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Comprehensive Emissions Test Report

Grede LLC-Iron Mountain
Particulate, Metals, VOC
Compliance Testing

Testing Date(s): May 8-10, 2012
Report Date: June 19, 2012
Revision Date: No revison to date

Subject Facility:

Grede LLC-Iron Mountain
801 South Carpenter Ave
Kingsford, MI 49802

Regulatory Permit No.:
MI-ROP-B1577-2009a
MI-PTI-B1577-2009a

Subject Emission Sources:

Cupola	EG-P009
Main Plant Pouring	EG-P016
Mod Plant Pouring	EG-P036

Test Locations:

Cupola BH Exhaust	324644
B & P Stacks	324180
B & P Stacks	324184
B & P Stacks	324192
B & P Stacks	324200
Disa Pouring	324484
No.5 HMP (TC Fan)	324848
No.6 HMP (East Hunter)	324632
No.7 HMP (West Hunter)	324662
Disa Exhaust	324678
Disa CC Exhaust	342682
Mod. Plt Exhaust	334116
Mod. Plt Exhaust	334176

Report Prepared For:

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Pace Project No. 1204-100

Table of Contents

Executive Summary

Grede Foundries, Inc. contracted Pace Analytical Services, Inc. to perform particulate, metals and total hydrocarbon emissions compliance testing on the Cupola, and particulate compliance testing on twelve Main Plant and Module Plant pouring and cooling exhaust stacks at the Grede Foundries facility located in Kingsford, Michigan. Testing was performed May 8-10, 2012. Summary results are highlighted in the following table:

Test Results Summary

Parameter	Run 1	Run 2	Run 3	Average
Main Plant and Module Plant Particulate Concentration, GR/DSCF				
BNP Pouring - 324180	0.0016	0.0013	0.0011	0.0013
BNP Pouring – 324184	0.0014	0.0013	0.0011	0.0013
BNP Pouring – 324192	0.0025	0.0026	0.0027	0.0026
BNP Pouring – 324200	0.0021	0.0018	0.0023	0.0020
Disa Pouring – 324484	0.0059	0.0008	0.0031	0.0033
No.6 HMP (E. Hunter) – 324632	0.0047	0.0040	0.0037	0.0041
No.7 HMP (W. Hunter) – 324662	0.0040	0.0026	0.0031	0.0032
Disa Exhaust – 324678	0.0018	0.0024	0.0048	0.0030
Disa CC – 324682	0.0027	0.0022	0.0020	0.0023
No.5 HMP (TC Fan) – 324848	0.0012	0.0016	0.0016	0.0015
Module Cooling – 334116	0.0014	0.0015	0.0017	0.0015
Module Cooling – 334176	0.0028	0.0028	0.0016	0.0024
Main Plant and Module Plant Particulate Emission Limit	0.010 GR/DSCF 40 CFR 63.7690(a)(5)(i)			
Cuploa 324664 Constituent Concentrations				
Particulate, GR/DSCF	0.0003	0.0007	0.0008	0.0006
Total Metals (sum), GR/DSCF	0.000032	0.000066	0.000069	0.000056
VOC, PPM as Hexane @ 10% O2	7.1	7.4	7.2	7.3

Cupola VOC Emission Limit = 20 PPM as Hexane @ 10% O2 40 CFR 63.7690 (a)(2)(i)
Cupola Metals Emission Limit (Total Metals) = 0.0005 GR/DSCF 40 CFR 63.7690 (a)(2)(ii)
Cupola Particulate Emission Limit = 0.006 GR/DSCF 40 CFR 63.7690 (a)(8)

Introduction

Pace Analytical Services, Inc. personnel conducted particulate, metals and total hydrocarbon emissions compliance testing on the Cupola, and particulate compliance testing on twelve Main Plant and Module Plant pouring and cooling exhaust stacks at the Grede Foundries facility located in Kingsford, Michigan. Terry Borgerding, Matt McDermott and Mike Walter lead a six-member team which performed on-site testing activities. Terry Borgerding provided administrative project management. Scott Flaminio with Grede Foundries coordinated plant activities during testing. Pace Analytical Services, Inc. prepared a comprehensive test protocol that was submitted to the Michigan Department of Environmental Quality (DEQ) and approved prior to testing. On-site activities consisted of the following measurements:

- Particulate, three independent 72-96 minute samplings on the Main Plant and Module Plant pouring stacks.
- Particulate & Metals, three independent two-hour samplings on the cupola exhaust vent.
- Total hydrocarbons, three independent one-hour monitoring periods on the cupola baghouse inlet.
- Orsat gas composition, integrated gas samples collected concurrent with cupola testing.
- Volumetric airflow, measurements collected in conjunction with isokinetic testing.

The project objectives were to quantify particulate, metals and THC emission constituents and compare them to applicable air emissions regulations stipulated by the Iron and Steel Foundry MACT and the facility Permit. These measurements were performed at the highest melt rate achievable. Quality protocols comply with regulatory compliance testing requirements.

Subsequent sections summarize the test results and provide descriptions of the process and test methods. Supporting information and raw data are in the appendices.

Results Summary

Results of particulate determinations are summarized in Tables 1-13 and in the executive summary. The particulate emission concentration from all of the Main Plant and Module Plant exhaust stacks tested was below the particulate emission limit of 0.010 GR/DSCF. Particulate emission concentration and mass rate from the Cupola exhaust vent was below the limit of 0.006 GR/DSCF and 0.1 LB/Ton Charged. Subsequent tables provide expanded detail of the testing results. All of the particulate testing performed was for front half particulate.

Results of metals determinations form the cupola baghouse exhaust are summarized in Table 14. The total metals emission concentration averaged 0.000056 GR/DSCF with a mass emission rate of 0.00097 LB/Ton Charged. Total metals is the sum of the eleven individual metals listed in Table 14. The total metals emission limit for this source is 0.0005 GR/DSCF and 0.008 LB/Ton Charged. Subsequent tables provide expanded detail of the testing results.

Detailed results of total hydrocarbon (THC) determinations measured from the cupola baghouse inlet are reported in Table 58. The THC concentration averaged 7.3 PPM as hexane @ 10% O2. The VOC emission limit for this source is 20 PPM as hexane @ 10% O2.

Particulate (Front half) and metals testing on the Cupola baghouse exhaust vent was performed from a single sample train following the procedures of EPA Method 5D and EPA Method 29. Sampling on the Cupola is preformed from an area above the baghouse compartments, and accessed from an open area along the side of the baghouse. Airflow measurements collected from the inlet to the baghouse were used to calculate particulate and metals mass rates. Test runs on the cupola were haulted when the cupola was in by-pass mode and resumed after the cupola returned to steady state. Down times are recorded on the Field Data Sheets included in Appendix A. Run 3 of the particulate and metals sampling was ended after 99.6 minutes of run time. The

cupola was in by pass mode and the operator was unsure of when the process would be back on line. In considering safety aspects of darkness, heavy rain, and working off a JLG Lift and considering that twenty of twenty four points were sampled and over 70 cubic feet of sample volume was collected, the team leader ended the run and processed the samples.

A cyclonic flow verification test was performed on all of the sources. Cyclonic flow conditions (>20 degrees) were present in the Disa Pouring – 324484 stack, Disa Exhaust – 324678 stack and the Module Cooling 334176 stack. Testing at these locations was conducted following procedures from the Emission Measurement Center Guideline Document – 008 (EMC GD-008) using the Alignment Approach. Cyclonic measurements are documented on the EPA Method 2 Field Data Sheets located in Appendix A. Linerar movement rate, actual flue gas velocity corrected for cyclonic flow was calculated for each run and used for emission rate calculations at these three sites. Cyclonic airflow determinations can be found in Tables 55-57.

The data in this report are indicative of emission characteristics of the measured sources for process conditions at the time of the test. Representations to other sources and test conditions are beyond the scope of this report.

Summary Tables

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 1

Results Summary
B&P Pouring 324180 Stack
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/8/12	5/8/12	5/8/12	
Time of Run	1505-1445	1710-1849	1925-2105	
Pouring Rate, TPH	0.65	0.65	0.65	0.65
Volumetric Flow Rate (Rounded to 100 CFM)				
ACFM	15,600	15,400	15,400	15,500
DSCFM	14,400	14,300	14,400	14,400
Gas Temperature, °F	82	81	73	79
Gas Moisture Content, %v/v	1.4	0.9	1.3	1.2
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.20	0.16	0.14	0.16
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0016	0.0013	0.0011	0.0013
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 2

Results Summary
B&P Pouring 324184 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date of Run	5/8/12	5/8/12	5/8/12	
Time of Run	1505-1646	1710-1849	1925-2105	
Pouring Rate, TPH	0.65	0.65	0.65	0.65
Volumetric Flow Rate (Rounded to 100 CFM)				
ACFM	16,400	16,200	16,200	16,300
DSCFM	14,900	14,900	14,900	14,900
Gas Temperature, °F	86	82	78	82
Gas Moisture Content, %v/v	1.6	1.1	2.0	1.6
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.19	0.17	0.14	0.16
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0014	0.0013	0.0011	0.0013
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 3

Results Summary
B&P Pouring 324192 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date of Run	5/9/12	5/9/12	5/9/12	
Time of Run	1540-1653	1707-1852	1907-2023	
Pouring Rate, TPH	1.43	1.43	1.43	1.43
Volumetric Flow Rate (Rounded to 100 CFM)				
ACFM	15,100	15,300	15,300	15,200
DSCFM	13,700	14,000	13,800	13,800
Gas Temperature, °F	96	91	100	96
Gas Moisture Content, %v/v	0.9	0.8	0.4	0.7
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.30	0.31	0.32	0.31
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0025	0.0026	0.0027	0.0026
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 4

Results Summary
B&P Pouring 324200 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date of Run	5/9/12	5/9/12	5/9/12	
Time of Run	0745-0925	1005-1143	1230-1427	
Pouring Rate, TPH	0.50	0.50	0.50	0.50
Volumetric Flow Rate (Rounded to 100 CFM)				
ACFM	18,600	18,800	18,800	18,700
DSCFM	17,000	17,200	17,100	17,100
Gas Temperature, °F	89	90	95	91
Gas Moisture Content, %v/v	1.0	0.8	0.7	0.9
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.30	0.26	0.34	0.30
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0021	0.0018	0.0023	0.0020
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 5

Results Summary
Disa Pouring 324484 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date of Run	5/9/12	5/9/12	5/9/12	
Time of Run	1530-1646	1815-1927	1940-2054	
Pouring Rate, TPH	2.18	2.18	2.18	2.18
Volumetric Flow Rate (Rounded to 10 CFM)				
ACFM	5,480	4,600	4,620	4,900
DSCFM	4,990	4,370	4,420	4,590
Gas Temperature, °F	93	68	66	76
Gas Moisture Content, %v/v	0.9	1.0	1.0	0.9
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.25	0.03	0.12	0.13
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0059	0.0008	0.0031	0.0033
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 6

Results Summary
#6 HMP(E. Hunter) 324632 Stack
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/9/12	5/9/12	5/9/12	
Time of Run	0745-0925	1015-1152	1230-1427	
Pouring Rate, TPH	1.18	1.18	1.18	1.18
Volumetric Flow Rate (Rounded to 10 CFM)				
ACFM	7,030	6,960	6,930	6,970
DSCFM	6,260	6,090	6,120	6,160
Gas Temperature, °F	103	109	107	106
Gas Moisture Content, %v/v	1.1	1.7	1.2	1.3
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.25	0.21	0.19	0.22
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0047	0.0040	0.0037	0.0041
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 7

Results Summary
Cupola 324644 Baghouse Vent
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/8/12	5/8/12	5/8/12	
Time of Run	0800-1050	1215-1539	1620-2005	
Cupola Melt Rate, TPH	14.66	9.06	9.06	10.93
Volumetric Flow Rate* (Rounded to 100 CFM)				
ACFM	46,500	49,000	48,600	48,000
DSCFM	19,300	20,000	20,000	19,800
Gas Temperature, °F	256	255	248	253
Gas Moisture Content, %v/v	5.6	5.1	4.8	5.2
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	3.6	3.9	3.0	3.5
Oxygen, O_2	17.0	16.8	17.8	17.2
Nitrogen, N_2 (by difference)	79.4	79.3	79.2	79.3
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.05	0.12	0.13	0.10
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0003	0.0007	0.0008	0.0006
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Mass Rate, LB/Ton charged	0.004	0.014	0.015	0.011

* As Measured from the baghouse Inlet

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 8

Results Summary
#7 HMP(W. Hunter) 324662 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date of Run	5/10/12	5/10/12	5/10/12	
Time of Run	0805-0944	1000-1116	1225-1341	
Pouring Rate, TPH	0.76	0.76	0.76	0.76
Volumetric Flow Rate (Rounded to 10 CFM)				
ACFM	9,140	9,320	9,530	9,330
DSCFM	8,410	8,490	8,730	8,540
Gas Temperature, °F	87	92	89	89
Gas Moisture Content, %v/v	0.8	0.9	0.8	0.8
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.29	0.19	0.23	0.24
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0040	0.0026	0.0031	0.0032
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 9

Results Summary
Disa Exhaust 324678 Stack
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/8/12	5/8/12	5/8/12	
Time of Run	0720-0836	0910-1027	1206-1324	
Pouring Rate, TPH	3.46	3.46	3.46	3.46
Volumetric Flow Rate (Rounded to 100 CFM)				
ACFM	27,300	26,800	27,500	27,200
DSCFM	24,500	23,100	24,100	23,900
Gas Temperature, °F	96	119	109	108
Gas Moisture Content, %v/v	1.2	1.0	1.2	1.2
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.39	0.48	1.00	0.62
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0018	0.0024	0.0048	0.0030
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 10

Results Summary
Disa CC Exhaust 324682 Stack
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/9/12	5/9/12	5/9/12	
Time of Run	1600-1736	1815-1922	1940-2052	
Pouring Rate, TPH	2.18	2.18	2.18	2.18
Volumetric Flow Rate (Rounded to 100 CFM)				
ACFM	32,000	31,200	30,900	31,400
DSCFM	29,500	28,900	28,800	29,100
Gas Temperature, °F	86	84	80	83
Gas Moisture Content, %v/v	0.7	0.7	0.8	0.7
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.68	0.55	0.50	0.58
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0027	0.0022	0.0020	0.0023
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 11

Results Summary
#5 HMP (TC Fan) 324848 Stack
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/8/12	5/8/12	5/8/12	
Time of Run	0725-0903	0925-1102	1200-1346	
Pouring Rate, TPH	1.87	1.87	1.87	1.87
Volumetric Flow Rate (Rounded to 100 CFM)				
ACFM	11,800	12,000	11,800	11,900
DSCFM	10,800	11,000	10,600	10,800
Gas Temperature, °F	80	81	91	84
Gas Moisture Content, %v/v	1.3	1.0	1.2	1.2
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.12	0.15	0.15	0.14
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0012	0.0016	0.0016	0.0015
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 12

Results Summary
Module Cooling 344116 Stack
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/10/12	5/10/12	5/10/12	
Time of Run	0740-0852	0920-1032	1155-1305	
Pouring Rate, TPH	1.66	1.66	1.66	1.66
Volumetric Flow Rate (Rounded to 10 CFM)				
ACFM	10,400	10,440	10,490	10,440
DSCFM	9,800	9,670	9,620	9,700
Gas Temperature, °F	78	86	93	85
Gas Moisture Content, %v/v	0.4	0.6	0.3	0.5
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.11	0.12	0.14	0.12
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0014	0.0015	0.0017	0.0015
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 13

Results Summary
Module Cooling 334176 Stack
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/10/12	5/10/12	5/10/12	
Time of Run	0810-0935	0950-1115	1155-1321	
Pouring Rate, TPH	1.66	1.66	1.66	1.66
Volumetric Flow Rate (Rounded to 10 CFM)				
ACFM	6,780	6,630	6,860	6,760
DSCFM	6,380	6,140	6,260	6,260
Gas Temperature, °F	78	84	92	85
Gas Moisture Content, %v/v	0.5	0.9	0.9	0.8
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	0.0	0.0	0.0	0.0
Oxygen, O_2	21.0	21.0	21.0	21.0
Nitrogen, N_2 (by difference)	79.0	79.0	79.0	79.0
Particulate Mass Rate, LB/HR				
Dry Catch Particulate	0.15	0.14	0.08	0.13
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*
Particulate Concentration, GR/DSCF				
Dry Catch Particulate	0.0028	0.0028	0.0016	0.0024
Dry Catch + Organic Wet Catch	*NA*	*NA*	*NA*	*NA*
Dry Catch + M-202 (PM-10 Eq.)	*NA*	*NA*	*NA*	*NA*

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Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 14

Metals Results Summary
Cupola 324644 Baghouse Vent
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/8/12	5/8/12	5/8/12	
Time of Run	0800-1050	1215-1539	1620-2005	
Cupola Melt Rate, TPH	14.66	9.06	9.06	10.93
Volumetric Flow Rate* (Rounded to 100 CFM)				
ACFM	46,500	49,000	48,600	48,000
DSCFM	19,300	20,000	20,000	19,800
Gas Temperature, °F	256	255	248	253
Gas Moisture Content, %v/v	5.6	5.1	4.8	5.2
Gas Composition, %v/v, dry				
Carbon Dioxide, CO_2	3.6	3.9	3.0	3.5
Oxygen, O_2	17.0	16.8	17.8	17.2
Nitrogen, N_2 (by difference)	79.4	79.3	79.2	79.3
Metals Emission Factors, LB/Ton charged				
Antimony	0.000004	0.000003	0.000004	0.000004
Arsenic	<0.000000	0.000001	<0.000001	≤0.000001
Beryllium	<0.000000	<0.000000	<0.000000	<0.000000
Cadmium	0.000003	0.000005	0.000002	0.000003
Chromium	0.000011	0.000041	0.000065	0.000039
Cobalt	0.000000	0.000001	0.000001	0.000001
Lead	0.000050	0.000103	0.000046	0.000066
Manganese	0.000213	0.000421	0.000192	0.000275
Nickel	0.000059	0.000638	0.000949	0.000549
Selenium	0.000002	0.000014	0.000002	0.000006
Mercury	0.000024	0.000020	0.000038	0.000027
Total Metal HAPs (sum)	0.000367	0.001246	0.001299	0.000971

* As Measured from the baghouse Inlet

Non-detect results are shown as less than (<) the sum of fraction LRLs. '≤' denotes a mix of detected and non-detected results.

Detail Tables

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Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 15

Major Gases and Moisture Results
B&P Pouring 324180 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	1505-1445	1710-1849	1925-2105
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.66	20.76	20.69
Nitrogen	77.90	78.28	78.01
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	20.0	13.0	18.0
Moisture Content, %v/v	1.40	0.93	1.26
Moisture Content if Saturated, %v/v	3.86	3.75	2.90
Relative Humidity, % rH	36%	25%	44%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.81	28.86	28.82

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

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Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 16

Major Gases and Moisture Results
B&P Pouring 324184 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	1505-1646	1710-1849	1925-2105
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.61	20.71	20.53
Nitrogen	77.74	78.11	77.41
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.2	20.9
Moisture Collected, ml	23.0	16.0	29.0
Moisture Content, %v/v	1.61	1.14	2.03
Moisture Content if Saturated, %v/v	4.38	3.85	3.41
Relative Humidity, % rH	37%	30%	59%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.78	28.84	28.74

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

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Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 17

Major Gases and Moisture Results
B&P Pouring 324192 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	1540-1653	1707-1852	1907-2023
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.76	20.79	20.88
Nitrogen	78.28	78.41	78.73
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	13.0	11.0	5.0
Moisture Content, %v/v	0.92	0.76	0.35
Moisture Content if Saturated, %v/v	5.94	5.12	6.75
Relative Humidity, % rH	16%	15%	5%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.86	28.88	28.92

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

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Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 18

Major Gases and Moisture Results
B&P Pouring 324200 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	0745-0925	1005-1143	1230-1427
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.74	20.78	20.80
Nitrogen	78.22	78.36	78.44
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	18.0	15.0	13.0
Moisture Content, %v/v	1.01	0.83	0.73
Moisture Content if Saturated, %v/v	4.80	5.01	5.76
Relative Humidity, % rH	21%	17%	13%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.85	28.87	28.88

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

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Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 19

Major Gases and Moisture Results
Disa Pouring 324484 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	1530-1646	1815-1927	1940-2054
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.77	20.73	20.75
Nitrogen	78.34	78.20	78.26
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	14.0	15.0	14.0
Moisture Content, %v/v	0.85	1.03	0.95
Moisture Content if Saturated, %v/v	5.46	2.41	2.21
Relative Humidity, % rH	16%	43%	43%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.87	28.85	28.86

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

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Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 20

Major Gases and Moisture Results
#6 HMP(E. Hunter) 324632 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	0745-0925	1015-1152	1230-1427
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.72	20.60	20.69
Nitrogen	78.16	77.68	78.03
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	15.0	23.0	17.0
Moisture Content, %v/v	1.08	1.68	1.25
Moisture Content if Saturated, %v/v	7.29	8.72	8.21
Relative Humidity, % rH	15%	19%	15%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.84	28.78	28.82

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

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Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 21

Major Gases and Moisture Results
Cupola 324644 Baghouse Vent
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	0800-1050	1215-1539	1620-2005
Major Gas Constituents - Instrumental, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	3.60	3.90	3.00
Oxygen	17.00	16.80	17.80
Nitrogen (by difference)	79.40	79.30	79.20
Wet Basis (calculated)			
Carbon Dioxide	3.40	3.70	2.86
Oxygen	16.05	15.94	16.95
Nitrogen	74.98	75.23	75.41
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	17.3	17.0	17.9
Moisture Collected, ml	105.0	104.0	69.0
Moisture Content, %v/v	5.56	5.13	4.79
Moisture Content if Saturated, %v/v	NA (>BP)	NA (>BP)	NA (>BP)
Relative Humidity, % rH	NA (>BP)	NA (>BP)	NA (>BP)
Molecular Weight of Flue Gas, lb/lb-mole			
Dry	29.26	29.30	29.19
Wet	28.63	28.72	28.66

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Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 22

Major Gases and Moisture Results
#7 HMP(W. Hunter) 324662 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/10/12	5/10/12	5/10/12
Time of Run	0805-0944	1000-1116	1225-1341
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.79	20.77	20.77
Nitrogen	78.42	78.33	78.35
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	13.0	12.0	12.0
Moisture Content, %v/v	0.75	0.86	0.84
Moisture Content if Saturated, %v/v	4.53	5.25	4.84
Relative Humidity, % rH	17%	16%	17%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.88	28.87	28.87

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 23

Major Gases and Moisture Results
Disa Exhaust 324678 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	0720-0836	0910-1027	1206-1324
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.70	20.73	20.69
Nitrogen	78.06	78.18	78.05
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	17.0	14.0	17.0
Moisture Content, %v/v	1.20	1.05	1.22
Moisture Content if Saturated, %v/v	5.93	11.79	8.87
Relative Humidity, % rH	20%	9%	14%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.83	28.85	28.83

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 24

Major Gases and Moisture Results
Disa CC Exhaust 324682 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	1600-1736	1815-1922	1940-2052
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.80	20.81	20.79
Nitrogen	78.45	78.50	78.39
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	10.0	10.0	12.0
Moisture Content, %v/v	0.71	0.65	0.79
Moisture Content if Saturated, %v/v	4.32	4.04	3.61
Relative Humidity, % rH	16%	16%	22%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.88	28.89	28.87

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 25

Major Gases and Moisture Results
#5 HMP (TC Fan) 324848 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	0725-0903	0925-1102	1200-1346
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.68	20.73	20.70
Nitrogen	77.98	78.19	78.06
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	21.0	17.0	19.0
Moisture Content, %v/v	1.31	1.04	1.21
Moisture Content if Saturated, %v/v	3.65	3.73	5.09
Relative Humidity, % rH	36%	28%	24%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.82	28.85	28.83

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 26

Major Gases and Moisture Results
Module Cooling 344116 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/10/12	5/10/12	5/10/12
Time of Run	0740-0852	0920-1032	1155-1305
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.87	20.82	20.88
Nitrogen	78.69	78.53	78.74
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	6.0	9.0	5.0
Moisture Content, %v/v	0.40	0.61	0.34
Moisture Content if Saturated, %v/v	3.35	4.34	5.34
Relative Humidity, % rH	12%	14%	6%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.92	28.89	28.92

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 27

Major Gases and Moisture Results
Module Cooling 334176 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/10/12	5/10/12	5/10/12
Time of Run	0810-0935	0950-1115	1155-1321
Major Gas Constituents - Ambient, % v/v			
Dry Basis (as measured)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.95	20.95	20.95
Nitrogen (by difference)	79.01	79.01	79.01
Wet Basis (calculated)			
Carbon Dioxide	0.04	0.04	0.04
Oxygen	20.84	20.75	20.76
Nitrogen	78.60	78.28	78.29
Portable Oxygen Monitor Result			
Time Weighted Average, $\%O_2$	20.9	20.9	20.9
Moisture Collected, ml	8.0	14.0	14.0
Moisture Content, %v/v	0.52	0.93	0.92
Moisture Content if Saturated, %v/v	3.36	4.04	5.22
Relative Humidity, % rH	15%	23%	18%
Molecular Weight of Flue Gas, lb/lb-mole			
Dry[1]	28.96	28.96	28.96
Wet	28.90	28.86	28.86

[1] Dry molecular weight reflects ambient gas proportions: 78.08% Nitrogen, 20.95% Oxygen, 0.93% Argon, and 0.038% Carbon Dioxide.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 28

Particulate Results
B&P Pouring 324180 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	1505-1445	1710-1849	1925-2105
Sample Duration, Minutes	96	96	96
Average Flue Gas Temperature, °F	82.1	81.2	73.5
Moisture Content of Flue Gas, %v/v	1.4	0.9	1.3
Particulate Collected, mg			
Dry Catch	6.8	5.5	4.8
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 100 CFM)			
ACFM	15,600	15,400	15,400
SCFM	14,600	14,400	14,600
DSCFM	14,400	14,300	14,400
Sample Volume, Meter Conditions, Ft^3	68.70	68.25	68.55
Sample Volume, Dry Standard, Ft^3	66.13	65.49	66.21
Particulate Concentration			
Dry Catch, GR/DSCF	0.0016	0.0013	0.0011
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.20	0.16	0.14
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 29

Particulate Results
B&P Pouring 324184 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	1505-1646	1710-1849	1925-2105
Sample Duration, Minutes	96	96	96
Average Flue Gas Temperature, °F	86.0	82.0	78.3
Moisture Content of Flue Gas, %v/v	1.6	1.1	2.0
Particulate Collected, mg			
Dry Catch	6.2	5.7	4.6
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 100 CFM)			
ACFM	16,400	16,200	16,200
SCFM	15,200	15,100	15,200
DSCFM	14,900	14,900	14,900
Sample Volume, Meter Conditions, Ft^3	69.65	69.33	69.47
Sample Volume, Dry Standard, Ft^3	66.11	65.45	65.99
Particulate Concentration			
Dry Catch, GR/DSCF	0.0014	0.0013	0.0011
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.19	0.17	0.14
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 30

Particulate Results
B&P Pouring 324192 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	1540-1653	1707-1852	1907-2023
Sample Duration, Minutes	72	72	72
Average Flue Gas Temperature, °F	96.0	91.1	100.2
Moisture Content of Flue Gas, %v/v	0.9	0.8	0.4
Particulate Collected, mg			
Dry Catch	10.8	11.3	11.5
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 100 CFM)			
ACFM	15,100	15,300	15,300
SCFM	13,800	14,100	13,900
DSCFM	13,700	14,000	13,800
Sample Volume, Meter Conditions, Ft^3	70.26	72.53	70.91
Sample Volume, Dry Standard, Ft^3	65.65	67.30	66.52
Particulate Concentration			
Dry Catch, GR/DSCF	0.0025	0.0026	0.0027
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.30	0.31	0.32
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 31

Particulate Results
B&P Pouring 324200 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	0745-0925	1005-1143	1230-1427
Sample Duration, Minutes	96	96	96
Average Flue Gas Temperature, °F	89.1	90.4	95.0
Moisture Content of Flue Gas, %v/v	1.0	0.8	0.7
Particulate Collected, mg			
Dry Catch	11.2	9.7	12.4
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 100 CFM)			
ACFM	18,600	18,800	18,800
SCFM	17,200	17,400	17,200
DSCFM	17,000	17,200	17,100
Sample Volume, Meter Conditions, Ft^3	85.67	88.10	88.02
Sample Volume, Dry Standard, Ft^3	83.26	84.34	83.41
Particulate Concentration			
Dry Catch, GR/DSCF	0.0021	0.0018	0.0023
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.30	0.26	0.34
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 32

Particulate Results
Disa Pouring 324484 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	1530-1646	1815-1927	1940-2054
Sample Duration, Minutes	72	72	72
Average Flue Gas Temperature, °F	93.2	68.1	65.5
Moisture Content of Flue Gas, %v/v	0.9	1.0	1.0
Particulate Collected, mg			
Dry Catch	29.2	3.4	13.9
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 10 CFM)			
ACFM	5,480	4,600	4,620
SCFM	5,030	4,420	4,460
DSCFM	4,990	4,370	4,420
Sample Volume, Meter Conditions, Ft^3	81.00	71.11	70.59
Sample Volume, Dry Standard, Ft^3	76.74	67.90	68.62
Particulate Concentration			
Dry Catch, GR/DSCF	0.0059	0.0008	0.0031
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.25	0.03	0.12
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 33

Particulate Results
#6 HMP(E. Hunter) 324632 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	0745-0925	1015-1152	1230-1427
Sample Duration, Minutes	96	96	96
Average Flue Gas Temperature, °F	102.6	108.7	106.6
Moisture Content of Flue Gas, %v/v	1.1	1.7	1.2
Particulate Collected, mg			
Dry Catch	19.8	16.5	15.0
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 10 CFM)			
ACFM	7,030	6,960	6,930
SCFM	6,330	6,200	6,200
DSCFM	6,260	6,090	6,120
Sample Volume, Meter Conditions, Ft^3	66.49	65.75	66.20
Sample Volume, Dry Standard, Ft^3	64.65	63.31	63.30
Particulate Concentration			
Dry Catch, GR/DSCF	0.0047	0.0040	0.0037
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.25	0.21	0.19
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 34

Particulate Results
Cupola 324644 Baghouse Vent
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	0800-1050	1215-1539	1620-2005
Sample Duration, Minutes	120	120	99.6
Average Flue Gas Temperature, °F	255.6	255.5	247.5
Moisture Content of Flue Gas, %v/v	5.6	5.1	4.8
Particulate Collected, mg			
Dry Catch	1.8	4.2	3.3
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate* (Rounded to 100 CFM)			
ACFM	46,500	49,000	48,600
SCFM	21,600	22,500	22,600
DSCFM	19,300	20,000	20,000
Sample Volume, Meter Conditions, Ft^3	91.18	98.66	70.06
Sample Volume, Dry Standard, Ft^3	83.90	90.54	64.58
Particulate Concentration			
Dry Catch, GR/DSCF	0.0003	0.0007	0.0008
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.05	0.12	0.13
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

* As Measured from the baghouse Inlet

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 35

Particulate Results
#7 HMP(W. Hunter) 324662 Stack
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/10/12	5/10/12	5/10/12
Time of Run	0805-0944	1000-1116	1225-1341
Sample Duration, Minutes	96	72	72
Average Flue Gas Temperature, °F	87.2	91.9	89.3
Moisture Content of Flue Gas, %v/v	0.8	0.9	0.8
Particulate Collected, mg			
Dry Catch	20.8	10.8	13.5
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 10 CFM)			
ACFM	9,140	9,320	9,530
SCFM	8,470	8,570	8,800
DSCFM	8,410	8,490	8,730
Sample Volume, Meter Conditions, Ft^3	84.00	68.52	71.27
Sample Volume, Dry Standard, Ft^3	80.90	64.79	66.46
Particulate Concentration			
Dry Catch, GR/DSCF	0.0040	0.0026	0.0031
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.29	0.19	0.23
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 36

Particulate Results
Disa Exhaust 324678 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	0720-0836	0910-1027	1206-1324
Sample Duration, Minutes	72	72	72
Average Flue Gas Temperature, °F	95.7	119.3	109.3
Moisture Content of Flue Gas, %v/v	1.2	1.0	1.2
Particulate Collected, mg			
Dry Catch	7.9	9.8	20.3
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 100 CFM)			
ACFM	27,300	26,800	27,500
SCFM	24,800	23,400	24,400
DSCFM	24,500	23,100	24,100
Sample Volume, Meter Conditions, Ft^3	68.35	65.31	68.53
Sample Volume, Dry Standard, Ft^3	65.90	62.21	64.87
Particulate Concentration			
Dry Catch, GR/DSCF	0.0018	0.0024	0.0048
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.39	0.48	1.00
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 37

Particulate Results
Disa CC Exhaust 324682 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/9/12	5/9/12	5/9/12
Time of Run	1600-1736	1815-1922	1940-2052
Sample Duration, Minutes	96	72	72
Average Flue Gas Temperature, °F	85.7	83.6	80.1
Moisture Content of Flue Gas, %v/v	0.7	0.7	0.8
Particulate Collected, mg			
Dry Catch	11.5	10.2	9.4
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 100 CFM)			
ACFM	32,000	31,200	30,900
SCFM	29,800	29,100	29,100
DSCFM	29,500	28,900	28,800
Sample Volume, Meter Conditions, Ft^3	69.40	74.90	73.98
Sample Volume, Dry Standard, Ft^3	65.91	71.50	71.34
Particulate Concentration			
Dry Catch, GR/DSCF	0.0027	0.0022	0.0020
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.68	0.55	0.50
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 38

Particulate Results
#5 HMP (TC Fan) 324848 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	0725-0903	0925-1102	1200-1346
Sample Duration, Minutes	96	96	96
Average Flue Gas Temperature, °F	80.3	80.9	90.6
Moisture Content of Flue Gas, %v/v	1.3	1.0	1.2
Particulate Collected, mg			
Dry Catch	6.0	7.7	7.7
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 100 CFM)			
ACFM	11,800	12,000	11,800
SCFM	11,000	11,100	10,800
DSCFM	10,800	11,000	10,600
Sample Volume, Meter Conditions, Ft^3	76.40	78.55	76.45
Sample Volume, Dry Standard, Ft^3	74.41	75.86	73.25
Particulate Concentration			
Dry Catch, GR/DSCF	0.0012	0.0016	0.0016
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.12	0.15	0.15
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 39

Particulate Results
Module Cooling 344116 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/10/12	5/10/12	5/10/12
Time of Run	0740-0852	0920-1032	1155-1305
Sample Duration, Minutes	72	72	72
Average Flue Gas Temperature, °F	77.9	86.0	92.5
Moisture Content of Flue Gas, %v/v	0.4	0.6	0.3
Particulate Collected, mg			
Dry Catch	6.2	6.6	7.4
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 10 CFM)			
ACFM	10,400	10,440	10,490
SCFM	9,840	9,730	9,650
DSCFM	9,800	9,670	9,620
Sample Volume, Meter Conditions, Ft^3	71.25	72.05	72.28
Sample Volume, Dry Standard, Ft^3	69.95	69.07	68.78
Particulate Concentration			
Dry Catch, GR/DSCF	0.0014	0.0015	0.0017
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.11	0.12	0.14
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 40

Particulate Results
Module Cooling 334176 Stack
Test 1

Parameter	Run 1	Run 2	Run 3
Date of Run	5/10/12	5/10/12	5/10/12
Time of Run	0810-0935	0950-1115	1155-1321
Sample Duration, Minutes	84	84	84
Average Flue Gas Temperature, °F	78.0	83.7	91.8
Moisture Content of Flue Gas, %v/v	0.5	0.9	0.9
Particulate Collected, mg			
Dry Catch	13.0	12.5	7.2
Inorganic Wet Catch	*NR*	*NR*	*NR*
Organic Wet Catch	*NR*	*NR*	*NR*
Volumetric Flow Rate (Rounded to 10 CFM)			
ACFM	6,780	6,630	6,860
SCFM	6,410	6,200	6,320
DSCFM	6,380	6,140	6,260
Sample Volume, Meter Conditions, Ft^3	72.92	72.45	74.96
Sample Volume, Dry Standard, Ft^3	72.55	70.08	71.35
Particulate Concentration			
Dry Catch, GR/DSCF	0.0028	0.0028	0.0016
Inorganic Wet Catch, GR/DSCF	*NR*	*NR*	*NR*
Organic Wet Catch, GR/DSCF	NR	NR	NR
Dry Catch+Organic WC, GR/DSCF	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), GR/DSCF	*NA*	*NA*	*NA*
Particulate Emission Rate			
Dry Catch Only, LB/HR	0.15	0.14	0.08
Inorganic Wet Catch Only, LB/HR	*NR*	*NR*	*NR*
Organic Wet Catch Only, LB/HR	NR	NR	NR
Dry Catch+Organic WC, LB/HR	*NA*	*NA*	*NA*
Total Particulate (PM-10 Eq.), LB/HR	*NA*	*NA*	*NA*

NR=Not required or not requested.

NA = Not applicable

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 41a

Metals Concentration Results
Cupola 324644 Baghouse Vent
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	0800-1050	1215-1539	1620-2005
Sample Duration, Minutes	120	120	99.6
Average Flue Gas Temperature, °F	255.6	255.5	247.5
Moisture Content of Flue Gas, %v/v	5.6	5.1	4.8
Sample Volume, Meter Conditions, Ft^3	91.18	98.66	70.06
Sample Volume, Dry Standard, Ft^3	83.90	90.54	64.58
Sample Volume, Dry Standard, m^3	2.38	2.56	1.83
Constituent Concentration, µg/dscm			
Antimony	0.75	0.38	0.47
Arsenic	<0.08	0.08	<0.11
Beryllium	<0.02	<0.02	<0.03
Cadmium	0.69	0.55	0.28
Chromium	2.32	4.97	7.89
Cobalt	0.09	0.13	0.17
Lead	10.09	12.43	5.55
Manganese	43.14	51.01	23.29
Nickel	12.03	77.33	114.98
Selenium	0.37	1.74	0.19
Mercury	4.89	2.37	4.60
Total Metals (sum), ug/dscm	74.369	150.989	157.418
Total Metals (sum), GR/DSCF	0.000032	0.000066	0.000069

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 41b

Metals Mass Rate Results
Cupola 324644 Baghouse Vent
Test 1

Parameter	**Run 1**	**Run 2**	**Run 3**
Date of Run	5/8/12	5/8/12	5/8/12
Time of Run	0800-1050	1215-1539	1620-2005
Sample Duration, Minutes	120	120	99.6
Volumetric Flow Rate* (Rounded to 100 CFM)			
ACFM	46,500	49,000	48,600
SCFM	21,600	22,500	22,600
DSCFM	19,300	20,000	20,000
Constituent Mass Rate, LB/HR			
Antimony	0.000054	0.000028	0.000035
Arsenic	<0.000011	0.000011	<0.000011
Beryllium	<0.000002	<0.000001	<0.000002
Cadmium	0.000050	0.000041	0.000021
Chromium	0.00017	0.00037	0.00059
Cobalt	0.000007	0.000010	0.000013
Lead	0.00073	0.00093	0.00042
Manganese	0.00312	0.00381	0.00174
Nickel	0.00087	0.00578	0.00860
Selenium	0.00003	0.00013	0.00001
Mercury	0.000354	0.000177	0.000344

* As Measured from the baghouse Inlet

Non-detect results are shown as less than (<) the sum of fraction LRLs.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 42

Airflow Measurement Results
B&P Pouring 324180 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/8/12
Time of Measurement		1420
Barometric Pressure, Inches Hg		28.64
Static Pressure, Inches WC		0.15
Absolute Gas Pressure (In. Hg)		28.65
Average Gas Temperature, °F		86
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		0.9
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		37.65
Duct Cross-sectional Area, Sq. Ft.		7.07
Volumetric Flow Rate (Rounded to 100 CFM)		
ACFM		16,000
SCFM		14,800
DSCFM		14,700

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 43

Airflow Measurement Results
B&P Pouring 324184 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/8/12
Time of Measurement		1445
Barometric Pressure, Inches Hg		28.64
Static Pressure, Inches WC		0.17
Absolute Gas Pressure (In. Hg)		28.65
Average Gas Temperature, °F		88
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		0.8
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		40.34
Duct Cross-sectional Area, Sq. Ft.		7.07
Volumetric Flow Rate (Rounded to 100 CFM)		
ACFM		17,100
SCFM		15,800
DSCFM		15,700

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 44

Airflow Measurement Results
B&P Pouring 324192 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/9/12
Time of Measurement		1520
Barometric Pressure, Inches Hg		28.76
Static Pressure, Inches WC		0.14
Absolute Gas Pressure (In. Hg)		28.77
Average Gas Temperature, °F		92
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		1.2
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		35.77
Duct Cross-sectional Area, Sq. Ft.		7.07
Volumetric Flow Rate (Rounded to 100 CFM)		
ACFM		15,200
SCFM		14,000
DSCFM		13,800

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 45

Airflow Measurement Results
B&P Pouring 324200 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/9/12
Time of Measurement		0710
Barometric Pressure, Inches Hg		28.76
Static Pressure, Inches WC		0.16
Absolute Gas Pressure (In. Hg)		28.77
Average Gas Temperature, °F		88
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		0.8
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		43.02
Duct Cross-sectional Area, Sq. Ft.		7.07
Volumetric Flow Rate (Rounded to 100 CFM)		
ACFM		18,200
SCFM		16,900
DSCFM		16,800

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 46

Airflow Measurement Results
Disa Pouring 324484 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/9/12
Time of Measurement		1500
Barometric Pressure, Inches Hg		28.76
Static Pressure, Inches WC		-0.05
Absolute Gas Pressure (In. Hg)		28.76
Average Gas Temperature, °F		90
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		1.0
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		24.57
Duct Cross-sectional Area, Sq. Ft.		4.91
Volumetric Flow Rate (Rounded to 10 CFM)		
ACFM		7,240
SCFM		6,680
DSCFM		6,610

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 47

Airflow Measurement Results
#6 HMP(E. Hunter) 324632 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/9/12
Time of Measurement		0730
Barometric Pressure, Inches Hg		28.76
Static Pressure, Inches WC		-1.10
Absolute Gas Pressure (In. Hg)		28.68
Average Gas Temperature, °F		98
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		0.9
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		36.59
Duct Cross-sectional Area, Sq. Ft.		3.14
Volumetric Flow Rate (Rounded to 10 CFM)		
ACFM		6,900
SCFM		6,260
DSCFM		6,200

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 48

Airflow Measurement Results
Cupola Baghouse Inlet
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	1/0/00	1/0/00	1/0/00	
Time of Measurement	0730	1200	1600	
Barometric Pressure, Inches Hg	28.64	28.64	28.64	28.64
Static Pressure, Inches WC	-2.24	-2.37	-2.23	-2.28
Absolute Gas Pressure (In. Hg)	28.48	28.47	28.48	28.47
Average Gas Temperature, °F	624	636	621	627
Moisture Determination Procedure	Method 4			
Average Moisture Content, %v/v	10.4	11.2	11.6	11.1
Gas Molecular Weight (Instrumental), lb/lb-mole				
Dry	30.0	30.0	30.0	30.0
Wet	28.7	28.7	28.6	28.7
Flue Gas Average Velocity, FPS	61.74	65.01	64.44	63.73
Duct Cross-sectional Area, Sq. Ft.	12.57	12.57	12.57	12.57
Volumetric Flow Rate (Rounded to 100 CFM)				
ACFM	46,500	49,000	48,600	48,100
SCFM	21,600	22,500	22,600	22,200
DSCFM	19,300	20,000	20,000	19,700

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 49

Airflow Measurement Results
#7 HMP(W. Hunter) 324662 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/10/12
Time of Measurement		0715
Barometric Pressure, Inches Hg		28.82
Static Pressure, Inches WC		-1.15
Absolute Gas Pressure (In. Hg)		28.74
Average Gas Temperature, °F		77
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		1.2
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		43.90
Duct Cross-sectional Area, Sq. Ft.		3.41
Volumetric Flow Rate (Rounded to 10 CFM)		
ACFM		8,980
SCFM		8,480
DSCFM		8,380

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 50

Airflow Measurement Results
Disa Exhaust 324678 Stack
Test 1

Parameter		**Preliminary**	**Preliminary**
Date of Run		5/8/12	5/8/12
Time of Measurement		1804	1855
Barometric Pressure, Inches Hg		28.64	28.64
Static Pressure, Inches WC		-0.27	-0.27
Absolute Gas Pressure (In. Hg)		28.62	28.62
Average Gas Temperature, °F		82	85
Moisture Determination Procedure	Wet/Dry Bulb		
Average Moisture Content, %v/v		1.0	0.9
Gas Molecular Weight (Ambient), lb/lb-mole			
Dry		29.0	29.0
Wet		28.9	28.9
Flue Gas Average Velocity, FPS		51.47	52.93
Duct Cross-sectional Area, Sq. Ft.		9.62	9.62
Volumetric Flow Rate (Rounded to 100 CFM)			
ACFM		29,700	30,600
SCFM		27,700	28,300
DSCFM		27,400	28,100

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 51

Airflow Measurement Results
Disa CC Exhaust 324682 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/9/12
Time of Measurement		1530
Barometric Pressure, Inches Hg		28.76
Static Pressure, Inches WC		-0.35
Absolute Gas Pressure (In. Hg)		28.73
Average Gas Temperature, °F		110
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		1.1
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		55.80
Duct Cross-sectional Area, Sq. Ft.		9.62
Volumetric Flow Rate (Rounded to 100 CFM)		
ACFM		32,200
SCFM		28,700
DSCFM		28,400

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 52

Airflow Measurement Results
#5 HMP (TC Fan) 324848 Stack
Test 1

Parameter		Preliminary
Date of Run		5/8/12
Time of Measurement		0705
Barometric Pressure, Inches Hg		28.64
Static Pressure, Inches WC		-2.20
Absolute Gas Pressure (In. Hg)		28.48
Average Gas Temperature, °F		65
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		1.2
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		60.86
Duct Cross-sectional Area, Sq. Ft.		3.14
Volumetric Flow Rate (Rounded to 100 CFM)		
ACFM		11,500
SCFM		11,000
DSCFM		10,900

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 53

Airflow Measurement Results
Module Cooling 344116 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/10/12
Time of Measurement		0720
Barometric Pressure, Inches Hg		28.82
Static Pressure, Inches WC		-0.19
Absolute Gas Pressure (In. Hg)		28.81
Average Gas Temperature, °F		78
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		1.1
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		35.92
Duct Cross-sectional Area, Sq. Ft.		4.91
Volumetric Flow Rate (Rounded to 10 CFM)		
ACFM		10,580
SCFM		10,000
DSCFM		9,880

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 54

Airflow Measurement Results
Module Cooling 334176 Stack
Test 1

Parameter		**Preliminary**
Date of Run		5/10/12
Time of Measurement		0745
Barometric Pressure, Inches Hg		28.84
Static Pressure, Inches WC		-0.40
Absolute Gas Pressure (In. Hg)		28.81
Average Gas Temperature, °F		70
Moisture Determination Procedure	Wet/Dry Bulb	
Average Moisture Content, %v/v		1.0
Gas Molecular Weight (Ambient), lb/lb-mole		
Dry		29.0
Wet		28.9
Flue Gas Average Velocity, FPS		29.33
Duct Cross-sectional Area, Sq. Ft.		4.91
Volumetric Flow Rate (Rounded to 10 CFM)		
ACFM		8,640
SCFM		8,290
DSCFM		8,210

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 55

Cyclonic Airflow Measurements
Disa Pouring 324484 Stack
TEST 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/8/2008	5/8/2008	5/8/2008	
Time of Measurement	1530-1646	1815-1927	1940-2054	
Number of Sampling Ports	2	2	2	
Number of Points Sampled	24	24	24	
Barometric Pressure (In. Hg)	28.76	28.76	28.76	28.76
Static Pressure (In. WC)	-0.05	0.00	0.00	-0.02
Absolute Flue Gas Pressure (In. Hg)	28.76	28.76	28.76	28.76
Average Flue Gas Temperature (F)	93	68	66	76
Average Moisture Content (%v/v)	0.9	1.0	1.0	0.9
Dry Molecular Wt. of Gas (lb/lb-mole)	28.8	28.8	28.8	28.8
Average Yaw Angle				41.7
Range of Yaw Angles				25 to 60
Flue Gas Average Velocity (FPS)*	18.60	15.62	15.69	16.64
Duct Dimension (Inches)	30.0	30.0	30.0	
Duct Cross-sectional Area (Sq. Ft.)	4.91	4.91	4.91	
Volumetric Flow Rate				
ACFM	5,480	4,600	4,620	4,900
SCFM	5,030	4,420	4,460	4,640
DSCFM	4,990	4,370	4,420	4,590

* Linear movement rate, actual flue gas velocity corrected for cyclonic flow.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 56

Cyclonic Airflow Measurements
Disa Exhaust 324678 Stack
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/8/2012	5/8/2012	5/8/2012	
Time of Measurement	0720-0836	0910-1027	1206-1324	
Number of Sampling Ports	2	2	2	
Number of Points Sampled	24	24	24	
Barometric Pressure (In. Hg)	28.64	28.64	28.64	28.64
Static Pressure (In. WC)	-0.27	-0.27	-0.27	-0.27
Absolute Flue Gas Pressure (In. Hg)	28.62	28.62	28.62	28.62
Average Flue Gas Temperature (F)	96	119	109	108
Average Moisture Content (%v/v)	1.2	1.0	1.2	1.2
Dry Molecular Wt. of Gas (lb/lb-mole)	28.8	28.8	28.8	28.8
Average Yaw Angle				25.2
Range of Yaw Angles				15 to 40
Flue Gas Average Velocity (FPS)*	47.24	46.40	47.55	47.06
Duct Dimension (Inches)	42.0	42.0	42.0	
Duct Cross-sectional Area (Sq. Ft.)	9.62	9.62	9.62	
Volumetric Flow Rate				
ACFM	27,270	26,790	27,450	27,170
SCFM	24,780	23,360	24,350	24,160
DSCFM	24,480	23,120	24,050	23,880

* Linear movement rate, actual flue gas velocity corrected for cyclonic flow.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 57

Cyclonic Airflow Measurements
Module Cooling 334176 Stack
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/7/2008	5/7/2008	5/7/2008	
Time of Measurement	0810-0935	0950-1115	1155-1321	
Number of Sampling Ports	2	2	2	
Number of Points Sampled	24	24	24	
Barometric Pressure (In. Hg)	28.84	28.84	28.84	28.84
Static Pressure (In. WC)	-0.40	-0.40	-0.40	-0.40
Absolute Flue Gas Pressure (In. Hg)	28.81	28.81	28.81	28.81
Average Flue Gas Temperature (F)	78	84	92	85
Average Moisture Content (%v/v)	0.5	0.9	0.9	0.8
Dry Molecular Wt. of Gas (lb/lb-mole)	28.8	28.8	28.8	28.8
Average Yaw Angle				36.9
Range of Yaw Angles				30 to 40
Flue Gas Average Velocity (FPS)*	23.04	22.49	23.29	22.94
Duct Dimension (Inches)	30.0	30.0	30.0	
Duct Cross-sectional Area (Sq. Ft.)	4.91	4.91	4.91	
Volumetric Flow Rate				
ACFM	6,780	6,630	6,860	6,760
SCFM	6,410	6,200	6,320	6,310
DSCFM	6,380	6,140	6,260	6,260

* Linear movement rate, actual flue gas velocity corrected for cyclonic flow.

Grede Foundries, Inc.

Grede-Iron Mountain
Kingsford, Michigan
Pace Project No. 1204-100

Table 58

Total Hydrocarbon Results
Cupola Baghouse Inlet
Test 1

Parameter	Run 1	Run 2	Run 3	Average
Date of Run	5/9/12	5/9/12	5/9/12	
Time of Run	753-853	950-1050	1155-1246	
Sample Duration (Minutes)	60	60	41.5	
Stack Temperature (°F)	650	644	647	647
Duct Moisture Content (%v/v)	8.9	10.5	6.9	8.7
Major Gas Constituents - Instrumental, % v/v				
Dry Basis (as measured)				
Carbon Dioxide	9.70	9.90	9.90	9.83
Oxygen	10.70	10.40	10.60	10.57
Nitrogen (by difference)	79.60	79.70	79.50	79.60
Total Hydrocarbon Concentration, PPMv - Wet				
THC as Propane	12.2	12.8	12.7	12.6
THC as n-Hexane[1]	6.1	6.4	6.4	6.3
Total Hydrocarbon Concentration, PPMv - Dry				
THC as Propane	13.38	14.27	13.68	13.78
THC as n-Hexane[1]	6.69	7.13	6.84	6.89
Total Hydrocarbon Concentration, PPMv - Dry @ 10% Oxygen				
THC as n-Hexane[1]	7.1	7.4	7.2	7.3

[1] Linear alkane response factor derived from number of carbon atoms
#REF!

Process Description

The Grede Foundries, Inc. Kingsford Michigan facility produces gray iron castings, typically for industrial machinery and various transportation industry customers. The major processes at Grede include raw material handling (metals, fluxes, and metallurgical coke), metal melting, mold and core production, casting and finishing.

Grede operates a main foundry and a module foundry under one roof. A single WRIB Company high efficiency cupola (EG-P009) provides all of the molten iron used by the main and module foundry. The cupola has a maximum melt rate of 20 tons per hour. Molten iron is stored in an electric holding furnace with a capacity of 28 tons prior to pouring. Emission control equipment for the cupola exhaust includes four natural gas afterburners for VOC and CO, a low efficiency scrubber (quench tank) for SO2, and a Hartzell Engineering Corp. baghouse for PM/PM10.

Test Procedures

EPA Method 1 specifies test location acceptability criteria and defines the minimum number of traverse points for representative sampling. Linear measurements from upstream and downstream flow disturbances and the duct equivalent diameter are compared and the distances related to number of diameters. A flow disturbance can be defined as anything that changes or upsets the direction of flow within the duct including bends, dampers, fans, shape or size transitions, and open flames. Method 1 stipulates that test ports should be located at least eight diameters downstream and two diameters upstream of any flow disturbance. The minimum acceptable criteria are two diameters downstream and 0.5 diameters upstream of flow disturbances. The test location must also be free of cyclonic or multidirectional flow. Once the distances have been determined, the values are used to select the minimum number of traverse points for representative sampling. Shorter distances require a greater number of traverse points. The test site configuration and measurement details are documented on EPA Method 1Field Data Sheet.

Pace FSD conducted this method as written with no deviations.

Alternative Method 3 allows the use of published or ambient gas concentrations (dry molecular weight of 28.96 LB/LB-mole) in cases where the source gas is free of combustion components. Ambient gas concentrations result in a dry molecular weight of 28.96 (29.0) LB/LB-mole.

Gas Constituent	% v/v	Molecular Weight	LB/LB -mole
Nitrogen, N_2	78.08	28.01	21.87
Oxygen, O_2	20.95	32	6.70
Argon, Ar	0.93	39.95	0.37
Carbon Dioxide, CO_2	0.038	44.01	0.02
Sum of Gas Constituents			28.96

Pace FSD conducts the method as written with the following routine deviation:

In the field, the gas sample is analyzed within two hours of collection using a portable O_2 detector. At a later time, potentially outside of the eight hour hold period, the gas sample is re-analyzed using an Orsat gas analyzer to quantify CO_2 and O_2 concentrations. The preliminary analysis result from the portable O_2 detector is used to validate the Orsat results. The Orsat results are acceptable when the O_2 result from the field and the O_2 result from the lab are $\leq 0.3\%$.

EPA Method 3A defines procedures to measure carbon dioxide (CO_2) and oxygen (O_2) concentrations from stationary sources. A stainless steel sampling probe and a sampling line draw a sample of the gas stream from the duct to a thermo-electric gas conditioner to remove moisture. The conditioned gas stream is delivered to an infrared gas analyzer to quantify CO_2 concentrations and paramagnetic gas analyzer quantifies

O_2 concentrations. Zero grade cylinder air or a zero gas generator provides zero gas. Span gases include varying concentrations of EPA Protocol 1 CO_2/O_2 mixed standards specific to the target calibration range. A computerized data acquisition system logs CO_2/O_2 concentrations for one-minute averages. The logged results are integrated to test periods and tabulated with standardized spreadsheets in Microsoft Excel. The operator also maintains comprehensive test records on the Gas Monitoring Field Data Sheet. Equipment used for CO_2/O_2 testing includes:

Probe Material:	Stainless Steel
Moisture Removal:	Thermo-electric
Transfer Line:	Teflon™
Analytical Technique:	Non-dispersive Infrared Detector (CO_2) Paramagnetic Detector (O_2)
Calibration Gas:	EPA Protocol 1

Pace FSD conducted this method as written with no deviations.

EPA Method 4 defines procedures to measure the moisture content of emission gas streams from stationary sources. A stainless steel sampling probe draws a sample of the gas stream from the duct to a series of impingers to condense the water vapor. The first two impingers initially contain deionized water and a third impinger is dry. A desiccant packed drying column follows the impingers to quantitatively collect the remaining moisture. An ice bath maintains the impinger train temperature (outlet) at 68°F or less. Collected water condensate is measured and discarded. Method 4 equations convert the condensed liquid volume to a gas volume. The water vapor volume compared with the dry standard gas volume collected through the isokinetic train determines the moisture content of the emissions gas stream and is reported in percent by volume. The operator maintains comprehensive test records on EPA Method 4 Field Data Sheet, Constant Rate Moisture Sampling.

Probe Material:	Stainless Steel
Filter Media:	Glass or Quartz Fiber or Glass Wool
Impinger Train Material:	Borosilicate Glass
Desiccant:	Drierite
Condensate Measure:	Graduated Cylinder or Electronic Scale
Desiccant Measure:	Electronic Scale

Pace FSD conducted this method as written with no deviations.

EPA Method 4 - Isokinetic defines procedures to measure the moisture content of emission gas streams from stationary sources. The moisture content of the gas stream is determined in conjunction with an isokinetic sampling train. Collected water condensate is measured from the back half of the isokinetic train. Method 4 equations convert the condensed liquid volume to a gas volume. The water vapor volume compared with the dry standard gas volume collected through the isokinetic train

determines the moisture content of the emissions gas stream and is reported in percent by volume. Equipment used for measuring moisture content includes:

Probe Material:	Borosilicate glass or Stainless Steel
Filter Media:	Glass or Quartz fiber
Impinger Train Material:	Borosilicate Glass
Desiccant:	Drierite
Condensate Measure:	Graduated Cylinder or Electronic Scale
Desiccant Measure:	Electronic Scale

Pace FSD conducted this method as written with no deviations.

EPA Method 5 defines procedures to measure particulate emissions from stationary sources. Using traverse points determined from EPA Method 1 and incorporating procedures from EPA Methods 2, 3, and 4, a sample gas stream is isokinetically drawn from the emission stream. The particulate dry fraction collects in the sampling probe and on a quartz or glass-fiber filter. The probe and filter components of the sampling train are heated to 248°F (±25°F) to prevent moisture condensation and preserve sample integrity. The filtered sample gas stream passes through a series of impingers to condense water vapor and collect gaseous constituents. The two impingers initially contain deionized water, and the third impinger is empty. A desiccant packed drying column follows the impingers to quantitatively collect the remaining moisture. An ice bath maintains the impinger train temperature (outlet) at 68°F or less. The impinger contents can be discarded or saved for additional analyses. Sample recovery and train clean up are performed after each run using procedures to ensure sample integrity and quantitative recovery. The train operator maintains comprehensive test records on EPA Method 5 Field Data Sheet, Isokinetic Particulate Sampling. Details of particulate testing are outlined below:

Nozzle/Probe Material:	Stainless Steel and Borosilicate Glass
Filter Holder Material:	Borosilicate Glass
Filter Media:	Glass-fiber, >99.95% efficient at 0.3 µm
Impinger Train Material:	Borosilicate Glass
Impinger Reagents:	Deionized Water
Recovery Reagents:	Acetone Deionized water
Control Train:	Gas meter, orifice, differential pressure gauges, pump, valves, temperature monitors and controllers
Analytical Techniques:	Gravimetric

Pace FSD conducts the method as written with the following routine deviation:

The method specifies performance verifications be completed on the sampling volume meter (DTM) after each test series. Performance verification consists of a three point comparison to a calibrated dry test meter (DTM) with an acceptance criterion of ±5%. In

lieu of the performance verification, Pace does a full calibration of each test meter after 500 elapsed cubic feet or 90 days, which ever occurs first, using a wet test meter (primary standard) and a more stringent acceptance criterion of ±2%.

EPA Method 5D defines procedures to measure particulate emissions from positive pressure fabric filters in terms of concentration (mg/dscm or GR/DSCF) and emission rate (kg/HR or LB/HR). Using traverse points determined using EPA Method 1 or the alternative measurement sites specified in Method 5D, a sample gas stream is isokinetically withdrawn from the emission stream. For monovent sampling, the isokinetic rate is calculated from fabric filter inlet airflows. The particulate dry fraction collects on a glass-fiber filter. The probe and filter components of the sampling train are maintained at a temperature at or above the exhaust gas temperature up to 248°F (±25°F) to prevent moisture condensation and preserve sample integrity. The filtered sample gas stream passes through a series of impingers to condense water vapor and collect gaseous constituents. The first two impingers initially contain deionized water, and the third impinger is dry. A desiccant packed drying column follows the impingers to quantitatively collect the remaining moisture. An ice bath maintains the impinger train temperature (outlet) at 68°F or less. Sample recovery and train clean up are performed after each run using procedures to ensure sample integrity and quantitative recovery. The train operator maintains comprehensive test records on EPA Method 5 Field Data Sheet, Isokinetic Particulate Sampling. Details of particulate testing are outlined below:

Nozzle/Probe Material:	Stainless Steel and Borosilicate Glass
Filter Holder Material:	Borosilicate Glass
Filter Media:	Glass-fiber, >99.95% efficient at 0.3 µm
Impinger Train Material:	Borosilicate Glass
Impinger Reagents:	Deionized Water
Recovery Reagents:	Acetone Deionized Water
Control Train:	Gas meter, orifice, differential pressure gauges, pump, valves, temperature monitors & controllers
Analytical Techniques:	Gravimetric

Pace FSD conducted this method as written with no deviations.

EPA Method 25A defines procedures used to measure total hydrocarbons from stationary sources. A stainless steel sampling probe and heat-traced Teflon™ sampling line draw a sample of the gas stream from the duct directly to the analytical system. A total hydrocarbon monitor utilizing a flame ionization detector (FID) quantifies total hydrocarbon concentrations. Zero grade cylinder air or a zero gas generator provides zero gas. Span gases include varying concentrations of EPA Protocol propane (C_3H_8) standards specific to the target calibration range. A computerized data acquisition system logs THC concentrations for one-minute averages. The logged results are integrated to test periods and tabulated with standardized spreadsheets in Microsoft Excel. The analyzer results are multiplied by 3 to report results as carbon (C_1). The

operator also maintains comprehensive test records on the Gas Monitoring Field Data Sheet. Equipment used for THC testing includes:

Probe Material:	Stainless Steel
Transfer Line:	Teflon™, (heated)
Analytical Technique:	Flame Ionization Detector (FID)
Calibration Gas:	EPA Protocol 1

Pace FSD conducted this method as written with no deviations.

Multimetal: EPA Method 29 defines procedures to measure metal emissions from stationary sources. Using traverse points determined from EPA Method 1 and incorporating procedures from EPA Methods 2, 3, 4, and 5, a sample gas stream is isokinetically drawn from the emission stream. The particulate fraction of metals emissions collects in the sampling probe and on a quartz-fiber filter. The probe and filter components of the sampling train are heated to 248°F (±25°F) to prevent moisture condensation and preserve sample integrity. The filtered sample gas stream passes through a series of reagent-filled impingers to collect the vapor fraction of metals emissions. The first two impingers are prepared with a 5% nitric acid (HNO_3)/10% hydrogen peroxide (H_2O_2) solution and are followed by a dry impinger. Impingers 4 and 5 are prepared with a 4% potassium permanganate ($KMnO_4$)/10% sulfuric acid (H_2SO_4) absorbing solution followed by another dry impinger. A desiccant packed drying column follows the impingers to quantitatively collect the remaining moisture. A dry impinger may precede the reagent impingers for additional condensate capacity in high moisture sources. An ice bath maintains the impinger train temperature (outlet) at 68°F or less. Sample recovery and train clean up are performed after each run using procedures to ensure sample integrity and quantitative recovery. The train operator maintains comprehensive test records on EPA Method 29 Field Data Sheet. Details of metals testing are outlined below:

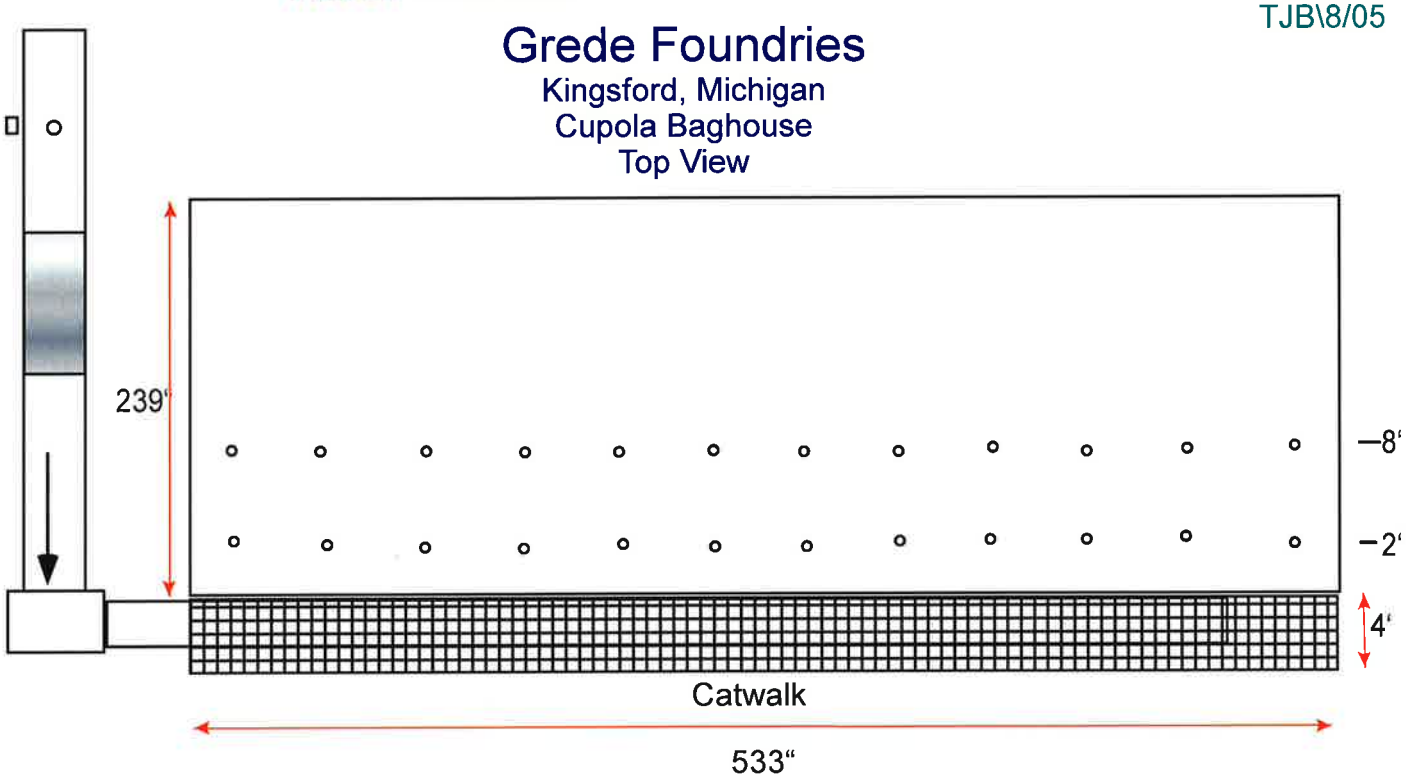
Nozzle/Probe Material:	Quartz and Borosilicate Glass
Filter Holder Material:	Borosilicate Glass and Teflon™ Filter Support
Filter Media:	Quartz Fiber, >99.95% efficient at 0.3 µm
Impinger Train Material:	Borosilicate Glass
Impinger Reagents:	5% HNO_3 and 10% H_2O_2 4% $KMnO_4$ and 10% H_2SO_4
Recovery Reagents:	Acetone (front-half only) 0.1 N HNO_3 (front-half only) 4% $KMnO_4$ and 10% H_2SO_4 8N HCl Deionized Water
Control Train:	EPA Method 5
Analytical Technique:	Inductively Coupled Plasma/Mass Spectrometry Cold Vapor Atomic Absorption Spectroscopy

Pace FSD conducted this method as written with no deviations.

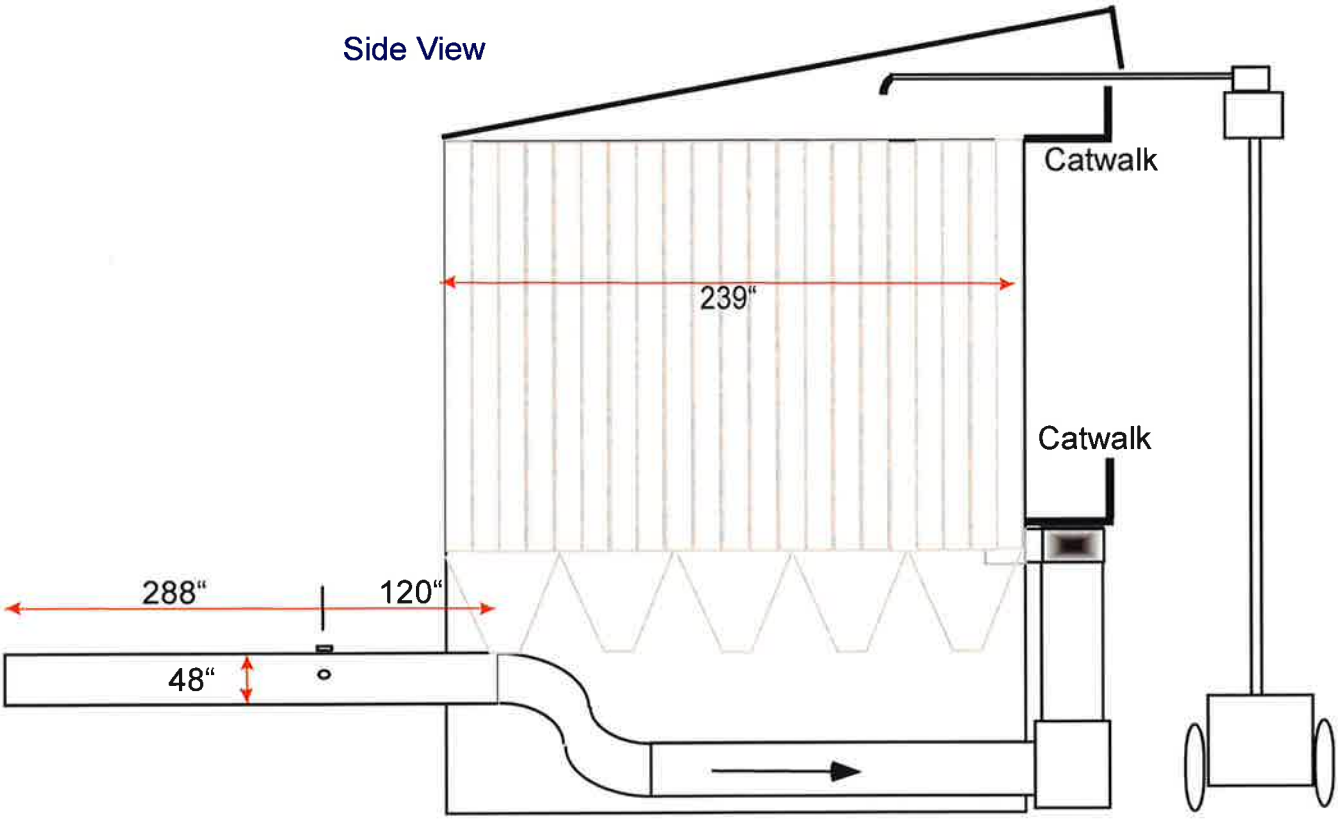
Pace Analytical
Field Services Division

Figure 1
Site Diagram
TJB\8/05

Grede Foundries
Kingsford, Michigan
Cupola Baghouse
Top View

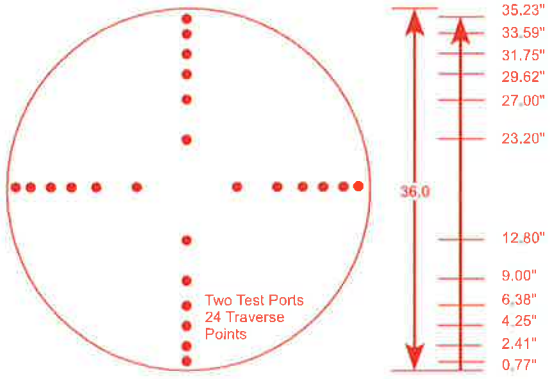


Side View

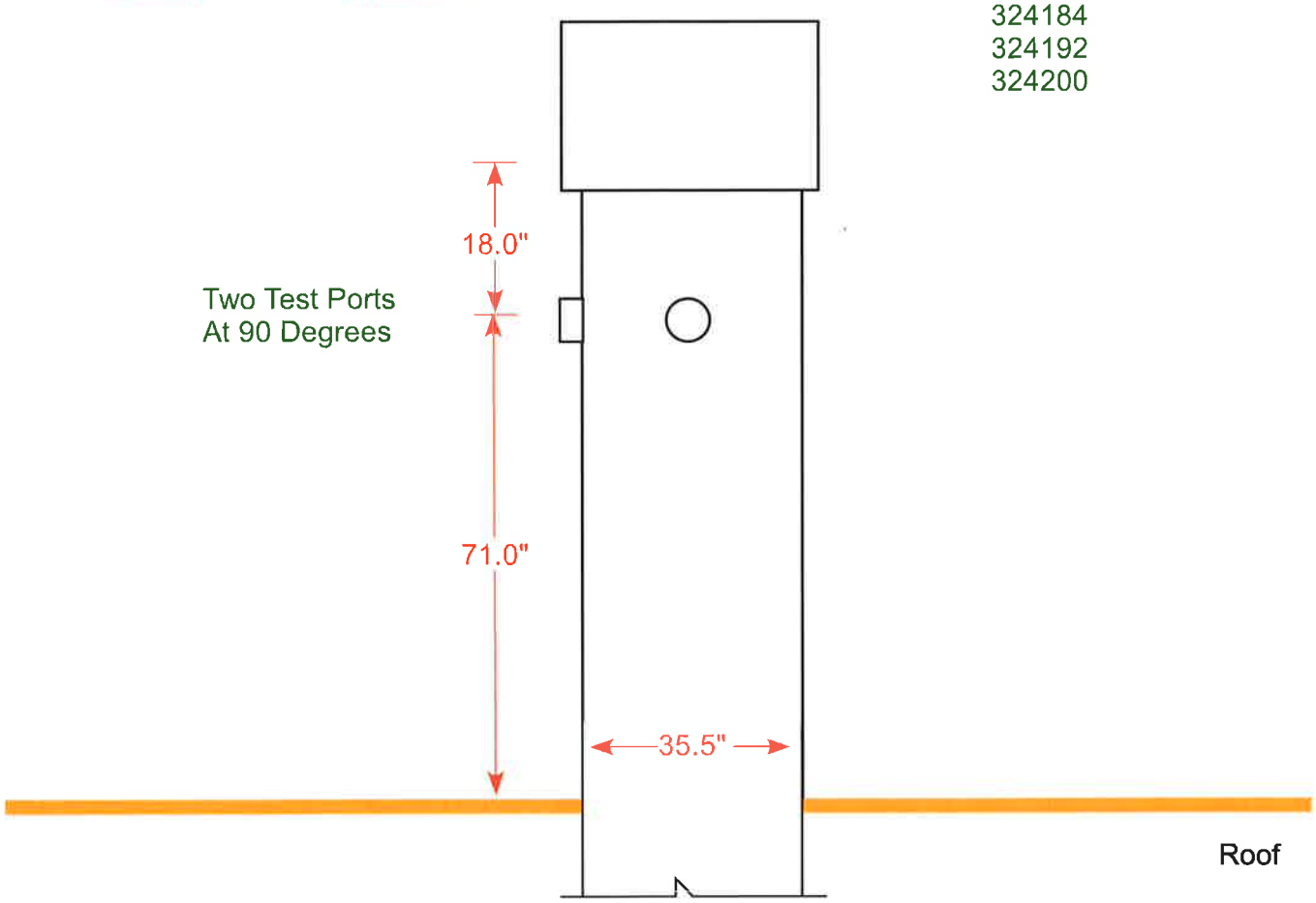


Pace Analytical
Field Services Division

Figure 2
Grede Foundries, Inc.
Kingsford, Michigan
B & P Pouring Stacks
JDT \ 1/06



Four B & P
Stacks Are
Similar.
Stack IDs
324180
324184
324192
324200



Pace Analytical
Field Services Division

Figure 3
Grede Foundries, Inc.
Kingsford, Michigan
Module Pouring TT Exhausts
tjb/ 5/12

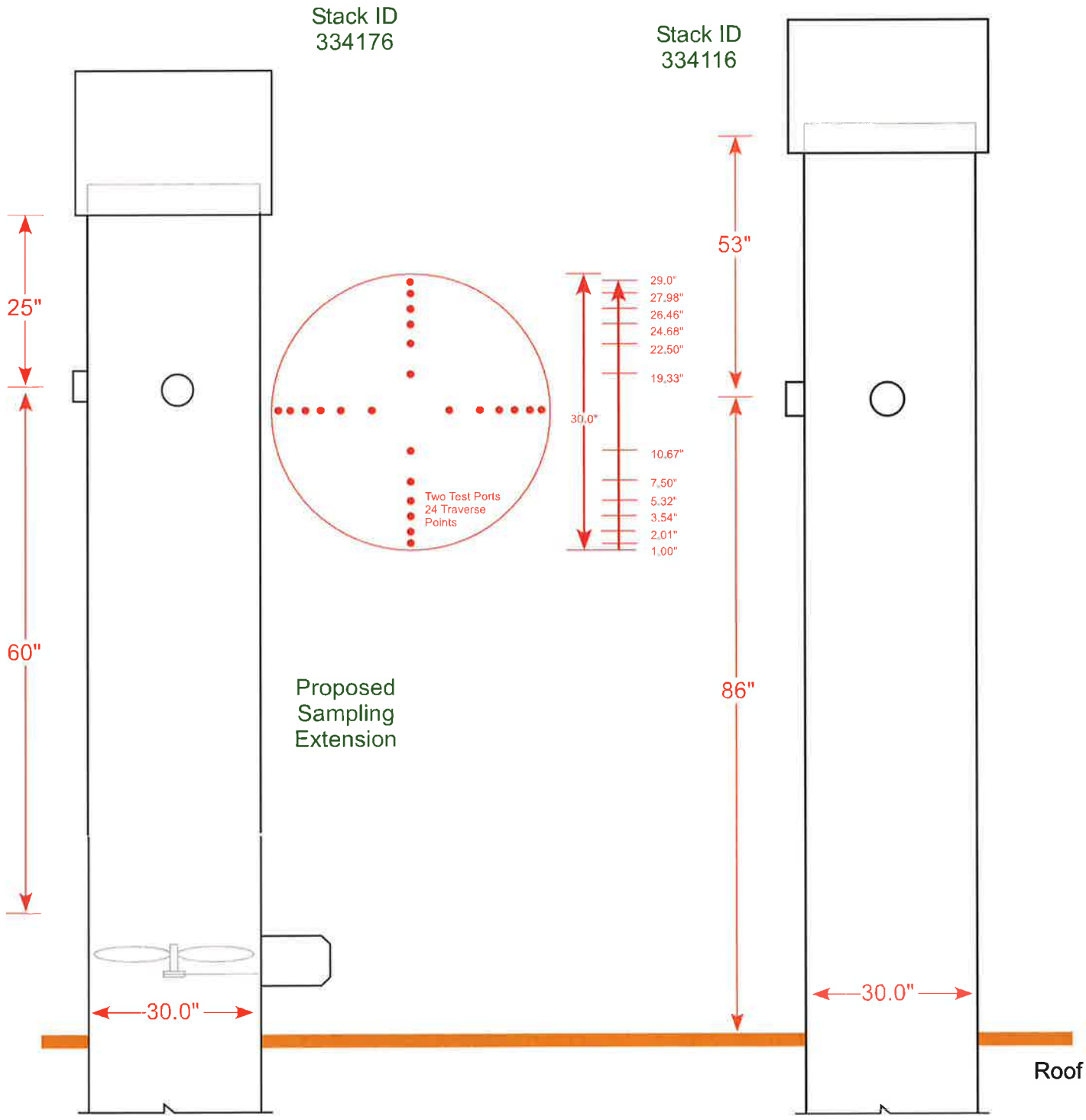


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Figure 4
Grede Foundries, Inc.
Kingsford, Michigan
Disa Exhaust Stacks (324484, 324678, 324682)
tjb 5/12

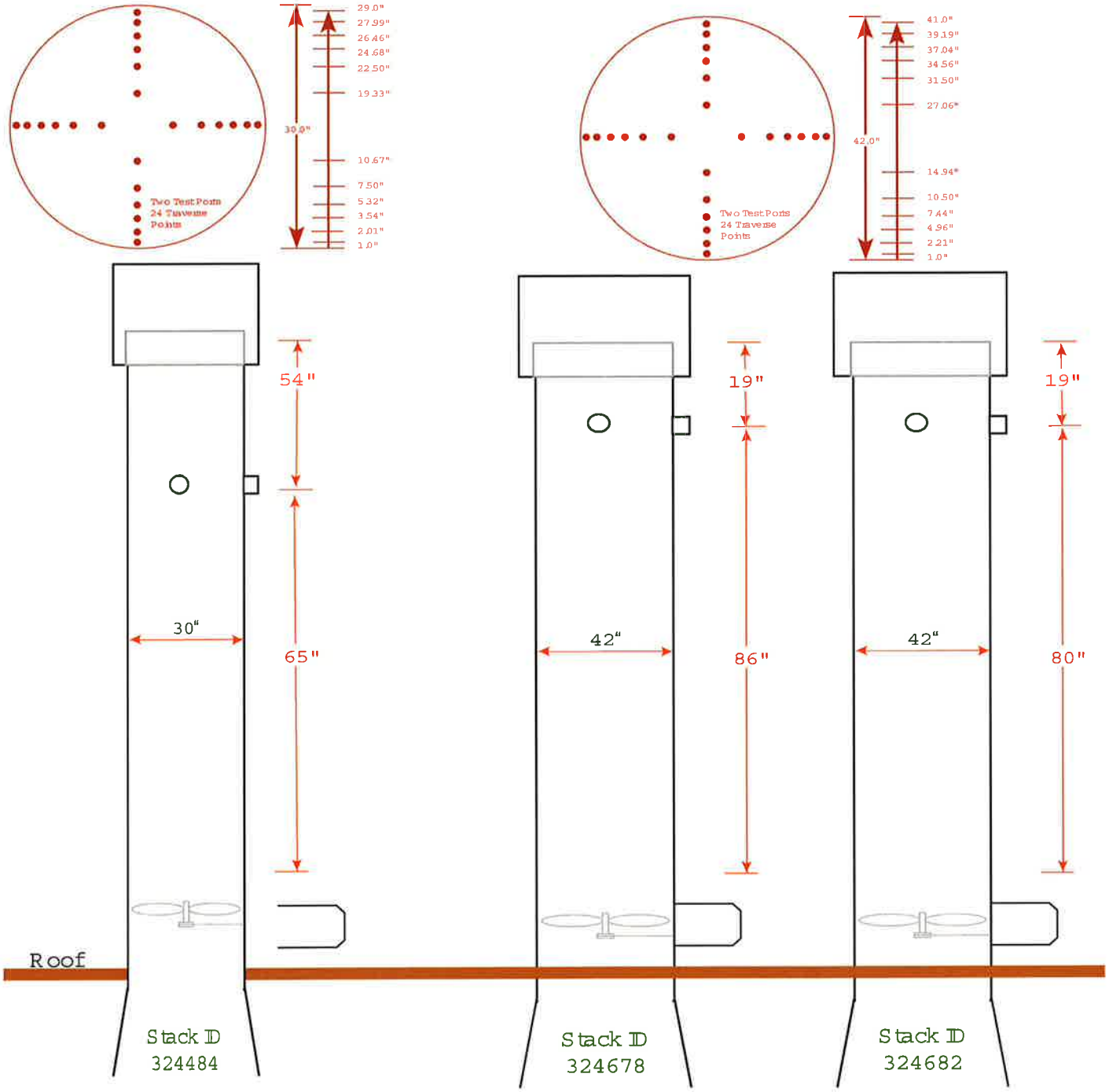

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Figure 5
Grede Foundries, Inc.
Kingsford, Michigan
No.5 HMP (TC Fan) Stack
DBS \ 3/07

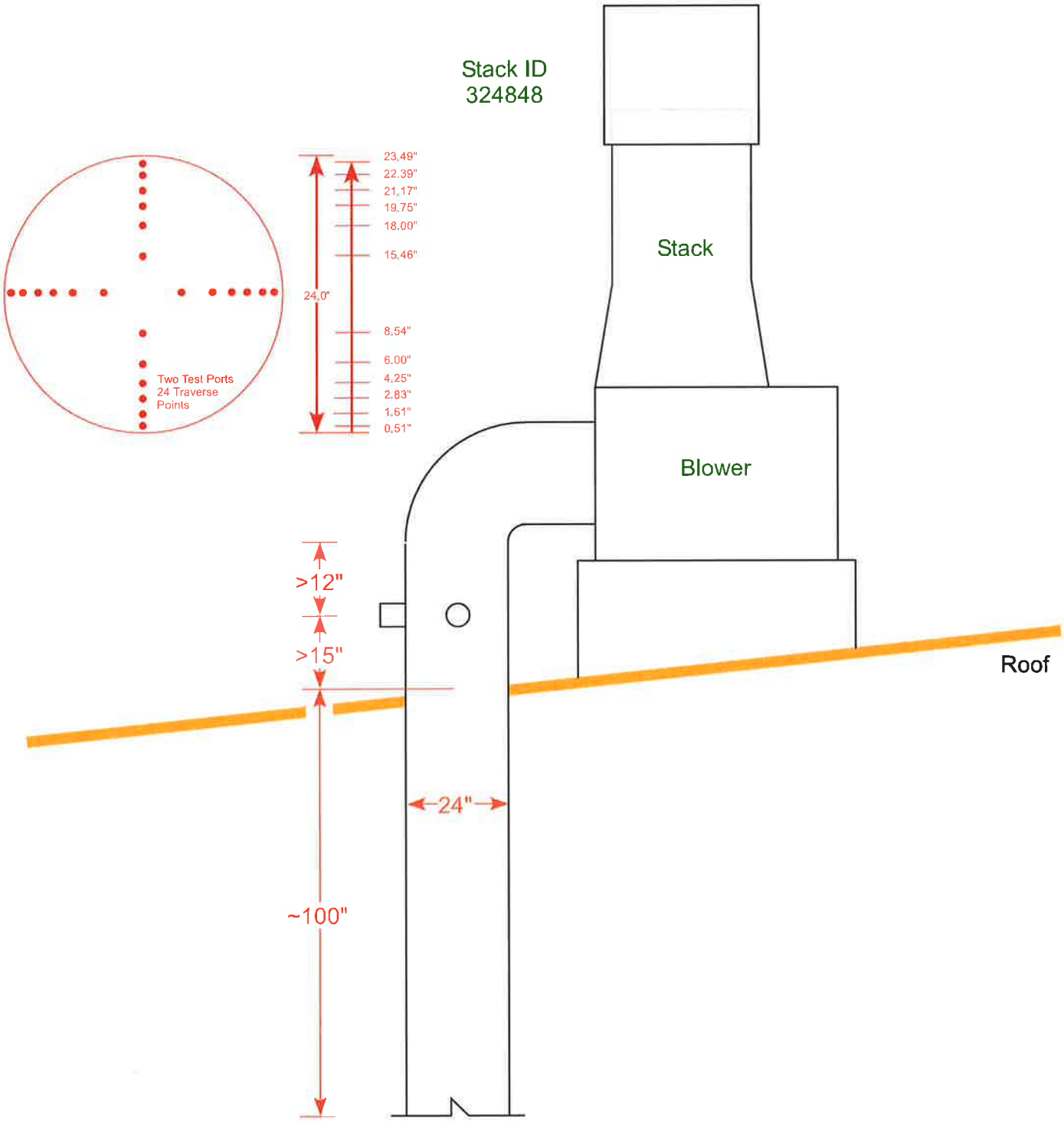

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Figure 6
Grede Foundries, Inc.
Kingsford, Michigan
No.6 HMP (East Hunter) 324632 Stack
tjb \ 6/12

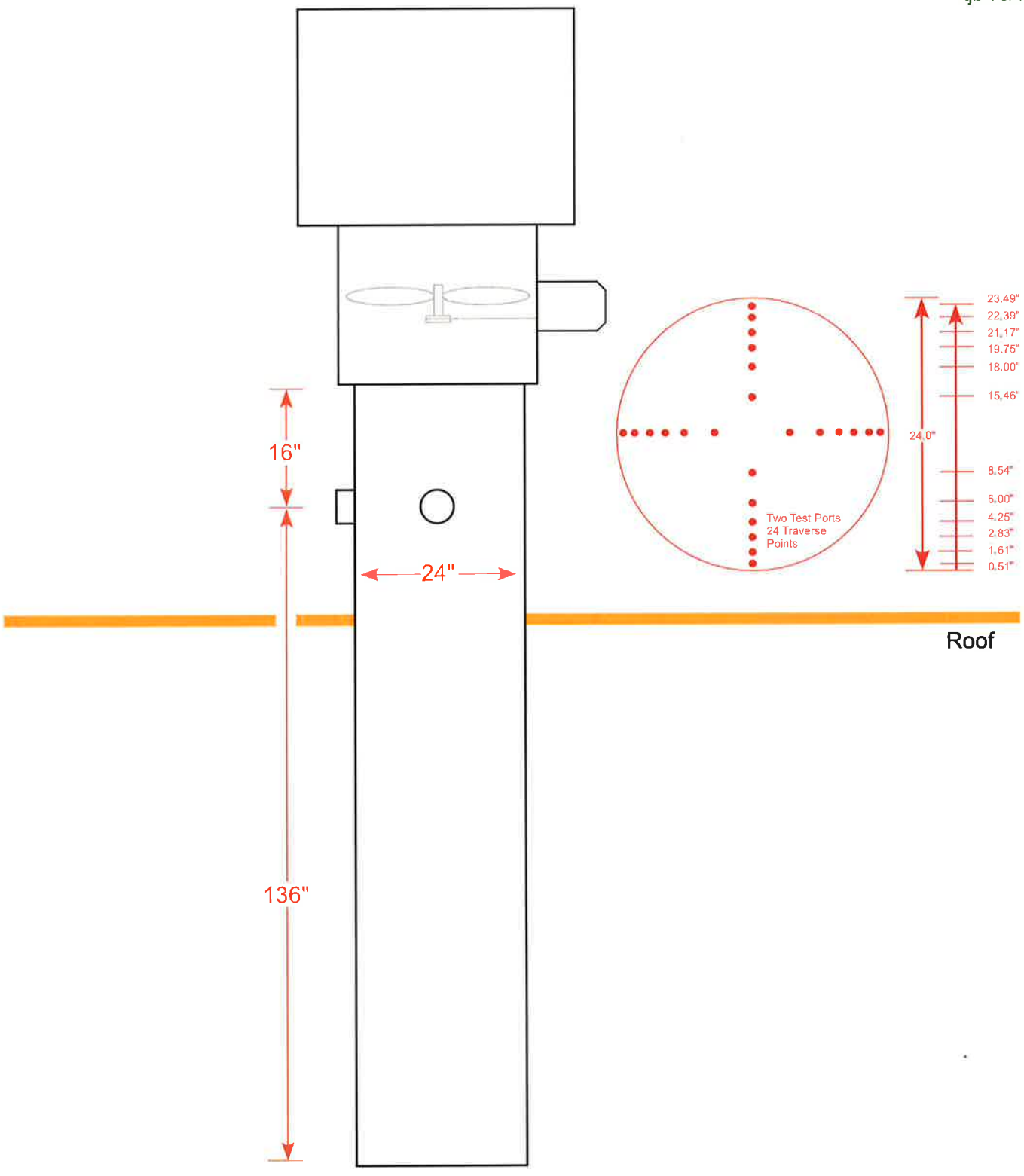

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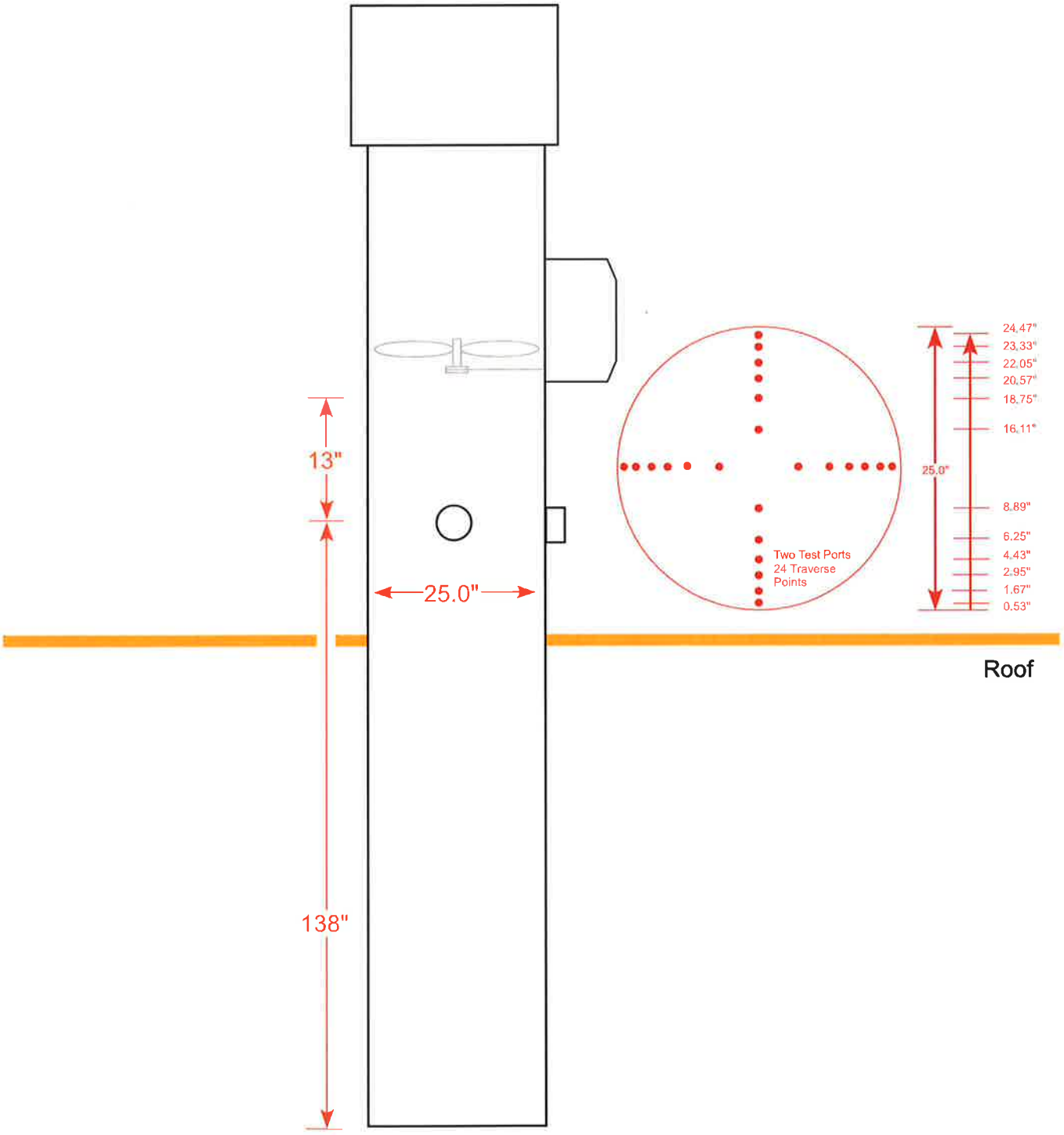
Figure 7
Grede Foundries, Inc.
Kingsford, Michigan
No.7 HMP (West Hunter) 324662 Stack
JDT \ 1/06



Report Signatures

Field Testing and Reporting Performed by: Pace Analytical Services, Inc.
Field Services Division
1700 Elm Street, Suite 200
Minneapolis, MN 55414

Field Testing Affirmation

All field testing was performed in accordance with stated test methods subject to modifications and deviations listed herein. Raw field data presented in this report accurately reflects results and information as recorded at the time of tests or otherwise noted.

Date 6/19/12

Matt McDermott, QSTI
Field Analyst

Report Affirmation

To the best of my knowledge, this report accurately represents the compiled field and laboratory information with no material omissions, alterations or misrepresentations.

Date 6/19/12

Terry Borgerding, QSTI
Project Manager

Responsible Charge Affirmation

I have reviewed the information herein and it is approved for distribution.

Date 6/19/12

Terry Borgerding, QSTI
Operations Manager, Air