SOURCE TEST REPORT
2021 COMPLIANCE TESTING

FORD MOTOR COMPANY
FLAT ROCK, MICHIGAN

COATING OPERATIONS

Prepared For:

Ford Motor Company - Flat Rock Assembly Plant
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Flat Rock, MI 48134

For Submittal To:

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ACCREDITED
TO ASTM D3518 ONLY
CERT #1925.01

MONTROSE
AIR QUALITY SERVICES

REVIEW AND CERTIFICATION

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

Signature: David Trahan Date: 02 / 01 / 2022

Name: David Trahan Title: Field Project Manager

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

Signature: Matthew Libman Date: 02 / 01 / 2022

Name: Matt Libman Title: Logistics Manager

EXECUTIVE SUMMARY

Ford Motor Company - Environmental Quality Office contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on the Regenerative Catalytic Oxidizers (RCOs) and Regenerative Thermal Oxidizer (RTO) (FGCONTROLS) serving EU-Ecoat, EU-Guidecoat, EU-Topcoat at the Ford Motor Company - Flat Rock Assembly Plant facility (State Registration No.: N0929) located in Flat Rock, Michigan. Testing was performed on December 7, 2021, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit No. MI-ROP-N0929-2018.

Testing at each of the EU-Ecoat, EU-Guidecoat, and EU-Topcoat sampling locations consisted of three 60-minute VOC test runs.

TABLE 1
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
FG-CONTROLS
DECEMBER 7, 2021

Parameter/Units	Total Results	Emission Limits
RCO Exhaust Flow Weighted VOC, as propane		
ppmvw	10.4	5
RCO VOC Destruction Efficiency (DE)		
%	80.2	--
RTO VOC (TGO) Destruction Efficiency (DE)		
%	97.8	--
Overall VOC Destruction Efficiency (DE)		
%	82.9	--

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1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

Ford Motor Company - Environmental Quality Office contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on the Regenerative Catalytic Oxidizers (RCOs) and Regenerative Thermal Oxidizer (RTO) (FGCONTROLS) serving EU-Ecoat, EU-Guidecoat, EU-Topcoat at the Ford Motor Company - Flat Rock Assembly Plant facility (State Registration No.: N0929) located in Flat Rock, Michigan. Testing was performed on December 7, 2021, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit No. MI-ROP-N0929-2018.

The specific objectives were to:

- Verify the flow-weighted concentration of volatile organic compound (VOC), as propane, for the RCO Exhausts
- Determine the volatile organic compound (VOC) destruction efficiency (DE) of the RCOs serving EU-Guidecoat and EU-Topcoat
- Determine the VOC (TGO) DE of the RTO serving EU-Ecoat, EU-Guidecoat and EU-Topcoat ovens
- Determine the Overall VOC (TGO) DE of the FG-CONTROLS serving EU-Ecoat, EU-Guidecoat, and EU-Topcoat
- Conduct the test program with a focus on safety

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

TABLE 1-1
FG-CONTROLS SUMMARY OF TEST PROGRAM

Test Dates	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
12/7/2021	RCO Combined Inlet	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	7-12
12/7/2021	RCO Combined Inlet	Moisture	EPA 4	1	30
12/7/2021	RCO Combined Inlet	VOC (TGO)	EPA 25A	3	60
12/7/2021	RCO Combined Inlet	CH_4, C_2H_6	EPA 18	3	60

TABLE 1-1
FG-CONTROLS SUMMARY OF TEST PROGRAM (CONTINUED)

12/7/2021	RCO A, B, C Exhausts	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	5-11
12/7/2021	RCO A, B, C Exhausts	O_2, CO_2	EPA 3	3	30-44
12/7/2021	RCO A Exhaust	Moisture	EPA 4	1	30
12/7/2021	RCO B Exhaust	Moisture	EPA 4	1	30
12/7/2021	RCO C Exhaust	Moisture	EPA 4	1	44
12/7/2021	RCO A, B, C Exhausts	VOC (TGO)	EPA 25A	3	60
12/7/2021	RCO A, B, C Exhausts	CH_4, C_2H_6	EPA 18	3	60
12/7/2021	RTO Inlet/Exhaust	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	5-20
12/7/2021	RTO Inlet/Exhaust	O_2, CO_2	EPA 3	1	35 (Inlet) 30 (Exhaust)
12/7/2021	RTO Inlet/Exhaust	Moisture	EPA 4	1	35 (Inlet) 30 (Exhaust)
12/7/2021	RTO Inlet/Exhaust	VOC (TGO)	EPA 25A	3	60

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

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to their respective permit limits in Table 1-2. Detailed results for individual test runs can be found in Section 5.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-2. The tests were conducted according to the test plan (protocol) that was received by the EGLE July 20, 2021 and approved on October 7, 2021.

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	Ford Motor Company - Flat Rock Assembly Plant 1 International Drive Flat Rock, MI 48134	
Project Contact:	Susan Hicks	Katie Ernst
Title	Senior Environmental Engineer	Environmental Engineer
Company:	Ford Motor Company - Environmental Quality Office	Ford Motor Company - Flat Rock Assembly Plant
Telephone:	313-594-3185	248-496-4353
Email:	shicks3@ford.com	kholcom3@ford.com

Agency Information

Regulatory Agency:	EGLE	
Agency Contact:	Matthew Karl	Jonathan Lamb
Telephone:	517-282-2126	313-348-2527
Email:	karlm@michigan.gov	lambj1@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	Matt Libman	David Trahan
Title:	Logistics Manager	Field Project Manager
Telephone:	630-625-2114	248-548-8070
Email:	mlibman@montrose-env.com	dtrahan@montrose-env.com

Laboratory Information

Laboratory:	Montrose Air Quality Services, LLC
City, State:	Elk Grove, IL 60007
Method:	EPA Method 18

Test personnel and observers are summarized in Table 1-2.

TABLE 1-2
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
David Trahan	Montrose	Field Project Manager, QI
Brandon Check	Montrose	Client Project Manager, QI
Matt Libman	Montrose	Logistics Manager, QI
Brian Romani	Montrose	Field Project Manager, QI
Shawn Jaworski	Montrose	Senior Field Technician, QI
Mike Nummer	Montrose	Field Technician
David Kaponen	Montrose	Field Technician
Conner Malroney	Montrose	Field Technician
Jeremy Devries	Montrose	Field Technician
Dakota Gauf	Montrose	Field Technician
Susan Hicks	Ford Motor Company	Observer/Client Liaison/Test Coordinator
Katie Ernst	Ford Motor Company	Observer
Jon Lamb	EGLE	Observer
Matt Karl	EGLE	Observer

2.0 SUMMARY OF RESULTS

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to EGLE Permit No. MI-ROP-N0929-2018. Detailed results for individual test runs can be found in Section 5.0. All supporting data (including process data) can be found in the appendices.

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

TABLE 2-1
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
FG-CONTROLS
DECEMBER 7, 2021

Parameter/Units	Total Results	Emission Limits
RCO Exhaust Flow Weighted VOC, as propane		
ppmvw	10.4	5
RCO VOC Destruction Efficiency (DE)		
%	80.2	--
RTO VOC (TGO) Destruction Efficiency (DE)		
%	97.8	--
Overall VOC Destruction Efficiency (DE)		
%	82.9	--

3.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

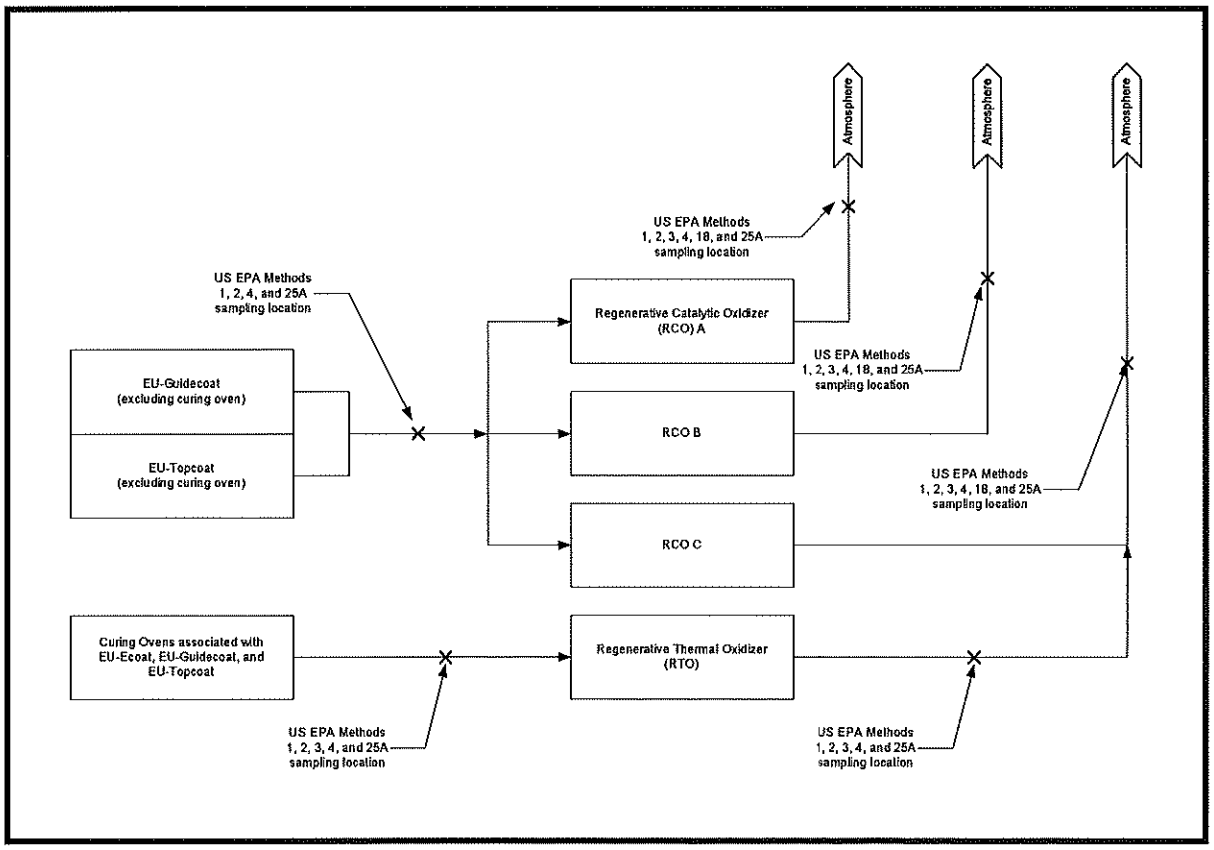
3.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The Ford Motor Company Flat Rock Assembly Plant's coating operations includes the electrocoating of vehicle bodies (EU-Ecoat), the application of EU-Guidecoat includes colored primer. EU-Topcoat includes the application of basecoat and clearcoat coatings. Emissions from EU-Guidecoat and EU-Topcoat were controlled by three regenerative catalytic oxidizers (RCOs). Emissions from EU-Ecoat, EU-Guidecoat and EU-Topcoat ovens are controlled by a regenerative thermal oxidizer (RTO).

The RCO A, RCO B, RCO C, and RTO (FG-CONTROLS) and emission units EU-Ecoat, EU-Guidecoat, and EU-Topcoat were in operation during this test event.

The sampling location schematic is displayed in Figure 3-1.

FIGURE 3-1
FGCONTROLS SAMPLING LOCATION SCHEMATIC



3.2 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while the source/units and air pollution control devices were operating at the conditions required by the permit. The units were tested when operating normally.

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

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

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

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

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

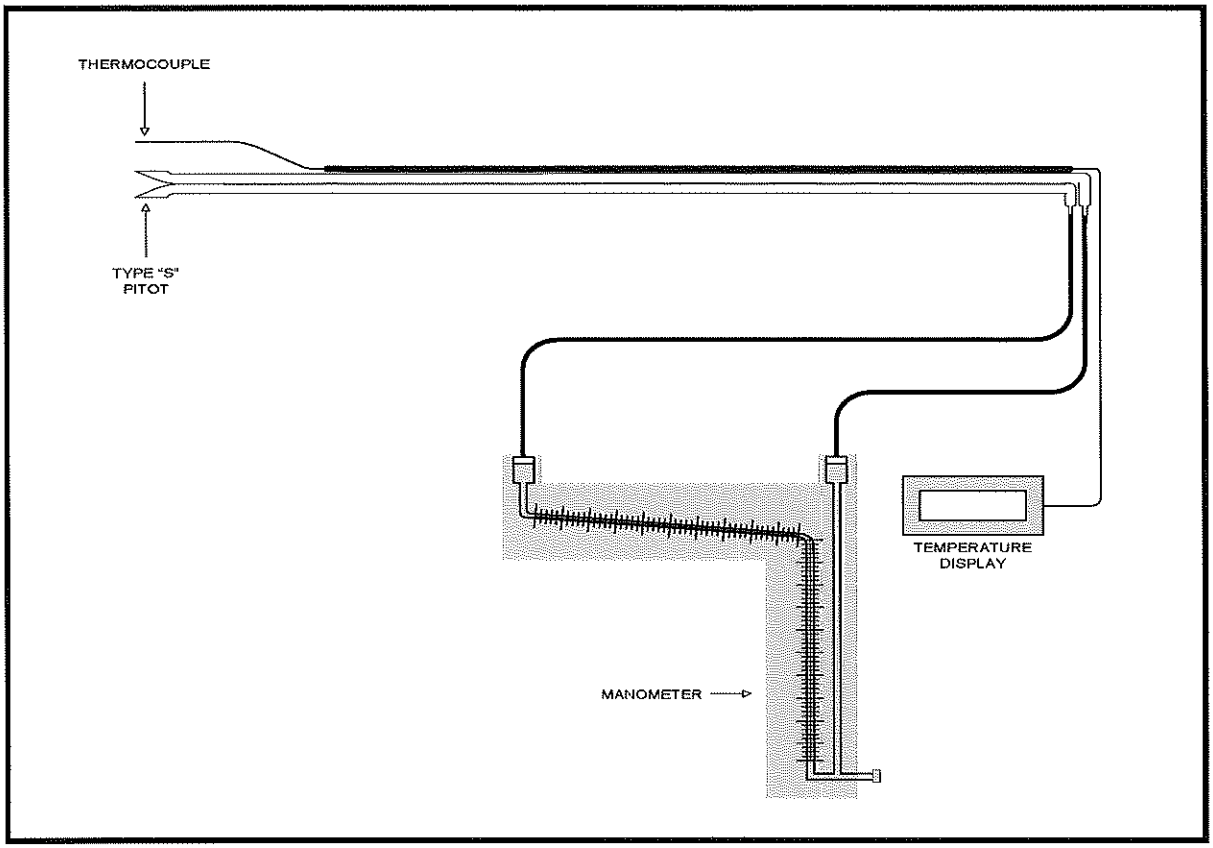
The sample port and traverse point locations are detailed in Appendix A.

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

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stausscheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1.

The sampling system is detailed in Figure 4-1

FIGURE 4-1
US EPA METHOD 2 SAMPLING SYSTEM



4.1.3 EPA Method 3, Gas Analysis for the Determination of Dry Molecular Weight

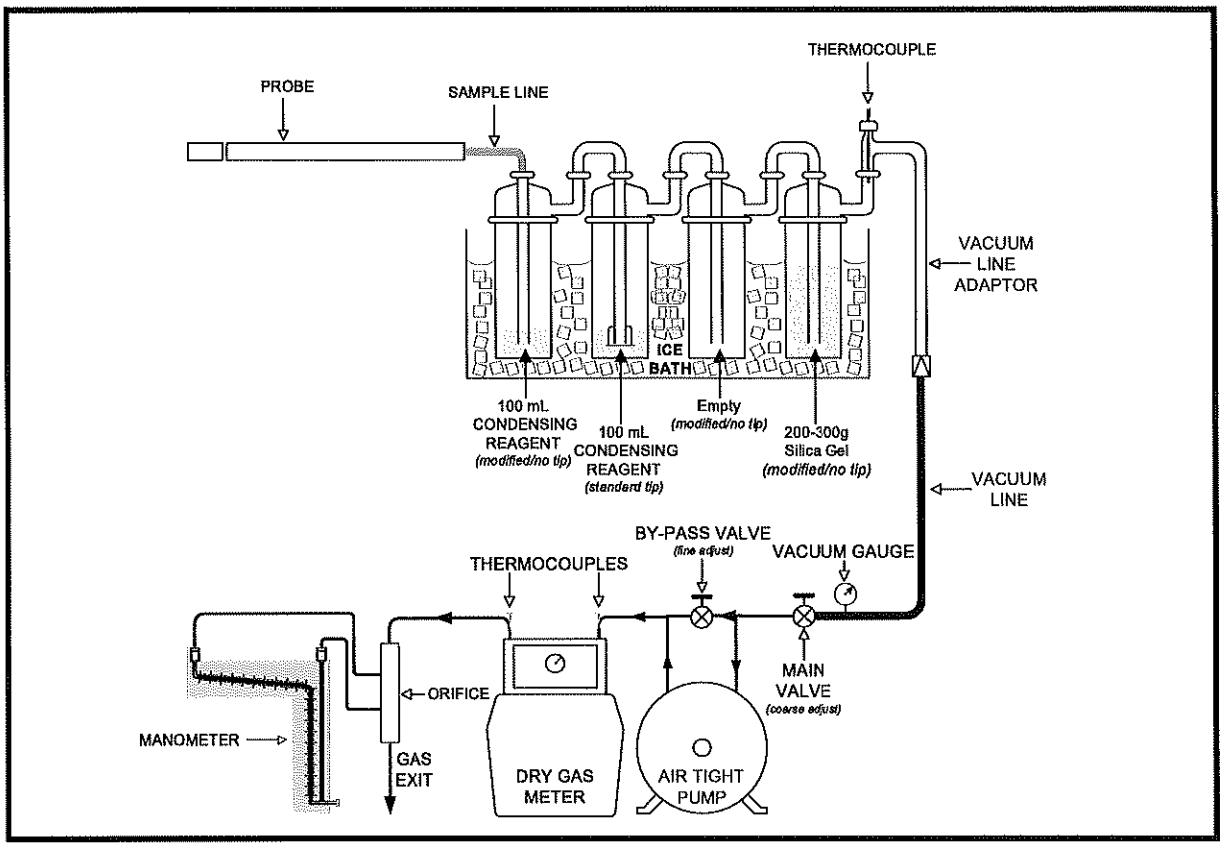
EPA Method 3 is used to calculate the dry molecular weight of the stack gas using one of three methods. The first choice is to measure the percent O_2 and CO_2 in the gas stream. A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent CO_2 and percent O_2 using either an Orsat or a Fyrite analyzer.

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

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

The typical sampling system is detailed in Figure 4-2.

FIGURE 4-2
US EPA METHOD 4 (DETACHED) SAMPLING TRAIN



4.1.5 EPA Method 18, Measurement of Gaseous Organic Compound Emissions by Gas Chromatography

EPA Method 18 is used to measure gaseous organic compounds from stationary sources. The major organic components of a gas mixture are separated by gas chromatography (GC) and are individually quantified using a flame ionization detector (FID), photoionization detector (PID), electron capture detector (ECD), or other appropriate detection principles. The retention times of each separated component are compared with those of known compounds under identical conditions.

The sampling system (RCO locations) is detailed in Figure 4-4.

4.1.6 EPA Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

EPA Method 25A is an instrumental test method used to measure the concentration of THC in stack gas. A gas sample is extracted from the source through a heated sample line and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

The sampling system is detailed in Figures 4-3 and 4-4.

FIGURE 4-3
EPA METHOD 25A SAMPLING TRAIN

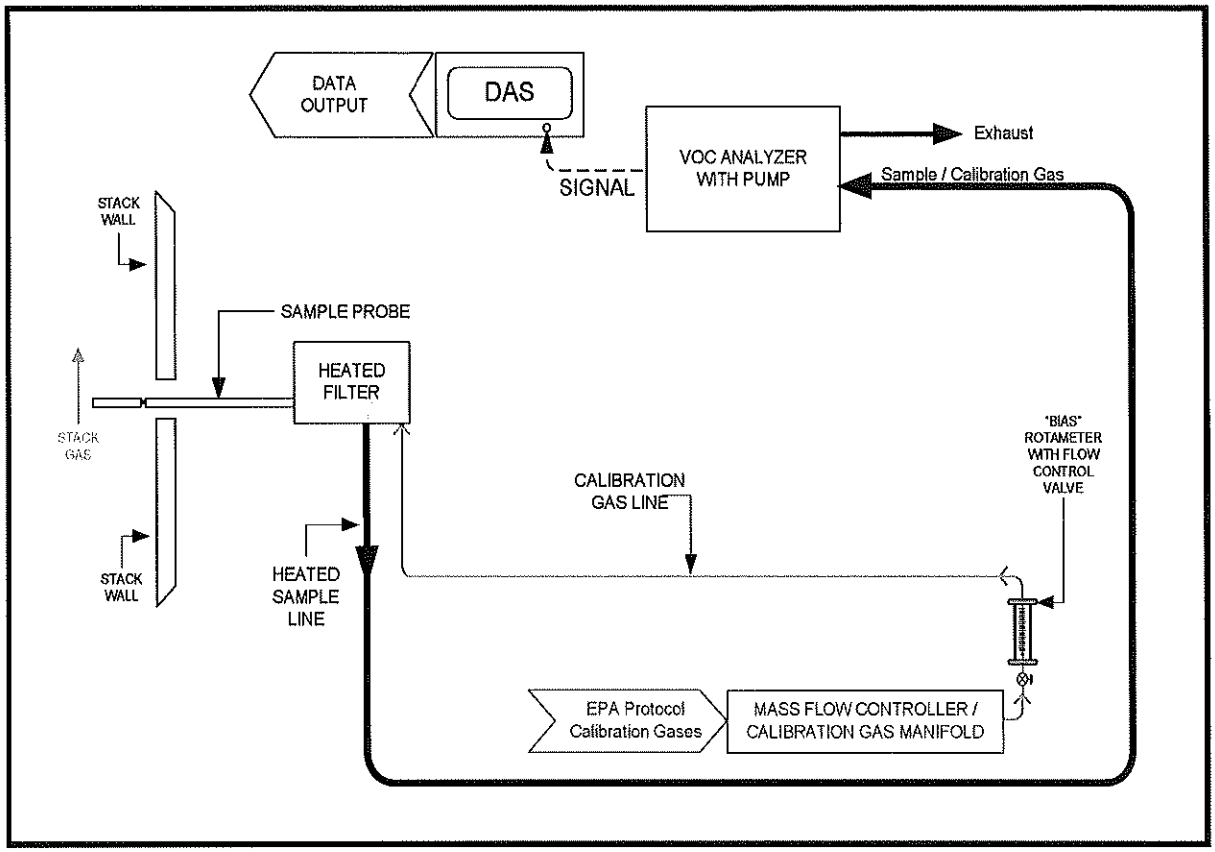
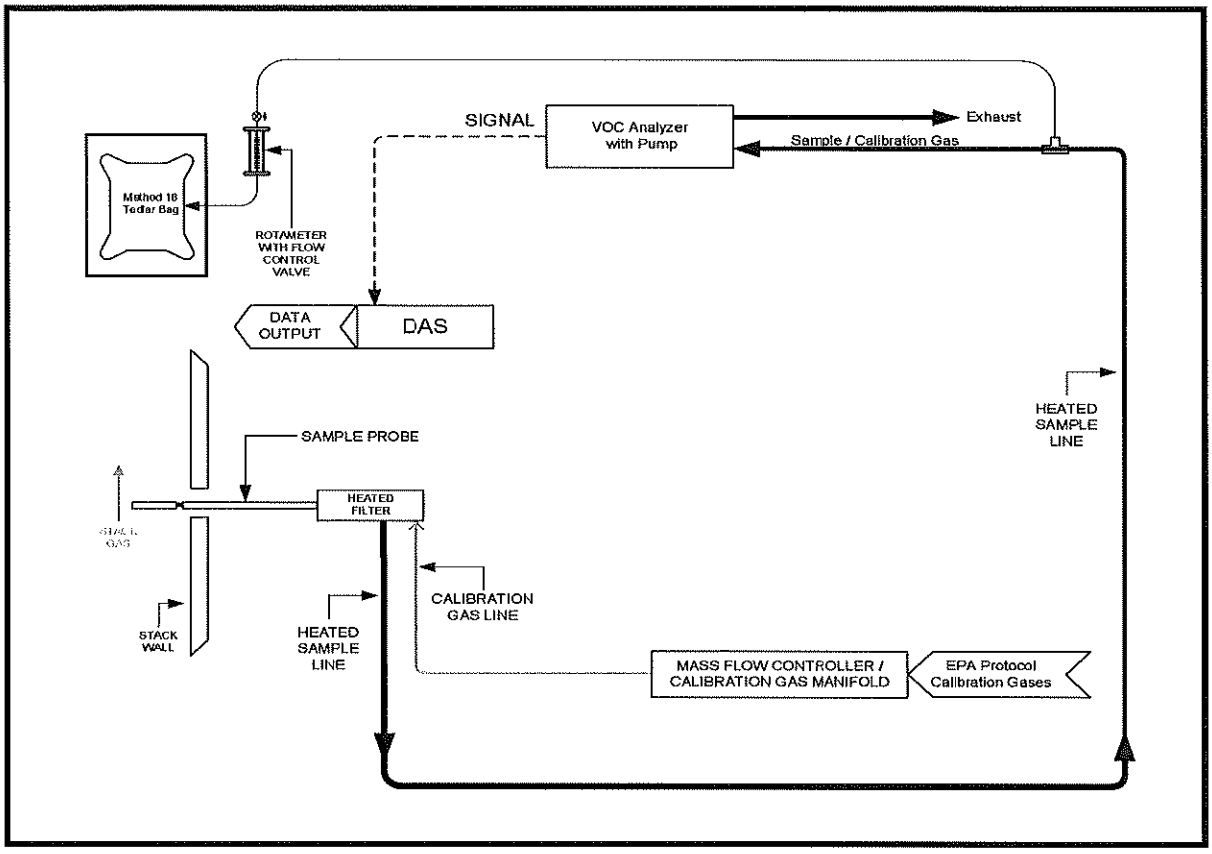


FIGURE 4-4
EPA METHOD 25A AND 18-BAG (CH_4/C_2H_6) SAMPLING TRAIN



4.2 FLUE GAS SAMPLING LOCATIONS

Information regarding the sampling locations is presented in Table 4-1.

TABLE 4-1
SAMPLING LOCATIONS

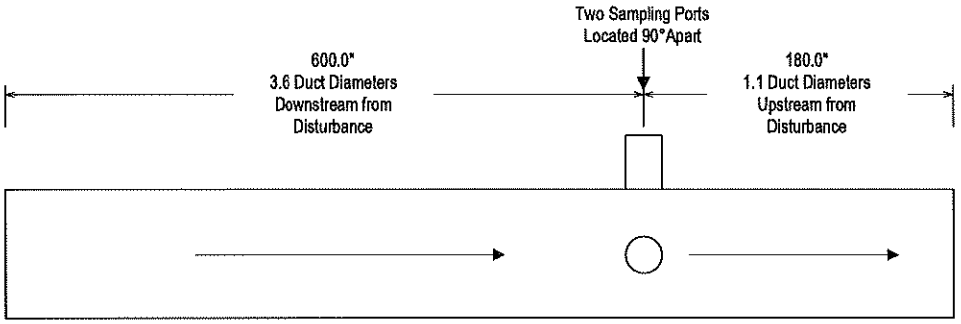
Sampling Location	Stack Inside Dimensions (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
RCO A Exhaust Stack	107.0	420 / 3.9	960 / 9.0	Flow:16 (8/port); Moisture/Gaseous: 1
RCO B Exhaust Stack	107.0	420 / 3.9	960 / 9.0	Flow:16 (8/port); Moisture/Gaseous: 1
RCO C Exhaust Stack	107.0	420 / 3.9	960 / 9.0	Flow:16 (8/port); Moisture/Gaseous: 1
RCO Combined Inlet Duct	168.0	600 / 3.6	180 / 1.1	Flow:16 (8/port); Moisture/Gaseous: 1
RTO Inlet Duct	50	234 / 4.7	234 / 4.7	Run 1 Flow: 20 (10/port); Run 2 Flow: 16 (8/port); Run 3 Flow: 16 (8/port); Moisture/Gaseous: 1
RTO Exhaust Duct	46.0 X 42.0	90 / 2.0	170 / 3.9	Run 1 Flow: 27 (9/port); Run 2 Flow: 18 (6/port); Run 3 Flow: 18 (6/port); Moisture/Gaseous: 1

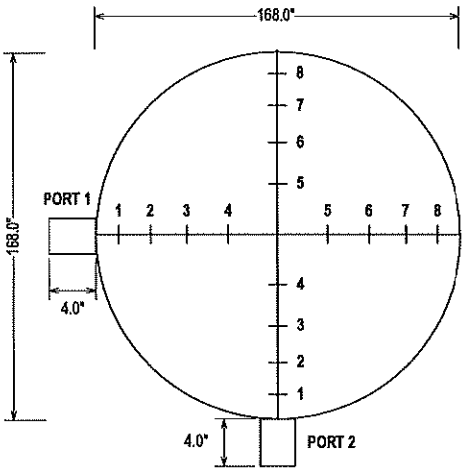
Sample locations were verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions were confirmed prior to testing using EPA Method 1, Section 11.4. See Appendices A.1 through A. 6 for more information. The traverse point location drawings for each sampling location are located in Figures 4-5 through 4-10.

4.3 PROCESS TEST METHODS

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

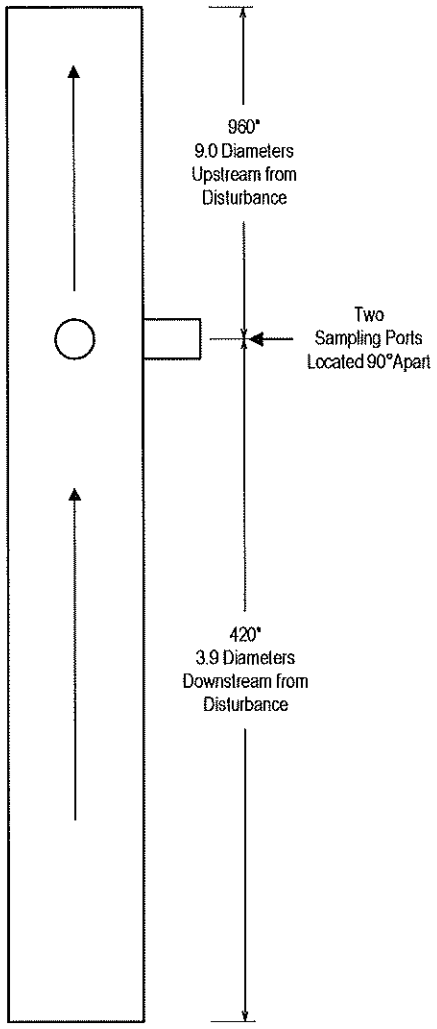
FIGURE 4-5
RCO COMBINED INLET DUCT FLOW TRAVERSE

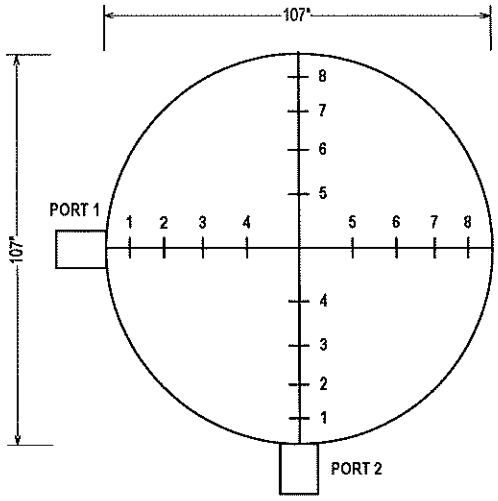




Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	3.2	5.4	5.4
2	10.5	17.6	17.6
3	19.4	32.6	32.6
4	32.3	54.3	54.3
5	67.7	113.7	113.7
6	80.6	135.4	135.4
7	89.5	150.4	150.4
8	96.8	162.6	162.6

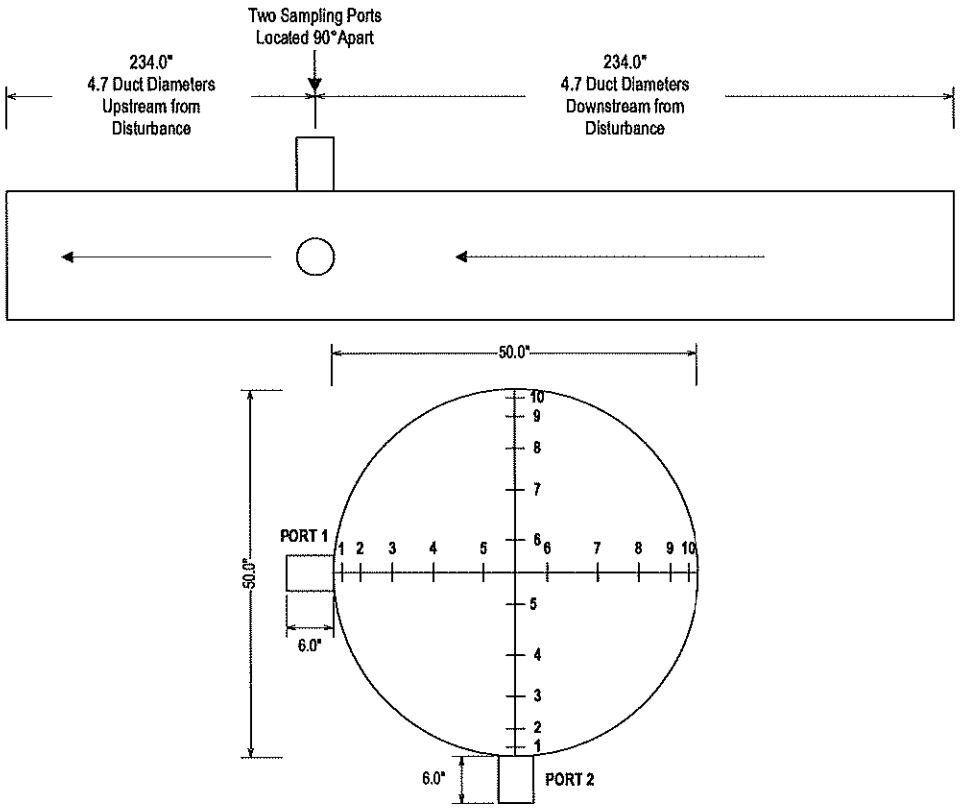
FIGURE 4-6
RCO A, B, AND C EXHAUST STACKS FLOW TRAVERSES





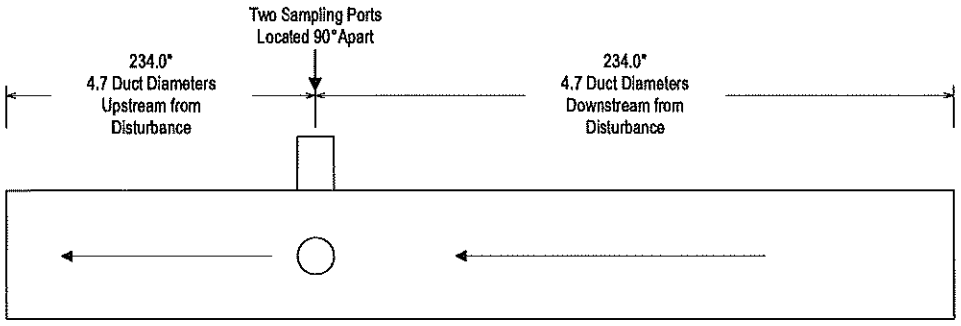
Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	3.2	3.4	3.4
2	10.5	11.2	11.2
3	19.4	20.8	20.8
4	32.3	34.6	34.6
5	67.7	72.4	72.4
6	80.6	86.2	86.2
7	89.5	95.8	95.8
8	96.8	103.6	103.6

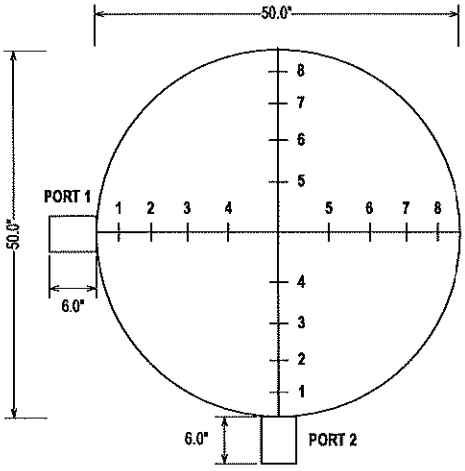
FIGURE 4-7
RTO INLET DUCT FLOW TRAVERSE-RUN 1



Point	% of Duct Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	2.6	1.3	1.3
2	8.2	4.1	4.1
3	14.6	7.3	7.3
4	22.6	11.3	11.3
5	34.2	17.1	17.1
6	65.8	32.9	32.9
7	77.4	38.7	38.7
8	85.4	42.7	42.7
9	91.8	45.9	45.9
10	97.4	48.7	48.7

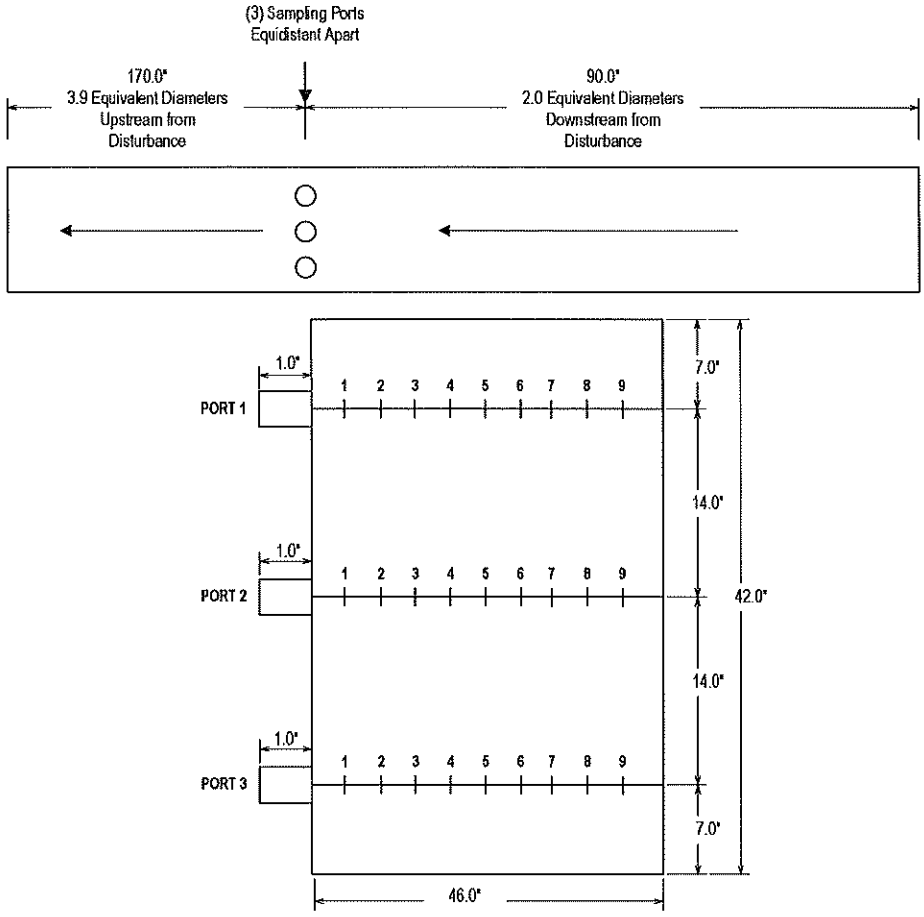
FIGURE 4-8
RTO INLET DUCT FLOW TRAVERSE-RUNS 2 AND 3





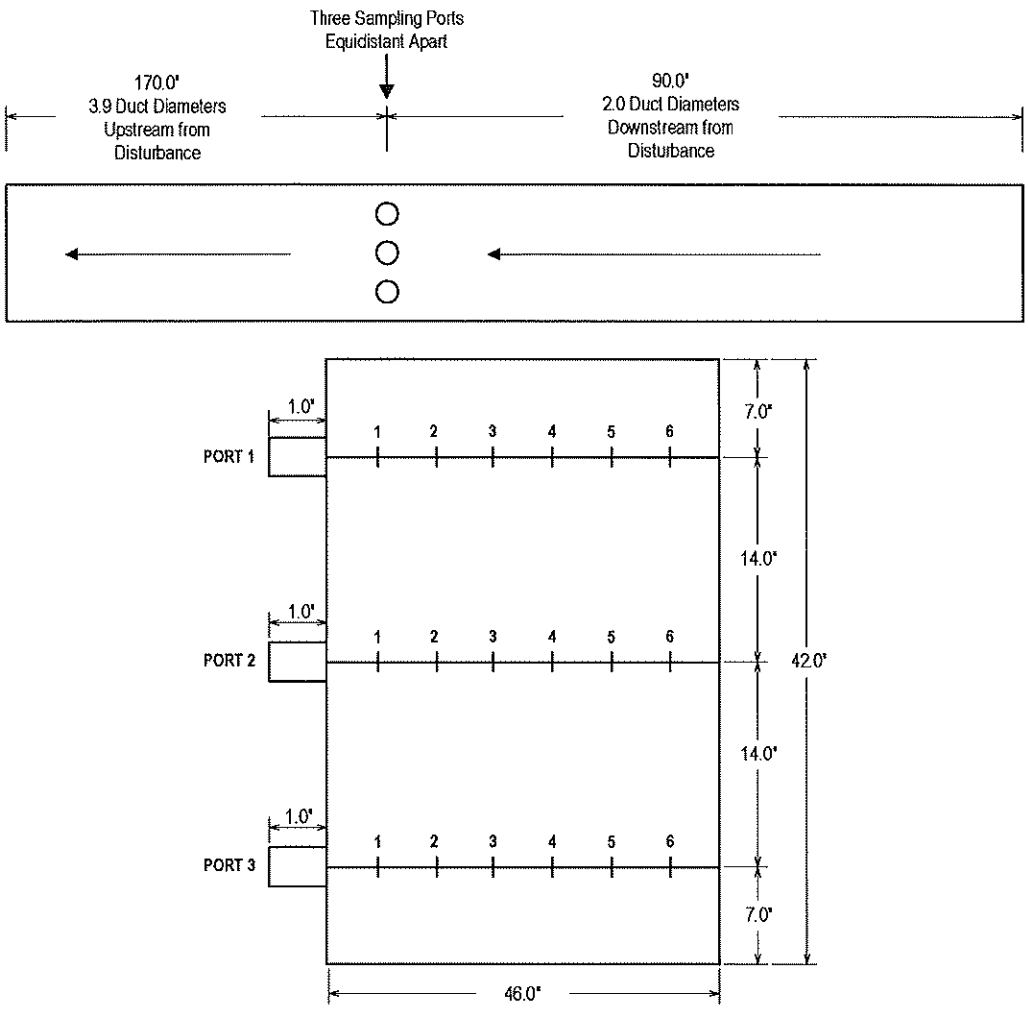
Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	3.2	1.6	1.6
2	10.5	5.3	5.3
3	19.4	9.7	9.7
4	32.3	16.2	16.2
5	67.7	33.9	33.9
6	80.6	40.3	40.3
7	89.5	44.8	44.8
8	96.8	48.4	48.4

FIGURE 4-9
RTO EXHAUST DUCT FLOW TRAVERSE-RUN 1



Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2	Distance from Inside Wall (in.) PORT 3
1	5.6	2.6	2.6	2.6
2	16.7	7.7	7.7	7.7
3	27.8	12.8	12.8	12.8
4	38.9	17.9	17.9	17.9
5	50.0	23.0	23.0	23.0
6	61.1	28.1	28.1	28.1
7	72.2	33.2	33.2	33.2
8	83.3	38.3	38.3	38.3
9	94.4	43.4	43.4	43.4

FIGURE 4-10
RTO EXHAUST DUCT FLOW TRAVERSE-RUNS 2 AND 3



Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2	Distance from Inside Wall (in.) PORT 3
1	8.3	3.8	3.8	3.8
2	25.0	11.5	11.5	11.5
3	41.7	19.2	19.2	19.2
4	58.3	26.8	26.8	26.8
5	75.0	34.5	34.5	34.5
6	91.7	42.2	42.2	42.2

5.0 TEST DISCUSSION AND RESULTS

5.1 FIELD TEST DEVIATIONS AND EXCEPTIONS

The sample volume for the single moisture run performed at the RCO Combined Inlet Duct was slightly less than the 0.60 scm (21 scf) requirement of EPA Method 4, Section 8.1.1.2. It is the opinion of MAQS that this sample volume deficiency had little to no impact on the moisture content measured at the RCO Combined Inlet Duct.

Due to high sample train vacuum, constant rate sampling for the single moisture run performed at the RTO Inlet Duct could not be maintained as required by EPA Method 4, Section 6.1.4. Its is the opinion of MAQS that the non-constant sampling rate had little to no impact on the moisture content measured at the RTO Inlet Duct.

5.2 PRESENTATION OF RESULTS

The average results are compared to the permit limits in Table 2-1. The results of individual compliance test runs performed are presented in Tables 5-1 through 5-8. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

At the RCO Combined Inlet a dry molecular weight of 29.0 g/g-mole (EPA Method 2, Section 8.6) was applied to each concentration run since the processes were considered to emit essentially ambient air.

TABLE 5-1
RCO AND RTO VOC EMISSIONS AND DE RESULTS -

Run Number	1	2	3	Average
Process Data				
RCO A temperature, °F	1149	1150	1150	1149
RCO B temperature, °F	1319	1320	1321	1320
RCO C temperature, °F	1114	1112	1105	1110
RTO temperature, °F	1464	1458	1468	1463
VOC, as propane				
RCO A Exhaust Stack, lb/hr	12.6	11.7	7.5	10.6
RCO B Exhaust Stack, lb/hr	5.2	7.9	5.2	6.1
RCO C Exhaust Stack, lb/hr	14.2	14.2	12.1	13.5
VOC (TGO), as propane				
RCO A/B/C Inlet Duct, lb/hr	168.9	131.2	155.8	152.0
RTO-Inlet Duct, lb/hr	23.0	32.0	22.2	25.7
RTO-Exhaust Duct, lb/hr	0.67	0.70	0.33	0.57
RCO VOC Destruction Efficiency (DE)				
%	81.4	74.7	84.3	80.2
RTO VOC (TGO) Destruction Efficiency (DE)				
%	97.1	97.8	98.5	97.8
Overall VOC Destruction Efficiency (DE)				
%	83.3	79.3	86.1	82.9

TABLE 5-2
RCO FLOW-WEIGHTED VOC CONCENTRATION RESULTS -

Run Number	1	2	3	Average
RCO Exhaust Stacks Volumetric Flowrate				
RCO A flow rate, scfm	136,132	137,056	135,808	136,332
RCO B flow rate, scfm	126,257	125,996	128,863	127,038
RCO C flow rate, scfm	156,526	159,296	154,497	156,773
RCO A, B, C combined flow rate, scfm	418,914	422,347	419,168	420,143
RCO Exhaust Stacks VOC, as propane				
RCO A, ppmvw	13.3	12.3	7.8	11.1
RCO B, ppmvw	5.9	9.1	5.9	7.0
RCO C, ppmvw	13.1	12.9	11.3	12.4
Flow-Weighted VOC, as propane				
ppmvw	11.0	11.6	8.5	10.4

TABLE 5-3
VOC EMISSIONS RESULTS -
RCO A EXHAUST STACK

Run Number	1	2	3	Average
Date	12/7/2021	12/7/2021	12/7/2021	--
Time*	7:10-8:10	9:15-10:15	11:45-15:00	--
Flue Gas Parameters				
O_2, % volume dry	21.0	21.0	21.0	21.0
CO_2, % volume dry	0.0	0.0	0.0	0.0
flue gas temperature, °F	157.1	159.3	157.3	157.9
moisture content, % volume	2.44	2.44	2.44	2.44
volumetric flow rate, scfm	136,132	137,056	135,808	136,332
TGO, as propane				
ppmvw	53.7	54.0	50.0	52.5
Methane				
ppmvw, as methane	82.3	85.3	86.3	84.6
response factor	2.17	2.17	2.17	2.17
ppmvw, as propane	37.9	39.3	39.8	39.0
Ethane				
ppmvw, as ethane	3.53	3.49	3.49	3.50
response factor	1.48	1.48	1.48	1.48
ppmvw, as propane	2.39	2.36	2.36	2.37
VOC, as propane				
ppmvw	13.3	12.3	7.8	11.1
lb/hr	12.6	11.7	7.5	10.6

* Sampling was paused during Run 3 from 12:05-14:20 due to production delays.

TABLE 5-4
VOC EMISSIONS RESULTS -
RCO B EXHAUST STACK

Run Number	1	2	3	Average
Date	12/7/2021	12/7/2021	12/7/2021	--
Time*	7:10-8:10	9:15-10:15	11:45-15:00	--
Flue Gas Parameters				
O_2, % volume dry	21.0	21.0	21.0	21.0
CO_2, % volume dry	0.0	0.0	0.0	0.0
flue gas temperature, °F	160.1	160.9	162.6	161.2
moisture content, % volume	2.22	2.22	2.22	2.22
volumetric flow rate, scfm	126,257	125,996	128,863	127,038
TGO, as propane				
ppmvw	25.0	25.9	23.2	24.7
Methane				
ppmvw, as methane	40.8	35.9	37.4	38.0
response factor	2.34	2.34	2.34	2.34
ppmvw, as propane	17.4	15.3	15.9	16.2
Ethane				
ppmvw, as ethane	2.49	2.19	2.08	2.25
response factor	1.48	1.48	1.48	1.48
ppmvw, as propane	1.68	1.48	1.41	1.52
VOC, as propane				
ppmvw	5.9	9.1	5.9	7.0
lb/hr	5.2	7.9	5.2	6.1

* Sampling was paused during Run 3 from 12:05-14:20 due to production delays.

TABLE 5-5
VOC EMISSIONS RESULTS -
RCO C EXHAUST STACK

Run Number	1	2	3	Average
Date	12/7/2021	12/7/2021	12/7/2021	--
Time*	7:10-8:10	9:15-10:15	11:45-15:00	--
Flue Gas Parameters				
O_2, % volume dry	21.0	21.0	21.0	21.0
CO_2, % volume dry	0.0	0.0	0.0	0.0
flue gas temperature, °F	163.1	160.4	166.3	163.3
moisture content, % volume	2.95	2.95	2.95	2.95
volumetric flow rate, scfm	156,526	159,296	154,497	156,773
TGO, as propane				
ppmvw	25.0	25.1	23.1	24.4
Methane				
ppmvw, as methane	31.4	32.1	31.3	31.6
response factor	2.83	2.83	2.83	2.83
ppmvw, as propane	11.1	11.3	11.0	11.1
Ethane				
ppmvw, as ethane	1.22	1.25	1.21	1.23
response factor	1.48	1.48	1.48	1.48
ppmvw, as propane	0.82	0.84	0.82	0.83
VOC, as propane				
ppmvw	13.1	12.9	11.3	12.4
lb/hr	14.2	14.2	12.1	13.5

* Sampling was paused during Run 3 from 12:05-14:20 due to production delays.

TABLE 5-6
VOC (TGO) EMISSIONS RESULTS -
RCO COMBINED INLET DUCT

Run Number	1	2	3	Average
Date	12/7/2021	12/7/2021	12/7/2021	--
Time*	7:10-8:10	9:15-10:15	11:45-15:00	--
Flue Gas Parameters				
flue gas temperature, °F	60.5	61.4	61.3	61.0
moisture content, % volume	1.15	1.15	1.15	1.15
volumetric flow rate, scfm	351,544	345,407	353,439	350,130
TGO, as propane				
ppmvw	88.3	73.4	82.2	81.3
Methane				
ppmvw, as methane	47.1	46.4	46.2	46.6
response factor	2.86	2.86	2.86	2.86
ppmvw, as propane	16.5	16.2	16.2	16.3
Ethane				
ppmvw, as ethane	2.52	2.52	2.50	2.51
response factor	1.48	1.48	1.48	1.48
ppmvw, as propane	1.70	1.70	1.69	1.70
VOC, as propane				
ppmvw	70.1	55.5	64.4	63.3
lb/hr	168.9	131.2	155.8	152.0

* Sampling was paused during Run 3 from 12:05-14:20 due to production delays.

TABLE 5-7
VOC (TGO) EMISSIONS RESULTS -
RTO INLET DUCT

Run Number	1	2	3	Average
Date	12/7/2021	12/7/2021	12/7/2021	--
Time*	7:10-8:10	9:15-10:15	11:45-15:00	--
Flue Gas Parameters				
O_2, % volume dry	19.5	19.5	19.5	19.5
CO_2, % volume dry	0.0	0.0	0.0	0.0
flue gas temperature, °F	225.1	232.8	224.0	227.3
moisture content, % volume	0.99	0.99	0.99	0.99
volumetric flow rate, scfm	25,206	26,578	27,746	26,510
VOC (TGO), as propane				
ppmvw	132.8	175.4	116.5	141.6
lb/hr	23.0	32.0	22.2	25.7

* Sampling was paused during Run 3 from 12:05-14:20 due to production delays.

TABLE 5-8
VOC EMISSIONS RESULTS -
RTO EXHAUST DUCT

Run Number	1	2	3	Average
Date	12/7/2021	12/7/2021	12/7/2021	--
Time*	7:10-8:10	9:15-10:15	11:45-15:00	--
Flue Gas Parameters				
O_2, % volume dry	19.7	19.7	19.7	19.7
CO_2, % volume dry	1.0	1.0	1.0	1.0
flue gas temperature, °F	325.7	318.0	314.3	319.3
moisture content, % volume	1.14	1.14	1.14	1.14
volumetric flow rate, scfm	28,129	28,549	29,247	28,642
VOC (TGO), as propane				
ppmvw	3.46	3.58	1.64	2.89
lb/hr	0.67	0.70	0.33	0.57

* Sampling was paused during Run 3 from 12:05-14:20 due to production delays.

5.3 QA/QC AUDITS

The meter boxes and sampling trains used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes and minimum sample durations met the applicable QA/QC criteria. Except for sampling at the RCO Combined Inlet Duct and the RTO Inlet Duct. See Section 5.4 for details.

EPA Method 18 analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met.

EPA Method 25A FIA calibration audits were within the measurement system performance specifications for the calibration drift checks and calibration error checks.

An EPA Method 205 field evaluation of the calibration gas dilution system was conducted. The dilution accuracy and precision QA specifications were met.

5.4 QA/QC DISCUSSION

The EPA Method 4 sampling train at the RCO Combined Inlet duct did not meet the minimum sample volume requirement of the method. See Section 5.1 for details.

The EPA Method 4 sampling train at the RTO Inlet duct did not sample at a constant sample rate as required by the method. See Section 5.1 for details.

5.5 QUALITY STATEMENT

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