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**Source Test Report for
2023 PEMS RAA Testing**

**Regenerative Thermal Oxidizer and Heat Recovery
Steam Generator (EU-RTO&HRSG)**

**Marysville Ethanol, LLC
Marysville, Michigan**

Prepared For:

**Marysville Ethanol, LLC
2512 Busha Highway
Marysville, MI 48040**

Prepared By:

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Submittal Date: October 4, 2023

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:



Date:

October 3, 2023

Name:

John Nestor

Title:

District Manager

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1.0 Introduction

1.1 Summary of Test Program

Marysville Ethanol, LLC (State Registration No.: N7493) contracted Montrose Air Quality Services, LLC (Montrose) to perform the Relative Accuracy Audit (RAA) for the Predictive Emission Monitoring Systems (PEMS) associated with the Regenerative Thermal Oxidizer and Heat Recovery Steam Generator (EU-RTO&HRSG) at the Marysville Ethanol, LLC facility located in Marysville, Michigan. Testing was performed on August 7, 2023, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit-to-Install No. 175-05D by evaluating the quality of the emissions data produced by Marysville Ethanol, LLC's PEMS in accordance with 40 CFR Part 60, Appendices B and F.

The specific objectives were to:

- Verify the relative accuracy of nitrogen oxides (NO_x) (lb/MMBtu) (as NO₂), NO_x (ppm), and O₂ (% as O₂) in accordance with Performance Specification 16 (PS-16)
- 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
Summary of Test Program

Test Date	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
8/7/2023	EU-RTO& HRSG	O ₂	EPA 3A	3	30
8/7/2023	EU-RTO& HRSG	NO _x	EPA 7E	3	30

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.

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 RA test results are summarized and compared to their respective regulatory requirements in Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-3.

Table 1-2
Summary of Part 60 RAA Results – EU-RTO&HRSG
August 7, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 60			
Oxygen (O₂)			
% volume dry	PS-16	0.3	1.0% as O ₂
Nitrogen Oxides (NO_x)			
ppmvd	PS-16	3.89	± 20% of RM
lb/MMBtu	PS-16	1.71	± 20% of RM

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location: Marysville Ethanol, LLC
 2512 Busha Highway
 Marysville, MI 48040

Project Contact: Aric Metevia
 Role: Plant Manager

Company: Marysville Ethanol, LLC
 Telephone: 810-479-8277

Email: ametevia@marysvilleethanol.com

Susan Jack
 Production Manager
 Marysville Ethanol, LLC
 810-479-8266

sjack@marysvilleethanol.com

Testing Company Information

Testing Firm: Montrose Air Quality Services, LLC

Contact: John Nestor

Title: District Manager

Telephone: 248-765-5032

Email: jonestor@montrose-env.com

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Test personnel and observers are summarized in Table 1-3.

Table 1-3
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
John Nestor	Montrose	Client Project Manager, QI
Shane Rabideau	Montrose	Field Technician
Susan Jack	Marysville Ethanol, LLC	Observer/Client Liaison/Test Coordinator

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

The Marysville Ethanol facility operates two natural gas fired 45 MMBtu/hr dryers and a 125 MMBtu/hr natural gas fired regenerative thermal oxidizer (RTO) with a heat recovery steam generator (HRSG). The RTO controls emissions from several emission units. Low-NOx combustors minimize the emissions of nitrogen oxides from the process. The EU-RTO&HRSG were in operation during this test event.

2.2 Facility PEMS and Reference Method (RM) CEMS Descriptions

The Facility PEMS information is presented in Table 2-1, and the RM CEMS analyzer information is presented in Table 2-2.

**Table 2-1
Facility PEMS Information**

Analyzer Type	Manufacturer	Model No.	Serial No.	Range
O ₂	CMC Solutions, LLC	TO/HRSG Stack Model	S10.65175	0-20%
NO _x	CMC Solutions, LLC	TO/HRSG Stack Model	S10.65175	0-100 ppm

**Table 2-2
RM CEMS Information**

Analyzer Type	Manufacturer	Model No.	Serial No.	Range
O ₂	Teledyne	T802	197	0-20.00%
NO _x	Teledyne	200H	727	0-90.73 ppm

2.3 Flue Gas Sampling Location

Information regarding the sampling location is presented in Table 2-3.

**Table 2-3
Sampling Location**

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EU-RTO& HRSG Stack (S-10)	83	360 / 4.3	780 / 9.4	Gaseous: 3

See Appendix A.1 for more information.

2.4 Operating Conditions and Process Data

The PEMS RAA was performed while the EU-RTO&HRSG was operating normally.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The Facility PEMS and process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- Facility PEMS data for each 30-minute RAA run
- Steam Flow, lb/hr
- Natural Gas Usage, MMBtu/hr

3.0 Sampling and Analytical Procedures

3.1 Test Methods

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

3.1.1 EPA Method 3A, Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 3A is an instrumental test method used to measure the concentration of O₂ and CO₂ in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentration of O₂ and CO₂. The performance requirements of the method must be met to validate data.

The typical sampling system is detailed in Figure 3-1.

3.1.2 EPA Method 7E, Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 7E is an instrumental test method used to continuously measure emissions of NO_x as NO₂. Conditioned gas is sent to an analyzer to measure the concentration of NO_x. NO and NO₂ can be measured separately or simultaneously together but, for the purposes of this method, NO_x is the sum of NO and NO₂. The performance requirements of the method must be met to validate the data.

The typical sampling system is detailed in Figure 3-1.

3.1.3 EPA Method 19, Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates

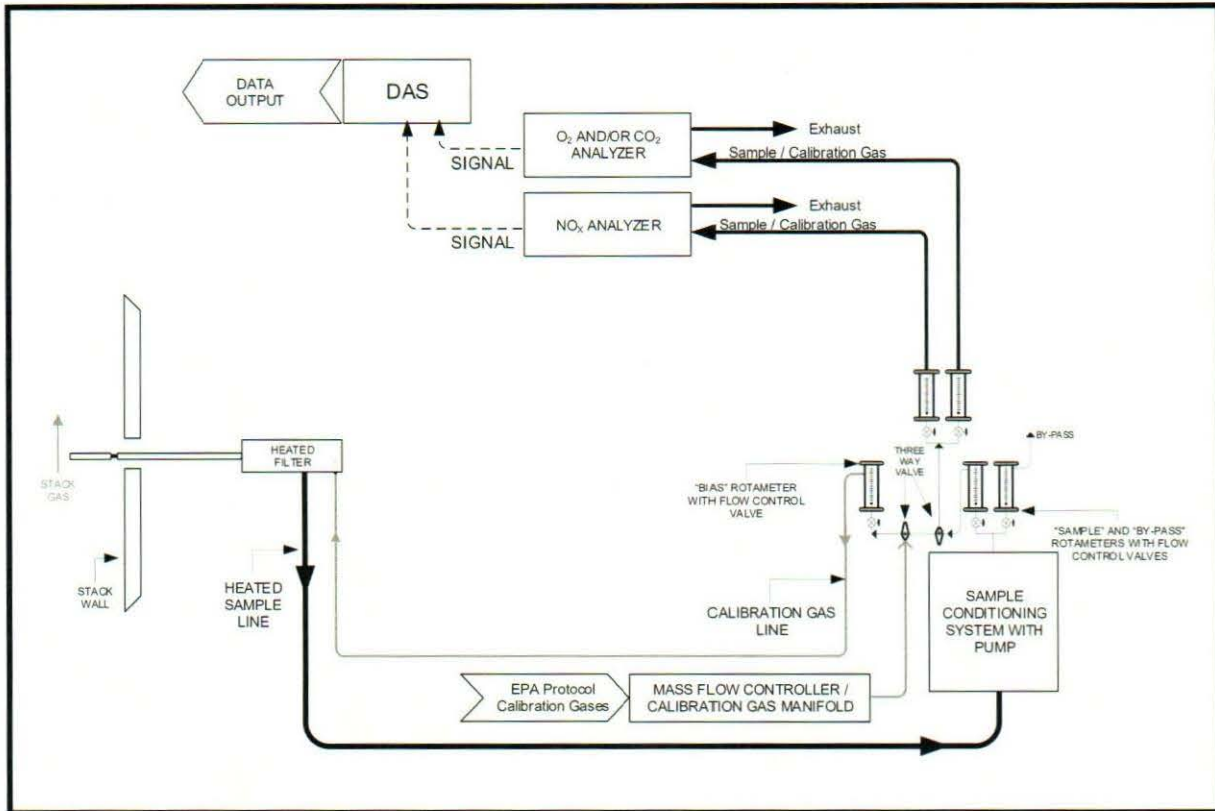
EPA Method 19 is used to calculate mass emission rates in units of lb/MMBtu. EPA Method 19, Table 19-2 contains a list of assigned fuel factors for different types of fuels, which can be used for these calculations.

3.1.4 EPA Performance Specification 16, Specifications and Test Procedures for Predictive Emission Monitoring Systems in Stationary Sources

EPA Performance Specification 16 is a specification used to evaluate the acceptability of Predictive Emission Monitoring Systems (PEMS) to show compliance with an emission limitation under 40 CFR 60, 61, or 63. These procedures are used to certify a PEMS after initial installation and periodically thereafter to ensure the system is operating properly and

meets the requirements of all applicable regulations. Ongoing QA/QC tests include sensor evaluation, bias correction, quarterly Relative Accuracy Audits (RAA), and annual Relative Accuracy Test Audits (RATA).

Figure 3-1
EPA Method 3A and 7E Sampling Train



3.2 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.

4.0 Test Discussion and Results

4.1 Field Test Deviations and Exceptions

No field deviations or exceptions from the test plan or test methods occurred during this test program.

4.2 Presentation of Results

The RAA results are compared to the regulatory requirements in Table 1-2. The results of individual test runs performed are presented in Tables 4-1 through 4-3. 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.

Table 4-1
NO_x (lb/MMBtu) RAA Results -
EU-RTO&HRSG

Run No.	Date	Time	RM	PEMS	Difference	Steam Flow (klb/hr)
1	8/7/2023	11:15-11:44	0.068	0.068	0.0002	101.9
2	8/7/2023	11:55-12:24	0.067	0.068	0.0014	102.1
3	8/7/2023	12:35-13:04	0.066	0.068	0.0018	101.5
Averages			0.065	0.067	0.0011	101.8
Unit Load			Normal			
RA based on mean RM value			1.71	%		

Table 4-2
NO_x (ppm) RAA Results -
EU-RTO&HRSG

Run No.	Date	Time	RM	PEMS	Difference	Steam Flow (klb/hr)
1	8/7/2023	11:15-11:44	51.055	52.157	1.102	101.9
2	8/7/2023	11:55-12:24	49.945	52.309	2.364	102.1
3	8/7/2023	12:35-13:04	49.665	52.058	2.393	101.5
Averages			50.222	52.175	1.9531	101.8
Unit Load			Normal			
RA based on mean RM value			3.89	%		

Table 4-3
O₂ (%-dry) RAA Results -
EU-RTO&HRSG

Run No.	Date	Time	RM	PEMS	Difference	Steam Flow (klb/hr)
1	8/7/2023	11:15-11:44	4.520	4.237	-0.283	101.9
2	8/7/2023	11:55-12:24	4.596	4.217	-0.379	102.1
3	8/7/2023	12:35-13:04	4.597	4.228	-0.369	101.5
Averages			4.571	4.227	-0.343	101.8
Unit Load			Normal			
RA based on mean difference			0.34	% as O ₂		

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

Table 5-1 presents a summary of the gas cylinder information.

Table 5-1
Part 60 Gas Cylinder Information

Gas Type	Gas Concentrations	Cylinder ID	Expiration Date
O ₂ , Balance N ₂	10.08%	EB0164485	4/20/2031
O ₂ , Balance N ₂	20.00%	CC469833	12/17/2029
NO _x , Balance N ₂	50.11 ppmv	CC11630	4/27/2031
NO _x , Balance N ₂	90.73 ppmv	SG9169048BAL	8/27/2030

EPA Method 3A and 7E calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

The NO₂ to NO converter efficiency check of the analyzer was conducted per the procedures in EPA Method 7E, Section 16.2. The conversion efficiency met the criteria of the method.

5.2 QA/QC Discussion

All QA/QC criteria were met during this test program.

5.3 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).



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Appendix A

Field Data and Calculations



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Appendix A.1

Sampling Locations

EU-RTO&HRSG SAMPLING LOCATION SCHEMATIC

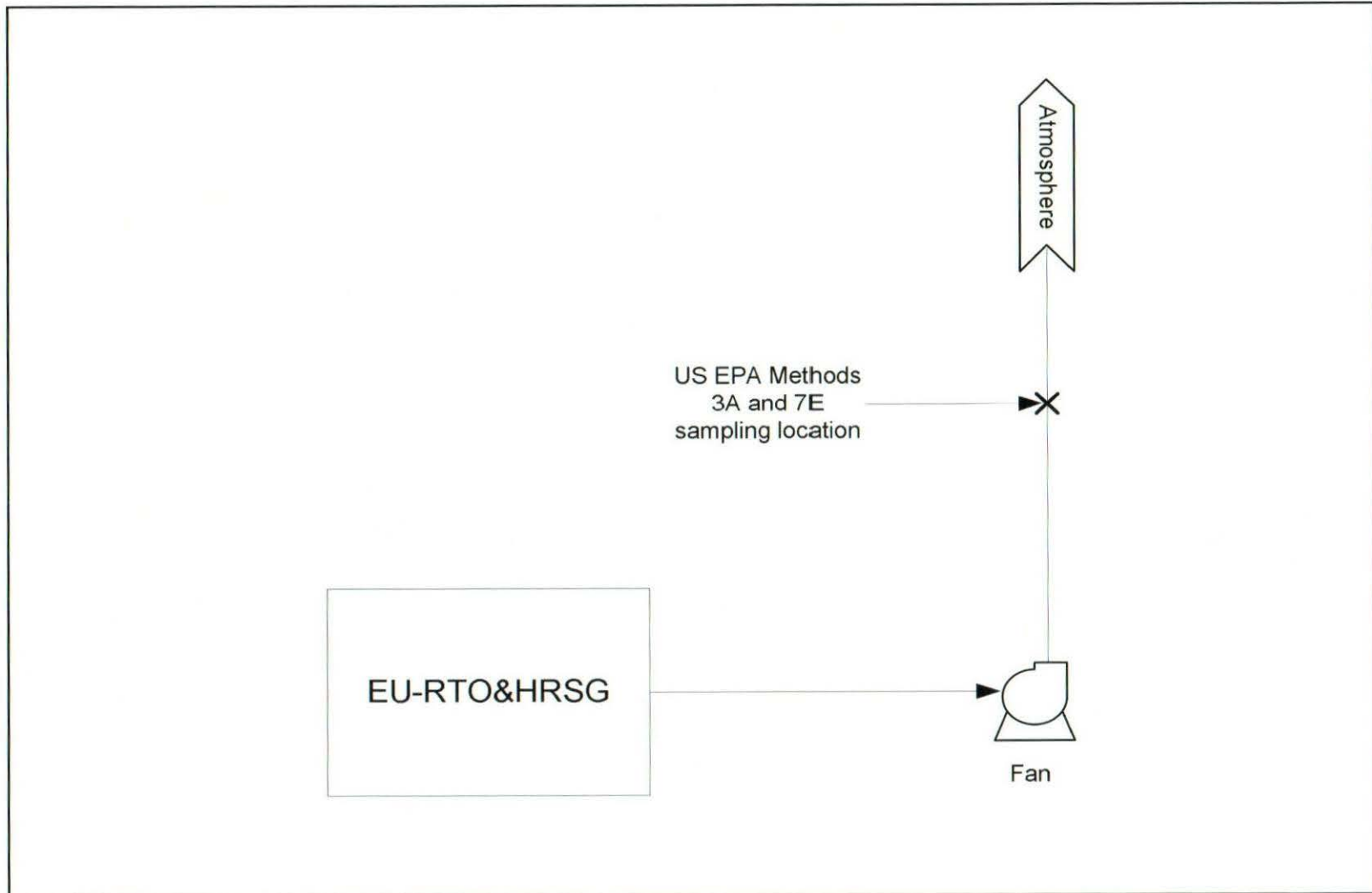
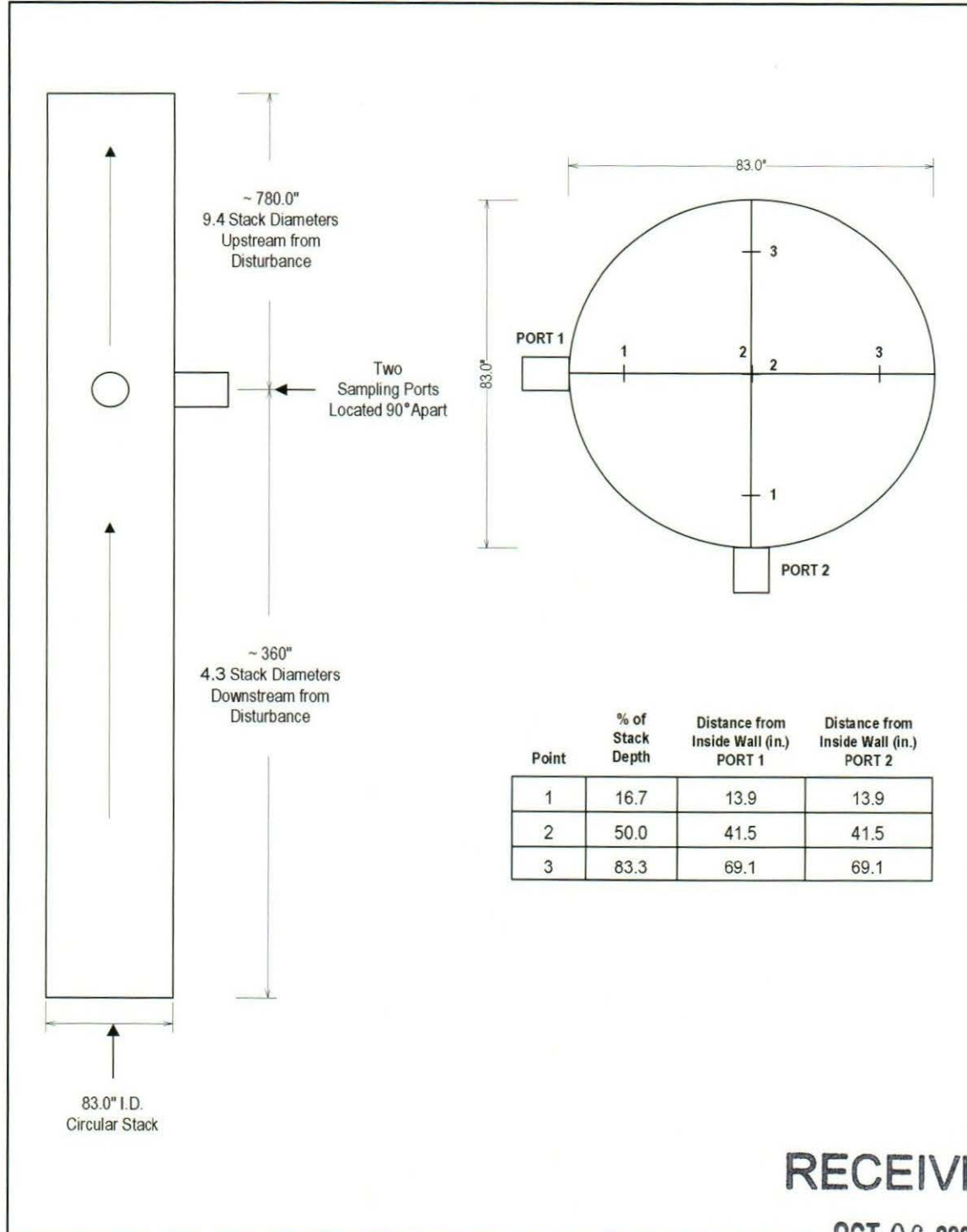


FIGURE 2.2V
EU-RTO&HRSG EXHAUST TRAVERSE POINT LOCATION DRAWING



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