

1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

R.L. Adams Plastics, Inc. (State Registration No.: N7221) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on the Polystyrene Foam Extrusion Lines (EUPRODUCTION) at the R.L. Adams Plastics, Inc. facility located in Wyoming, Michigan. Testing was performed on July 13, 2021, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operation Permit No. MI-ROP-N7221-2019a.

The specific objectives were to:

- Verify the emissions of volatile organic compounds (VOC) from the SVESTR1 exhaust stack serving EUPRODUCTION
- 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(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
7/13/2021	EUPRODUCTION Extrusion Line 1	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	5-15
7/13/2021	EUPRODUCTION Extrusion Line 1	O ₂ , CO ₂	EPA 3	3	1
7/13/2021	EUPRODUCTION Extrusion Line 1	Moisture	EPA 4 wb/db	3	1
7/13/2021	EUPRODUCTION Extrusion Lines 2 & 3	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	6-18
7/13/2021	EUPRODUCTION Extrusion Lines 2 & 3	O ₂ , CO ₂	EPA 3	3	1
7/13/2021	EUPRODUCTION Extrusion Lines 2 & 3	Moisture	EPA 4 wb/db	3	1
7/13/2021	EUPRODUCTION SVESTR1	THC	EPA 25A	3	61

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 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 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-3. The tests were conducted according to the Intent-to-Test notification dated May 25, 2021 that was submitted to the EGLE.

**TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
EUPRODUCTION
JULY 13, 2021**

Parameter/Units	Average Results	Emission Limits
Volatile Organic Compounds (VOC), as isopentane		
lb/hr	1.30	--
tons/yr	5.70	170

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location: R.L. Adams Plastics, Inc.
5955 Cross Roads Commerce
Wyoming, MI 49519

Project Contact: Sean Fey
Role: Director of Engineering
Company: R.L. Adams Plastics, Inc.
Telephone: 616-261-4400
Email: sfey@goadams.com

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Agency Information

Regulatory Agency:	EGLE	
Agency Contact:	Karen Kajiya-Mills	April Lazzaro
Telephone:	517-335-3122	616-558-1092
Email:	kajiya-millk@michigan.gov	LazzaroA1@michigan.gov
Agency Contact:	Matthew Karl	
Telephone:	517-282-2126	
Email:	KarlM@Michigan.gov	

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	Matthew Young	David Trahan
Title:	District Manager	Field Project Manager
Telephone:	248-548-8070	248-548-8070
Email:	myoung@montrose-env.com	dtrahan@montrose-env.com

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

**TABLE 1-3
TEST PERSONNEL AND OBSERVERS**

Name	Affiliation	Role/Responsibility
David Trahan	Montrose	Field Project Manager, G1 QI
Scott Dater	Montrose	Field Technician
Benjamin Durham	Montrose	Field Technician
Sean Fey	R.L. Adams Plastics, Inc.	Observer/Client Liaison/Test Coordinator
Matthew Karl	EGLE	Observer
April Lazzaro	EGLE	Observer



2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

R.L. Adams Plastics, Inc. manufactures art foam products. Laminate and plate stock are manufactured on the Polystyrene Foam Extrusion Lines (EUPRODUCTION). EUPRODUCTION includes four storage silos for storing the raw polystyrene pellets, one 12,000 gallon isopentane storage tank, one 6,634 gallon 1,1-difluoroethane storage tank, four extruders which combine the blowing agent with the polystyrene resin to create the polystyrene foam sheet stock, the preproduction storage area for storing the extruded rolls, two laminators, five thermoformers for making thermoformed finished products, and the finished product storage and shipping warehouse. Emissions are controlled by five baghouses. EUPRODUCTION was in operation for this test event, and testing was performed at the Extrusion Line 1 Duct, Extrusion Lines 2 and 3 Duct, and the uncontrolled SVESTR1 exhaust stack.

2.2 FLUE GAS SAMPLING LOCATIONS

Information regarding the sampling locations is presented in Table 2-1.

**TABLE 2-1
 SAMPLING LOCATIONS**

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EUPRODUCTION SVESTR1 Exhaust Stack	42	--	--	Gaseous: 1
EUPRODUCTION Extrusion Line 1 Duct	19.8	25.0 / 1.3	34.0 / 1.7	Flow: 16 (8/port)
EUPRODUCTION Extrusion Lines 2 and 3 Duct	26	97.0 / 3.7	30.0 / 1.2	Flow: 16 (8/port)

Because EUPRODUCTION SVESTR1 Exhaust Stack did not meet EPA Method 1 criteria, volumetric flow rate measurements were performed at the two ducts feeding into SVESTR1, the EUPRODUCTION Extrusion Line 1 Duct and the EUPRODUCTION Extrusion Lines 2 and 3 Duct.

The EUPRODUCTION Extrusion Lines 2 and 3 Duct sampling location was verified in the field to conform to EPA Method 1. However, the sampling location at the EUPRODUCTION Extrusion Line 1 Duct did not meet EPA Method 1, Section 11.1.1 criteria which requires that the sample ports be located at a position at least two stack diameters downstream and a half-diameter upstream from any flow disturbances. The sampling location at the EUPRODUCTION Extrusion Line 1 Duct was located 1.3 stack diameters downstream from the nearest flow disturbance.

Acceptable cyclonic flow conditions were confirmed at both flow locations prior to testing using EPA Method 1, Section 11.4. See Appendix A.1 for more information.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while Extrusion Lines 1-3 were operating at the production rates specified by EGLE and while using isopentane as the blowing agent for product production.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The process data that was provided to EGLE AQD, but confidentiality was requested by R. L. Adams due to the proprietary nature of the information. See Appendix B for more information.

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3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 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.

3.1.1 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.

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

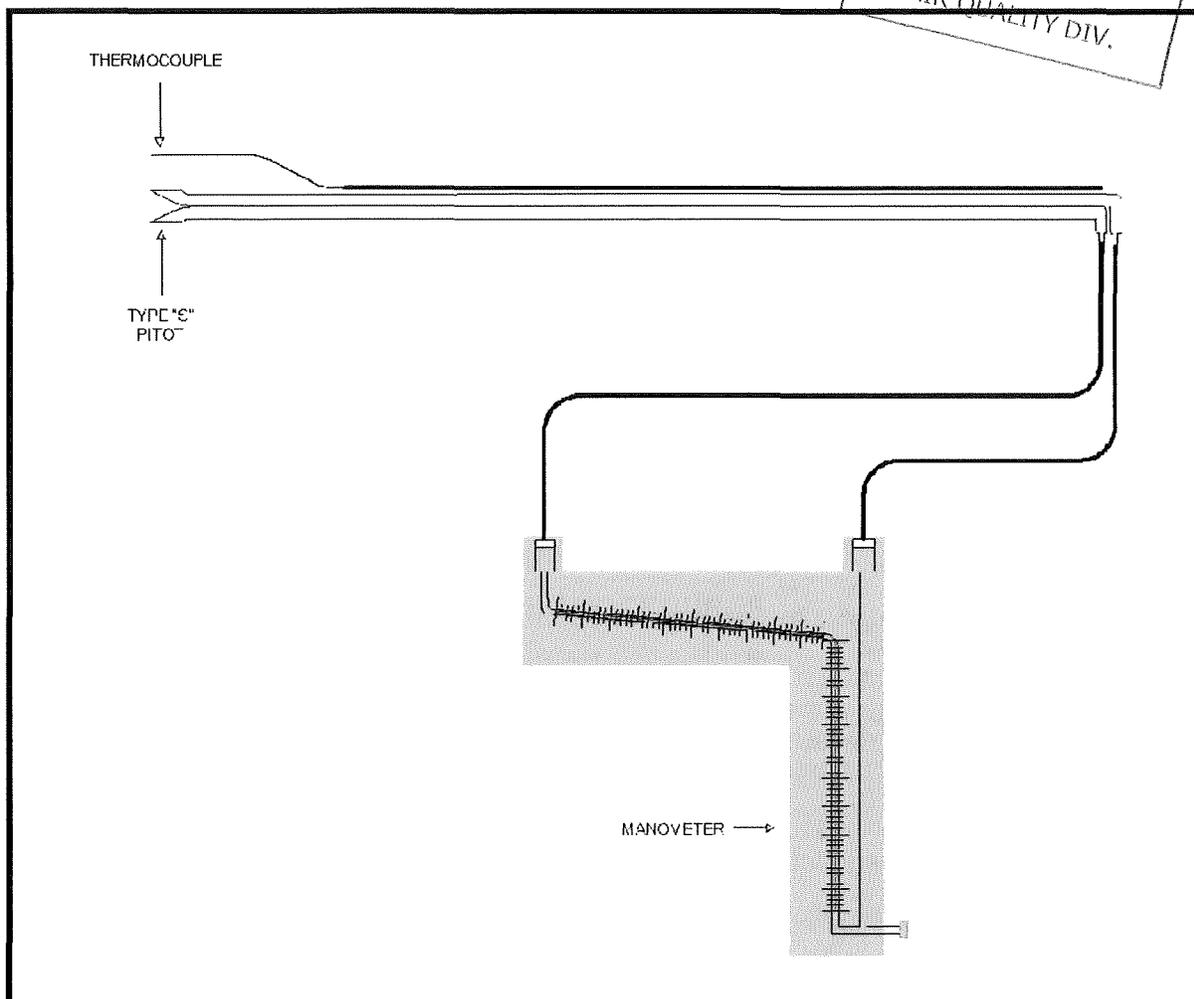
3.1.3 EPA Method 3, Gas Analysis for the Determination of Dry Molecular Weight

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 O₂ and CO₂ 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 CO₂ and percent O₂ using either an Orsat or a Fyrite analyzer. The second choice is to use stoichiometric calculations to calculate dry molecular weight. The third choice is to use an assigned value of 30.0, in lieu of actual measurements, for processes burning natural gas, coal, or oil.

The typical sampling system is detailed in Figure 3-2.

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FIGURE 3-1
EPA METHOD 2 SAMPLING TRAIN

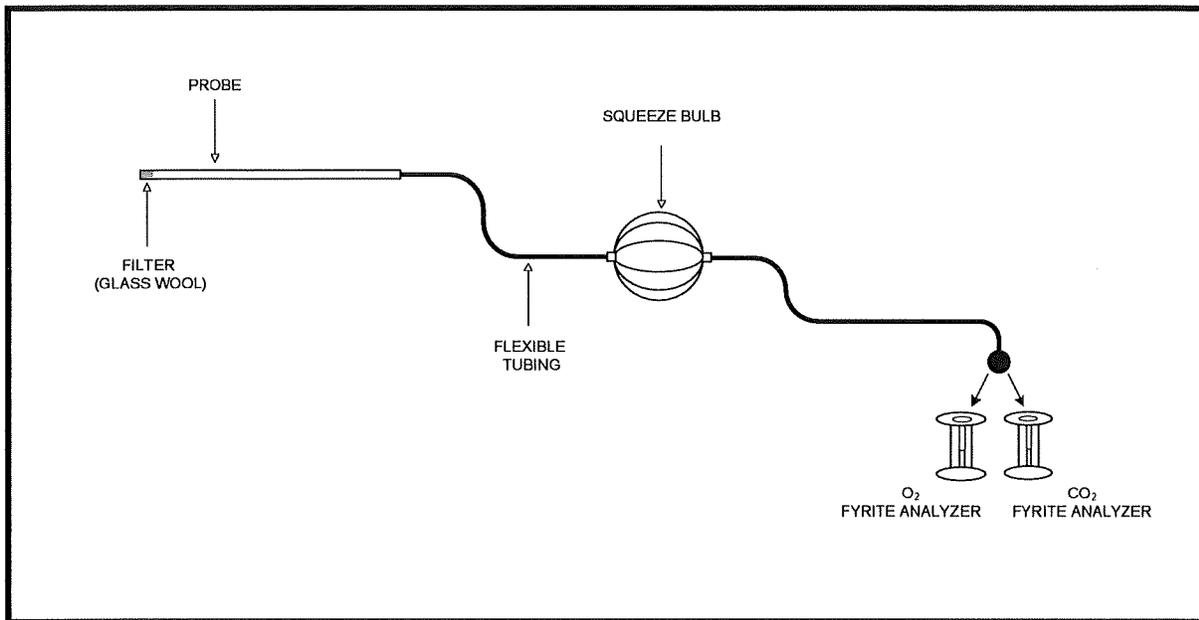


3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

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.

For this test, the EPA Method 4 wb/db Approximation Method was used. The approximate moisture content and relative humidity of the gas stream is measured with a sling psychrometer.

FIGURE 3-2
EPA METHOD 3 (FYRITE ANALYZER) SAMPLING TRAIN

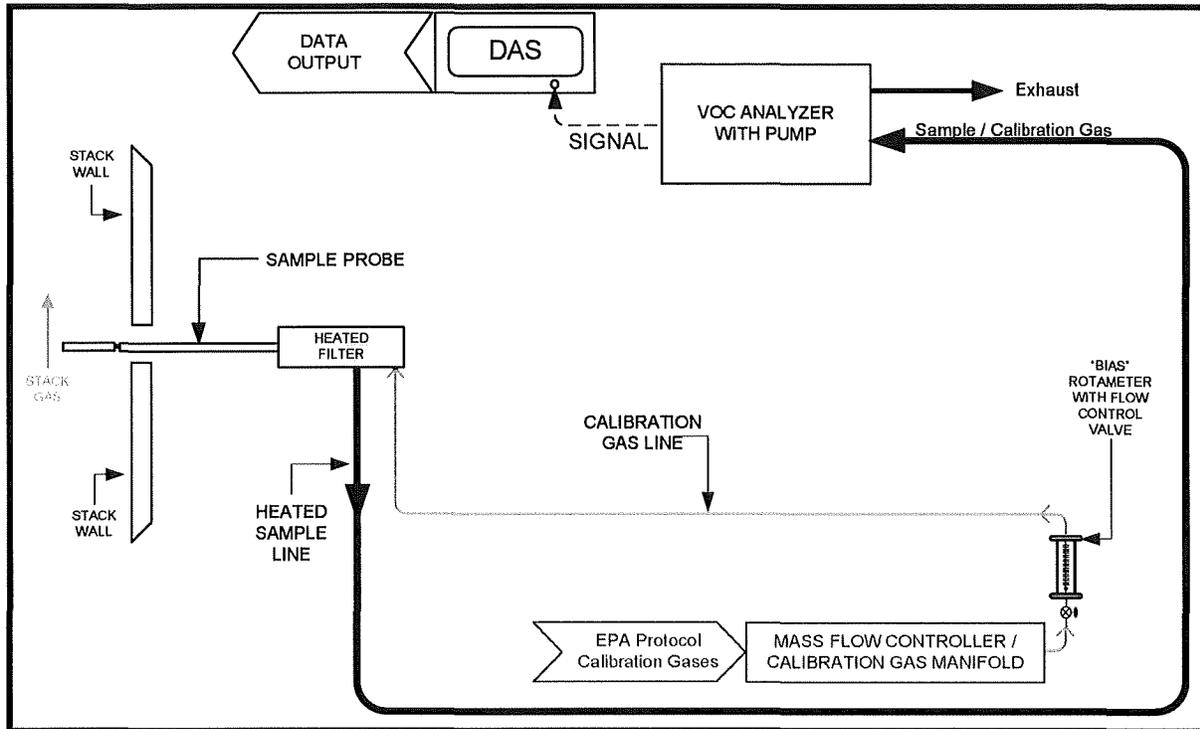


3.1.5 EPA Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

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 typical sampling system is detailed in Figure 3-3.

**FIGURE 3-3
EPA METHOD 25A 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

The sampling location at the EUPRODUCTION Extrusion Line 1 Duct did not meet EPA Method 1, Section 11.1.1 criteria. See Section 2.3 for details.

4.2 PRESENTATION OF RESULTS

The average results are compared to the permit limits in Table 1-2. The results of individual compliance 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.

Measured EUPRODUCTION SVESTR1 Exhaust Stack total gaseous organics (TGO) emissions (as propane) were converted (on a molecular weight basis) to VOC emissions (as isopentane).

**TABLE 4-1
 VOLUMETRIC FLOW RATE RESULTS -
 EXTRUSION LINE 1 DUCT**

Run Number	1	2	3	Average
Date	7/13/2021	7/13/2021	7/13/2021	--
Time	14:19-14:34	15:52-15:57	16:41-16:48	--
Flue Gas Parameters				
O ₂ , % volume dry	21.00	21.00	21.00	21.00
CO ₂ , % volume dry	0.00	0.00	0.00	0.00
flue gas temperature, °F	88.8	89.9	91.7	90.1
moisture content, % volume	2.87	2.58	2.65	2.70
volumetric flow rate, scfm	2,557	2,510	2,496	2,521

**TABLE 4-2
 VOLUMETRIC FLOW RATE RESULTS -
 EXTRUSION LINES 2 AND 3 DUCT**

Run Number	1	2	3	Average
Date	7/13/2021	7/13/2021	7/13/2021	--
Time	14:50-15:08	15:32-15:38	16:59-17:05	--
Flue Gas Parameters				
O ₂ , % volume dry	21.00	21.00	21.00	21.00
CO ₂ , % volume dry	0.00	0.00	0.00	0.00
flue gas temperature, °F	90.1	88.9	92.0	90.3
moisture content, % volume	3.01	3.15	2.80	2.99
volumetric flow rate, scfm	3,681	3,695	3,617	3,664

**TABLE 4-3
 VOC EMISSIONS RESULTS -
 EUPRODUCTION SVESTR1 EXHAUST STACK**

Run Number	1	2	3	Average
Date	7/13/2021	7/13/2021	7/13/2021	--
Time	14:14-15:15	15:30-16:31	16:40-17:41	--
Combined Extrusion Line Duct Flue Gas Parameters				
volumetric flow rate, scfm	6,237	6,205	6,113	6,185
Total Gaseous Organics (TGO), as Propane				
ppmvd	28.4	33.6	31.7	31.2
lb/hr	1.22	1.43	1.33	1.33
Volatile Organic Compounds (VOC), as Isopentane				
lb/hr	1.19	1.40	1.31	1.30
tons/yr	5.23	6.15	5.72	5.70

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5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

Fyrite analyzer audits were performed during this test in accordance with EPA Method 3, Section 10.1 requirements. The results were within $\pm 0.5\%$ of the respective audit gas concentrations.

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

5.2 QA/QC DISCUSSION

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

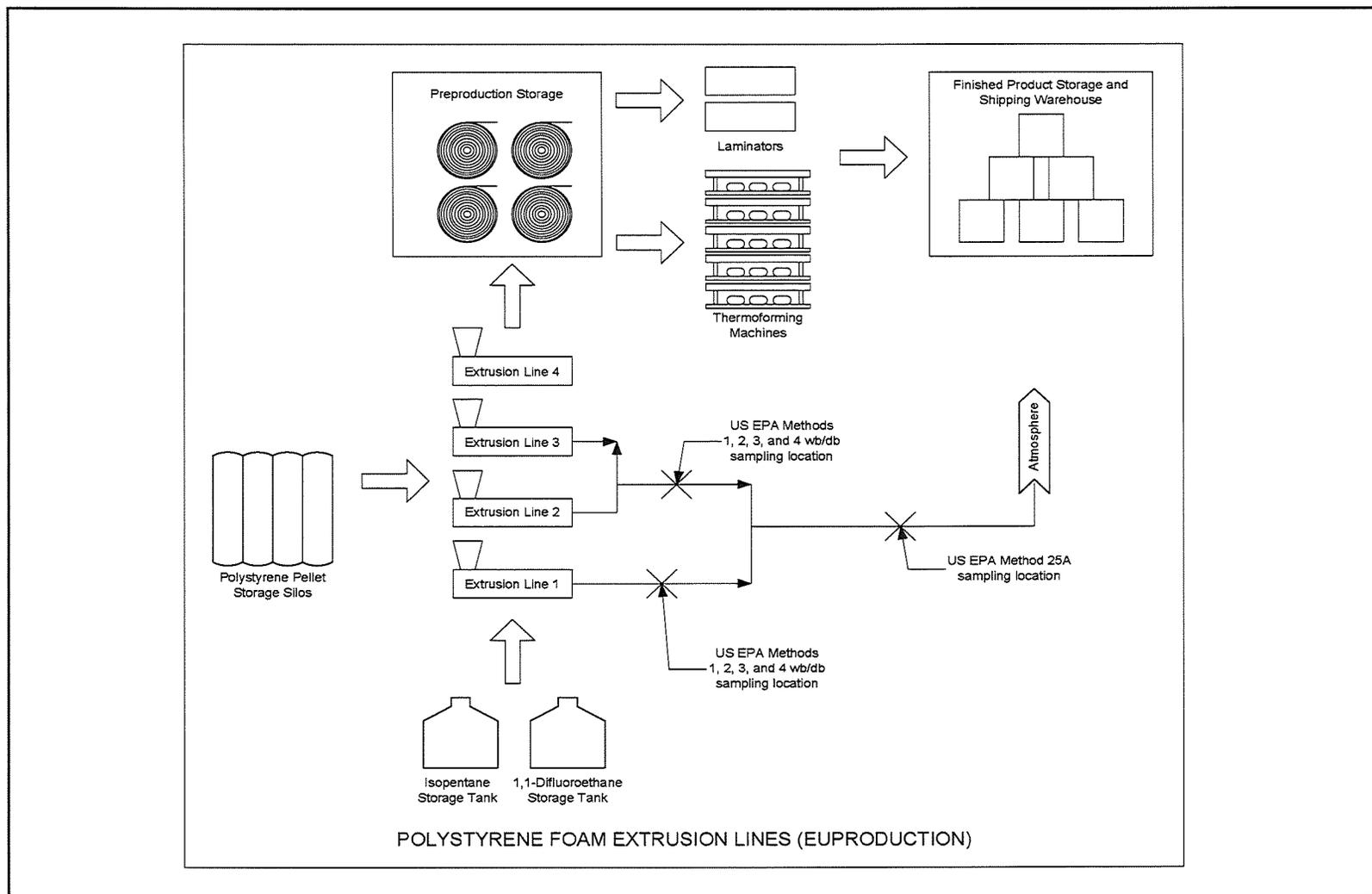
5.3 QUALITY STATEMENT

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).

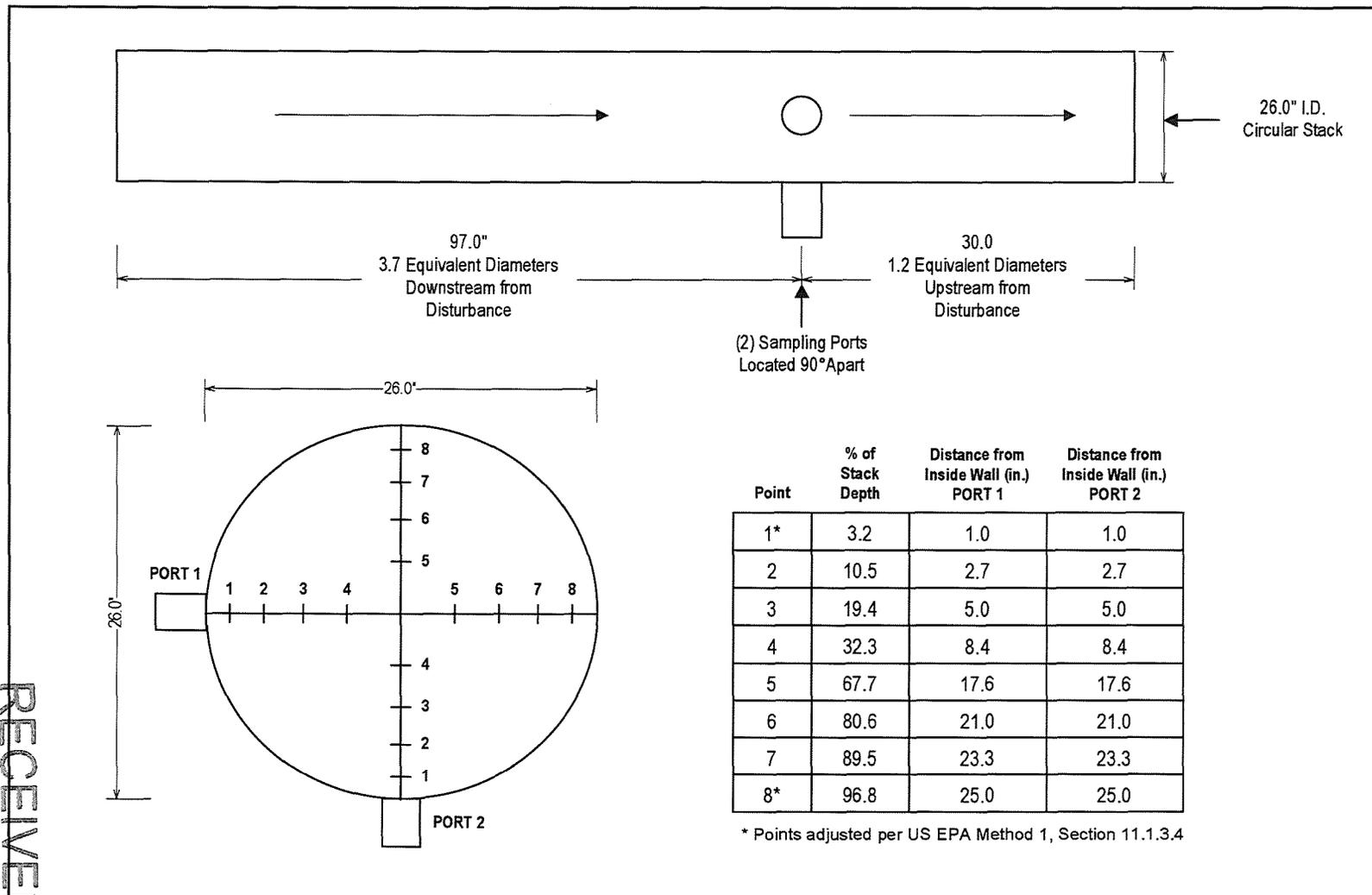
APPENDIX A FIELD DATA AND CALCULATIONS

Appendix A.1 Sampling Locations

EUPRODUCTION PROCESS AND SAMPLING LOCATION SCHEMATIC



EXTRUSION LINES 2 AND 3 DUCT TRAVERSE POINT LOCATION DRAWING



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