



# MACT EEEEE Compliance Air Emissions Test Report

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Grede, LLC – Iron Mountain  
Cupola (EU-P009),  
Main Plant Pouring and Cooling  
(EU-P016), and  
Module Pouring and Cooling  
(EU-P036)  
801 South Carpenter Avenue  
Kingsford, Michigan  
Project No. M235011  
December 12 through 15, 2023





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Test Report**

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December 12 through 15, 2023**

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**Project No. M235011**

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## 1.0 EXECUTIVE SUMMARY

Mostardi Platt conducted a compliance emissions test program on the emission points EU-P009, EU-P016, EU-P036 at the Grede, LLC Iron Mountain Facility in Kingsford, Michigan. The purpose of this test program is to determine compliance with concentrations and emission rates as outlined in 40CFR63, Subpart EEEEE, "National Emission Standards for Hazardous Air Pollutants for Iron and Steel Foundries" and detailed in Section 2.0 below.

The test locations, test dates, and test parameters are summarized below.

TEST PARAMETERS		
Test Locations	Test Dates	Test Parameters
EU-P009 Cupola	12/12/2023 – 12/15/2023	Particulate Matter (PM), Opacity, VOHAP
EU-P016 Main Plant Pouring and Cooling		PM and Opacity
EU-P036 Module Pouring and Cooling		

EU-P009 CUPOLA				
Test Location	Test Date	Test Parameter	Emission Limit	Emission Rate
Baghouse Inlet	12/14/2023	VOHAP	20 ppmvd @ 10% O <sub>2</sub>	0.25 ppmvd @ 10% O <sub>2</sub>
Monovent Baghouse Exhaust	12/14/2023	PM	0.006 gr/dscf	0.0010 gr/dscf
		Opacity	≤ 20%	0%

EU-P016 MAIN PLANT POURING AND COOLING				
Test Location	Test Date	Test Parameter	Emission Limit	Emission Rate
SV-S016-324632	12/13/2023	PM	0.010 gr/dscf	0.0012 gr/dscf
		Opacity	≤ 20%	0%
SV-S016-324662	12/13/2023	PM	0.010 gr/dscf	0.0023 gr/dscf
		Opacity	≤ 20%	0%
SV-S016-324678	12/12/2023	PM	0.010 gr/dscf	0.002 gr/dscf
		Opacity	≤ 20%	0%
SV-S016-324682	12/12/2023	PM	0.010 gr/dscf	0.0012 gr/dscf
		Opacity	≤ 20%	0%
SV-S016-324484	12/12/2023	PM	0.010 gr/dscf	0.0058 gr/dscf
		Opacity	≤ 20%	0%
SV-S016-324848	12/13/2023	PM	0.010 gr/dscf	0.0007 gr/dscf
		Opacity	≤ 20%	0%

EU-P036 MODULE POURING AND COOLING				
Test Location	Test Date	Test Parameter	Emission Limit	Emission Rate
SV-S036-334116	12/14/2023	PM	0.010 gr/dscf	0.002 gr/dscf
		Opacity	≤ 20%	0%
SV-S036-334176	12/15/2023	PM	0.010 gr/dscf	0.0014 gr/dscf
		Opacity	≤ 20%	0%

The identifications of the individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	Address	Contact
Test Coordinator	Grede, LLC – Iron Mountain 801 South Carpenter Avenue Kingsford, Michigan 49802	Tom White EHS Manager (715) 548-1095 <a href="mailto:tom.white@grede.com">tom.white@grede.com</a>
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Stuart L. Burton Director / Regional Manager (630) 993-2100 (phone) <a href="mailto:sburton@mp-mail.com">sburton@mp-mail.com</a>

The test crew consisted of A. Wentworth, E. Cuellar, J. Devereux, J. Meade, M. Fiorante, M. Sather, S. McGough, V. Vang, and S. Burton of Mostardi Platt.

Mr. Daniel Droste of EGLE observed a portion of the test program.

## 2.0 TEST METHODOLOGY

Emission testing was conducted following the methods specified in 40 CFR, Part 60, Appendix A, and 40 CFR, Part 51, Appendix M. Schematics of the test section diagrams and sampling trains used are included in Appendix A and B, respectively. Calculation examples and nomenclature are included in Appendix C and laboratory analysis data are found in Appendix D. Copies of analyzer print-outs and field data sheets for each test run are included in Appendix E and F, respectively. Operating data as provided by Grede, LLC Iron Mountain is included in Appendix I.

The following methodologies were used during the test program:

## Method 1 and Method Traverse Point and Volumetric Flowrate Determination

Test measurement points are selected in accordance with Method 1, 40 CFR, Part 60, Appendix A. The characteristics of the measurement locations are summarized below.

EU-P009 CUPOLA					
Test Location	Stack Diameter (Feet)	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
Baghouse Inlet	4.0	2.5	6.0	Volumetric Flowrate	16
				THC, CO <sub>2</sub> , and O <sub>2</sub>	12 (Stratification Run 1) 3 (Test Runs 2 and 3)
Monovent Baghouse Exhaust	19.917 x 44.417 27.5 equiv. dia.	N/A	N/A	PM	24

EU-P016 MAIN PLANT POURING AND COOLING					
Test Location	Stack Diameter (Inches)	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
SV-S016-324632	24.0	0.7	5.7	PM	24
SV-S016-324662	25.0	0.5	5.5	PM	24
SV-S016-324678	42.0	2.8	2.9	PM	24
SV-S016-324682	30.0	0.6	2.7	PM	24
SV-S016-324484	30.0	1.8	2.2	PM	24
SV-S016-324848	24.0	0.5	4.8	PM	24

EU-P036 MODULE POURING AND COOLING					
Test Location	Stack Diameter (Inches)	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
SV-S036-334116	30.0	1.8	2.9	PM	24
SV-S036-334176	30.0	0.8	2.0	PM	24

Test measurement points were selected in accordance with Method 1. A cyclonic flow determination was conducted at each test location in accordance with Section 11.4 of Method 1. Gas velocity at the baghouse inlet was measured following Method 2, for purposes of calculating monovent exhaust gas volumetric flow rate. Volumetric flow was sampled at the inlet of the cupola baghouse and was conducted prior to and at the conclusion of each PM run. The average velocity was calculated per procedures in Section 12.2 of Method 5D. A wind tunnel calibrated S-type pitot tube, differential pressure gauge, thermocouples and temperature readouts were used to determine gas velocity at each sample point. Temperature measurements were taken at the inlet of each baghouse cell in operation and averaged prior to and at the conclusion of each PM run for purposes of calculating dilution air flow rates per Section 12.3 of Method 5D. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix G.

## **Method 2 Velocity Determination**

The gas velocity was determined using Reference Method 2, 40CFR60, Appendix A. Velocity pressures were determined by traversing the duct with an S-type pitot tube. Temperatures were measured using a K-type thermocouple with a calibrated digital temperature indicator. The molecular weight and moisture content of the gases are determined to permit the calculation of the volumetric flowrate.

## **Method 3A Oxygen (O<sub>2</sub>)/Carbon Dioxide (CO<sub>2</sub>) Determination**

Flue gas molecular weight was determined in accordance with Method 3A. ECOM analyzers were used to determine flue gas oxygen and carbon dioxide content and, by difference, nitrogen content. All of the equipment used was calibrated in accordance with the specifications of the Method and calibration data are included in Appendix G. Copies of the gas cylinder certifications are included in Appendix H.

## **Method 5 Filterable Particulate Matter Determination**

Filterable particulate concentrations and emission rates were determined at EU-P016 Main Plant Pouring and EU-P036 Module Pouring in accordance with Method 5. The probe and filter housing were maintained at a temperature of 248°F +/- 25°F. An Environmental Supply Company, Inc. sampling train was used to sample stack gas at an isokinetic rate. Four impingers were utilized, the first two each containing 100ml of deionized water, the third will remain empty, and the fourth will contain approximately 200 grams of silica gel. The impingers were weighed prior to and after each test run in order to determine moisture content of the stack gas. The total sample time was 90 minutes – such that a minimum of 1.7 dscm of sample was collected for each run.

PM in the sample probe was recovered utilizing acetone; a minimum of three passes of the probe brush through the entire probe were performed, followed by a visual inspection of the acetone exiting the probe. If the acetone solution exiting the probe was clear, the wash was considered complete, if not, another pass of the brush through the probe was made and inspected until the solution is clear. The nozzle was then removed from the probe and cleaned in a similar manner, utilizing an appropriately sized nozzle brush. It is anticipated that the filter and filter housing will be recovered in the Mostardi Platt mobile laboratory. The filter housing was washed a minimum of three times with acetone and inspected for cleanliness, and the filter was placed in its corresponding petri dish. The acetone wash and the filter were labeled and marked, then analyzed at Mostardi Platt's laboratory in Elmhurst, Illinois. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data can be found in Appendix G.

## **Method 5D Filterable Particulate Matter (FPM) Determination**

Filterable particulate concentrations and emission rates were determined at the cupola baghouse monovalent exhaust in accordance with Method 5D, 40CFR60, Appendix A. An Environmental Supply Company, Inc. sampling train was used to sample stack gas at an isokinetic rate, as specified in the Method. Twenty-four (24) test points were traversed at the cupola baghouse monovalent exhaust utilizing a twelve (12) foot glass-lined probe. Drawings depicting the sampling ports, test point locations, and sampling trains are appended. Velocity pressures were determined from the baghouse inlet volumetric flow rate testing and corrected for area per Section 12.2 of this method. All temperatures were measured using K-type thermocouples with calibrated digital temperature indicators. The probe and filter temperatures were maintained at 248°F +/- 25°F during the test program. Particulate matter in the sample probe was recovered using an HPLC reagent-grade acetone wash. These washes were placed in sealed and marked containers for analysis. The probe wash and filter catch were analyzed by Mostardi Platt in accordance with the Method in the Elmhurst, Illinois laboratory. Laboratory data are found in Appendix D. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix G.

## **Method 9 Visual Emission Determination**

Visible emissions were determined in accordance with Method 9, 40 CFR, Part 60, Appendix A. Visible emissions observations were conducted and recorded by certified visual emissions observers during each filterable particulate matter run. Copies of the readers' certifications are presented in Appendix J.

## **Method 25A Total Organic Concentrations Determination**

The Method 25A sampling and measurement system meets the requirements for stack sampling of VOCs set forth by the United States Environmental Protection Agency (USEPA). In particular, it meets the requirements of USEPA Reference Method 25A, "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer," 40CFR60, Appendix A. This method applies to the measurement of total gaseous organic concentration of hydrocarbons. With this method, a gas sample was extracted from the sample location through a heated Teflon sample line to the analyzer. VOHAP was determined as hexane utilizing propane calibration gases and performing and applying a hexane response factor on site of 0.518.

The flame ionization detector (FID) used during this program was a TECO Model 51 High-Temperature Total Hydrocarbon Analyzer. It is a highly sensitive FID that provide a direct reading of total organic vapor concentrations with linear ranges of 0-10, 100, 1000, and 10,000 ppm by volume. The instrument was calibrated using ultra-zero air and propane in air EPA Protocol standards. The calibrations were performed before and after sampling with calibration checks performed between each test run. Sampling was conducted continuously for three one-hour periods. Sample times and locations were logged simultaneously on a data logger.

Calculations were performed by computer or by hand. An explanation of the nomenclature and calculations along with the complete test results is included in the appendix. Also appended are calibration data and copies of the raw field data sheets.

### 3.0 TEST RESULT SUMMARIES

**Client:** Grede, LLC - Iron Mountain  
**Facility:** Kingsford, Michigan  
**Test Location:** Cupola Monovent Baghouse Outlet (EU-P009)  
**Test Method:** 5D

Source Condition	Normal	Normal	Normal	
Date	12/14/23	12/14/23	12/15/23	
Start Time	10:45	13:25	7:55	
End Time	12:34	15:28	9:48	
	Run 1	Run 2	Run 3	Average
<b>Stack Conditions</b>				
Average Gas Temperature, °F	153.4	171.8	159.4	161.5
Flue Gas Moisture, percent by volume	2.5%	3.8%	2.4%	2.9%
Average Flue Pressure, in. Hg	29.16	29.16	29.10	29.14
Gas Sample Volume, dscf	73.022	92.381	77.654	81.019
Average Gas Velocity, ft/sec	1.623	1.395	1.746	1.588
Gas Volumetric Flow Rate, acfm	86,160	74,078	92,678	84,305
Gas Volumetric Flow Rate, dscfm	70,457	58,056	74,966	67,826
Gas Volumetric Flow Rate, scfm	72,284	60,335	76,835	69,818
Average %CO <sub>2</sub> by volume, dry basis	2.3	2.4	2.1	2.3
Average %O <sub>2</sub> by volume, dry basis	18.5	18.2	18.7	18.5
Isokinetic Variance	100.7	102.0	100.7	101.1
<b>Filterable Particulate Matter (Method 5D)</b>				
grams collected	0.00584	0.00755	0.00289	0.00543
grains/acf	0.0010	0.0010	0.0005	0.0008
grains/dscf	0.0012	0.0013	0.0006	0.0010
lb/hr	0.745	0.628	0.369	0.581

Grede, LLC - Iron Mountain  
Kingsford, Michigan  
Cupola Baghouse Inlet  
Gaseous Summary

Test No.	Date	Start Time	End Time	CO <sub>2</sub> % (dry)	O <sub>2</sub> % (dry)	Moisture, %	Flowrate, DSCFM	Flowrate, SCFM	THC ppm as C <sub>3</sub> H <sub>8</sub> (wet)	THC ppm as C <sub>3</sub> H <sub>8</sub> (dry)	THC ppmvd as C <sub>3</sub> H <sub>8</sub> @10%	*THC ppmvd as C <sub>6</sub> H <sub>14</sub> @10% O <sub>2</sub>
1	12/14/23	10:45	11:50	11.6	7.7	7.6	17,520	18,961	0.5	0.54	0.45	0.23
2	12/14/23	13:25	14:38	12.2	7.5	7.9	18,233	19,765	0.3	0.33	0.26	0.14
3	12/15/23	08:20	09:19	12.4	7.5	8.0	18,781	20,404	0.8	0.87	0.71	0.37
<b>Average</b>				12.1	7.6	7.8	18,178	19,710	0.5	0.58	0.47	0.25

\* Propane ppmvd was converted to hexane ppmvd by multiplying by the response factor of 0.518 as determined onsite.

**Client:** Grede, LLC - Iron Mountain  
**Facility:** Iron Mountain Facility  
**Test Location:** Main Plant Pouring SV-S016-324632  
**Test Method:** 5

	Source Condition	Normal	Normal	Normal	
	Date	12/13/23	12/13/23	12/13/23	
	Start Time	8:40	11:16	13:40	
	End Time	10:38	12:54	15:18	
		Run 1	Run 2	Run 3	
		Average			
<b>Stack Conditions</b>					
Average Gas Temperature, °F		100.6	102.5	115.0	106.0
Flue Gas Moisture, percent by volume		0.3%	0.6%	0.4%	0.4%
Average Flue Pressure, in. Hg		29.22	29.22	29.22	29.22
Gas Sample Volume, dscf		73.941	73.727	73.077	73.582
Average Gas Velocity, ft/sec		23.610	23.609	23.920	23.713
Gas Volumetric Flow Rate, acfm		4,450	4,450	4,509	4,470
Gas Volumetric Flow Rate, dscfm		4,081	4,057	4,027	4,055
Gas Volumetric Flow Rate, scfm		4,093	4,079	4,044	4,072
Average %CO <sub>2</sub> by volume, dry basis		0.0	0.0	0.1	0.0
Average %O <sub>2</sub> by volume, dry basis		20.9	20.7	20.5	20.7
Isokinetic Variance		99.9	100.2	100.0	100.0
<b>Filterable Particulate Matter (Method 5)</b>					
grams collected		0.00499	0.00550	0.00608	0.00552
grains/acf		0.0010	0.0010	0.0011	0.0010
grains/dscf		0.0010	0.0012	0.0013	0.0012
lb/hr		0.036	0.040	0.044	0.040

Client: Grede, LLC - Iron Mountain  
 Facility: Kingsford, Michigan  
 Test Location: Main Plant Pouring SV-S016-324662  
 Test Method: 5

	Source Condition	Normal	Normal	Normal	
	Date	12/13/23	12/13/23	12/13/23	
	Start Time	8:20	10:55	13:20	
	End Time	10:11	12:33	14:58	
	Run 1	Run 2	Run 3	Average	
<b>Stack Conditions</b>					
Average Gas Temperature, °F	50.6	64.3	70.7	61.9	
Flue Gas Moisture, percent by volume	0.5%	0.5%	1.0%	0.7%	
Average Flue Pressure, in. Hg	29.22	29.22	29.22	29.22	
Gas Sample Volume, dscf	74.52	73.011	74.394	73.975	
Average Gas Velocity, ft/sec	49.151	49.440	51.003	49.865	
Gas Volumetric Flow Rate, acfm	10,050	10,109	10,428	10,196	
Gas Volumetric Flow Rate, dscfm	10,098	9,897	10,034	10,010	
Gas Volumetric Flow Rate, scfm	10,149	9,943	10,134	10,075	
Average %CO <sub>2</sub> by volume, dry basis	0.0	0.0	0.0	0.0	
Average %O <sub>2</sub> by volume, dry basis	20.9	20.9	20.9	20.9	
Isokinetic Variance	100.2	100.2	100.7	100.4	
<b>Filterable Particulate Matter (Method 5)</b>					
grams collected	0.01080	0.01028	0.01219	0.01109	
grains/acf	0.0022	0.0021	0.0024	0.0022	
grains/dscf	0.0022	0.0022	0.0025	0.0023	
lb/hr	0.194	0.184	0.217	0.198	

**Client:** Grede, LLC - Iron Mountain  
**Facility:** Kingsford, Michigan  
**Test Location:** Main Plant Pouring SV-S016-324678  
**Test Method:** 5

	Source Condition	Normal	Normal	Normal	
	Date	12/12/23	12/12/23	12/12/23	
	Start Time	8:50	11:23	13:45	
	End Time	10:28	13:02	15:23	
		Run 1	Run 2	Run 3	Average
<b>Stack Conditions</b>					
Average Gas Temperature, °F		59.5	58.8	59.6	59.3
Flue Gas Moisture, percent by volume		0.7%	1.1%	0.7%	0.8%
Average Flue Pressure, in. Hg		28.81	28.81	28.81	28.81
Gas Sample Volume, dscf		72.246	75.365	74.448	74.020
Average Gas Velocity, ft/sec		31.199	32.501	32.131	31.944
Gas Volumetric Flow Rate, acfm		18,010	18,762	18,548	18,440
Gas Volumetric Flow Rate, dscfm		17,502	18,194	18,030	17,909
Gas Volumetric Flow Rate, scfm		17,627	18,390	18,152	18,056
Average %CO <sub>2</sub> by volume, dry basis		0.0	0.0	0.0	0.0
Average %O <sub>2</sub> by volume, dry basis		20.9	20.9	20.9	20.9
Isokinetic Variance		100.4	100.7	100.4	100.5
<b>Filterable Particulate Matter (Method 5)</b>					
grams collected		0.01324	0.00837	0.00908	0.01023
grains/acf		0.0027	0.0017	0.0018	0.0021
grains/dscf		0.0028	0.0017	0.0019	0.0021
lb/hr		0.424	0.267	0.291	0.327

Client: Grede, LLC - Iron Mountain  
 Facility: Kingsford, Michigan  
 Test Location: Main Plant Pouring SV-S016-324682  
 Test Method: 5

Source Condition	Normal	Normal	Normal	
Date	12/12/23	12/12/23	12/12/23	
Start Time	8:36	11:38	13:48	
End Time	10:20	13:18	15:26	
	Run 1	Run 2	Run 3	Average
<b>Stack Conditions</b>				
Average Gas Temperature, °F	74.9	80.8	77.5	77.7
Flue Gas Moisture, percent by volume	0.9%	1.1%	0.7%	0.9%
Average Flue Pressure, in. Hg	28.72	28.68	28.72	28.71
Gas Sample Volume, dscf	70.85	73.227	72.564	72.214
Average Gas Velocity, ft/sec	17.568	18.076	17.998	17.881
Gas Volumetric Flow Rate, acfm	5,174	5,324	5,301	5,266
Gas Volumetric Flow Rate, dscfm	4,857	4,928	4,964	4,916
Gas Volumetric Flow Rate, scfm	4,902	4,983	4,998	4,961
Average %CO <sub>2</sub> by volume, dry basis	0.0	0.0	0.0	0.0
Average %O <sub>2</sub> by volume, dry basis	20.9	20.9	20.9	20.9
Isokinetic Variance	101.6	103.5	101.8	102.3
<b>Filterable Particulate Matter (Method 5)</b>				
grams collected	0.00474	0.00734	0.00521	0.00576
grains/acf	0.0010	0.0014	0.0010	0.0011
grains/dscf	0.0010	0.0015	0.0011	0.0012
lb/hr	0.043	0.065	0.047	0.052

Client: Grede, LLC - Iron Mountain  
 Facility: Kingsford, Michigan  
 Test Location: Main Plant Pouring SV-S016-324484  
 Test Method: 5

	Source Condition	Normal	Normal	Normal	
	Date	12/12/23	12/12/23	12/12/23	
	Start Time	8:36	11:38	13:48	
	End Time	10:14	13:24	15:26	
		Run 1	Run 2	Run 3	Average
<b>Stack Conditions</b>					
Average Gas Temperature, °F		86.4	103.1	88.3	92.6
Flue Gas Moisture, percent by volume		0.9%	1.5%	1.5%	1.3%
Average Flue Pressure, in. Hg		28.74	28.74	28.74	28.74
Gas Sample Volume, dscf		72.728	73.685	74.638	73.684
Average Gas Velocity, ft/sec		26.454	27.640	27.256	27.117
Gas Volumetric Flow Rate, acfm		7,791	8,141	8,028	7,987
Gas Volumetric Flow Rate, dscfm		7,169	7,219	7,316	7,235
Gas Volumetric Flow Rate, scfm		7,232	7,332	7,425	7,330
Average %CO <sub>2</sub> by volume, dry basis		0.0	0.0	0.0	0.0
Average %O <sub>2</sub> by volume, dry basis		20.7	20.9	20.9	20.8
Isokinetic Variance		100.3	100.9	100.9	100.7
<b>Filterable Particulate Matter (Method 5)</b>					
grams collected		0.03599	0.02208	0.02538	0.02782
grains/acf		0.0070	0.0041	0.0048	0.0053
grains/dscf		0.0076	0.0046	0.0052	0.0058
lb/hr		0.469	0.286	0.329	0.361

Client: Grede, LLC - Iron Mountain  
 Facility: Kingsford, Michigan  
 Test Location: Main Plant Pouring SV-S016-324848  
 Test Method: 5

	Source Condition	Normal	Normal	Normal
	Date	12/13/23	12/13/23	12/13/23
	Start Time	8:40	11:16	13:40
	End Time	10:36	12:56	15:18
	Run 1	Run 2	Run 3	Average
<b>Stack Conditions</b>				
Average Gas Temperature, °F	75.8	80.6	76.8	77.7
Flue Gas Moisture, percent by volume	0.4%	0.8%	0.5%	0.6%
Average Flue Pressure, in. Hg	29.25	29.25	29.25	29.25
Gas Sample Volume, dscf	88.072	88.323	88.951	88.449
Average Gas Velocity, ft/sec	57.449	58.280	57.939	57.889
Gas Volumetric Flow Rate, acfm	10,829	10,986	10,921	10,912
Gas Volumetric Flow Rate, dscfm	10,392	10,409	10,447	10,416
Gas Volumetric Flow Rate, scfm	10,434	10,491	10,502	10,476
Average %CO <sub>2</sub> by volume, dry basis	0.0	0.0	0.0	0.0
Average %O <sub>2</sub> by volume, dry basis	20.6	20.5	20.4	20.5
Isokinetic Variance	99.6	99.7	100.1	99.8
<b>Filterable Particulate Matter (Method 5)</b>				
grams collected	0.00357	0.00583	0.00318	0.00419
grains/acf	0.0006	0.0010	0.0005	0.0007
grains/dscf	0.0006	0.0010	0.0006	0.0007
lb/hr	0.056	0.091	0.049	0.065

**Client:** Grede, LLC - Iron Mountain  
**Facility:** Kingsford, Michigan  
**Test Location:** Module Pouring SV-S036-334116  
**Test Method:** 5

	Source Condition	Normal	Normal	Normal	
	Date	12/14/23	12/14/23	12/14/23	
	Start Time	10:50	13:04	15:04	
	End Time	12:30	14:44	16:44	
		Run 1	Run 2	Run 3	
				Average	
<b>Stack Conditions</b>					
Average Gas Temperature, °F		96.1	99.4	95.9	97.1
Flue Gas Moisture, percent by volume		1.0%	0.3%	0.2%	0.5%
Average Flue Pressure, in. Hg		29.12	29.12	29.12	29.12
Gas Sample Volume, dscf		65.442	67.82	68.189	67.150
Average Gas Velocity, ft/sec		26.965	28.079	28.045	27.696
Gas Volumetric Flow Rate, acfm		7,942	8,270	8,260	8,157
Gas Volumetric Flow Rate, dscfm		7,266	7,573	7,621	7,487
Gas Volumetric Flow Rate, scfm		7,339	7,597	7,636	7,524
Average %CO <sub>2</sub> by volume, dry basis		0.0	0.0	0.0	0.0
Average %O <sub>2</sub> by volume, dry basis		20.8	20.7	20.8	20.8
Isokinetic Variance		100.5	99.9	99.8	100.1
<b>Filterable Particulate Matter (Method 5)</b>					
grams collected		0.00932	0.01334	0.00788	0.01018
grains/acf		0.0020	0.0028	0.0016	0.0021
grains/dscf		0.0022	0.0030	0.0018	0.0023
lb/hr		0.137	0.197	0.116	0.150

Client: Grede, LLC - Iron Mountain  
 Facility: Kingsford, Michigan  
 Test Location: Module Pouring SV-S036-334176  
 Test Method: 5

Source Condition	Normal	Normal	Normal	
Date	12/15/23	12/15/23	12/15/23	
Start Time	8:00	10:00	12:00	
End Time	9:38	11:38	13:38	
	Run 1	Run 2	Run 3	Average
<b>Stack Conditions</b>				
Average Gas Temperature, °F	89.3	93.0	92.2	91.5
Flue Gas Moisture, percent by volume	0.0%	0.3%	0.0%	0.1%
Average Flue Pressure, in. Hg	29.05	29.05	29.05	29.05
Gas Sample Volume, dscf	79.192	79.165	80.154	79.504
Average Gas Velocity, ft/sec	14.380	14.452	14.627	14.486
Gas Volumetric Flow Rate, acfm	4,235	4,256	4,308	4,266
Gas Volumetric Flow Rate, dscfm	3,950	3,934	3,997	3,960
Gas Volumetric Flow Rate, scfm	3,952	3,945	3,999	3,965
Average %CO <sub>2</sub> by volume, dry basis	0.0	0.0	0.0	0.0
Average %O <sub>2</sub> by volume, dry basis	20.0	20.9	20.9	20.6
Isokinetic Variance	99.4	99.8	99.4	99.5
<b>Filterable Particulate Matter (Method 5)</b>				
grams collected	0.00813	0.00643	0.00680	0.00712
grains/acf	0.0015	0.0012	0.0012	0.0013
grains/dscf	0.0016	0.0013	0.0013	0.0014
lb/hr	0.054	0.042	0.045	0.047

## 4.0 CERTIFICATION

Mostardi Platt is pleased to have been of service to Grede, LLC. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT



Stuart L. Burton

Program Manager



Jeffrey M. Crivlare

Quality Assurance

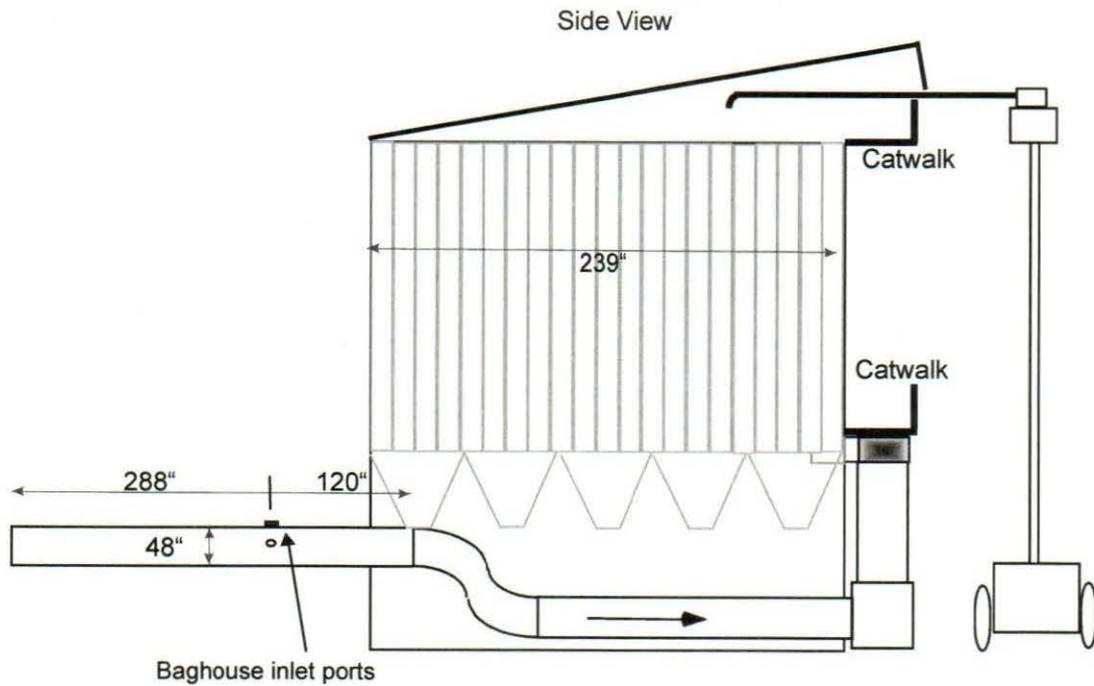
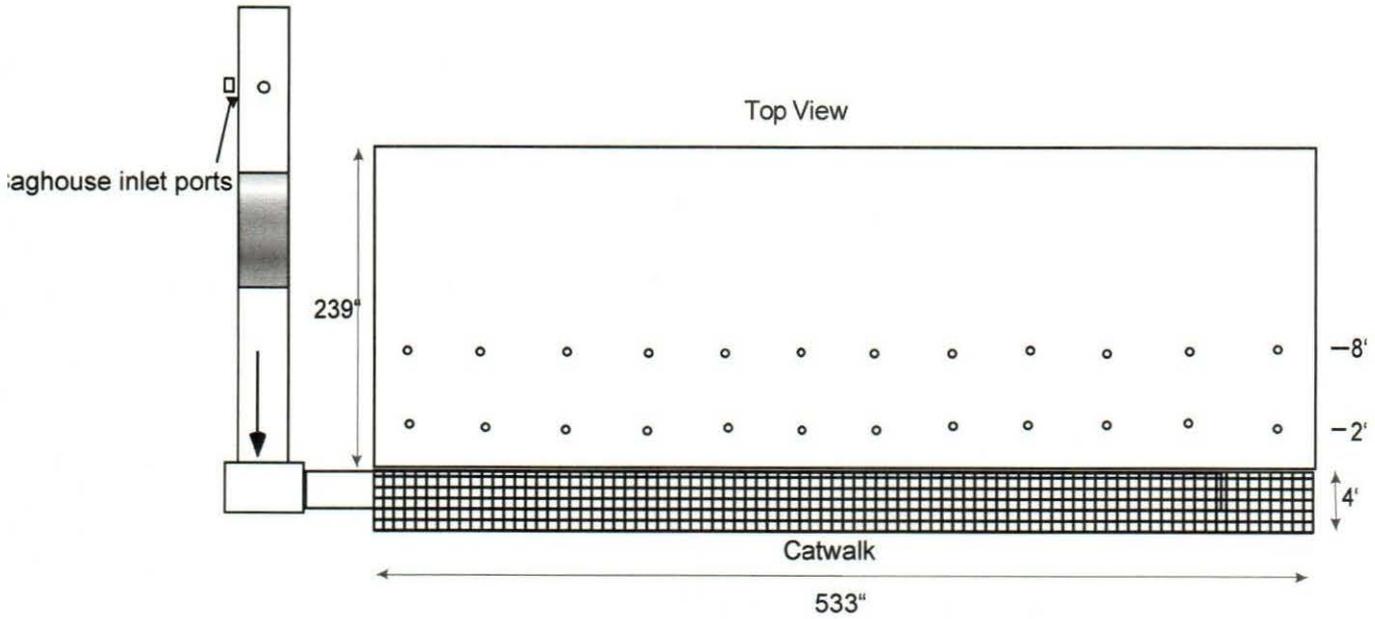
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## APPENDICES

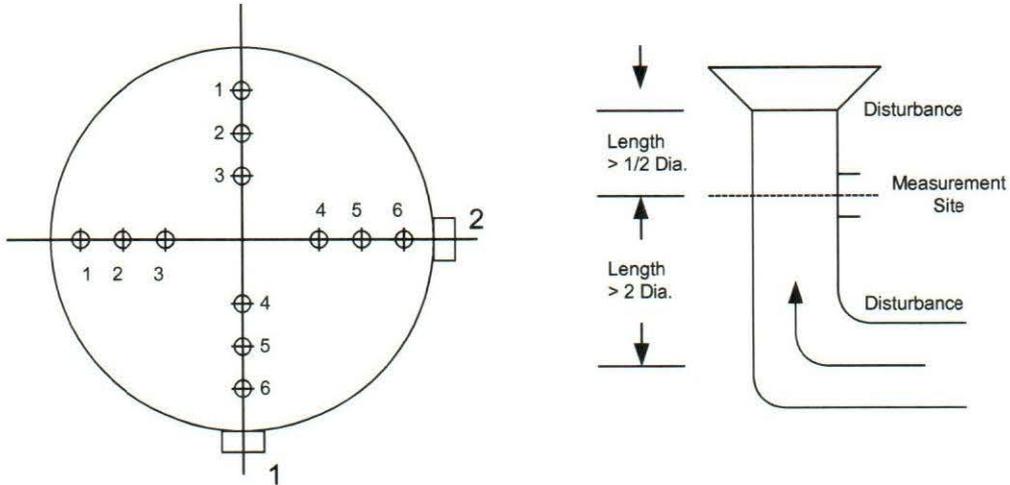
## Appendix A - Test Section Diagrams

## EU-016 Test Section Diagrams

# EQUAL AREA TRAVERSE FOR CUPOLA MONOVENT BAGHOUSE EXHAUST



## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Gaseous Stratification Check)



Project: Grede, LLC-Iron Mountain  
Kingsford, Michigan

Test Location: Cupola Baghouse Inlet

Duct Diameter: 4 Feet

Duct Area: 12.57 Square Feet

No. Points Across Diameter: 6

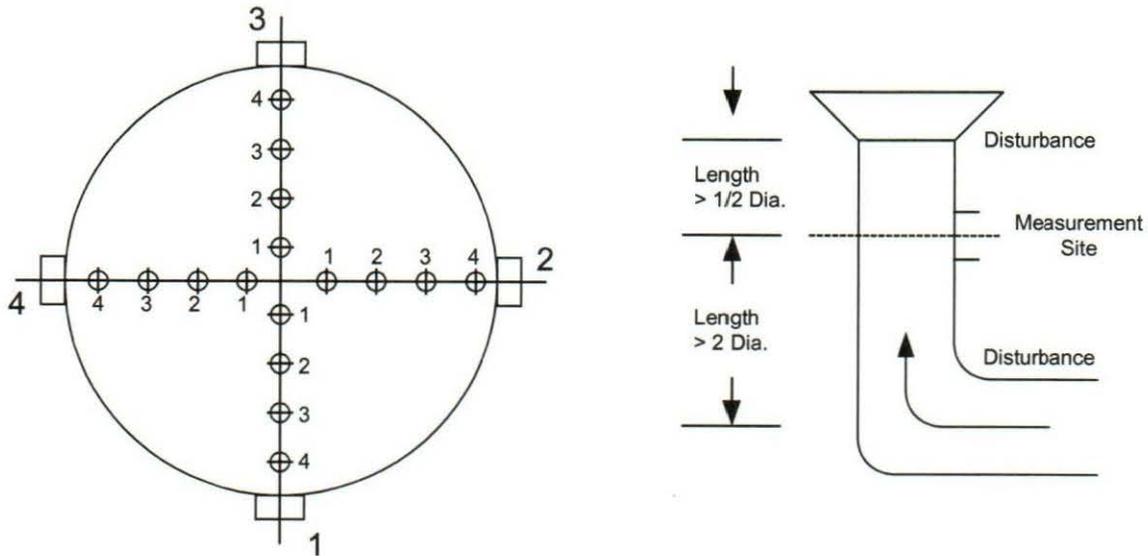
No. of Ports: 2

Port Length: 3 Inches

Upstream Diameters: 2.5

Downstream Diameters: 6.0

## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Flow Rate Determination)



Project: Grede, LLC-Iron Mountain  
Kingsford, Michigan

Test Location: Cupola Baghouse Inlet

Duct Diameter: 4 Feet

Duct Area: 12.57 Square Feet

No. Points Across Diameter: 8

No. of Ports: 2

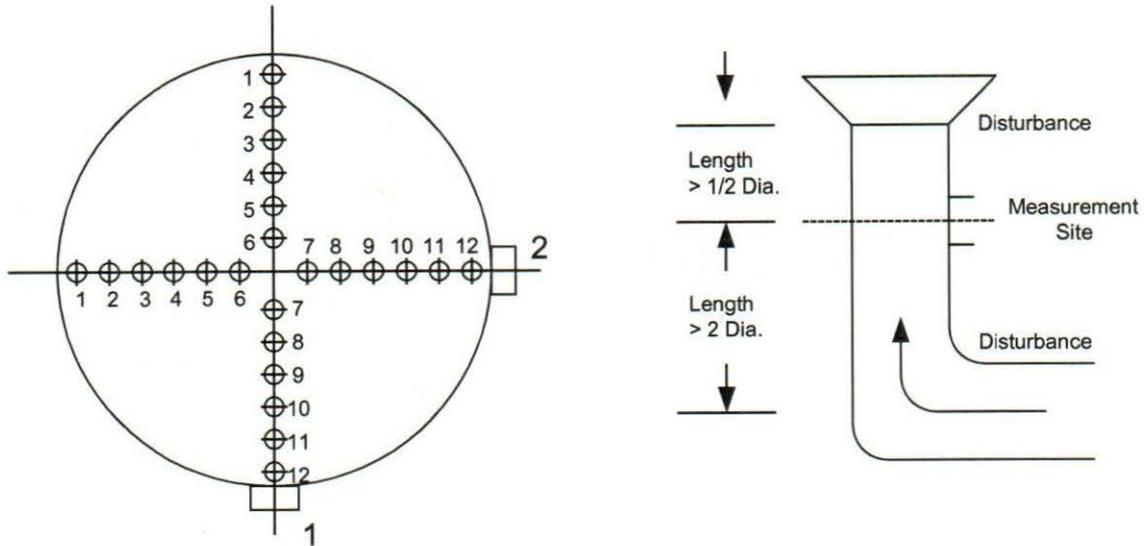
Port Length: 3 Inches

Upstream Diameters: 2.5

Downstream Diameters: 6.0

## EU-016 Main Pouring Test Section Diagrams

## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Particulate Matter Determination)



Project: Grede, LLC-Iron Mountain  
Kingsford, Michigan

Test Location: SV-S016-324632

Duct Diameter: 24.0 Inches

Duct Area: 3.14 Square Feet

No. Points Across Diameter: 12

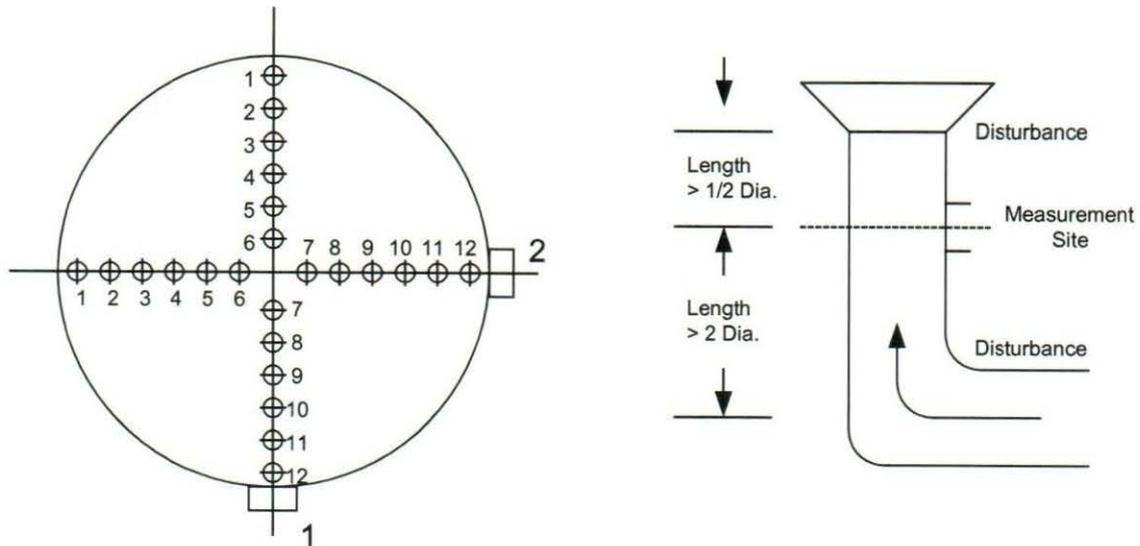
No. of Ports: 2

Port Length: 6.5

Upstream Diameters: 0.7

Downstream Diameters: 5.7

## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Particulate Matter Determination)



Project: Grede, LLC-Iron Mountain  
Kingsford, Michigan

Test Location: SV-S016-324662

Duct Diameter: 25.0 Inches

Duct Area: 3.41 Square Feet

No. Points Across Diameter: 12

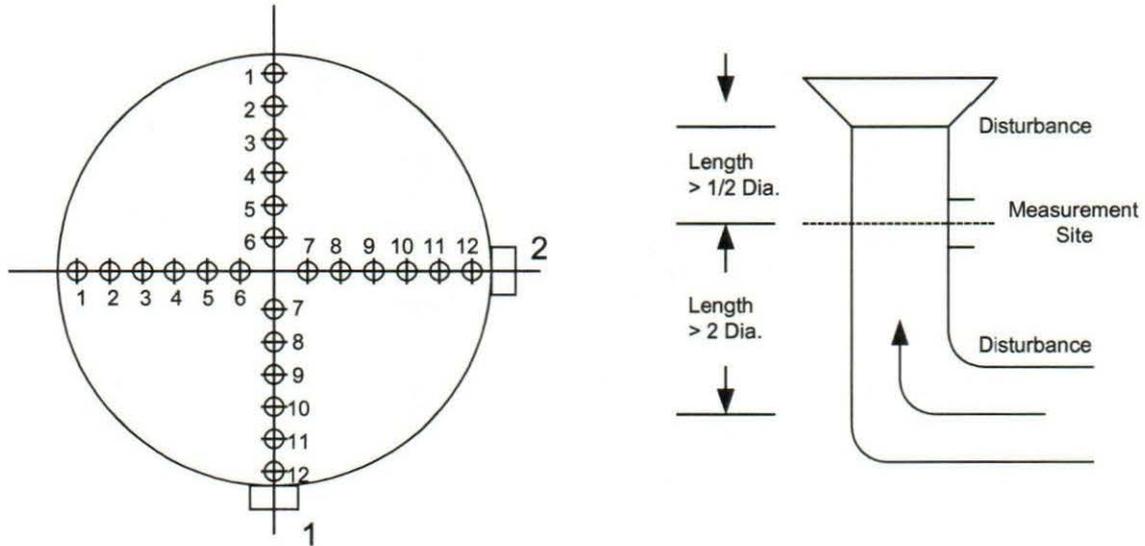
No. of Ports: 2

Port Length: 0.0 inches

Upstream Diameters: 0.5

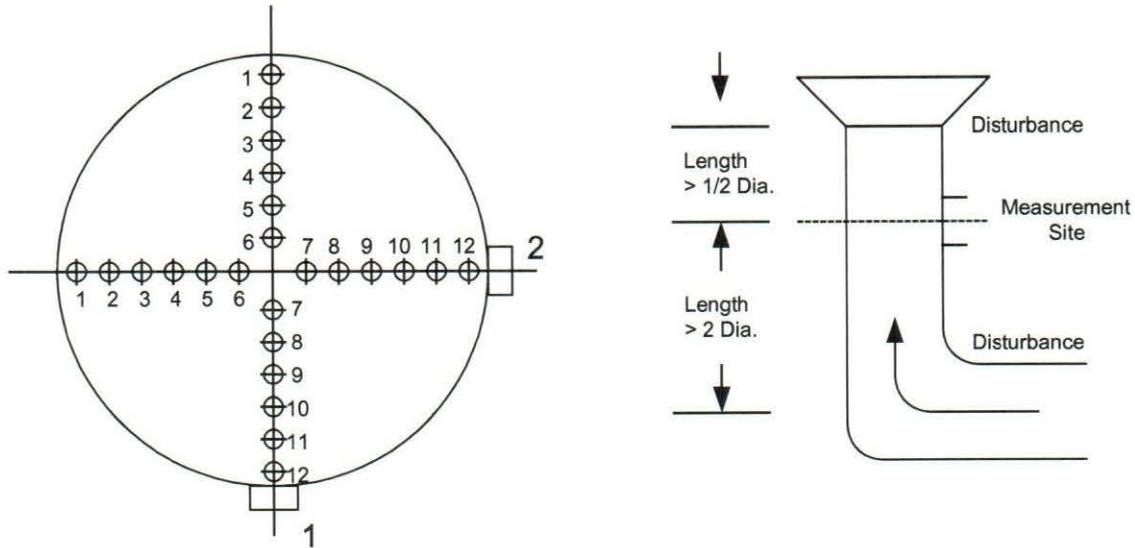
Downstream Diameters: 5.5

## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Particulate Matter Determination)



Project: Grede, LLC-Iron Mountain  
Kingsford, Michigan  
Test Location: SV-S016-324678  
Duct Diameter: 42.0 Inches  
Duct Area: 9.62 Square Feet  
No. Points Across Diameter: 12  
No. of Ports: 2  
Port Length: 0.0 inches  
Upstream Diameters: 2.8  
Downstream Diameters: 2.9

## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Particulate Matter Determination)



Project: Grede, LLC-Iron Mountain  
Kingsford, Michigan

Test Location: SV-S016-324682

Duct Diameter: 30.0 Inches

Duct Area: 4.91 Square Feet

No. Points Across Diameter: 12

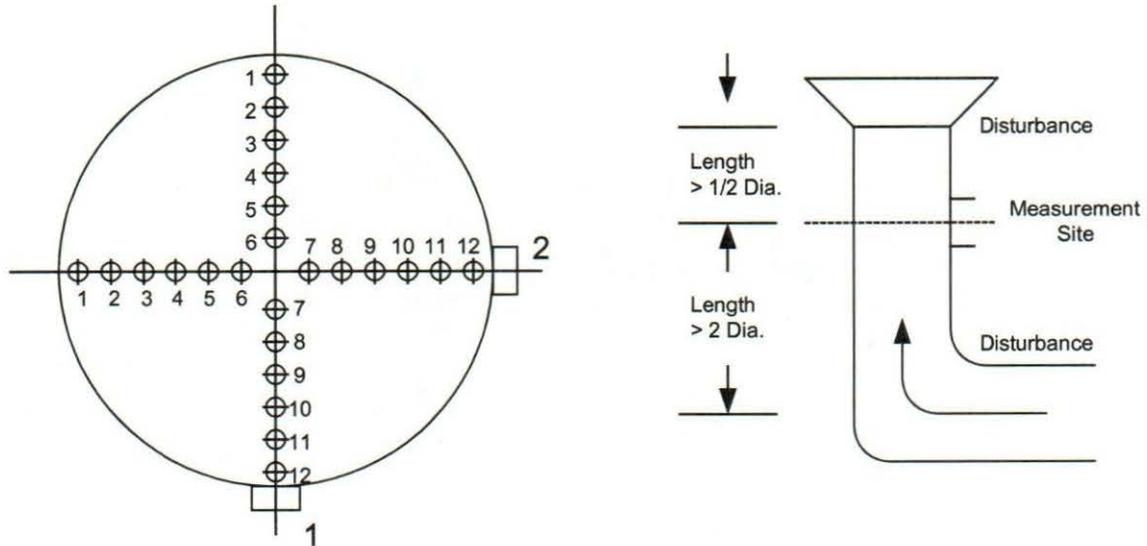
No. of Ports: 2

Port Length: 0.25 inches

Upstream Diameters: 0.6

Downstream Diameters: 2.7

## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Particulate Matter Determination)



Project: Grede, LLC-Iron Mountain  
Kingsford, Michigan

Test Location: SV-S016-324484

Duct Diameter: 30.0 Inches

Duct Area: 4.91 Square Feet

No. Points Across Diameter: 12

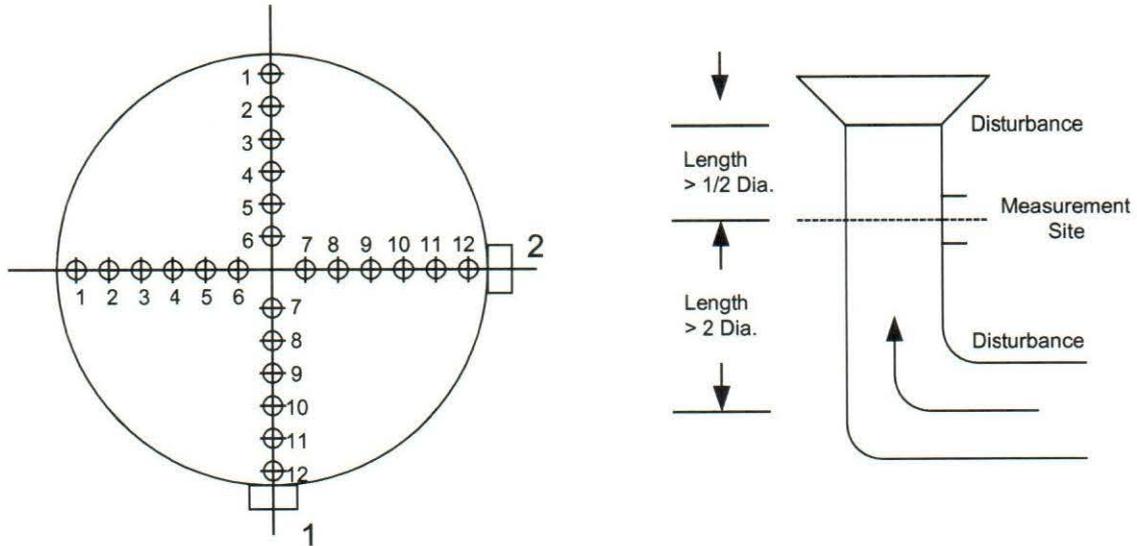
No. of Ports: 2

Port Length: 6.5 inches

Upstream Diameters: 1.8

Downstream Diameters: 2.2

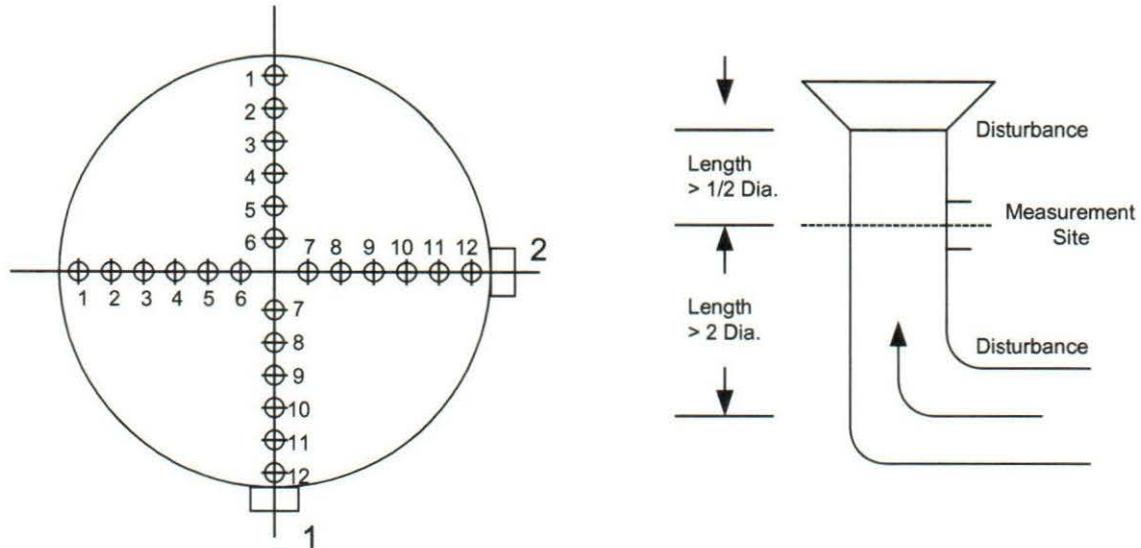
## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Particulate Matter Determination)



Project: Grede, LLC-Iron Mountain  
 Kingsford, Michigan  
 Test Location: SV-S016-324848  
 Duct Diameter: 24.0 Inches  
 Duct Area: 3.14 Square Feet  
 No. Points Across Diameter: 12  
 No. of Ports: 2  
 Port Length: 0.25 inches  
 Upstream Diameters: 0.5  
 Downstream Diameters: 4.8

**EU-036 Module Pouring Test Section Diagrams**

## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Particulate Matter Determination)



Project: Grede, LLC-Iron Mountain  
Kingsford, Michigan

Test Location: SV-S036-334116

Duct Diameter: 30.0 Inches

Duct Area: 4.91 Square Feet

No. Points Across Diameter: 12

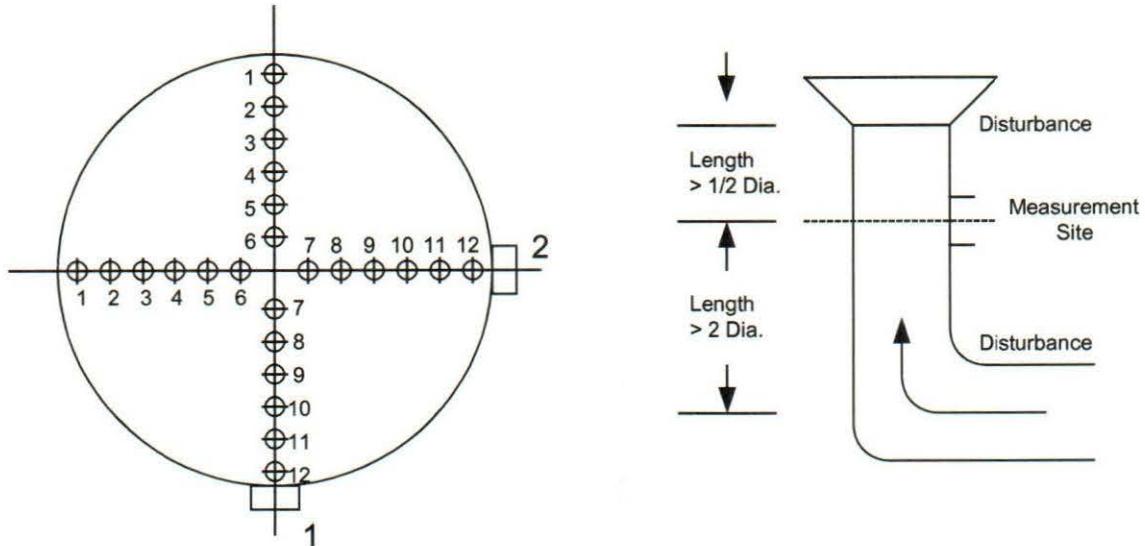
No. of Ports: 2

Port Length: 0.0 inches

Upstream Diameters: 1.8

Downstream Diameters: 2.9

## EQUAL AREA TRAVERSE FOR ROUND DUCTS (Particulate Matter Determination)



Project: Grede, LLC-Iron Mountain  
Kingsford, Michigan

Test Location: SV-S036-334176

Duct Diameter: 30.0 Inches

Duct Area: 4.91 Square Feet

No. Points Across Diameter: 12

No. of Ports: 2

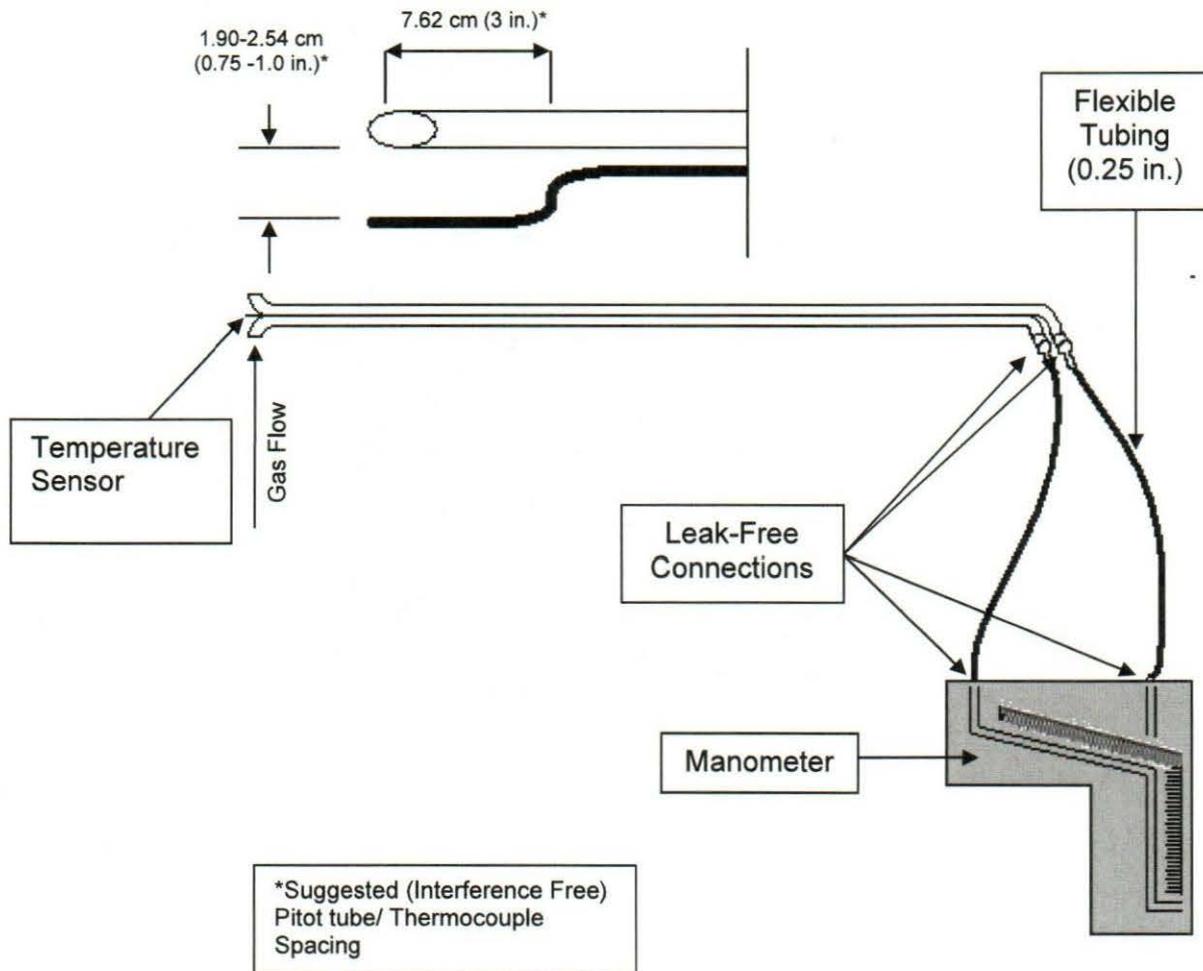
Port Length: 0.0 inches

Upstream Diameters: 0.8

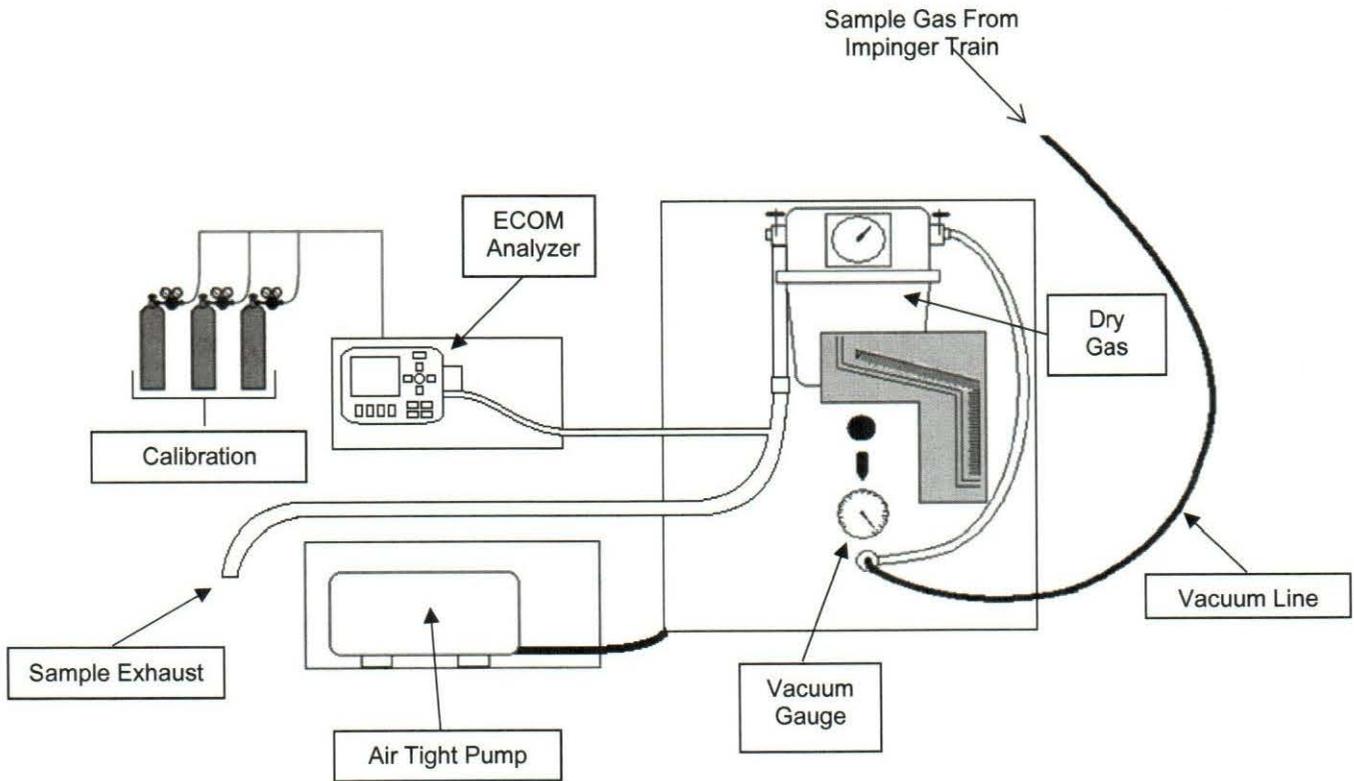
Downstream Diameters: 2.0

## Appendix B - Sample Train Diagrams

# USEPA Method 2 – Type S Pitot Tube Manometer Assembly



# USEPA Method 3A - Integrated Oxygen/Carbon Dioxide Sample Train Diagram Utilizing ECOM To Measure from Sample Exhaust





# USEPA Method 25A – Total Gaseous Organic Compound Sample Train

