

**Results of the September 21-23, 2021 Emissions Tests
Performed at Hibbing Taconite Company's Taconite
Processing Facility Located in Hibbing, Minnesota**

Pellet Indurating Furnace Line 3

SV029-SV032, EU022
(STRU036-STRU039)

Agency Interest ID: 1146

Air Emissions Permit No. 13700061-007

Barr Project No. 23691428.27

Prepared for
Hibbing Taconite Company
Hibbing, Minnesota

November 2021



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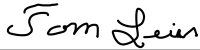
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Report Certification

Certification of Sampling Procedures:

I certify under penalty of law that the sampling procedures were performed in accordance with the approved test plan and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below.



Thomas Leier
Senior Air Quality Technician
Barr Engineering Co.

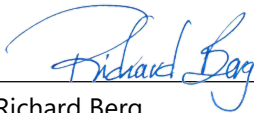
November 5, 2021

Date

Certification of Analytical Procedures:

I certify under penalty of law that the analytical procedures were performed in accordance with the requirements of the test methods and that the data presented for use in the test report were, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below.

1. Element One, Inc. performed analysis for mercury and lead.



Richard Berg
Senior Air Quality Technician
Barr Engineering Co.

November 5, 2021

Date

Certification of Test Report by Testing Company:

I certify under penalty of law that this test report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed sampling and analysis relating to the performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below.



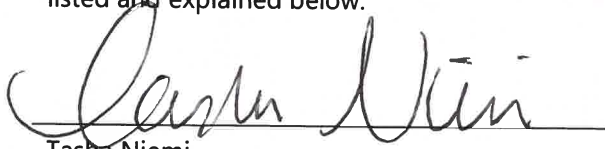
Tom Kuchinski
Stack Testing Services Coordinator
Barr Engineering Co.

November 5, 2021

Date

Certification of Test Report by Owner or Operator of Emission Facility:

I certify under penalty of law that the information submitted in this test report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on the process and control equipment during the month prior to the performance test. Based on my inquiry of the person or persons who performed the operational and maintenance activities, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below.



Tasha Niemi

Environmental Manager

Hibbing Taconite Company

11/4/2021

Date

Executive Summary

Barr Engineering Company performed emissions tests on September 21-23, 2021, at the Hibbing Taconite Company's taconite facility located in Hibbing, Minnesota. Emissions tests were performed on the Pellet Indurating Furnace Line 3 (EU022) stacks (SV029-SV032) to measure mercury in support of requirements set forth in the Minnesota (MN) Rule 7007.0502 (Mercury reduction Plan) and update lead emission factors. Additionally, filterable particulate matter (filterable PM) testing was performed concurrently with the mercury testing to demonstrate continued compliance for the Taconite Maximum Achievable Control Technology (Taconite MACT) found in 40 CFR Part 63 Subpart RRRRR.

Stack vent identification numbers, emission unit identification numbers and test results are presented in Tables ES-1.

Table ES-1 Executive Summary Table

Average Test Results				
Test Parameter 1-4, 5 and 29	Pellet Indurating Furnace Line 3			
Air Emissions Permit Group	GP003			
Stack Vent Number	SV029	SV030	SV031	SV032
Emission Unit	EU022			
Test Date	9/21-22/2021	9/22-23/2021	9/21-22/2021	9/22-23/2021
Parametric Limits Adopted From Test	No	No	No	No
Particulate Concentration, gr/dscf				
PM - Filterable	0.0042	0.0047	0.0051	0.0053
Lead Concentrations, µg/dscm				
Total Lead (Pb)	12.2	11.8	18.5	17.5
Lead Emission Rate, lb/hr				
Total Lead (Pb)	0.0074	0.0071	0.010	0.0102
Mercury Concentrations, µg/dscm				
Filterable Hg	<0.048	<0.042	<0.053	<0.043
Condensable Hg	1.5	2.6	4.7	6.9
Total Mercury	1.5	2.6	4.7	6.9
Mercury Emission Rate, lb/hr				
Filterable Hg	<0.000029	<0.00003	<0.00003	<0.00002
Condensable Hg	0.00089	0.0016	0.0026	0.0040
Total Mercury	0.00092	0.0016	0.0026	0.0040
Estimated Annual Mercury Emissions, lb/yr ¹	8.06	14.02	22.78	35.04

¹ Annual emissions calculated assuming 8760 operating hours per year

1.0 Introduction

Barr Engineering Co. performed emissions tests on September 21-23, 2021, at the Hibbing Taconite Company's taconite facility located in Hibbing, Minnesota. Emissions tests were performed on the Pellet Indurating Furnace Line 3 (EU022) stacks (SV029-SV032) to measure mercury in support of requirements set forth in the Minnesota (MN) Rule 7007.0502 (Mercury reduction Plan) and update lead emission Factors. Additionally, filterable PM testing was performed to test for MACT requirements. Parametric limits were not adopted.

A stack test plan dated July 21, 2021, was submitted to the Minnesota Pollution Control Agency (MPCA). A pretest meeting was held on September 15, 2021, between Andy Place of the MPCA, Hibbing Taconite Company Environmental Staff and Tom Leier of Barr Engineering Co. A copy of the stack test plan and corresponding communications are located in Appendix F.

Tom Leier led the Barr Engineering Co. test team. Corie Ekholm of Hibbing Taconite Company provided the coordination of the test team with facility operations. A member of the MPCA did not witness the testing. A list of project participants is provided in Appendix G.

Test run one on stacks SV029 and SV031 were stopped short of the 120-minute test run time due to facility operation issues. The shorten run time of 80-minutes was accepted by Andy Place of the MPCA in a phone conversation. All other test runs were 120-minute tests. Filterable PM was determined by U.S. EPA Method 5. Mercury and lead emissions were determined by U.S. EPA Method 29. Simultaneous tests were performed September 21-22, 2021, on the Pellet Indurating Furnace Line 3 stacks SV029 and SV031; and September 22-23, 2021, on SV030 and SV032.

2.0 Results

Filterable PM results are presented in pounds per hour (lb/hr). Mercury and lead results are presented in micrograms per dry standard cubic meter ($\mu\text{g}/\text{dscm}$) and lb/hr.

2.1 Pellet Indurating Furnace Line 3 (SV029-SV032)

Results of the September 21-23, 2021, filterable PM emissions tests are provided in Tables 1-4 Mercury and lead emissions are provided in Tables 5-12, respectively.

Test run one on September 21, 2021, was shortened due to facility operational issues. No other test abnormalities or process delays were experienced for Pellet Indurating Furnace Line 3.

All sources were operating at normal conditions for this test series. Process data collected during the testing is provided in Appendix E.

3.0 Process Description

Hibbing Taconite Company mines iron ore (magnetite) and produces taconite pellets that are shipped to steel producers for processing in blast furnaces.

The Pellet Indurating Furnace Line 3 (EU022) is a straight grate induration furnace with four emission points: SV029, SV030, SV031 and SV032. Emissions are controlled prior to each exhaust stack by a venturi rod deck wet scrubber. Prior to the scrubber, windbox exhaust air is pretreated to remove the coarse particulate matter by a multiclone.

Operating parameters for the process and control devices are provided in Appendix E.

4.0 Stack Testing Procedures and Methods

The testing was performed from ports meeting U.S. EPA Method 1 criteria. The U.S. EPA Method 1 criteria data are listed in Table 4-1. Sample port locations and traverse point details are provided in Figures 1-2.

Table 4-1 EPA Method 1 Criteria

Source/Emissions Unit (Plant or process descriptor)	Distance to Upstream Disturbances from Sample Site (In Diameters)	Distance to Downstream Disturbances from Sample Site (In Diameters)	Number of Ports	Number of Points
Pellet Indurating Furnace Line 3 (SV029-SV032)	8.6	1.8	2	12

Volumetric airflow determinations were performed in accordance with U.S. EPA Method 2 using an S type pitot tube. Airflows were determined in conjunction with the U.S. EPA Method 29 tests.

Stack gas oxygen and carbon dioxide compositions were determined using modified U.S. EPA Method 3A in conjunction with the U.S. EPA Method 29 tests. An integrated sample of dry stack gas was collected in a Tedlar bag during each test run. The stack gas was analyzed for oxygen and carbon dioxide concentrations using a Servomex Model 1440 analyzer calibrated with EPA protocol gases. Instrument analysis data and calibrations are located in Appendix B. Calibration gas certifications are located in Appendix D.

Stack gas moisture content determinations were performed in accordance with U.S. EPA Method 4, in conjunction with the U.S. EPA Method 29 tests.

Filterable PM was determined in accordance with U.S. EPA Method 5, in conjunction with the U.S. EPA Method 29 tests.

Mercury and lead concentrations and emission rates were determined in accordance with U.S. EPA Method 29. All glassware and reagent preparation was conducted in accordance with the standard and completed by Barr Engineering Co. Potassium permanganate sample reagents were prepared on-site daily. For each test, the samples were recovered in the controlled environment of Barr Engineering Co.'s mobile laboratory. The samples were analyzed by Element One of Wilmington, North Carolina. Element One's certified laboratory report and complete sample chain of custody is located in Appendix C.

The test methods referenced above are found in 40 CFR Part 60, Appendix A.

Tables

TABLE 1

PARTICULATE MATTER TEST RESULTS

Pellet Indurating Furnace Line 3 - Stack 1 (SV029)

Parameter	Run 1	Run 2	Run 3	Average
Scrubber - Pressure Drop, in. H ₂ O	4.5	4.3	4.2	4.3
Scrubber - Water Flow Rate, gal/min	413	412	410	412
Test Date	9/21/2021	9/22/2021	9/22/2021	---
Test Period	925 - 1100	804 - 1010	1050 - 1256	---
Test Duration, min	81	120	120	107
Average Stack Temperature, °F	111	113	113	112
Average Moisture Content, %V/V	7.0	6.7	6.4	6.7
Particulate Loading, g				
PM - Filterable	0.01683	0.02017	0.02454	0.02051
Air Flow Rate				
acfm	195,000	191,100	190,000	192,000
scfm	176,200	173,400	172,400	174,000
dscfm	163,900	161,700	161,300	162,300
Sample Volume				
acf	59.04	85.71	86.25	77.00
dscf	58.10	84.18	83.71	75.33
Isokinetic Variation, %				
	100.7	99.8	99.5	100.0
Particulate Matter Concentration, gr/dscf				
PM - Filterable	0.0045	0.0037	0.0045	0.0042
Particulate Matter Emission Rate, lb/hr				
PM - Filterable	6.3	5.1	6.3	5.9
Process Data				
Feed Rate, DLTPH	363	367	367	365
Feed Rate, DSTPH	407	411	409	409

TABLE 2

PARTICULATE MATTER TEST RESULTS

Pellet Indurating Furnace Line 3 - Stack 2 (SV030)

Parameter	Run 1	Run 2	Run 3	Average
Scrubber - Pressure Drop, in. H ₂ O	4.8	4.8	4.7	4.8
Scrubber - Water Flow Rate, gal/min	392	394	393	393
Test Date	9/22/2021	9/23/2021	9/23/2021	---
Test Period	1340 - 1545	722 - 926	1003 - 1220	---
Test Duration, min	120	120	120	120
Average Stack Temperature, °F	115	118	117	117
Average Moisture Content, %V/V	7.6	8.4	7.4	7.8
Particulate Loading, g				
PM - Filterable	0.02298	0.02237	0.03025	0.02520
Air Flow Rate				
acfm	197,900	191,500	192,800	194,100
scfm	178,900	171,200	172,600	174,200
dscfm	165,300	156,800	159,900	160,700
Sample Volume				
acf	88.80	84.42	85.00	86.07
dscf	85.58	82.43	82.91	83.64
Isokinetic Variation, %				
	99.2	100.7	99.4	99.8
Particulate Matter Concentration, gr/dscf				
PM - Filterable	0.0041	0.0042	0.0056	0.0047
Particulate Matter Emission Rate, lb/hr				
PM - Filterable	5.9	5.6	7.7	6.4
Process Data				
Feed Rate, DLTPH	365	366	359	363
Feed Rate, DSTPH	409	410	402	407

TABLE 3

PARTICULATE MATTER TEST RESULTS

Pellet Indurating Furnace Line 3 - Stack 3 (SV031)

Parameter	Run 1	Run 2	Run 3	Average
Scrubber - Pressure Drop, in. H ₂ O	4.6	4.3	4.4	4.4
Scrubber - Water Flow Rate, gal/min	435	427	427	430
Test Date	9/21/2021	9/22/2021	9/22/2021	---
Test Period	925 - 1100	804 - 1010	1050 - 1256	---
Test Duration, min	81	120	120	107
Average Stack Temperature, °F	129	139	135	134
Average Moisture Content, %V/V	11.2	9.8	9.7	10.2
Particulate Loading, g				
PM - Filterable	0.02066	0.02385	0.02193	0.02215
Air Flow Rate				
acfm	187,300	187,600	185,200	186,700
scfm	164,200	162,900	161,900	163,000
dscfm	145,800	146,900	146,200	146,300
Sample Volume				
acf	52.62	78.64	78.58	69.95
dscf	52.59	77.35	76.92	68.95
Isokinetic Variation, %				
	100.6	99.1	99.0	99.5
Particulate Matter Concentration, gr/dscf				
PM - Filterable	0.0061	0.0048	0.0044	0.0051
Particulate Matter Emission Rate, lb/hr				
PM - Filterable	7.6	6.0	5.5	6.4
Process Data				
Feed Rate, DLTPH	363	367	365	365
Feed Rate, DSTPH	407	411	409	409

TABLE 4

PARTICULATE MATTER TEST RESULTS

Pellet Indurating Furnace Line 3 - Stack 4 (SV032)

Parameter	Run 1	Run 2	Run 3	Average
Scrubber - Pressure Drop, in. H ₂ O	4.4	4.2	4.3	4.3
Scrubber - Water Flow Rate, gal/min	393	391	392	392
Test Date	9/22/2021	9/23/2021	9/23/2021	---
Test Period	1340 - 1545	722 - 928	1003 - 1220	---
Test Duration, min	120	120	120	120
Average Stack Temperature, °F	147	143	144	145
Average Moisture Content, %V/V	11.1	10.7	10.7	10.8
Particulate Loading, g				
PM - Filterable	0.02493	0.02191	0.03819	0.02834
Air Flow Rate				
acfm	208,400	197,400	203,900	203,200
scfm	178,400	169,300	174,500	174,100
dscfm	158,600	151,200	155,900	155,200
Sample Volume				
acf	86.05	80.94	83.77	83.59
dscf	84.01	80.28	83.01	82.43
Isokinetic Variation, %				
	99.7	99.9	100.2	99.9
Particulate Matter Concentration, gr/dscf				
PM - Filterable	0.0046	0.0042	0.0071	0.0053
Particulate Matter Emission Rate, lb/hr				
PM - Filterable	6.2	5.5	9.5	7.1
Process Data				
Feed Rate, DLTPH	365	366	359	363
Feed Rate, DSTPH	409	410	402	407

TABLE 5

EPA METHOD 29 METALS CONCENTRATION RESULTS

Pellet Indurating Furnace Line 3 - Stack 1 (SV029)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	9/21/2021	9/22/2021	9/22/2021	-
Test Period	925 - 1100	804 - 1010	1050 - 1256	-
Test Duration, min	81	120	120	107
Average Stack Temperature, °F	111	113	113	112
Average Moisture Content, %V/V	7.00	6.72	6.44	6.72
Filterable Metals Concentration, ug/dscm				
Lead (Pb)	11.2	9.8	10.1	10.4
Mercury (Hg)	< 0.061	< 0.042	< 0.042	< 0.048
Condensable Metals Concentration, ug/dscm				
Lead (Pb)	2.5	1.1	1.9	1.8
Mercury (Hg)	1.4	1.4	1.5	1.5
Total Metals Concentration, ug/dscm				
Lead (Pb)	13.8	10.9	12.0	12.2
Mercury (Hg)	1.5	1.5	1.5	1.5

< = Non Detect: Below detection limit in front half analysis

TABLE 6

EPA METHOD 29 METALS EMISSION RATE RESULTS

Pellet Indurating Furnace Line 3 - Stack 1 (SV029)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	9/21/2021	9/22/2021	9/22/2021	-
Test Period	925 - 1100	804 - 1010	1050 - 1256	-
Test Duration, min	81	120	120	107
Average Stack Temperature, °F	111	113	113	112
Average Moisture Content, %V/V	7.00	6.72	6.44	6.72
Air Flow Rate				
acfm	195,000	191,000	190,000	192,000
scfm	176,000	173,000	172,000	174,000
dscfm	164,000	162,000	161,000	162,000
Filterable Metals Emission Rate, lb/hr				
Lead (Pb)	0.0069	0.0059	0.0061	0.0063
Mercury (Hg)	< 0.000037	< 0.000025	< 0.000025	< 0.000029
Condensable Metals Emission Rate, lb/hr				
Lead (Pb)	0.0016	0.00065	0.0011	0.0011
Mercury (Hg)	0.00089	0.00087	0.00091	0.00089
Total Metals Emission Rate, lb/hr				
Lead (Pb)	0.0085	0.0066	0.0072	0.0074
Mercury (Hg)	0.00092	0.00089	0.00094	0.00092

< = Non Detect: Below detection limit in front half analysis

TABLE 7

EPA METHOD 29 METALS CONCENTRATION RESULTS

Pellet Indurating Furnace Line 3 - Stack 2 (SV030)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	9/22/2021	9/23/2021	9/23/2021	-
Test Period	1340 - 1545	722 - 926	1003 - 1220	-
Test Duration, min	120	120	120	120
Average Stack Temperature, °F	115	118	117	117
Average Moisture Content, %V/V	7.61	8.37	7.38	7.79
Filterable Metals Concentration, ug/dscm				
Lead (Pb)	12.7	9.4	10.0	10.7
Mercury (Hg)	< 0.041	< 0.043	< 0.043	< 0.042
Condensable Metals Concentration, ug/dscm				
Lead (Pb)	1.0	1.3	1.1	1.1
Mercury (Hg)	2.5	2.7	2.7	2.6
Total Metals Concentration, ug/dscm				
Lead (Pb)	13.7	10.6	11.1	11.8
Mercury (Hg)	2.5	2.7	2.7	2.6

< = Non Detect: Below detection limit in front half analysis

TABLE 8

EPA METHOD 29 METALS EMISSION RATE RESULTS

Pellet Indurating Furnace Line 3 - Stack 2 (SV030)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	9/22/2021	9/23/2021	9/23/2021	-
Test Period	1340 - 1545	722 - 926	1003 - 1220	-
Test Duration, min	120	120	120	120
Average Stack Temperature, °F	115	118	117	117
Average Moisture Content, %V/V	7.61	8.37	7.38	7.79
Air Flow Rate				
acfm	198,000	192,000	193,000	194,000
scfm	179,000	171,000	173,000	174,000
dscfm	165,000	157,000	160,000	161,000
Filterable Metals Emission Rate, lb/hr				
Lead (Pb)	0.0078	0.0055	0.0060	0.0064
Mercury (Hg)	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Condensable Metals Emission Rate, lb/hr				
Lead (Pb)	0.00064	0.00074	0.00068	0.00069
Mercury (Hg)	0.0015	0.0016	0.0016	0.0016
Total Metals Emission Rate, lb/hr				
Lead (Pb)	0.0085	0.0062	0.0067	0.0071
Mercury (Hg)	0.0016	0.0016	0.0016	0.0016

< = Non Detect: Below detection limit in front half analysis

TABLE 9

EPA METHOD 29 METALS CONCENTRATION RESULTS

Pellet Indurating Furnace Line 3 - Stack 3 (SV031)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	9/21/2021	9/22/2021	9/22/2021	-
Test Period	925 - 1100	804 - 1010	1050 - 1256	-
Test Duration, min	81	120	120	107
Average Stack Temperature, °F	129	139	135	134
Average Moisture Content, %V/V	11.23	9.81	9.68	10.24
Filterable Metals Concentration, ug/dscm				
Lead (Pb)	17.2	14.8	14.4	15.5
Mercury (Hg)	< 0.067	< 0.046	< 0.046	< 0.053
Condensable Metals Concentration, ug/dscm				
Lead (Pb)	4.3	3.0	1.6	3.0
Mercury (Hg)	4.7	4.6	4.7	4.7
Total Metals Concentration, ug/dscm				
Lead (Pb)	21.5	17.8	16.0	18.5
Mercury (Hg)	4.7	4.7	4.7	4.7

< = Non Detect: Below detection limit in front half analysis

TABLE 10

EPA METHOD 29 METALS EMISSION RATE RESULTS

Pellet Indurating Furnace Line 3 - Stack 3 (SV031)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	9/21/2021	9/22/2021	9/22/2021	-
Test Period	925 - 1100	804 - 1010	1050 - 1256	-
Test Duration, min	81	120	120	107
Average Stack Temperature, °F	129	139	135	134
Average Moisture Content, %V/V	11.23	9.81	9.68	10.24
Air Flow Rate				
acfm	187,000	188,000	185,000	187,000
scfm	164,000	163,000	162,000	163,000
dscfm	146,000	147,000	146,000	146,000
Filterable Metals Emission Rate, lb/hr				
Lead (Pb)	0.0094	0.0082	0.0079	0.0085
Mercury (Hg)	< 0.00004	< 0.00003	< 0.00003	< 0.00003
Condensable Metals Emission Rate, lb/hr				
Lead (Pb)	0.0024	0.0017	0.0009	0.0016
Mercury (Hg)	0.0025	0.0025	0.0026	0.0026
Total Metals Emission Rate, lb/hr				
Lead (Pb)	0.012	0.010	0.009	0.010
Mercury (Hg)	0.0026	0.0026	0.0026	0.0026

< = Non Detect: Below detection limit in front half analysis

TABLE 11

EPA METHOD 29 METALS CONCENTRATION RESULTS

Pellet Indurating Furnace Line 3 - Stack 4 (SV032)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	9/22/2021	9/23/2021	9/23/2021	-
Test Period	1340 - 1545	722 - 928	1003 - 1220	-
Test Duration, min	120	120	120	120
Average Stack Temperature, °F	147	143	144	145
Average Moisture Content, %V/V	11.10	10.69	10.67	10.82
Filterable Metals Concentration, ug/dscm				
Lead (Pb)	17.1	14.1	14.9	15.4
Mercury (Hg)	< 0.042	< 0.044	< 0.043	< 0.043
Condensable Metals Concentration, ug/dscm				
Lead (Pb)	2.5	1.8	2.1	2.1
Mercury (Hg)	6.4	6.9	7.3	6.9
Total Metals Concentration, ug/dscm				
Lead (Pb)	19.6	15.9	17.0	17.5
Mercury (Hg)	6.5	6.9	7.4	6.9

< = Non Detect: Below detection limit in front half analysis

TABLE 12

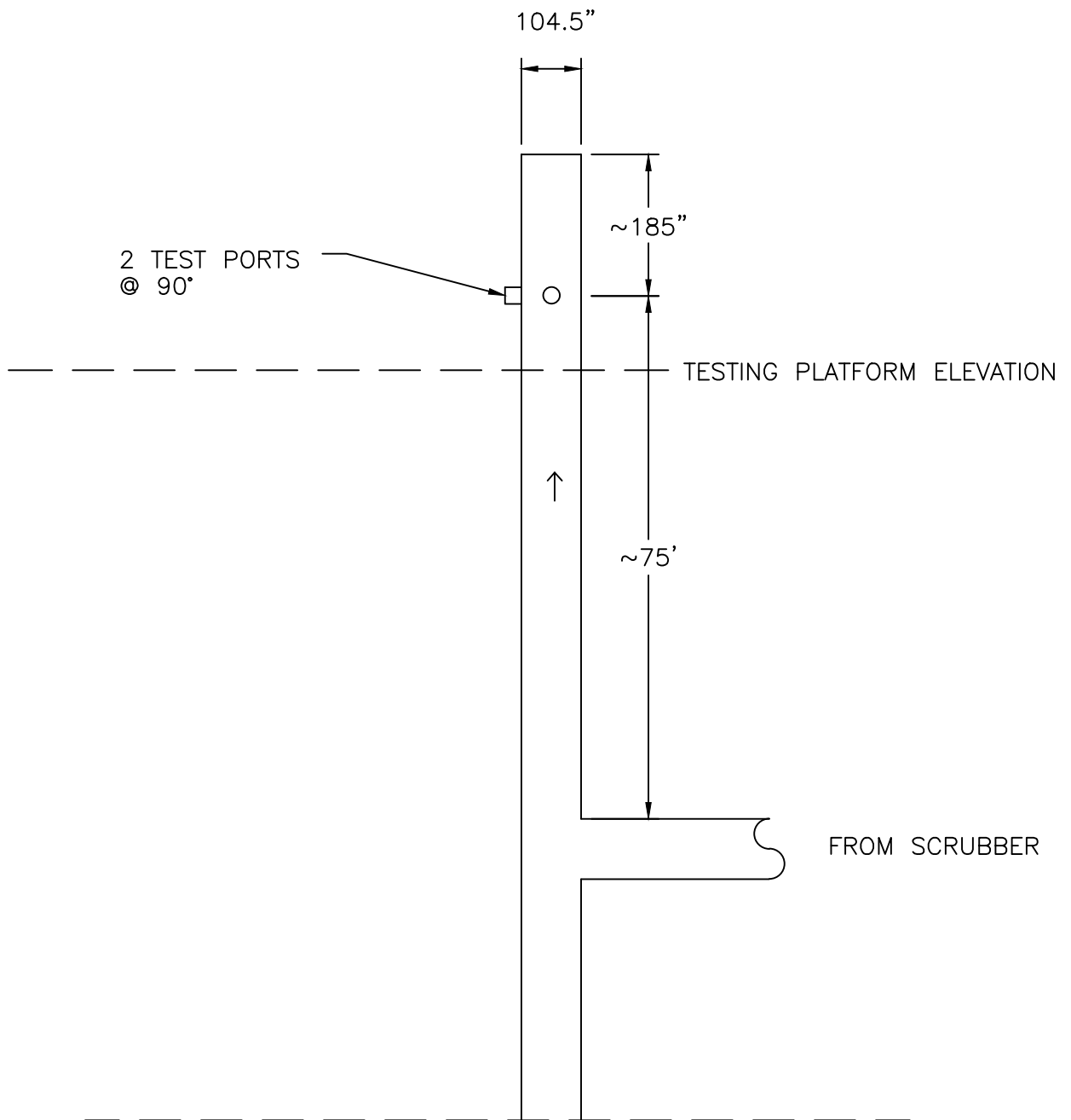
EPA METHOD 29 METALS EMISSION RATE RESULTS

Pellet Indurating Furnace Line 3 - Stack 4 (SV032)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	9/22/2021	9/23/2021	9/23/2021	-
Test Period	1340 - 1545	722 - 928	1003 - 1220	-
Test Duration, min	120	120	120	120
Average Stack Temperature, °F	147	143	144	145
Average Moisture Content, %V/V	11.10	10.69	10.67	10.82
Air Flow Rate				
acfm	208,000	197,000	204,000	203,000
scfm	178,000	169,000	175,000	174,000
dscfm	159,000	151,000	156,000	155,000
Filterable Metals Emission Rate, lb/hr				
Lead (Pb)	0.0102	0.0080	0.0087	0.0090
Mercury (Hg)	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Condensable Metals Emission Rate, lb/hr				
Lead (Pb)	0.0015	0.0010	0.0012	0.0012
Mercury (Hg)	0.0038	0.0039	0.0043	0.0040
Total Metals Emission Rate, lb/hr				
Lead (Pb)	0.0116	0.0090	0.0099	0.0102
Mercury (Hg)	0.0038	0.0039	0.0043	0.0040

< = Non Detect: Below detection limit in front half analysis

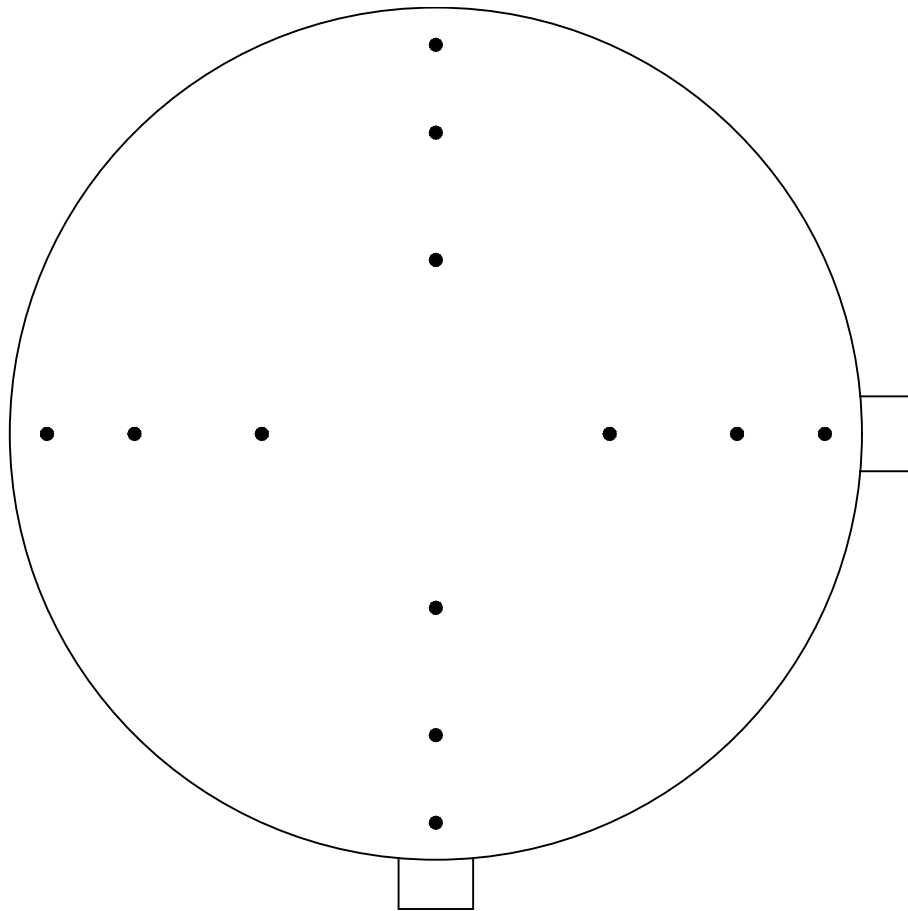
Figures



TEST PORT LOCATIONS
HIBBING TACONITE COMPANY
HIBBING, MINNESOTA
PELLET INDURATING FURNACE LINE 3 VENTURI SCRUBBERS
(SV029,030,031,032), (EU022)

NOT TO SCALE

FIGURE 1



NO. OF TEST PORTS	2
PORT LENGTH	6.375"
PORT DIAMETER	6"
NO. OF TRAVERSE POINTS	12
DUCT DIAMETER	104.50"

POINT	INSERTION DEPTH IN "
1	4.55
2	15.30
3	30.92
4	73.58
5	89.20
6	99.95

TRAVERSE POINT LOCATIONS
 HIBBING TACONITE COMPANY
 HIBBING, MINNESOTA
 PELLET INDURATING FURNACE LINE 3 VENTURI SCRUBBERS
 (SV029,030,031,032), (EU022)

NOT TO SCALE

FIGURE 2

Appendices

Appendix A

Report Calculations and Nomenclature

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, and Particulate Matter Emissions
EPA Methods 2, 3, 4 and 5
Pellet Indurating Furnace Line 3 - Stack 1 (SV029)

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/21/2021	9/22/2021	9/22/2021
Test Period	-	-	925 - 1100	804 - 1010	1050 - 1256
Number of Sample Ports	-	-	2	2	2
Number of Traverse Points	-	-	12	12	12
Duct Dimensions (diameter or Length x Width)	D, L X W	inches	104.50	104.50	104.50
Barometric Pressure	Pbar	in. Hg	29.30	29.50	29.50
Stack Static Pressure	Pg	in. H ₂ O	-0.70	-0.70	-0.70
Average Stack Temperature	Tsf	degrees F	111	113	113
Actual Dry Gas Meter Volume	Vm	cubic feet	59.04	85.71	86.25
Dry Gas Meter Calibration Factor	Y	-	1.0058	1.0058	1.0058
Average Orifice Meter Pressure Drop	DH	in H ₂ O	1.70	1.67	1.67
Average Meter Temperature	Tmf	degrees F	71	75	82
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) ^{0.5}	-	0.912	0.896	0.891
Mass of Water Vapor Condensed in Impingers	Vwc	g	81	114	104
Mass of Water Vapor Collected in Desiccant	Vwsg	g	12	15	18
Orsat Results, Dry Basis					
Oxygen	%O ₂	%v/v	20.2	20.1	20.1
Carbon Dioxide	%CO ₂	%v/v	0.4	0.4	0.4
Nitrogen + Carbon Monoxide	%N ₂ + %CO	%v/v	79.4	79.5	79.5
Nozzle Diameter	Dn	inches	0.218	0.218	0.218
Run Time	theta	minutes	81	120	120
Particulate Loading (From Lab Results)					
PM - Filterable	M _{PM}	g	0.01683	0.02017	0.02454

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, and Particulate Matter Emissions
EPA Methods 2, 3, 4 and 5
Pellet Indurating Furnace Line 3 - Stack 1 (SV029)

Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature $T_{sr} = T_{sf} + 460$	T_{sr}	degrees R	571	573	573
Stack Pressure $P_s = P_{bar} + P_g / 13.6$	P_s	in. Hg	29.25	29.45	29.45
Duct Area $A = \pi \times D^2 / (4 \times 144)$ or $A = L \times W / 144$	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions $V_{mstd} = 17.64 \times V_m \times Y \times ((P_{bar} + (DH / 13.6)) / (T_{mf} + 460))$	V_{mstd}	cubic feet	58.10	84.18	83.71
Average Moisture Content of Stack Gas $MC = ((0.04175 \times V_{wc} + 0.04715 \times V_{wsg}) / ((0.04715 \times V_{wc} + 0.04715 \times V_{wsg}) + (V_{mstd})) \times 100$	MC	% Vol	7.00	6.72	6.44
Molecular Weight of Stack Gas, dry $M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$	M_d	lb/lbmol	28.87	28.87	28.87
Molecular Weight of Stack Gas, wet $M_s = M_d \times (1 - (MC/100)) + 18 \times (MC/100)$	M_s	lb/lbmol	28.11	28.14	28.17
Average Stack Gas Velocity $V_s = 85.49 \times C_p \times (dP)^{0.5} \times ((T_{sr}/(P_s \times M_s))^{0.5})$	V_s	ft/sec	54.58	53.48	53.16
Actual Volumetric Air Flow Rate $Q_a = 60 \times V_s \times A$	Q_a	acfm	195,044	191,129	189,984
Volumetric Air Flow Rate at Standard Conditions $Q_s = Q_a \times (528 / (T_s + 460)) \times (P_s / 29.92)$	Q_s	scfm	176,193	173,369	172,406
Dry Volumetric Air Flow Rate at Standard Conditions $Q_d = Q_a \times (1 - (MC / 100)) \times (528 / T_{sr}) \times (P_s / 29.92)$	Q_d	dscfm	163,865	161,720	161,304
Nozzle Cross-Sectional Area $A_n = (3.14 \times D_n^2) / (4 \times 144)$	A_n	sq. ft	0.000259	0.000259	0.000259
Isokinetic Variation $I = (0.0945 \times T_{sr} \times V_{mstd}) / (P_s \times V_s \times A_n \times \theta \times (1 - (MC / 100)))$	I	%	100.7	99.8	99.5
PARTICULATE CONCENTRATION					
PM - Filterable $C_{sPM} = 15.432 \times M_{PM} / V_{mstd}$	C_{sPM}	gr/dscf	0.0045	0.0037	0.0045
PARTICULATE EMISSION RATE					
PM - Filterable $E_{PM}(lb/hr) = C_{sPM} \times Q_d \times 60 / 7000$	E_{PM}	lb/hr	6.3	5.1	6.3

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, and Particulate Matter Emissions
EPA Methods 2, 3, 4 and 5
Pellet Indurating Furnace Line 3 - Stack 2 (SV030)

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/22/2021	9/23/2021	9/23/2021
Test Period	-	-	1340 - 1545	722 - 926	1003 - 1220
Number of Sample Ports	-	-	2	2	2
Number of Traverse Points	-	-	12	12	12
Duct Dimensions (diameter or Length x Width)	D, L X W	inches	104.50	104.50	104.50
Barometric Pressure	Pbar	in. Hg	29.50	29.35	29.35
Stack Static Pressure	Pg	in. H ₂ O	-0.70	-0.70	-0.70
Average Stack Temperature	Tsf	degrees F	115	118	117
Actual Dry Gas Meter Volume	Vm	cubic feet	88.80	84.42	85.00
Dry Gas Meter Calibration Factor	Y	-	1.0058	1.0058	1.0058
Average Orifice Meter Pressure Drop	DH	in H ₂ O	1.76	1.61	1.64
Average Meter Temperature	Tmf	degrees F	85	75	76
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) ^{0.5}	-	0.924	0.888	0.897
Mass of Water Vapor Condensed in Impingers	Vwc	g	135	144	128
Mass of Water Vapor Collected in Desiccant	Vwsg	g	15	16	13
Orsat Results, Dry Basis					
Oxygen	%O ₂	%v/v	19.8	20.0	19.9
Carbon Dioxide	%CO ₂	%v/v	0.5	0.5	0.5
Nitrogen + Carbon Monoxide	%N ₂ + %CO	%v/v	79.7	79.5	79.6
Nozzle Diameter	Dn	inches	0.218	0.218	0.218
Run Time	theta	minutes	120	120	120
Particulate Loading (From Lab Results)					
PM - Filterable	M _{PM}	g	0.02298	0.02237	0.03025

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, and Particulate Matter Emissions
EPA Methods 2, 3, 4 and 5
Pellet Indurating Furnace Line 3 - Stack 2 (SV030)

Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature $T_{sr} = T_{sf} + 460$	T_{sr}	degrees R	575	578	577
Stack Pressure $P_s = P_{bar} + P_g / 13.6$	P_s	in. Hg	29.45	29.30	29.30
Duct Area $A = \pi \times D^2 / (4 \times 144)$ or $A = L \times W / 144$	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions $V_{mstd} = 17.64 \times V_m \times Y \times ((P_{bar} + (DH / 13.6)) / (T_{mf} + 460))$	V_{mstd}	cubic feet	85.58	82.43	82.91
Average Moisture Content of Stack Gas $MC = ((0.04175 \times V_{wc} + 0.04715 \times V_{wsg}) / ((0.04715 \times V_{wc} + 0.04715 \times V_{wsg}) + (V_{mstd})) \times 100$	MC	% Vol	7.61	8.37	7.38
Molecular Weight of Stack Gas, dry $M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$	M_d	lb/lbmol	28.87	28.88	28.88
Molecular Weight of Stack Gas, wet $M_s = M_d \times (1 - (MC/100)) + 18 \times (MC/100)$	M_s	lb/lbmol	28.04	27.97	28.07
Average Stack Gas Velocity $V_s = 85.49 \times C_p \times (dP)^{0.5} \times ((T_{sr}/(P_s \times M_s))^{0.5})$	V_s	ft/sec	55.39	53.59	53.96
Actual Volumetric Air Flow Rate $Q_a = 60 \times V_s \times A$	Q_a	acfm	197,938	191,507	192,825
Volumetric Air Flow Rate at Standard Conditions $Q_s = Q_a \times (528 / (T_s + 460)) \times (P_s / 29.92)$	Q_s	scfm	178,908	171,172	172,648
Dry Volumetric Air Flow Rate at Standard Conditions $Q_d = Q_a \times (1 - (MC / 100)) \times (528 / T_{sr}) \times (P_s / 29.92)$	Q_d	dscfm	165,293	156,845	159,907
Nozzle Cross-Sectional Area $A_n = (3.14 \times D_n^2) / (4 \times 144)$	A_n	sq. ft	0.000259	0.000259	0.000259
Isokinetic Variation $I = (0.0945 \times T_{sr} \times V_{mstd}) / (P_s \times V_s \times A_n \times \theta \times (1 - (MC / 100)))$	I	%	99.2	100.7	99.4
PARTICULATE CONCENTRATION					
PM - Filterable $C_{sPM} = 15.432 \times M_{PM} / V_{mstd}$	C_{sPM}	gr/dscf	0.0041	0.0042	0.0056
PARTICULATE EMISSION RATE					
PM - Filterable $E_{PM}(lb/hr) = C_{sPM} \times Q_d \times 60 / 7000$	E_{PM}	lb/hr	5.9	5.6	7.7

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, and Particulate Matter Emissions
EPA Methods 2, 3, 4 and 5
Pellet Indurating Furnace Line 3 - Stack 3 (SV031)

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/21/2021	9/22/2021	9/22/2021
Test Period	-	-	925 - 1100	804 - 1010	1050 - 1256
Number of Sample Ports	-	-	2	2	2
Number of Traverse Points	-	-	12	12	12
Duct Dimensions (diameter or Length x Width)	D, L X W	inches	104.50	104.50	104.50
Barometric Pressure	Pbar	in. Hg	29.30	29.50	29.50
Stack Static Pressure	Pg	in. H ₂ O	-0.70	-0.70	-0.70
Average Stack Temperature	Tsf	degrees F	129	139	135
Actual Dry Gas Meter Volume	Vm	cubic feet	52.62	78.64	78.58
Dry Gas Meter Calibration Factor	Y	-	1.0094	1.0094	1.0094
Average Orifice Meter Pressure Drop	DH	in H ₂ O	1.50	1.50	1.49
Average Meter Temperature	Tmf	degrees F	64	76	79
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) ^{0.5}	-	0.856	0.855	0.847
Mass of Water Vapor Condensed in Impingers	Vwc	g	128	162	158
Mass of Water Vapor Collected in Desiccant	Vwsg	g	13	17	17
Orsat Results, Dry Basis					
Oxygen	%O ₂	%v/v	19.3	19.1	19.1
Carbon Dioxide	%CO ₂	%v/v	0.7	0.8	0.8
Nitrogen + Carbon Monoxide	%N ₂ + %CO	%v/v	80.0	80.1	80.1
Nozzle Diameter	Dn	inches	0.220	0.220	0.220
Run Time	theta	minutes	81	120	120
Particulate Loading (From Lab Results)					
PM - Filterable	M _{PM}	g	0.02066	0.02385	0.02193

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, and Particulate Matter Emissions
EPA Methods 2, 3, 4 and 5
Pellet Indurating Furnace Line 3 - Stack 3 (SV031)

Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature $T_{sr} = T_{sf} + 460$	T_{sr}	degrees R	589	599	595
Stack Pressure $P_s = P_{bar} + P_g / 13.6$	P_s	in. Hg	29.25	29.45	29.45
Duct Area $A = \pi \times D^2 / (4 \times 144)$ or $A = L \times W / 144$	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions $V_{mstd} = 17.64 \times V_m \times Y \times ((P_{bar} + (DH / 13.6)) / (T_{mf} + 460))$	V_{mstd}	cubic feet	52.59	77.35	76.92
Average Moisture Content of Stack Gas $MC = ((0.04175 \times V_{wc} + 0.04715 \times V_{wsg}) / ((0.04715 \times V_{wc} + 0.04715 \times V_{wsg}) + (V_{mstd})) \times 100$	MC	% Vol	11.23	9.81	9.68
Molecular Weight of Stack Gas, dry $M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$	M_d	lb/lbmol	28.88	28.89	28.89
Molecular Weight of Stack Gas, wet $M_s = M_d \times (1 - (MC/100)) + 18 \times (MC/100)$	M_s	lb/lbmol	27.66	27.82	27.84
Average Stack Gas Velocity $V_s = 85.49 \times C_p \times (dP)^{0.5} \times ((T_{sr}/(P_s \times M_s))^{0.5})$	V_s	ft/sec	52.41	52.51	51.83
Actual Volumetric Air Flow Rate $Q_a = 60 \times V_s \times A$	Q_a	acfm	187,283	187,640	185,239
Volumetric Air Flow Rate at Standard Conditions $Q_s = Q_a \times (528 / (T_s + 460)) \times (P_s / 29.92)$	Q_s	scfm	164,241	162,917	161,880
Dry Volumetric Air Flow Rate at Standard Conditions $Q_d = Q_a \times (1 - (MC / 100)) \times (528 / T_{sr}) \times (P_s / 29.92)$	Q_d	dscfm	145,799	146,938	146,213
Nozzle Cross-Sectional Area $A_n = (3.14 \times D_n^2) / (4 \times 144)$	A_n	sq. ft	0.000264	0.000264	0.000264
Isokinetic Variation $I = (0.0945 \times T_{sr} \times V_{mstd}) / (P_s \times V_s \times A_n \times \theta \times (1 - (MC / 100)))$	I	%	100.6	99.1	99.0
PARTICULATE CONCENTRATION					
PM - Filterable $C_{sPM} = 15.432 \times M_{PM} / V_{mstd}$	C_{sPM}	gr/dscf	0.0061	0.0048	0.0044
PARTICULATE EMISSION RATE					
PM - Filterable $E_{PM}(lb/hr) = C_{sPM} \times Q_d \times 60 / 7000$	E_{PM}	lb/hr	7.6	6.0	5.5

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, and Particulate Matter Emissions
EPA Methods 2, 3, 4 and 5
Pellet Indurating Furnace Line 3 - Stack 4 (SV032)

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/22/2021	9/23/2021	9/23/2021
Test Period	-	-	1340 - 1545	722 - 928	1003 - 1220
Number of Sample Ports	-	-	2	2	2
Number of Traverse Points	-	-	12	12	12
Duct Dimensions (diameter or Length x Width)	D, L X W	inches	104.50	104.50	104.50
Barometric Pressure	Pbar	in. Hg	29.50	29.35	29.35
Stack Static Pressure	Pg	in. H ₂ O	-0.70	-0.70	-0.70
Average Stack Temperature	Tsf	degrees F	147	143	144
Actual Dry Gas Meter Volume	Vm	cubic feet	86.05	80.94	83.77
Dry Gas Meter Calibration Factor	Y	-	1.0094	1.0094	1.0094
Average Orifice Meter Pressure Drop	DH	in H ₂ O	1.79	1.60	1.71
Average Meter Temperature	Tmf	degrees F	80	69	70
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) ^{0.5}	-	0.941	0.893	0.921
Mass of Water Vapor Condensed in Impingers	Vwc	g	202	181	191
Mass of Water Vapor Collected in Desiccant	Vwsg	g	20	23	19
Orsat Results, Dry Basis					
Oxygen	%O ₂	%v/v	18.6	18.8	18.8
Carbon Dioxide	%CO ₂	%v/v	0.9	0.9	0.9
Nitrogen + Carbon Monoxide	%N ₂ + %CO	%v/v	80.5	80.3	80.3
Nozzle Diameter	Dn	inches	0.220	0.220	0.220
Run Time	theta	minutes	120	120	120
Particulate Loading (From Lab Results)					
PM - Filterable	M _{PM}	g	0.02493	0.02191	0.03819

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, and Particulate Matter Emissions
EPA Methods 2, 3, 4 and 5
Pellet Indurating Furnace Line 3 - Stack 4 (SV032)

Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature $T_{sr} = T_{sf} + 460$	T_{sr}	degrees R	607	603	604
Stack Pressure $P_s = P_{bar} + P_g / 13.6$	P_s	in. Hg	29.45	29.30	29.30
Duct Area $A = \pi \times D^2 / (4 \times 144)$ or $A = L \times W / 144$	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions $V_{mstd} = 17.64 \times V_m \times Y \times ((P_{bar} + (DH / 13.6)) / (T_{mf} + 460))$	V_{mstd}	cubic feet	84.01	80.28	83.01
Average Moisture Content of Stack Gas $MC = ((0.04175 \times V_{wc} + 0.04715 \times V_{wsg}) / ((0.04715 \times V_{wc} + 0.04715 \times V_{wsg}) + (V_{mstd})) \times 100$	MC	% Vol	11.10	10.69	10.67
Molecular Weight of Stack Gas, dry $M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$	M_d	lb/lbmol	28.89	28.90	28.90
Molecular Weight of Stack Gas, wet $M_s = M_d \times (1 - (MC/100)) + 18 \times (MC/100)$	M_s	lb/lbmol	27.68	27.73	27.73
Average Stack Gas Velocity $V_s = 85.49 \times C_p \times (dP)^{0.5} \times ((T_{sr}/(P_s \times M_s))^{0.5})$	V_s	ft/sec	58.31	55.23	57.05
Actual Volumetric Air Flow Rate $Q_a = 60 \times V_s \times A$	Q_a	acfm	208,377	197,384	203,861
Volumetric Air Flow Rate at Standard Conditions $Q_s = Q_a \times (528 / (T_s + 460)) \times (P_s / 29.92)$	Q_s	scfm	178,376	169,267	174,544
Dry Volumetric Air Flow Rate at Standard Conditions $Q_d = Q_a \times (1 - (MC / 100)) \times (528 / T_{sr}) \times (P_s / 29.92)$	Q_d	dscfm	158,582	151,172	155,927
Nozzle Cross-Sectional Area $A_n = (3.14 \times D_n^2) / (4 \times 144)$	A_n	sq. ft	0.000264	0.000264	0.000264
Isokinetic Variation $I = (0.0945 \times T_{sr} \times V_{mstd}) / (P_s \times V_s \times A_n \times \theta \times (1 - (MC / 100)))$	I	%	99.7	99.9	100.2
PARTICULATE CONCENTRATION					
PM - Filterable $C_{sPM} = 15.432 \times M_{PM} / V_{mstd}$	C_{sPM}	gr/dscf	0.0046	0.0042	0.0071
PARTICULATE EMISSION RATE					
PM - Filterable $E_{PM}(lb/hr) = C_{sPM} \times Q_d \times 60 / 7000$	E_{PM}	lb/hr	6.2	5.5	9.5

EPA Method 29 Metals Calculation Summary
Determination of Metal Emissions
EPA Method 29

Pellet Indurating Furnace Line 3 - Stack 1 (SV029)

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/21/2021	9/22/2021	9/22/2021
Test Period	-	-	925 - 1100	804 - 1010	1050 - 1256
Run Time	theta	min	81	120	120
Meter Volume at Standard Conditions Vmstd	Vmstd-ft3	cubic feet	58.10	84.18	83.71
Meter Volume at Standard Conditions Vmstd	Vmstd-m3	cubic meter	1.65	2.38	2.37
Conditions (M2,M4, ISO Calcs)	Qd	DSCFM	163,865	161,720	161,304
Laboratory Results					
Metals Loading, Filterable Analysis, ug			Front Half	Front Half	Front Half
Lead (Pb)	Pb-ug	FH-ug	18.5	23.4	23.9
Mercury (Hg)	Hg-ug	FH-ug	< 0.1	< 0.1	< 0.1
Metals Loading, Condensable Analysis, ug			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb-ug	BH-ug	4.1	2.5	4.4
Mercury (Hg)	Hg-ug	BH-ug	2.4	3.4	3.6
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Filterable Metals Concentration, ug/dscm					
ug/dscm = FHx ug / Vmstd-m3			Front Half	Front Half	Front Half
Lead (Pb)	Pb	ug/dscm	11.2	9.8	10.1
Mercury (Hg)	Hg	ug/dscm	<0.061	<0.042	<0.042
Condensable Metals Concentration, ug/dscm					
ug/dscm = BH Tot-ug / Vmstd-m3			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb	ug/dscm	2.5	1.0	1.8
Mercury (Hg)	Hg	ug/dscm	1.4	1.4	1.5
Total Metals Concentration, ug/dscm					
Total ug/dscm = (FH Tot-ug + BH Tot-ug) / Vmstd m3 x 0.001			Total	Total	Total
Lead (Pb)	Pb	ug/dscm	13.7	10.8	11.9
Mercury (Hg)	Hg	ug/dscm	1.5	1.5	1.5
Front Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Front Half	Front Half	Front Half
Lead (Pb)	Pb	lb/hr	0.0069	0.0059	0.0061
Mercury (Hg)	Hg	lb/hr	<0.00004	<0.00003	<0.00003
Back Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Back Half	Back Half	Back Half
Lead (Pb)	Pb	lb/hr	0.0015	0.0006	0.0011
Mercury (Hg)	Hg	lb/hr	0.00089	0.00087	0.00091
Total Metals Emission Rate, lb/hr					
Metal-E = Front half lb/hr + Back Half lb/hr			Total	Total	Total
Lead (Pb)	Pb	lb/hr	0.0084	0.0066	0.0072
Mercury (Hg)	Hg	lb/hr	0.00092	0.00089	0.00094

< = Non Detect: Below detection limit in front half analysis

EPA Method 29 Metals Calculation Summary
Determination of Metal Emissions
EPA Method 29

Pellet Indurating Furnace Line 3 - Stack 2 (SV030)

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/22/2021	9/23/2021	9/23/2021
Test Period	-	-	1340 - 1545	722 - 926	1003 - 1220
Run Time	theta	min	120	120	120
Meter Volume at Standard Conditions Vmstd	Vmstd-ft3	cubic feet	85.58	82.43	82.91
Meter Volume at Standard Conditions Vmstd	Vmstd-m3	cubic meter	2.42	2.33	2.35
Conditions (M2,M4, ISO Calcs)	Qd	DSCFM	165,293	156,845	159,907
Laboratory Results					
Metals Loading, Filterable Analysis, ug			Front Half	Front Half	Front Half
Lead (Pb)	Pb-ug	FH-ug	31.3	22.5	24.0
Mercury (Hg)	Hg-ug	FH-ug	< 0.1	< 0.1	< 0.1
Metals Loading, Condensable Analysis, ug			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb-ug	BH-ug	2.5	2.9	2.7
Mercury (Hg)	Hg-ug	BH-ug	6.0	6.2	6.3
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Filterable Metals Concentration, ug/dscm					
ug/dscm = FHx ug / Vmstd-m3			Front Half	Front Half	Front Half
Lead (Pb)	Pb	ug/dscm	12.9	9.6	10.2
Mercury (Hg)	Hg	ug/dscm	<0.041	<0.043	<0.043
Condensable Metals Concentration, ug/dscm					
ug/dscm = BH Tot-ug / Vmstd-m3			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb	ug/dscm	1.0	1.3	1.1
Mercury (Hg)	Hg	ug/dscm	2.5	2.7	2.7
Total Metals Concentration, ug/dscm					
Total ug/dscm = (FH Tot-ug + BH Tot-ug) / Vmstd m3 x 0.001			Total	Total	Total
Lead (Pb)	Pb	ug/dscm	14.0	10.9	11.4
Mercury (Hg)	Hg	ug/dscm	2.5	2.7	2.7
Front Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Front Half	Front Half	Front Half
Lead (Pb)	Pb	lb/hr	0.0080	0.0057	0.0061
Mercury (Hg)	Hg	lb/hr	< 0.00003	< 0.00003	< 0.00003
Back Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Back Half	Back Half	Back Half
Lead (Pb)	Pb	lb/hr	0.00064	0.00074	0.00068
Mercury (Hg)	Hg	lb/hr	0.0015	0.0016	0.0016
Total Metals Emission Rate, lb/hr					
Metal-E = Front half lb/hr + Back Half lb/hr			Total	Total	Total
Lead (Pb)	Pb	lb/hr	0.0086	0.0064	0.0068
Mercury (Hg)	Hg	lb/hr	0.0016	0.0016	0.0016

< = Non Detect: Below detection limit in front half analysis

EPA Method 29 Metals Calculation Summary
Determination of Metal Emissions
EPA Method 29

Pellet Indurating Furnace Line 3 - Stack 3 (SV031)

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/21/2021	9/22/2021	9/22/2021
Test Period	-	-	925 - 1100	804 - 1010	1050 - 1256
Run Time	theta	min	81	120	120
Meter Volume at Standard Conditions Vmstd	Vmstd-ft3	cubic feet	52.59	77.35	76.92
Meter Volume at Standard Conditions Vmstd	Vmstd-m3	cubic meter	1.49	2.19	2.18
Conditions (M2,M4, ISO Calcs)	Qd	DSCFM	145,799	146,938	146,213
Laboratory Results					
Metals Loading, Filterable Analysis, ug			Front Half	Front Half	Front Half
Lead (Pb)	Pb-ug	FH-ug	26.2	33.1	32.0
Mercury (Hg)	Hg-ug	FH-ug	< 0.1	< 0.1	< 0.1
Metals Loading, Condensable Analysis, ug			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb-ug	BH-ug	6.5	6.6	3.5
Mercury (Hg)	Hg-ug	BH-ug	6.9	10.1	10.2
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Filterable Metals Concentration, ug/dscm					
ug/dscm = FHx ug / Vmstd-m3			Front Half	Front Half	Front Half
Lead (Pb)	Pb	ug/dscm	17.6	15.1	14.7
Mercury (Hg)	Hg	ug/dscm	< 0.067	< 0.046	< 0.046
Condensable Metals Concentration, ug/dscm					
ug/dscm = BH Tot-ug / Vmstd-m3			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb	ug/dscm	4.3	3.0	1.6
Mercury (Hg)	Hg	ug/dscm	4.7	4.6	4.7
Total Metals Concentration, ug/dscm					
Total ug/dscm = (FH Tot-ug + BH Tot-ug) / Vmstd m3 x 0.001			Total	Total	Total
Lead (Pb)	Pb	ug/dscm	21.9	18.1	16.3
Mercury (Hg)	Hg	ug/dscm	4.7	4.7	4.7
Front Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Front Half	Front Half	Front Half
Lead (Pb)	Pb	lb/hr	0.0096	0.0083	0.0080
Mercury (Hg)	Hg	lb/hr	< 0.00004	< 0.00003	< 0.00003
Back Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Back Half	Back Half	Back Half
Lead (Pb)	Pb	lb/hr	0.0024	0.0017	0.0009
Mercury (Hg)	Hg	lb/hr	0.0025	0.0025	0.0026
Total Metals Emission Rate, lb/hr					
Metal-E = Front half lb/hr + Back Half lb/hr			Total	Total	Total
Lead (Pb)	Pb	lb/hr	0.012	0.010	0.009
Mercury (Hg)	Hg	lb/hr	0.0026	0.0026	0.0026

< = Non Detect: Below detection limit in front half analysis

EPA Method 29 Metals Calculation Summary
Determination of Metal Emissions
EPA Method 29

Pellet Indurating Furnace Line 3 - Stack 4 (SV032)

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/22/2021	9/23/2021	9/23/2021
Test Period	-	-	1340 - 1545	722 - 928	1003 - 1220
Run Time	theta	min	120	120	120
Meter Volume at Standard Conditions Vmstd	Vmstd-ft3	cubic feet	84.01	80.28	83.01
Meter Volume at Standard Conditions Vmstd	Vmstd-m3	cubic meter	2.38	2.27	2.35
Conditions (M2,M4, ISO Calcs)	Qd	DSCFM	158,582	151,172	155,927
Laboratory Results					
Metals Loading, Filterable Analysis, ug			Front Half	Front Half	Front Half
Lead (Pb)	Pb-ug	FH-ug	40.8	32.1	35.0
Mercury (Hg)	Hg-ug	FH-ug	< 0.1	< 0.1	< 0.1
Metals Loading, Condensable Analysis, ug			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb-ug	BH-ug	5.8	4.1	4.8
Mercury (Hg)	Hg-ug	BH-ug	15.3	15.6	17.2
Calculated Data					
Filterable Metals Concentration, ug/dscm					
ug/dscm = FHx ug / Vmstd-m3			Front Half	Front Half	Front Half
Lead (Pb)	Pb	ug/dscm	17.1	14.1	14.9
Mercury (Hg)	Hg	ug/dscm	< 0.042	< 0.044	< 0.043
Condensable Metals Concentration, ug/dscm					
ug/dscm = BH Tot-ug / Vmstd-m3			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb	ug/dscm	2.4	1.8	2.0
Mercury (Hg)	Hg	ug/dscm	6.4	6.9	7.3
Total Metals Concentration, ug/dscm					
Total ug/dscm = (FH Tot-ug + BH Tot-ug) / Vmstd m3 x 0.001			Total	Total	Total
Lead (Pb)	Pb	ug/dscm	19.6	15.9	16.9
Mercury (Hg)	Hg	ug/dscm	6.5	6.9	7.4
Front Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Front Half	Front Half	Front Half
Lead (Pb)	Pb	lb/hr	0.0102	0.0080	0.0087
Mercury (Hg)	Hg	lb/hr	< 0.00002	< 0.00002	< 0.00002
Back Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Back Half	Back Half	Back Half
Lead (Pb)	Pb	lb/hr	0.0014	0.0010	0.0012
Mercury (Hg)	Hg	lb/hr	0.0038	0.0039	0.0043
Total Metals Emission Rate, lb/hr					
Metal-E = Front half lb/hr + Back Half lb/hr			Total	Total	Total
Lead (Pb)	Pb	lb/hr	0.0116	0.0090	0.0099
Mercury (Hg)	Hg	lb/hr	0.0038	0.0039	0.0043

< = Non Detect: Below detection limit in front half analysis

Appendix B

Field Data Sheets

EPA METHOD 29
FIELD DATA SHEET

T10-1260

Project Hibbing Taconite Company

Smpl Loc Line 3 - ~~STACK~~ 50029Test No. 1Runs 1-2Meter y 1.0058 ΔH @ 1.8606Bar. Pres 29.30 in HgStat. Pres -0.70 in H₂OProbe Length 10 ftLiner Type: ☒ Glass ☐ S.S. ☐ OtherDate 9-21-21/9-22-21Pitot No. 10-5Cp 0.84P -

Operator TMR, RMP

CM 5SM -

Sample Train Leak Rate (cfm)					
Run 1			Run 2		
Pretest	<u>0</u>	at 15 in Hg	Pretest	<u>0</u>	at 15 in Hg
Posttest	<u>0</u>	at <u>5</u> in Hg	Posttest	<u>0</u>	at <u>5</u> in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/>	Neg. <input checked="" type="checkbox"/>	Pitot (3 in.)	Pos. <input checked="" type="checkbox"/>	Neg. <input checked="" type="checkbox"/>

Sample Point		Sample Time ΔT	Meter Volume Vm, ft ³	Velocity ΔP , in H ₂ O	Orifice ΔH , in H ₂ O	Train Vacuum in. Hg	TEST RUN 1 9-21-21			Meter Inlet Temp, °F	Meter Outlet Temp, °°F	TEST RUN 2 9-22-21							Meter Inlet Temp, °F	Meter Outlet Temp, °°F				
							Sample Train Temp, °F					Meter Volume Vm, ft ³	Velocity ΔP , in H ₂ O	Orifice ΔH , in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp, °F							
							Probe	Filter	Impngr Outlet								Probe	Filter	Impngr Outlet					
			70.80									130.20												
6	5	74.40	0.88	1.77	2.0	112	245	249	48	64	64	135.65	0.70	1.44	2.0	112	240	250	48	68	68			
6	10	78.18	0.89	1.80	2.0	112	248	252	47	65	63	136.83	0.69	1.42	2.0	112	238	249	47	69	68			
5	15	81.96	0.89	1.80	2.0	112	251	251	46	66	64	140.11	0.75	1.54	2.0	113	220	248	45	70	68			
5	20	85.60	0.86	1.74	2.0	112	250	250	49	68	65	143.45	0.75	1.54	2.0	113	239	250	44	71	68			
4	25	89.35	0.87	1.77	2.0	112	250	250	50	69	66	146.80	0.75	1.54	2.0	113	238	248	45	72	69			
4	30	93.17	0.87	1.77	2.0	111	250	251	49	71	67	150.36	0.80	1.65	2.0	113	236	250	44	73	70			
3	35	96.95	0.90	1.84	2.5	112	250	248	50	72	68	154.05	0.80	1.65	2.0	113	250	251	44	75	71			
3	40	100.80	0.90	1.84	2.5	111	250	254	51	74	69	157.90	0.90	1.86	2.0	114	250	250	44	75	71			
2	45	104.55	0.91	1.87	2.5	111	251	251	53	74	69	161.80	0.91	1.88	2.0	114	250	250	45	76	72			
2	50	108.34	0.93	1.91	2.5	112	249	247	54	75	70	165.64	0.94	1.95	2.0	114	249	247	46	77	73			
1	55	111.91	0.93	1.50	2.0	111	250	254	54	76	71	169.25	0.92	1.70	2.0	113	250	250	46	77	73			
1	60	115.40	0.93	1.50	2.0	111	249	249	53	76	72	172.60	0.77	1.60	2.0	112	249	249	46	77	74			
6	65	118.80	0.70	1.45	2.0	108	249	248	52	75	73	176.16	0.81	1.69	2.0	111	247	248	47	76	75			
6	70	122.20	0.70	1.44	2.0	111	248	251	51	76	74	179.81	0.81	1.67	2.0	112	246	249	46	77	75			
5	75	125.60	0.77	1.59	2.0	112	249	251	51	77	73	183.38	0.81	1.69	2.0	112	249	251	46	78	76			
5	80	129.80	0.80	1.65	2.0	112	250	250	53	77	74	187.05	0.80	1.67	2.0	113	241	250	46	79	75			
4	85											190.60	0.81	1.69	2.0	113	244	252	47	79	76			
4	90											194.15	0.78	1.63	2.0	113	241	249	47	80	76			
3	95											197.63	0.81	1.67	2.0	113	240	254	48	81	77			
3	100											201.30	0.85	1.78	2.0	114	247	251	48	81	77			
2	105											205.05	0.94	1.76	2.0	113	244	249	48	82	78			
2	110											208.82	0.85	1.78	2.0	113	249	248	48	82	79			
1	115											212.27	0.98	1.88	2.0	114	250	250	48	82	79			
1	120											215.91	0.80	1.68	2.0	113	250	253	49	82	79			
5-120		Vm=59.04	0.83	$\Delta H=1.70$		Ts=111.4					Tm=70.5	219.71	0.80	$\Delta H=1.67$		Ts=112.9						Tm=25.15		

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	Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Air Flows	
	Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	ACFM	DSCFM
Run 1	61	20.3	7.5	0925	1100	1	15.2	0	480793	6145-1	0.218	195.100	163.900
Run 2	62	20.3	7.0	0804	1010	2	15.2	0	480794	6145-1	0.218	191.200	161.700

Nozzle Calibration	
Tech. TMR	Date 9-21-21
Nozzle No. 6145-1	
1	0.218
2	0.218
3	0.218

MOISTURE RECOVERY:	RUN 1							
	1	2	3	4	5	6	Desiccant	Total
Final wt., g	642.5	701.6	750.2	655.7	703.2	746.3	960.0	
Initial wt., g	636.5	704.8	746.7	654.9	706.8	747.5	950.2	
Difference	56.0	19.8	3.9	1.0	6.4	-6.2	11.8	92.7

RUN 2							
1	2	3	4	5	6	Desiccant	Total
717.5	726.8	753.0	610.6	742.3	740.4	1026.3	
630.4	761.5	747.8	609.7	740.3	738.9	1011.5	
79.1	25.3	5.2	0.9	2.0	1.3	14.8	128.6

EPA METHOD 29
FIELD DATA SHEET

T10-1260

3A-04

Project Hibbing Taconite CompanySmpl Loc Line 3 - STACK 1 SW029Date 9-22-21Operator TMR, RMPTest No. 1Runs 3Pitot No. 10-5CM 5SM —Meter γ 1.0058 ΔH @ 1.8606Cp 0.84P —Bar. Pres 29.50 in HgStat. Pres -0.7 in H₂OProbe Length 10 ftLiner Type: ☒ Glass ☐ S.S. ☐ Other

Sample Train Leak Rate (cfm)

Run 3				Run 4			
Pretest	<u>0</u>	at 15 in Hg		Pretest		at 15 in Hg	
Posttest	<u>0</u>	at <u>5</u> in Hg		Posttest		at	in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input checked="" type="checkbox"/>			Pitot (3 in.)	Pos. <input type="checkbox"/> Neg. <input type="checkbox"/>		

Operator		TMR, RMP		CM, RMP		CM, RMP		TEST RUN 3												TEST RUN 4											
Sample Point	Sample Time ΔT	Meter Volume Vm, ft ³	Velocity ΔP , in H ₂ O	Orifice ΔH , in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp., °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F	Meter Volume Vm, ft ³	Velocity ΔP , in H ₂ O	Orifice ΔH , in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp., °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F										
							Probe	Filter	Impngr Outlet								Probe	Filter	Impngr Outlet												
		216.20																													
6	5	219.70	0.75	1.57	2.0	111	227	252	57	78	78																				
6	10	223.20	0.78	1.63	2.0	112	233	247	52	78	78																				
5	15	226.78	0.80	1.68	2.0	111	235	257	51	79	78																				
5	20	230.40	0.81	1.70	2.0	112	231	244	51	79	78																				
4	25	234.04	0.79	1.66	2.0	112	232	249	52	80	78																				
4	30	237.64	0.80	1.68	2.0	113	232	250	52	81	78																				
3	35	241.21	0.79	1.66	2.0	113	231	251	52	81	79																				
3	40	244.83	0.82	1.72	2.0	114	230	252	52	82	79																				
2	45	248.44	0.81	1.70	2.0	114	230	253	53	83	80																				
2	50	252.00	0.81	1.70	2.0	114	231	250	54	83	80																				
1	55	255.70	0.82	1.72	2.0	114	232	252	53	84	81																				
1	60	259.00	0.66	1.39	2.0	112	233	251	54	84	81																				
6	65	262.25	0.70	1.48	2.0	111	233	253	56	83	82																				
6	70	265.74	0.70	1.48	2.0	111	235	248	54	83	82																				
5	75	269.29	0.75	1.58	2.0	112	239	239	55	84	82																				
5	80	272.82	0.74	1.56	2.0	112	240	260	57	84	82																				
4	85	276.42	0.78	1.65	2.0	111	246	240	59	84	81																				
4	90	280.02	0.79	1.67	2.0	112	244	251	60	84	81																				
3	95	283.78	0.88	1.85	3.0	113	248	246	62	84	81																				
3	100	287.58	0.89	1.87	3.0	115	249	249	62	84	82																				
2	105	291.40	0.90	1.90	3.0	114	251	249	63	85	82																				
2	110	295.22	0.91	1.92	3.0	114	249	255	64	85	82																				
1	115	298.87	0.80	1.69	2.5	114	248	248	65	85	82																				
1	120	302.45	0.80	1.69	2.5	113	248	244	66	85	83																				
		0 = 720	Vm = 8.25	$\Delta H = 1.64$		Ts = 112.7					Tm = 81.8	Vm =		$\Delta H =$		Ts =					Tm =										

	Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Air Flows	
	Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	ACFM	DSCFM
Run 1	78	20.2	7.0	1050	1256	3	152	0	400775	6155-1	0.218	190,000	161,300
Run 2													

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	<u>See</u>
2	<u>(2m 1)</u>
3	

RUN 3								
MOISTURE RECOVERY:	1	2	3	4	5	6	Desiccant	Total
Impinger								
Final wt., g	<u>710.2</u>	<u>782.4</u>	<u>749.8</u>	<u>736.7</u>	<u>750.8</u>	<u>742.3</u>	<u>962.3</u>	
Initial wt., g	<u>689.2</u>	<u>755.2</u>	<u>745.0</u>	<u>735.4</u>	<u>751.1</u>	<u>740.0</u>	<u>949.0</u>	
Difference	<u>21.1</u>	<u>27.2</u>	<u>4.3</u>	<u>1.3</u>	<u>-0.3</u>	<u>0.3</u>	<u>13.3</u>	<u>1222</u>

RUN 4								
1	2	3	4	5	6	Desiccant	Total	



EPA Method 29 - Field Data Sheet - Run 1

Project	Hibbing Taconite Company	Meter ID	C-5	Probe ID	10-5	Bar.Press.	29.30	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 1 SV029	Meter Y	1.0058	Pitot Tube No.	10-5	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/21/21	Orifice dH@	1.8606	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	1	Run #	1	Liner Type:	Glass	IMP Out TC	TIO-1260	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR/RMP					Barometer ID	BA-04	Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft3	Velocity Head DP, in. H2O	Orifice DH in. H2O	Ideal Point Volume Vm, ft3	Ideal Meter Vol Vm, ft3	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	925	70.80												
1	5.0	74.40	0.880	1.77	3.64	74.44	*	112	*	*	*	64	64	---
2	10.0	78.18	0.890	1.80	3.68	78.13	*	112	*	*	*	65	63	---
3	15.0	81.96	0.890	1.80	3.68	81.81	*	112	*	*	*	66	64	---
4	20.0	85.60	0.860	1.74	3.63	85.44	*	112	*	*	*	68	65	---
5	25.0	89.35	0.870	1.77	3.66	89.10	*	112	*	*	*	69	66	---
6	30.0	93.15	0.870	1.77	3.67	92.77	*	111	*	*	*	71	67	---
7	35.0	96.95	0.900	1.84	3.74	96.51	*	112	*	*	*	72	68	---
8	40.0	100.80	0.900	1.84	3.75	100.26	*	111	*	*	*	74	69	---
9	45.0	104.55	0.910	1.87	3.78	104.04	*	111	*	*	*	74	69	---
10	50.0	108.34	0.930	1.91	3.82	107.85	*	112	*	*	*	75	70	---
11	55.0	111.91	0.730	1.50	3.40	111.25	*	111	*	*	*	76	71	---
12	60.0	115.40	0.730	1.51	3.40	114.65	*	111	*	*	*	76	72	---
13	65.0	118.80	0.700	1.45	3.34	118.00	*	108	*	*	*	75	73	---
14	70.0	122.20	0.700	1.44	3.33	121.33	*	111	*	*	*	76	74	---
15	75.0	125.66	0.770	1.59	3.50	124.83	*	112	*	*	*	77	73	---
16	80.0	129.84	0.800	1.65	3.57	128.40	*	112	*	*	*	77	74	---
17	85.0	0.00	0.000				*	0	*	*	*	0	0	---
18	90.0	0.00	0.000				*	0	*	*	*	0	0	---
19	95.0	0.00	0.000				*	0	*	*	*	0	0	---
20	100.0	0.00	0.000				*	0	*	*	*	0	0	---
21	105.0	0.00	0.000				*	0	*	*	*	0	0	---
22	110.0	0.00	0.000				*	0	*	*	*	0	0	---
23	115.0	0.00	0.000				*	0	*	*	*	0	0	---
24	120.0	0.00	0.000				*	0	*	*	*	0	0	---
End Time	1100													
Run Time	81		Avg DH=	1.70			Avg Ts=	111.38				Avg Tm=	70.53	

Integrated Gas Sampling Data :

Bag No.	NA
Bag Vol.	NA liters
Leak Rate	NA cc/min

Filter No.	4Q0793
Nozzle No.	Glass-1
Nozzle Dn.	0.218

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total
692.5	784.6	750.2	635.9	747.2	741.3	962.0	
636.5	764.8	746.3	634.9	740.8	747.5	950.2	
56.0	19.8	3.9	1.0	6.4	-6.2	11.8	92.7

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 2

Project	Hibbing Taconite Company	Meter ID	C-5	Probe ID	10-5	Bar.Press.	29.50	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 1 SV029	Meter Y	1.0058	Pitot Tube No.	10-5	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/22/21	Orifice dH@	1.8606	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	1	Run #	2	Liner Type:	Glass	IMP Out TC	TIO-1260	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR/RMP							Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft ³	Velocity Head DP, in. H ₂ O	Orifice DH in. H ₂ O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft ³	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	804	130.20												
1	5.0	133.65	0.700	1.44	3.30	133.50	*	112	*	*	*	68	68	---
2	10.0	136.83	0.690	1.42	3.27	136.77	*	112	*	*	*	69	68	---
3	15.0	140.11	0.750	1.54	3.41	140.19	*	113	*	*	*	70	68	---
4	20.0	143.45	0.750	1.54	3.42	143.60	*	113	*	*	*	71	68	---
5	25.0	146.80	0.750	1.54	3.42	147.02	*	113	*	*	*	72	69	---
6	30.0	150.36	0.800	1.65	3.54	150.56	*	113	*	*	*	73	70	---
7	35.0	154.05	0.800	1.65	3.54	154.10	*	113	*	*	*	75	71	---
8	40.0	157.90	0.900	1.86	3.76	157.87	*	114	*	*	*	75	71	---
9	45.0	161.80	0.910	1.88	3.79	161.66	*	114	*	*	*	76	72	---
10	50.0	165.64	0.940	1.95	3.85	165.51	*	114	*	*	*	77	73	---
11	55.0	169.25	0.820	1.70	3.61	169.12	*	113	*	*	*	77	73	---
12	60.0	172.68	0.770	1.60	3.50	172.62	*	112	*	*	*	77	74	---
13	65.0	176.16	0.810	1.69	3.60	176.22	*	111	*	*	*	76	75	---
14	70.0	179.81	0.810	1.69	3.60	179.82	*	112	*	*	*	77	75	---
15	75.0	183.38	0.810	1.69	3.60	183.42	*	112	*	*	*	78	76	---
16	80.0	187.05	0.800	1.67	3.58	187.00	*	113	*	*	*	79	75	---
17	85.0	190.60	0.810	1.69	3.60	190.60	*	113	*	*	*	79	76	---
18	90.0	194.15	0.780	1.63	3.54	194.14	*	113	*	*	*	80	76	---
19	95.0	197.63	0.810	1.69	3.61	197.75	*	113	*	*	*	81	77	---
20	100.0	201.30	0.850	1.78	3.70	201.45	*	114	*	*	*	81	77	---
21	105.0	205.05	0.840	1.76	3.68	205.13	*	113	*	*	*	82	78	---
22	110.0	208.82	0.850	1.78	3.71	208.85	*	113	*	*	*	82	79	---
23	115.0	212.27	0.730	1.53	3.44	212.29	*	114	*	*	*	82	79	---
24	120.0	215.91	0.800	1.68	3.60	215.89	*	113	*	*	*	82	79	---
End Time	1010													
Run Time	120		Avg DH=	1.67			Avg Ts=	112.92				Avg Tm=	75.13	

Integrated Gas Sampling Data :

Bag No. 2
Bag Vol. 15 liters
Leak Rate 0 cc/min

Filter No. 4Q0794
Nozzle No. Glass-1
Nozzle Dn. 0.218

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total
717.5	786.8	753.0	610.6	742.3	740.2	1026.3	
638.4	761.5	747.8	609.7	740.3	738.9	1011.5	
79.1	25.3	5.2	0.9	2.0	1.3	14.8	128.6

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 3

Project	Hibbing Taconite Company	Meter ID	C-5	Probe ID	10-5	Bar.Press.	29.50	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 1 SV029	Meter Y	1.0058	Pitot Tube No.	10-5	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/22/21	Orifice dH@	1.8606	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	1	Run #	3	Liner Type:	Glass	IMP Out TC	TIO-1260	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR /RMP							Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft3	Velocity Head DP, in. H2O	Orifice DH in. H2O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft3	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1050	216.20												
1	5.0	219.70	0.750	1.57	3.48	219.68	*	111	*	*	*	78	78	---
2	10.0	223.20	0.780	1.63	3.55	223.23	*	112	*	*	*	78	78	---
3	15.0	226.78	0.800	1.68	3.59	226.82	*	111	*	*	*	79	78	---
4	20.0	230.40	0.810	1.70	3.62	230.44	*	112	*	*	*	79	78	---
5	25.0	234.04	0.790	1.66	3.57	234.01	*	112	*	*	*	80	78	---
6	30.0	237.64	0.800	1.68	3.59	237.60	*	113	*	*	*	81	78	---
7	35.0	241.24	0.790	1.66	3.58	241.18	*	113	*	*	*	81	79	---
8	40.0	244.83	0.820	1.72	3.64	244.82	*	114	*	*	*	82	79	---
9	45.0	248.44	0.810	1.70	3.62	248.44	*	114	*	*	*	83	80	---
10	50.0	252.00	0.810	1.70	3.63	252.07	*	114	*	*	*	83	80	---
11	55.0	255.70	0.820	1.72	3.65	255.72	*	114	*	*	*	84	81	---
12	60.0	259.00	0.660	1.39	3.29	259.01	*	112	*	*	*	84	81	---
13	65.0	262.25	0.700	1.48	3.39	262.41	*	111	*	*	*	83	82	---
14	70.0	265.74	0.700	1.48	3.39	265.80	*	111	*	*	*	83	82	---
15	75.0	269.29	0.750	1.58	3.51	269.30	*	112	*	*	*	84	82	---
16	80.0	272.82	0.740	1.56	3.49	272.79	*	112	*	*	*	84	82	---
17	85.0	276.42	0.780	1.65	3.58	276.37	*	111	*	*	*	84	81	---
18	90.0	280.02	0.790	1.67	3.60	279.97	*	112	*	*	*	84	81	---
19	95.0	283.78	0.880	1.85	3.79	283.76	*	113	*	*	*	84	81	---
20	100.0	287.58	0.890	1.87	3.81	287.57	*	115	*	*	*	84	82	---
21	105.0	291.40	0.900	1.90	3.83	291.40	*	114	*	*	*	85	82	---
22	110.0	295.22	0.910	1.92	3.86	295.26	*	114	*	*	*	85	82	---
23	115.0	298.87	0.800	1.69	3.62	298.88	*	114	*	*	*	85	82	---
24	120.0	302.45	0.800	1.69	3.62	302.51	*	113	*	*	*	85	83	---
End Time	1256													
Run Time	120		Avg DH=	1.67			Avg Ts=	112.67				Avg Tm=	81.50	

Integrated Gas Sampling Data :

Bag No.	3	Filter No.	4Q0795
Bag Vol.	15 liters	Nozzle No.	Glass-1
Leak Rate	0 cc/min	Nozzle Dn.	0.218

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total	
Final wt., g	710.3	782.4	749.8	736.7	750.8	740.3	967.3		
Initial wt., g	639.2	755.2	745.5	735.4	751.1	740.0	949.0		
Difference	71.1	27.2	4.3	1.3	-0.3	0.3	18.3	122.2	

* Data Recorded on Field Data Sheet



EPA METHOD 29
FIELD DATA SHEET

Project Hibbing Taconite Company

Smpl Loc Line 3 - STACK 2 SVO30 Test No. 2

Date 9-22-21

Operator TMR, RMP

CM 5

Runs 1-2

Pitot No. 10-5

SM

Meter y 1.0058
ΔH @ 1.8606

Cp 0.84

P

Bar. Pres 29.50 in Hg
Stat. Pres 6.70 in Hg

Probe Length 10 ft

Liner Type: Glass S.S. Other

BA-04
T10-1260

Sample Train Leak Rate (cfm)			
Run 1		Run 2	
Pretest	0 at 15 in Hg	Pretest	0 at 15 in Hg
Posttest	0 at 5 in Hg	Posttest	0 at 5 in Hg
Pitot (3 in.)	Pos. Neg.	Pitot (3 in.)	Pos. Neg.

		TEST RUN 1 9-22-21										TEST RUN 2 9-23-21									
Sample Point	Sample Time ΔT	Meter Volume Vm, ft³	Velocity ΔP, in H₂O	Orifice ΔH, in H₂O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp. °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F	Meter Volume Vm, ft³	Velocity ΔP, in H₂O	Orifice ΔH, in H₂O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp. °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°°F
							Probe	Filter	Impngnr Outlet								Probe	Filter	Impngnr Outlet		
		302.80										391.90									
6	5	306.44	0.80	1.64	2.0	94	237	249	60	82	84	395.20	0.72	1.46	2.0	119	239	253	52	72	73
6	10	310.04	0.81	1.66	2.0	115	250	253	53	83	83	398.60	0.72	1.46	2.0	119	232	250	47	72	73
5	15	313.67	0.84	1.72	2.0	114	249	248	49	83	83	402.00	0.75	1.52	2.0	119	233	248	43	73	73
5	20	317.33	0.87	1.78	2.0	115	250	248	49	84	83	405.40	0.77	1.56	2.0	120	232	248	43	74	73
4	25	321.04	0.88	1.80	2.0	116	250	256	50	85	83	408.84	0.79	1.60	2.0	120	233	252	43	75	73
4	30	324.83	0.90	1.85	2.0	114	249	251	51	85	83	412.34	0.80	1.62	2.0	120	233	250	42	76	73
3	35	328.56	0.88	1.80	2.0	115	248	248	52	86	85	416.00	0.87	1.77	2.0	119	232	252	42	76	73
3	40	332.29	0.86	1.77	2.0	116	251	245	53	86	84	419.66	0.87	1.79	2.0	118	231	252	42	77	74
2	45	336.00	0.85	1.75	2.0	114	251	257	54	87	84	423.42	0.88	1.79	2.5	119	232	252	43	78	74
2	50	339.73	0.87	1.79	2.0	115	251	253	53	87	84	427.23	0.86	1.76	2.5	117	233	252	43	78	75
1	55	343.50	0.88	1.80	2.0	114	252	251	52	87	85	430.62	0.71	1.45	2.0	117	233	247	43	78	75
1	60	347.23	0.82	1.69	2.0	115	250	252	53	87	85	434.00	0.74	1.52	2.0	117	232	250	43	78	76
6	65	350.96	0.80	1.64	2.0	116	249	251	54	86	85	437.24	0.74	1.52	2.0	117	241	253	43	77	76
6	70	354.69	0.79	1.62	2.0	117	250	251	54	87	85	440.62	0.75	1.57	2.0	118	250	256	42	77	76
5	75	358.42	0.83	1.71	2.0	116	251	249	55	87	85	444.13	0.85	1.74	2.0	118	249	250	43	77	76
5	80	362.15	0.85	1.75	2.0	116	251	249	55	87	85	447.80	0.82	1.67	2.0	119	251	251	44	77	76
4	85	365.88	0.84	1.73	2.0	116	249	249	55	87	85	451.50	0.80	1.63	2.0	119	250	249	45	77	75
4	90	369.61	0.82	1.75	2.0	116	250	250	56	88	85	455.21	0.84	1.71	2.0	119	250	250	46	77	75
3	95	373.34	0.92	1.90	2.5	114	248	245	57	88	85	458.75	0.83	1.69	2.0	119	248	251	47	77	75
3	100	377.07	0.94	1.94	2.5	114	250	251	57	88	86	462.32	0.82	1.67	2.0	119	250	251	48	77	75
2	105	380.80	0.90	1.86	2.5	115	250	251	57	88	86	466.09	0.84	1.71	2.0	119	248	250	49	77	75
2	110	384.53	0.91	1.88	2.5	115	250	251	58	88	86	469.71	0.81	1.65	2.0	118	247	248	49	77	75
1	115	388.26	0.80	1.65	2.0	114	251	250	58	88	86	473.00	0.68	1.39	2.0	117	249	250	50	78	75
1	120	391.99	0.83	1.72	2.0	113	249	251	59	88	86	476.32	0.70	1.43	2.0	117	251	250	49	77	75
O=		Vm=38.80	0.86	ΔH=1.76		Ts=115.0					Tm=85.48	Vm=41.42	0.79	ΔH=1.61		Ts=118.5					Tm=85.94

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Air Flows	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	ACFM	DSCFM
Run 1	83	20.0	8.5	1340	1545	1	152	0	400799	61052	0.218	197,900
Run 2	73	20.0	2.6	0722	0926	2	152	0	400800	61052	0.218	191,500

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	See
2	TEST 1
3	

MOISTURE RECOVERY:		RUN 1						
Impinger		1	2	3	4	5	6	Desiccant Total
Final wt., g		719.2	788.2	766.3	613.0	756.4	744.2	1022.6
Initial wt., g		640.8	757.0	760.2	612.4	740.4	742.1	1002.8
Difference		78.4	31.2	6.1	0.6	16.0	2.1	119.8

		RUN 2						
		1	2	3	4	5	6	Desiccant Total
		732.2	772.2	752.2	636.4	751.2	738.2	935.9
		672.1	735.9	749.1	635.4	751.3	730.2	920.1
		60.1	41.3	3.1	2.0	0.4	0	15.8



EPA METHOD 29
FIELD DATA SHEET

Project Hibbing Taconite Company

Smpl Loc Line 3 - STAKE 2 SVO30 Test No. 2

Date 9-23-21

Operator TMR, RMP

CM 15

Runs 3

Pitot No. 10-5

SM —

Meter γ 1.0058

ΔH @ 1.8606

Cp 0.84

P —

Bar. Pres 29.35 in Hg

Stat. Pres -0.70 in H₂O

Probe Length 10 ft

Liner Type: ☒ Glass ☐ S.S. ☐ Other

0A-104
710-1260

Sample Train Leak Rate (cfm)

Run 3		Run 4	
Pretest	0 at 15 in Hg	Pretest	at 15 in Hg
Posttest	0 at 5 in Hg	Posttest	at in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input checked="" type="checkbox"/>	Pitot (3 in.)	Pos. <input type="checkbox"/> Neg. <input type="checkbox"/>

TEST RUN 3											TEST RUN 4										
Sample Point	Sample Time ΔT	Meter Volume Vm, ft ³	Velocity ΔP, in H ₂ O	Orifice ΔH, in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp., °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F	Meter Volume Vm, ft ³	Velocity ΔP, in H ₂ O	Orifice ΔH, in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp., °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F
							Probe	Filter	Impngr Outlet								Probe	Filter	Impngr Outlet		
		436.60																			
6	5	482.07	0.80	1.63	2.0	115	236	249	56	72	73										
6	10	482.61	0.79	1.61	2.0	115	250	249	52	72	73										
5	15	487.73	0.86	1.75	2.0	115	250	249	48	73	72										
5	20	490.91	0.86	1.75	2.0	115	250	250	47	73	72										
4	25	494.54	0.85	1.74	2.0	114	250	246	47	74	72										
4	30	498.21	0.87	1.78	2.0	115	250	251	47	75	72										
3	35	501.87	0.85	1.73	2.0	116	250	248	47	76	72										
3	40	505.41	0.81	1.65	2.0	117	248	253	48	76	73										
2	45	509.10	0.84	1.70	2.0	117	250	252	48	77	73										
2	50	512.64	0.82	1.66	2.0	117	250	250	48	77	74										
1	55	516.08	0.74	1.50	2.0	118	246	249	48	78	74										
1	60	519.46	0.79	1.60	2.0	118	249	251	49	78	75										
6	65	523.00	0.70	1.50	2.0	117	241	247	54	76	76										
6	70	526.40	0.73	1.48	2.0	118	245	249	52	78	76										
5	75	529.83	0.77	1.56	2.0	118	247	253	52	79	76										
5	80	533.40	0.80	1.62	2.0	119	248	249	52	79	76										
4	85	536.80	0.80	1.63	2.0	118	248	249	53	80	76										
4	90	540.32	0.80	1.63	2.0	119	248	250	54	80	76										
3	95	543.93	0.83	1.68	2.0	121	249	252	55	80	77										
3	100	547.59	0.80	1.62	2.0	121	249	252	55	81	77										
2	105	551.05	0.78	1.58	2.0	121	249	251	56	81	77										
2	110	554.59	0.80	1.63	2.0	120	249	251	56	81	77										
1	115	558.12	0.77	1.59	2.0	118	251	250	57	81	77										
1	120	561.60	0.80	1.63	2.0	117	248	251	57	81	77										
Σ = 120		Vm = 85.00	ΔH = 1.64			Ts = 117.5					Tm = 76.0	Vm =		ΔH =		Ts =				Tm =	

85.00 ASW 10-11-21

85.00 ASWH 10-11-21

	Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Air Flows	
	Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	ACFM	DSCFM
Run 1	77	20.0	7.6	1003	1220	3	152	0	920861	61952	9218		
Run 2													

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	
2	
3	

MOISTURE RECOVERY: RUN 3							
Impinger	1	2	3	4	5	6	Desiccant Total
Final wt., g	722.0	738.1	758.0	612.7	719.5	721.5	1044.5
Initial wt., g	640.8	750.5	751.5	612.3	712.2	720.1	1002.6
Difference	81.2	88.6	106.5	0.4	7.3	1.4	141.9

RUN 4							
1	2	3	4	5	6	Desiccant	Total



EPA Method 29 - Field Data Sheet - Run 1

Project	Hibbing Taconite Company	Meter ID	C-5	Probe ID	10-5	Bar.Press.	29.50	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 2 SV030	Meter Y	1.0058	Pitot Tube No.	10-5	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/22/21	Orifice dH@	1.8606	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	2	Run #	1	Liner Type:	Glass-1	IMP Out TC	TIO-1260	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR /RMP					Barometer ID	BA-04	Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft3	Velocity Head DP, in. H2O	Orifice DH in. H2O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft3	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1340													
1	5.0	306.44	0.800	1.64	3.57	306.37	*	114	*	*	*	82	84	---
2	10.0	310.04	0.810	1.66	3.59	309.96	*	115	*	*	*	83	83	---
3	15.0	313.67	0.840	1.72	3.66	313.61	*	114	*	*	*	83	83	---
4	20.0	317.33	0.870	1.78	3.72	317.33	*	115	*	*	*	84	83	---
5	25.0	321.04	0.880	1.80	3.74	321.07	*	116	*	*	*	85	83	---
6	30.0	324.83	0.900	1.85	3.79	324.86	*	114	*	*	*	85	83	---
7	35.0	328.56	0.880	1.80	3.75	328.60	*	115	*	*	*	86	85	---
8	40.0	332.29	0.860	1.77	3.71	332.31	*	116	*	*	*	86	84	---
9	45.0	336.00	0.850	1.75	3.69	336.00	*	114	*	*	*	87	84	---
10	50.0	339.73	0.870	1.79	3.73	339.74	*	115	*	*	*	87	84	---
11	55.0	343.05	0.880	1.81	3.76	343.50	*	114	*	*	*	87	85	---
12	60.0	346.73	0.820	1.69	3.63	347.13	*	115	*	*	*	87	85	---
13	65.0	350.42	0.800	1.64	3.58	350.71	*	116	*	*	*	86	85	---
14	70.0	354.18	0.790	1.62	3.55	354.26	*	117	*	*	*	87	85	---
15	75.0	357.88	0.830	1.71	3.65	357.91	*	116	*	*	*	87	85	---
16	80.0	361.61	0.850	1.75	3.69	361.60	*	116	*	*	*	87	85	---
17	85.0	365.34	0.840	1.73	3.67	365.27	*	116	*	*	*	87	85	---
18	90.0	369.00	0.850	1.75	3.69	368.96	*	116	*	*	*	88	85	---
19	95.0	372.81	0.920	1.90	3.85	372.81	*	114	*	*	*	88	85	---
20	100.0	376.70	0.940	1.94	3.89	376.70	*	114	*	*	*	88	86	---
21	105.0	380.44	0.900	1.86	3.81	380.51	*	115	*	*	*	88	86	---
22	110.0	384.30	0.910	1.88	3.83	384.34	*	115	*	*	*	88	86	---
23	115.0	387.99	0.800	1.65	3.59	387.93	*	114	*	*	*	88	86	---
24	120.0	391.60	0.830	1.72	3.66	391.60	*	113	*	*	*	88	86	---
End Time	1545													
Run Time	120		Avg DH=	1.76			Avg Ts=	114.96				Avg Tm=	85.48	

Integrated Gas Sampling Data :

Bag No.	NA
Bag Vol.	NA liters
Leak Rate	NA cc/min

Filter No.	4Q0799
Nozzle No.	Glass-2
Nozzle Dn.	0.218

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total
719.5	788.2	766.3	613.0	756.4	744.2	1022.6	
640.8	757.0	760.2	612.4	740.4	742.1	1007.8	
78.7	31.2	6.1	0.6	16.0	2.1	14.8	149.5

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 2

Project	Hibbing Taconite Company	Meter ID	C-5	Probe ID	10-5	Bar.Press.	29.35	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 2 SV030	Meter Y	1.0058	Pitot Tube No.	10-5	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/23/21	Orifice dH@	1.8606	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	2	Run #	2	Liner Type:	Glass-1	IMP Out TC	TIO-1260	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR/RMP							Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft ³	Velocity Head DP, in. H ₂ O	Orifice DH in. H ₂ O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft ³	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	722													
1	5.0	395.29	0.720	1.46	3.35	395.25	*	119	*	*	*	72	73	---
2	10.0	398.60	0.720	1.46	3.34	398.59	*	119	*	*	*	72	73	---
3	15.0	402.00	0.750	1.52	3.41	402.00	*	119	*	*	*	73	73	---
4	20.0	405.40	0.770	1.56	3.46	405.45	*	120	*	*	*	74	73	---
5	25.0	408.84	0.790	1.60	3.50	408.96	*	120	*	*	*	75	73	---
6	30.0	412.34	0.800	1.62	3.53	412.48	*	120	*	*	*	76	73	---
7	35.0	416.00	0.870	1.77	3.68	416.17	*	119	*	*	*	76	73	---
8	40.0	419.66	0.870	1.77	3.69	419.86	*	118	*	*	*	77	74	---
9	45.0	423.42	0.880	1.79	3.71	423.57	*	119	*	*	*	78	74	---
10	50.0	427.25	0.860	1.76	3.68	427.25	*	117	*	*	*	78	75	---
11	55.0	430.62	0.710	1.45	3.35	430.60	*	117	*	*	*	78	75	---
12	60.0	434.00	0.740	1.52	3.42	434.02	*	117	*	*	*	78	76	---
13	65.0	437.24	0.740	1.52	3.42	437.44	*	117	*	*	*	77	76	---
14	70.0	440.62	0.750	1.53	3.44	440.88	*	118	*	*	*	77	76	---
15	75.0	444.13	0.850	1.74	3.66	444.54	*	118	*	*	*	77	76	---
16	80.0	447.80	0.820	1.67	3.59	448.13	*	119	*	*	*	77	76	---
17	85.0	451.50	0.800	1.63	3.55	451.68	*	119	*	*	*	77	75	---
18	90.0	455.21	0.840	1.71	3.63	455.31	*	119	*	*	*	77	75	---
19	95.0	458.75	0.830	1.69	3.61	458.92	*	119	*	*	*	77	75	---
20	100.0	462.32	0.820	1.67	3.59	462.51	*	119	*	*	*	77	75	---
21	105.0	466.09	0.840	1.71	3.63	466.14	*	119	*	*	*	77	75	---
22	110.0	469.71	0.810	1.65	3.57	469.71	*	118	*	*	*	77	75	---
23	115.0	473.00	0.680	1.39	3.28	472.98	*	117	*	*	*	78	75	---
24	120.0	476.32	0.700	1.43	3.33	476.31	*	117	*	*	*	77	75	---
End Time	926													
Run Time	120		Avg DH=	1.61			Avg Ts=	118.46				Avg Tm=	75.44	

Integrated Gas Sampling Data :

Bag No.	2
Bag Vol.	15 liters
Leak Rate	0 cc/min

Filter No.	4Q0800
Nozzle No.	Glass-2
Nozzle Dn.	0.218

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total	
737.2	777.2	752.2	636.4	751.7	738.2	935.9		
639.1	735.9	749.1	635.4	751.3	738.2	920.1		
98.1	41.3	3.1	1.0	0.4	0.0	15.8	159.7	

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 3

Project	Hibbing Taconite Company	Meter ID	C-5	Probe ID	10-5	Bar.Press.	29.35	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 2 SV030	Meter Y	1.0058	Pitot Tube No.	10-5	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/23/21	Orifice dH@	1.8606	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	2	Run #	3	Liner Type:	Glass-1	IMP Out TC	TIO-1260	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR/RMP							Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft ³	Velocity Head DP, in. H ₂ O	Orifice DH in. H ₂ O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft ³	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1003	476.60												
1	5.0	480.07	0.800	1.63	3.54	480.14	*	115	*	*	*	72	73	---
2	10.0	483.61	0.790	1.61	3.51	483.65	*	115	*	*	*	72	73	---
3	15.0	487.27	0.860	1.75	3.66	487.31	*	115	*	*	*	73	72	---
4	20.0	490.91	0.860	1.75	3.66	490.97	*	115	*	*	*	73	72	---
5	25.0	494.54	0.850	1.74	3.64	494.62	*	114	*	*	*	74	72	---
6	30.0	498.21	0.870	1.78	3.69	498.31	*	115	*	*	*	75	72	---
7	35.0	501.87	0.850	1.73	3.65	501.95	*	116	*	*	*	76	72	---
8	40.0	505.46	0.810	1.65	3.56	505.51	*	117	*	*	*	76	73	---
9	45.0	509.10	0.840	1.70	3.61	509.12	*	117	*	*	*	77	73	---
10	50.0	512.64	0.820	1.66	3.57	512.70	*	117	*	*	*	77	74	---
11	55.0	516.08	0.740	1.50	3.40	516.09	*	118	*	*	*	78	74	---
12	60.0	519.46	0.790	1.60	3.51	519.60	*	118	*	*	*	78	75	---
13	65.0	523.00	0.740	1.50	3.40	523.01	*	117	*	*	*	76	76	---
14	70.0	526.40	0.730	1.48	3.38	526.38	*	118	*	*	*	78	76	---
15	75.0	529.83	0.770	1.56	3.47	529.86	*	118	*	*	*	79	76	---
16	80.0	533.40	0.800	1.62	3.54	533.40	*	119	*	*	*	79	76	---
17	85.0	536.80	0.800	1.63	3.54	536.94	*	118	*	*	*	80	76	---
18	90.0	540.32	0.800	1.63	3.54	540.48	*	119	*	*	*	80	76	---
19	95.0	543.93	0.830	1.68	3.60	544.08	*	121	*	*	*	80	77	---
20	100.0	547.59	0.800	1.62	3.54	547.62	*	121	*	*	*	81	77	---
21	105.0	551.05	0.780	1.58	3.50	551.12	*	121	*	*	*	81	77	---
22	110.0	554.59	0.800	1.63	3.55	554.67	*	120	*	*	*	81	77	---
23	115.0	558.12	0.780	1.59	3.51	558.18	*	118	*	*	*	81	77	---
24	120.0	561.60	0.800	1.63	3.56	561.73	*	117	*	*	*	81	77	---
End Time	1220													
Run Time	120		Avg DH=	1.64			Avg Ts=	117.46				Avg Tm=	76.06	

Integrated Gas Sampling Data :

Bag No.	3
Bag Vol.	15 liters
Leak Rate	0 cc/min

Filter No.	4Q0861
Nozzle No.	Glass-1
Nozzle Dn.	0.218

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total
722.0	781.1	758.0	612.7	719.5	721.5	1014.5	
640.8	750.5	751.5	612.3	712.0	720.1	1002.0	
81.2	30.6	6.5	0.4	7.5	1.4	12.5	140.1

* Data Recorded on Field Data Sheet



EPA METHOD 29
FIELD DATA SHEET

Project Hibbing Taconite Company

Smpl Loc Line 3 - 5423 S/V031 Test No. 3

Date 9-21-21 / 9-22-21

Operator TMR, RMP CM 15

Runs 1-2

Pitot No. 10-36

SM -

Meter y 1.0094
ΔH @ 1.9764

Cp 0.84

P -

Bar. Pres 29.30 in Hg
Stat. Pres -0.70 in H₂O

Probe Length 10 ft

Liner Type: ☒ Glass ☐ S.S. ☐ Other TIO-5

Barometer
BA-04

Sample Train Leak Rate (cfm)			
Run 1		Run 2	
Pretest	0 at 15 in Hg	Pretest	0 at 15 in Hg
Posttest	0 at 5 in Hg	Posttest	0 at 5 in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input type="checkbox"/>	Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input type="checkbox"/>

TEST RUN 1												TEST RUN 2											
Sample Point	Sample Time ΔT	Meter Volume Vm, ft³	Velocity ΔP, in H₂O	Orifice ΔH, in H₂O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp., °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F	Meter Volume Vm, ft³	Velocity ΔP, in H₂O	Orifice ΔH, in H₂O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp., °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F		
							Probe	Filter	Impngr Outlet								Probe	Filter	Impngr Outlet				
		508.50										558.60											
6	5	508.65	0.72	1.47	3.5	126	235	250	50	61	one	558.80	0.67	1.36	3.5	131	250	250	57	71	one		
6	10	508.87	0.70	1.43	3.5	128	233	251	49	61	channel	571.90	0.66	1.34	3.5	137	249	250	57	72	channel		
5	15	512.07	0.72	1.47	3.5	128	247	250	49	61		550.09	0.73	1.40	3.5	138	250	250	58	72			
5	20	515.19	0.72	1.47	3.5	129	253	250	51	62		571.83	0.74	1.50	3.5	138	250	250	56	72			
4	25	518.50	0.74	1.51	3.5	129	247	250	51	63		571.57	0.75	1.52	3.5	139	248	248	56	73			
4	30	521.77	0.81	1.65	4.0	130	251	252	51	63		574.83	0.75	1.57	3.5	138	250	251	56	73			
3	35	525.39	0.80	1.63	4.0	130	252	251	52	63		578.20	0.79	1.60	4.0	140	251	250	57	73			
3	40	528.81	0.80	1.64	4.0	129	250	252	54	64		581.62	0.80	1.62	4.0	139	249	250	57	74			
2	45	532.30	0.80	1.64	4.0	129	252	250	55	64		585.10	0.81	1.65	4.0	139	251	250	58	74			
2	50	535.70	0.80	1.64	4.0	129	251	251	57	65		588.60	0.80	1.63	4.0	140	249	250	59	75			
1	55	538.93	0.65	1.34	3.5	128	250	251	56	65		591.75	0.68	1.39	3.5	139	248	250	60	76			
1	60	542.00	0.66	1.36	3.5	128	250	251	57	65		594.99	0.71	1.45	3.5	139	250	252	60	76			
6	65	545.10	0.67	1.38	3.5	128	248	250	56	66		598.20	0.67	1.37	3.5	138	248	248	60	76			
6	70	548.15	0.66	1.36	3.5	128	251	250	56	66		601.30	0.68	1.39	3.5	139	248	249	60	77			
5	75	551.30	0.73	1.50	3.5	129	249	251	56	67		604.46	0.67	1.39	3.5	140	247	247	60	77			
5	80	555.12	0.77	1.55	3.5	129	249	250	57	67		607.60	0.69	1.41	3.5	139	250	250	59	77			
4	85	PLANT DOWN										610.69	0.71	1.45	3.5	139	247	246	59	78			
4	90	PLANT DOWN										614.00	0.73	1.49	3.5	140	249	250	59	78			
3	95	PLANT DOWN										617.10	0.79	1.62	4.0	140	251	255	60	79			
3	100	PLANT DOWN										620.60	0.81	1.66	4.0	140	250	250	60	79			
2	105	PLANT DOWN										624.10	0.81	1.66	4.0	139	249	248	61	80			
2	110	PLANT DOWN										627.65	0.81	1.67	4.0	139	250	249	62	81			
1	115	PLANT DOWN										631.05	0.68	1.40	3.5	138	248	249	62	80			
1	120	PLANT DOWN										634.24	0.65	1.34	3.5	137	250	250	59	81			
0=	81	Vm=57.6	0.73	ΔH=1.50		Ts=127.6						637.64	0.77	ΔH=1.50		Ts=128.5							

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Air Flows	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	ACFM	DSCFM
Run 1	60	19.0	10.5	0925	1100	1	15L	0	400796	01452	0.220	187,200
Run 2	67	19.0	11.0	0804	1010	2	15L	0	400797	01452	0.220	187,200

Nozzle Calibration	
Tech. <u>TMR</u>	Date <u>9-21-21</u>
Nozzle No. <u>61935-3</u>	
1	0.220
2	0.220
3	0.220

MOISTURE RECOVERY:		RUN 1							Total
Impinger		1	2	3	4	5	6	Desiccant	
Final wt., g	722.3	780.0	745.1	651.5	758.2	747.1	1005.5		
Initial wt., g	642.7	727.2	747.0	650.4	750.3	746.0	997.4		
Difference	80.0	42.8	2.1	1.1	-0.1	1.1	13.1		14.1

RUN 2							3
1	2	3	4	5	6	Desiccant	Total
767.8	799.1	815.8	654.5	765.2	761.4	1011.8	
649.6	766.0	810.3	653.1	762.5	762.5	995.2	
120.2	72.1	5.5	1.4	2.7	-1.1	16.6	178.4



EPA METHOD 29
FIELD DATA SHEET

Project Hibbing Taconite Company
Smpl Loc Line 3 - 55ALK3 SVO31
Date 9-22-21
Operator TMR, RMP

Test No. 3 Runs 3
Pitot No. 10-6 SM —
CM 15

Meter γ 1.6044
ΔH @ 1.9784
Cp 0.84
P —

Bar. Pres 29.50 in Hg
Stat. Pres -0.7 in Hg
Probe Length 10 ft
Liner Type: ☒ Glass ☐ S.S. ☐ Other

GA-04
T10-5

Sample Train Leak Rate (cfm)			
Run 3		Run 4	
Pretest	at 15 in Hg	Pretest	at 15 in Hg
Posttest	at 5 in Hg	Posttest	at in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input checked="" type="checkbox"/>	Pitot (3 in.)	Pos. <input type="checkbox"/> Neg. <input type="checkbox"/>

TEST RUN 3											TEST RUN 4										
Sample Point	Sample Time ΔT	Meter Volume Vm, ft ³	Velocity ΔP, in H ₂ O	Orifice ΔH, in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp, °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F	Meter Volume Vm, ft ³	Velocity ΔP, in H ₂ O	Orifice ΔH, in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp, °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F
							Probe	Filter	Impngr Outlet								Probe	Filter	Impngr Outlet		
		634.60																			
6	5	631.77	0.67	1.38	3.5	133	227	250	65	81	one										
6	10	640.90	0.65	1.35	3.5	133	239	249	58	77	circum										
5	15	644.10	0.68	1.40	3.5	134	235	250	52	75											
5	20	647.20	0.67	1.42	3.5	133	279	251	53	76											
4	25	650.48	0.71	1.46	3.5	134	235	245	53	76											
4	30	653.70	0.71	1.46	3.5	133	238	251	56	77											
3	35	657.06	0.80	1.65	4.0	134	237	251	55	76											
3	40	660.53	0.80	1.64	4.0	136	239	250	57	78											
2	45	664.04	0.80	1.65	4.0	136	231	253	58	79											
2	50	667.48	0.79	1.63	4.0	136	231	254	59	79											
1	55	670.50	0.62	1.28	3.5	134	234	253	59	79											
1	60	674.00	0.63	1.31	3.5	133	241	249	60	79											
6	65	677.10	0.64	1.33	3.5	134	249	250	62	79											
6	70	680.10	0.63	1.31	3.5	133	248	248	59	79											
5	75	683.10	0.70	1.45	3.5	135	249	250	59	79											
5	80	686.10	0.71	1.47	3.5	135	246	247	59	79											
4	85	689.37	0.76	1.57	3.5	134	249	251	60	79											
4	90	692.95	0.74	1.53	3.5	135	249	249	61	79											
3	95	696.15	0.79	1.63	4.0	135	247	255	62	80											
3	100	699.65	0.77	1.59	4.0	136	245	249	63	80											
2	105	703.10	0.80	1.65	4.0	136	251	250	63	80											
2	110	706.61	0.80	1.65	4.0	136	245	251	64	81											
1	115	709.91	0.68	1.41	3.5	135	240	250	65	80											
1	120	713.18	0.70	1.45	3.5	134	240	251	66	80											
	0-120	Vm=78.58	0.72	ΔH=1.49		Ts=134.7				Tm=78.63		Vm=		ΔH=		Ts=				Tm=	

	Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Air Flows	
	Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	ACFM	DSCFM
Run 1	81	19.0	11.0	1050	1256	3	15L	0	40078	Glass-3	0.220	185.300	146.300
Run 2													

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	See
2	Rm 7
3	

MOISTURE RECOVERY: RUN 3								
Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	763.7	792.8	750.3	654.6	751.7	749.0	1000.0	
Initial wt., g	645.5	759.4	745.3	653.4	752.0	747.9	983.5	
Difference	118.2	33.4	4.8	1.2	-6.3	0.1	16.9	174.8

RUN 4							
1	2	3	4	5	6	Desiccant	Total



EPA Method 29 - Field Data Sheet - Run 1

Project	Hibbing Taconite Company	Meter ID	C-15	Probe ID	10-6	Bar.Press.	29.30	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 3 SV031	Meter Y	1.0094	Pitot Tube No.	10-6	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/21/21	Orifice dH@	1.9764	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	3	Run #	1	Liner Type:	Glass	IMP Out TC	TIO-5	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR/RMP					Barometer ID	BA-04	Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft ³	Velocity Head DP, in. H ₂ O	Orifice DH in. H ₂ O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft ³	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	925	502.50												
1	5.0	505.65	0.720	1.47	3.21	505.71	*	126	*	*	*	61	61	---
2	10.0	508.87	0.700	1.43	3.17	508.88	*	128	*	*	*	61	61	---
3	15.0	512.07	0.720	1.47	3.21	512.09	*	128	*	*	*	61	61	---
4	20.0	515.29	0.720	1.47	3.21	515.30	*	129	*	*	*	62	62	---
5	25.0	518.50	0.740	1.51	3.26	518.55	*	129	*	*	*	63	63	---
6	30.0	521.97	0.810	1.65	3.41	521.97	*	130	*	*	*	63	63	---
7	35.0	525.39	0.800	1.63	3.39	525.36	*	130	*	*	*	63	63	---
8	40.0	528.81	0.800	1.64	3.39	528.75	*	129	*	*	*	64	64	---
9	45.0	532.30	0.800	1.64	3.40	532.15	*	129	*	*	*	64	64	---
10	50.0	535.70	0.800	1.64	3.40	535.55	*	129	*	*	*	65	65	---
11	55.0	538.93	0.650	1.34	3.08	538.62	*	128	*	*	*	65	65	---
12	60.0	542.00	0.660	1.36	3.10	541.72	*	128	*	*	*	65	65	---
13	65.0	545.10	0.670	1.38	3.12	544.84	*	128	*	*	*	66	66	---
14	70.0	548.15	0.660	1.36	3.10	547.95	*	128	*	*	*	66	66	---
15	75.0	551.30	0.730	1.50	3.26	551.21	*	129	*	*	*	67	67	---
16	80.0	555.12	0.750	1.55	3.31	554.52	*	129	*	*	*	67	67	---
17	85.0	0.00	0.000				*	0	*	*	*	0	0	---
18	90.0	0.00	0.000				*	0	*	*	*	0	0	---
19	95.0	0.00	0.000				*	0	*	*	*	0	0	---
20	100.0	0.00	0.000				*	0	*	*	*	0	0	---
21	105.0	0.00	0.000				*	0	*	*	*	0	0	---
22	110.0	0.00	0.000				*	0	*	*	*	0	0	---
23	115.0	0.00	0.000				*	0	*	*	*	0	0	---
24	120.0	0.00	0.000				*	0	*	*	*	0	0	---
End Time	1100													
Run Time	81		Avg DH=	1.50			Avg Ts=	128.56				Avg Tm=	63.94	

Integrated Gas Sampling Data :

Bag No. NA
Bag Vol. NA liters
Leak Rate NA cc/min

Filter No. 4Q0796
Nozzle No. Glass-3
Nozzle Dn. 0.220

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total	
722.7	780.0	745.1	651.5	750.2	747.1	1005.5		
642.7	737.2	742.0	650.4	750.3	746.0	992.4		
80.0	42.8	3.1	1.1	-0.1	1.1	13.1	141.1	

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 2

Project	Hibbing Taconite Company	Meter ID	C-15	Probe ID	10-6	Bar.Press.	29.50	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 3 SV031	Meter Y	1.0094	Pitot Tube No.	10-6	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/22/21	Orifice dH@	1.9764	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	3	Run #	2	Liner Type:	Glass	IMP Out TC	TIO-5	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR/RMP							Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft3	Velocity Head DP, in. H2O	Orifice DH in. H2O	Ideal Point Volume Vm, ft3	Ideal Meter Vol Vm, ft3	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	804	555.60												
1	5.0	558.80	0.670	1.36	3.10	558.70	*	131	*	*	*	71	71	---
2	10.0	561.90	0.660	1.34	3.09	561.79	*	137	*	*	*	72	72	---
3	15.0	565.09	0.730	1.48	3.25	565.03	*	138	*	*	*	72	72	---
4	20.0	568.33	0.740	1.50	3.27	568.30	*	138	*	*	*	72	72	---
5	25.0	571.57	0.750	1.52	3.29	571.59	*	139	*	*	*	73	73	---
6	30.0	574.83	0.750	1.53	3.30	574.89	*	138	*	*	*	73	73	---
7	35.0	578.21	0.790	1.60	3.38	578.27	*	140	*	*	*	73	73	---
8	40.0	581.62	0.800	1.62	3.40	581.67	*	139	*	*	*	74	74	---
9	45.0	585.10	0.810	1.65	3.43	585.10	*	139	*	*	*	74	74	---
10	50.0	588.60	0.800	1.62	3.41	588.50	*	140	*	*	*	75	75	---
11	55.0	591.85	0.680	1.39	3.15	591.65	*	139	*	*	*	76	76	---
12	60.0	594.99	0.710	1.45	3.22	594.88	*	139	*	*	*	76	76	---
13	65.0	598.20	0.670	1.37	3.14	598.01	*	138	*	*	*	76	76	---
14	70.0	601.36	0.680	1.39	3.16	601.17	*	139	*	*	*	77	77	---
15	75.0	604.46	0.670	1.37	3.14	604.31	*	140	*	*	*	77	77	---
16	80.0	607.60	0.690	1.41	3.18	607.49	*	139	*	*	*	77	77	---
17	85.0	610.60	0.710	1.45	3.23	610.72	*	139	*	*	*	78	78	---
18	90.0	614.00	0.730	1.49	3.28	614.00	*	140	*	*	*	78	78	---
19	95.0	617.10	0.790	1.62	3.41	617.41	*	140	*	*	*	79	79	---
20	100.0	620.60	0.810	1.66	3.46	620.87	*	140	*	*	*	79	79	---
21	105.0	624.10	0.810	1.66	3.46	624.33	*	139	*	*	*	80	80	---
22	110.0	627.65	0.810	1.67	3.47	627.80	*	139	*	*	*	81	81	---
23	115.0	631.05	0.680	1.40	3.19	630.99	*	138	*	*	*	80	80	---
24	120.0	634.24	0.650	1.34	3.11	634.10	*	137	*	*	*	81	81	---
End Time	1010													
Run Time	120		Avg DH=	1.50			Avg Ts=	138.54				Avg Tm=	76.00	

Integrated Gas Sampling Data :

Bag No. 2
Bag Vol. 15 liters
Leak Rate 0 cc/min

Filter No. 4Q0797
Nozzle No. Glass-3
Nozzle Dn. 0.220

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total	
769.8	799.1	815.8	654.5	765.2	761.4	1011.8		
649.6	766.0	810.3	653.1	762.5	762.5	995.2		
120.2	33.1	5.5	1.4	2.7	-1.1	16.6	178.4	

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 3

Project	Hibbing Taconite Company	Meter ID	C-15	Probe ID	10-6	Bar.Press.	29.50	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 3 SV031	Meter Y	1.0094	Pitot Tube No.	10-6	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/22/21	Orifice dH@	1.9764	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	3	Run #	3	Liner Type:	Glass	IMP Out TC	TIO-5	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR/RMP							Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft3	Velocity Head DP, in. H2O	Orifice DH in. H2O	Ideal Point Volume Vm, ft3	Ideal Meter Vol Vm, ft3	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1050													
1	5.0	637.77	0.670	1.38	3.16	637.76	*	138	*	*	*	81	81	---
2	10.0	640.90	0.650	1.35	3.13	640.89	*	133	*	*	*	77	77	---
3	15.0	644.10	0.680	1.40	3.18	644.07	*	134	*	*	*	75	75	---
4	20.0	647.30	0.690	1.42	3.19	647.26	*	133	*	*	*	76	76	---
5	25.0	650.48	0.710	1.46	3.24	650.50	*	134	*	*	*	76	76	---
6	30.0	653.70	0.710	1.46	3.24	653.74	*	133	*	*	*	77	77	---
7	35.0	657.06	0.800	1.65	3.44	657.18	*	134	*	*	*	76	76	---
8	40.0	660.53	0.800	1.64	3.43	660.61	*	136	*	*	*	78	78	---
9	45.0	664.04	0.800	1.65	3.44	664.05	*	136	*	*	*	79	79	---
10	50.0	667.48	0.790	1.63	3.43	667.48	*	136	*	*	*	79	79	---
11	55.0	670.50	0.620	1.28	3.04	670.52	*	134	*	*	*	79	79	---
12	60.0	674.00	0.630	1.31	3.07	673.59	*	133	*	*	*	79	79	---
13	65.0	677.10	0.640	1.33	3.09	676.68	*	134	*	*	*	79	79	---
14	70.0	680.10	0.630	1.31	3.07	679.76	*	133	*	*	*	79	79	---
15	75.0	683.10	0.700	1.45	3.23	682.99	*	135	*	*	*	79	79	---
16	80.0	686.10	0.710	1.47	3.25	686.24	*	135	*	*	*	79	79	---
17	85.0	689.37	0.760	1.57	3.37	689.61	*	134	*	*	*	79	79	---
18	90.0	692.95	0.740	1.53	3.32	692.93	*	135	*	*	*	79	79	---
19	95.0	696.15	0.790	1.63	3.43	696.36	*	135	*	*	*	80	80	---
20	100.0	699.65	0.770	1.59	3.39	699.75	*	136	*	*	*	80	80	---
21	105.0	703.10	0.800	1.65	3.46	703.20	*	136	*	*	*	80	80	---
22	110.0	706.61	0.800	1.65	3.46	706.66	*	136	*	*	*	81	81	---
23	115.0	709.91	0.680	1.41	3.20	709.85	*	135	*	*	*	80	80	---
24	120.0	713.18	0.700	1.45	3.24	713.09	*	134	*	*	*	80	80	---
End Time	1256													
Run Time	120		Avg DH=	1.49			Avg Ts=	134.67				Avg Tm=	78.63	

Integrated Gas Sampling Data :

Bag No. 3
Bag Vol. 15 liters
Leak Rate 0 cc/min

Filter No. 4Q0798
Nozzle No. Glass-3
Nozzle Dn. 0.220

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total	
763.7	792.8	750.3	654.6	751.7	748.5	1000.2		
645.5	759.4	745.5	653.4	752.0	747.9	983.3		
118.2	33.4	4.8	1.2	-0.3	0.6	16.9	174.8	

* Data Recorded on Field Data Sheet



EPA METHOD 29
FIELD DATA SHEET

Project Hibbing Taconite Company

Smpl Loc Line 3 - STALE 4 SVO32

Date 9-22-21

Operator TMR, RMP

Test No. 4

Runs 1-2

Pitot No. 10-6

CM 15

SM —

Meter γ 1.0094

ΔH @ 1.9784

Cp 0.84

P —

Bar. Pres 29.50 in Hg

Stat. Pres 29.50 in Hg

Probe Lngth 10 ft

Liner Type: ☒ Glass ☐ S.S. ☐ Other

0A-04

T10-5

Sample Train Leak Rate (cfm)			
Run 1		Run 2	
Pretest	0 at 15 in Hg	Pretest	0 at 15 in Hg
Posttest	0 at 5 in Hg	Posttest	0 at 5 in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input checked="" type="checkbox"/>	Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input checked="" type="checkbox"/>

TEST RUN 1												TEST RUN 2											
Sample Point	Sample Time ΔT	Meter Volume Vm, ft ³	Velocity ΔP , in H ₂ O	Orifice ΔH , in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp., °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F	Meter Volume Vm, ft ³	Velocity ΔP , in H ₂ O	Orifice ΔH , in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp., °F			Meter Inlet Temp, °F	Meter Outlet Temp, °°F		
							Probe	Filter	Impngr Outlet								Probe	Filter	Impngr Outlet				
		213.50										220.50											
6	5	216.91	0.77	1.55	4.0	147	242	251	67	80	one	223.70	0.68	1.36	3.0	143	250	251	55	69	one		
6	10	220.32	0.78	1.57	4.0	146	249	250	67	81	change	226.90	0.72	1.44	3.5	144	250	251	57	69	change		
5	15	223.76	0.89	1.79	4.5	148	250	250	58	81		230.12	0.79	1.58	3.5	143	250	250	53	69			
5	20	227.45	0.92	1.85	4.5	148	250	250	58	81		233.38	0.76	1.52	3.5	143	250	250	54	69			
4	25	231.12	0.94	1.89	5.0	149	250	249	59	81		236.70	0.81	1.62	3.5	143	252	252	54	69			
4	30	234.90	0.93	1.87	5.0	149	250	250	60	81		240.10	0.83	1.66	3.5	143	251	250	54	69			
3	35	238.66	0.99	1.99	5.0	149	249	249	61	81		243.64	0.92	1.84	4.0	144	251	251	54	69			
3	40	242.44	0.98	1.97	5.0	149	251	251	62	82		247.02	0.92	1.84	4.0	143	250	249	53	69			
2	45	246.17	0.95	1.91	5.0	148	251	251	63	82		250.91	0.93	1.86	4.0	143	251	250	53	69			
2	50	249.83	0.95	1.91	5.0	149	249	248	64	82		254.70	0.91	1.82	4.0	143	251	251	54	69			
1	55	257.00	0.69	1.39	4.0	148	250	249	65	82		258.00	0.69	1.38	3.5	142	249	247	55	69			
1	60	258.41	0.70	1.41	4.0	148	250	248	66	82		261.00	0.99	1.38	3.5	142	252	253	55	69			
6	65	259.71	0.79	1.55	4.0	148	250	250	68	83		264.40	0.75	1.50	3.5	143	250	247	51	69			
6	70	262.95	0.74	1.49	4.0	149	250	250	61	79		267.50	0.72	1.44	3.5	143	252	252	51	69			
5	75	266.25	0.84	1.69	4.0	145	249	250	55	79		270.95	0.80	1.60	3.5	143	250	249	52	69			
5	80	269.70	0.85	1.71	4.0	145	250	250	53	79		274.33	0.82	1.64	3.5	143	251	250	53	69			
4	85	273.24	0.93	1.87	5.0	146	250	249	52	79		277.72	0.84	1.68	3.5	143	250	251	54	69			
4	90	277.10	0.90	1.81	5.0	146	252	250	53	79		281.21	0.85	1.70	3.5	143	250	250	55	69			
3	95	281.00	1.00	2.01	5.0	146	250	252	52	79		284.57	0.87	1.78	3.5	144	249	250	56	69			
3	100	284.70	1.00	2.01	5.0	146	251	251	53	79		288.21	0.90	1.80	3.5	143	250	250	57	69			
2	105	288.58	0.97	1.95	5.0	145	250	250	53	79		291.64	0.90	1.80	3.5	143	250	251	58	69			
2	110	292.30	0.90	1.97	5.0	145	250	251	54	79		295.24	0.83	1.66	3.5	143	251	250	59	69			
1	115	296.00	0.90	1.81	5.0	145	250	248	54	80		298.60	0.65	1.26	3.5	142	244	249	60	69			
1	120	297.55	0.94	1.87	5.0	146	249	249	54	80		301.44	0.62	1.24	3.5	141	250	251	61	69			
0 = 120		Vm = 8.05	0.80	$\Delta H = 1.77$		Ts = 147.1					Tm = 79.7	Vm = 8.04	0.80	$\Delta H = 1.60$		Ts = 142.9					Tm = 69.0		

	Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Air Flows	
	Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	ACFM	DSCFM
Run 1	80	17.6	11.5	1340	1545	1	152	0	400862	61054	0-220	208.40	158.600
Run 2	69	18.6	11.1	1722	1928	2	152	0	400863	61054	0-220	192.400	151.200

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	see
2	TEST 3
3	

MOISTURE RECOVERY:							
RUN 1							
Impinger	1	2	3	4	5	6	Desiccant
Final wt., g	779.6	812.9	820.0	652.1	751.0	766.5	1011.6
Initial wt., g	652.2	768.7	804.9	655.6	742.8	760.7	991.6
Difference	127.4	44.4	10.1	1.2	8.2	5.8	20.0

RUN 2							
1	2	3	4	5	6	Desiccant	Total
792.3	788.2	750.1	653.7	753.9	743.9	946.1	
645.2	757.1	746.5	653.7	754.4	744.1	923.4	
147.1	31.1	3.6	0	-0.5	-0.2	72.7	702.8



EPA METHOD 29
FIELD DATA SHEET

Project Hibbing Taconite Company

Smpl Loc Line 3 - STALKY SW02 Test No. 4

Date 9-23-21

Operator TMR, RMP

CM 15

Runs 3

Pitot No. 10-6

SM —

Meter 1.0094
ΔH @ 1.9364
Cp 0.84
P —

Bar. Pres 29.35 in Hg
Stat. Pres -0.70 in H₂O

Probe Length 10 ft

Liner Type: ☒ Glass ☐ S.S. ☐ Other

BA-04
T10-5

Sample Train Leak Rate (cfm)			
Run 3		Run 4	
Pretest	0 at 15 in Hg	Pretest	at 15 in Hg
Posttest	0 at 5 in Hg	Posttest	at in Hg
Pitot (3 in.) Pos.	<input checked="" type="checkbox"/> Neg. <input checked="" type="checkbox"/>	Pitot (3 in.) Pos.	<input type="checkbox"/> Neg. <input type="checkbox"/>

TEST RUN 3											TEST RUN 4										
Sample Point	Sample Time ΔT	Meter Volume Vm, ft ³	Velocity ΔP, in H ₂ O	Orifice ΔH, in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp, °F			Meter Inlet Temp, °F	Meter Outlet Temp, °F	Meter Volume Vm, ft ³	Velocity ΔP, in H ₂ O	Orifice ΔH, in H ₂ O	Train Vacuum in. Hg	Stack Temp. Ts, °F	Sample Train Temp, °F			Meter Inlet Temp, °F	Meter Outlet Temp, °F
							Probe	Filter	Impngr Outlet								Probe	Filter	Impngr Outlet		
		881.10																			
6	5	885.13	0.81	1.63	3.5	142	240	753	54	68	ONE										
6	10	888.52	0.80	1.61	7.5	143	252	251	51	68	channel										
5	15	891.95	0.82	1.75	4.0	143	251	250	52	68											
5	20	895.46	0.89	1.79	4.0	143	251	250	53	68											
4	25	899.19	0.94	1.89	4.5	143	251	250	54	68											
4	30	902.80	0.93	1.87	4.5	143	249	250	55	68											
3	35	906.50	0.97	1.95	5.0	143	251	250	56	68											
3	40	910.32	1.00	2.01	5.0	143	249	251	56	68											
2	45	914.08	0.90	1.81	4.5	143	251	250	57	68											
2	50	917.80	0.93	1.87	4.5	143	249	249	57	69											
1	55	921.20	0.70	1.41	4.0	143	252	251	58	69											
1	60	924.36	0.69	1.39	4.0	142	249	250	60	69											
6	65	927.41	0.71	1.43	4.0	143	252	250	62	60											
6	70	930.62	0.71	1.43	4.0	143	250	250	59	70											
5	75	933.59	0.79	1.59	4.0	145	252	251	59	70											
5	80	937.17	0.84	1.69	4.5	145	250	250	60	70											
4	85	940.62	0.89	1.79	5.0	144	251	251	61	71											
4	90	944.13	0.82	1.75	5.0	146	251	250	62	71											
3	95	947.84	0.92	1.91	5.0	145	251	250	63	71											
3	100	951.52	0.94	1.89	5.0	146	248	249	63	72											
2	105	955.26	0.90	1.81	5.0	148	251	250	64	72											
2	110	958.90	0.91	1.83	5.0	148	252	254	65	72											
1	115	962.33	0.75	1.52	4.5	144	249	251	66	72											
1	120	965.5	0.75	1.52	4.5	142	250	249	67	73											
T= 120		Vm= 885.13	ΔH= 1.71			Ts= 142.9					Tm= 67.7	Vm=		ΔH=		Ts=					Tm=

83.77 Asm 10-11-21

63.77 ASW4 10-11-21

	Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Air Flows	
	Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	ACFM	DSCFM
Run 1	68	18.6	10.7	1003	1220	3	152	0	40824	6144	0.220	203.900	155.900
Run 2													

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	See
2	TEST 3
3	

MOISTURE RECOVERY: RUN 3									
Impinger	1	2	3	4	5	6	Desiccant	Total	
Final wt., g	720.2	824.3	813.1	686.3	721.1	740.0	934.0		
Initial wt., g	652.0	779.8	805.4	655.1	720.2	732.9	920.1		
Difference	126.7	444.5	77.7	0.4	8.9	2.1	13.9	710.2	

RUN 4							
1	2	3	4	5	6	Desiccant	Total



EPA Method 29 - Field Data Sheet - Run 1

Project	Hibbing Taconite Company	Meter ID	C-15	Probe ID	10-6	Bar.Press.	29.50	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 4 SV032	Meter Y	1.0094	Pitot Tube No.	10-6	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/22/21	Orifice dH@	1.9764	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	4	Run #	1	Liner Type:	Glass	IMP Out TC	TIO-5	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR /RMP					Barometer ID	BA-04	Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft3	Velocity Head DP, in. H2O	Orifice DH in. H2O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft3	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1340													
1	5.0	716.91	0.770	1.55	3.34	716.84	*	147	*	*	*	80	80	---
2	10.0	720.32	0.780	1.57	3.37	720.21	*	146	*	*	*	81	81	---
3	15.0	723.76	0.890	1.79	3.60	723.81	*	148	*	*	*	81	81	---
4	20.0	727.45	0.920	1.85	3.66	727.46	*	148	*	*	*	81	81	---
5	25.0	731.12	0.940	1.89	3.69	731.15	*	149	*	*	*	81	81	---
6	30.0	734.90	0.930	1.87	3.67	734.83	*	149	*	*	*	81	81	---
7	35.0	738.66	0.990	1.99	3.79	738.61	*	149	*	*	*	81	81	---
8	40.0	742.47	0.980	1.97	3.77	742.38	*	149	*	*	*	82	82	---
9	45.0	746.17	0.950	1.91	3.72	746.10	*	148	*	*	*	82	82	---
10	50.0	749.83	0.950	1.91	3.72	749.82	*	149	*	*	*	82	82	---
11	55.0	753.00	0.690	1.39	3.18	753.00	*	148	*	*	*	82	82	---
12	60.0	756.41	0.700	1.41	3.20	756.19	*	148	*	*	*	82	82	---
13	65.0	759.71	0.770	1.55	3.35	759.55	*	148	*	*	*	83	83	---
14	70.0	762.95	0.740	1.49	3.29	762.84	*	149	*	*	*	79	79	---
15	75.0	766.25	0.840	1.69	3.49	766.33	*	145	*	*	*	79	79	---
16	80.0	769.70	0.850	1.71	3.51	769.84	*	145	*	*	*	79	79	---
17	85.0	773.34	0.930	1.87	3.67	773.50	*	146	*	*	*	79	79	---
18	90.0	777.10	0.900	1.81	3.61	777.11	*	146	*	*	*	79	79	---
19	95.0	781.00	1.000	2.01	3.80	780.91	*	146	*	*	*	79	79	---
20	100.0	784.70	1.000	2.01	3.80	784.72	*	146	*	*	*	79	79	---
21	105.0	788.58	0.970	1.95	3.75	788.46	*	145	*	*	*	79	79	---
22	110.0	792.30	0.980	1.97	3.77	792.23	*	145	*	*	*	79	79	---
23	115.0	796.00	0.900	1.81	3.61	795.84	*	145	*	*	*	80	80	---
24	120.0	799.55	0.940	1.89	3.69	799.54	*	146	*	*	*	80	80	---
End Time	1545													
Run Time	120		Avg DH=	1.79			Avg Ts=	147.08				Avg Tm=	80.42	

Integrated Gas Sampling Data :

Bag No.	NA
Bag Vol.	NA liters
Leak Rate	NA cc/min

Filter No.	4Q0862
Nozzle No.	Glass-3
Nozzle Dn.	0.220

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total
779.6	817.9	820.0	657.1	751.0	766.5	1011.6	
652.2	768.5	809.9	655.6	742.8	760.7	991.6	
127.4	49.4	10.1	1.5	8.2	5.8	20.0	222.4

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 2

Project	Hibbing Taconite Company	Meter ID	C-15	Probe ID	10-6	Bar.Press.	29.35	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 4 SV032	Meter Y	1.0094	Pitot Tube No.	10-6	Stat Press.	-0.7	in. H2O	Pretest 0.000 at 15 in. Hg
Date	09/23/21	Orifice dH@	1.9764	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	4	Run #	2	Liner Type:	Glass	IMP Out TC	TIO-5	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR /RMP							Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft3	Velocity Head DP, in. H2O	Orifice DH in. H2O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft3	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	722	800.50												
1	5.0	803.70	0.680	1.36	3.11	803.61	*	143	*	*	*	69	69	---
2	10.0	806.90	0.720	1.44	3.20	806.80	*	144	*	*	*	69	69	---
3	15.0	810.12	0.790	1.58	3.35	810.15	*	143	*	*	*	69	69	---
4	20.0	813.38	0.760	1.52	3.29	813.44	*	143	*	*	*	69	69	---
5	25.0	816.70	0.810	1.62	3.39	816.83	*	143	*	*	*	69	69	---
6	30.0	820.10	0.830	1.66	3.43	820.26	*	143	*	*	*	69	69	---
7	35.0	823.64	0.920	1.84	3.61	823.87	*	144	*	*	*	69	69	---
8	40.0	827.21	0.920	1.84	3.61	827.48	*	143	*	*	*	69	69	---
9	45.0	830.90	0.930	1.86	3.63	831.11	*	143	*	*	*	69	69	---
10	50.0	834.70	0.910	1.82	3.59	834.71	*	143	*	*	*	69	69	---
11	55.0	838.00	0.690	1.38	3.13	837.84	*	142	*	*	*	69	69	---
12	60.0	841.00	0.690	1.38	3.13	840.97	*	142	*	*	*	69	69	---
13	65.0	844.40	0.750	1.50	3.26	844.24	*	143	*	*	*	69	69	---
14	70.0	847.50	0.720	1.44	3.20	847.44	*	143	*	*	*	69	69	---
15	75.0	850.95	0.800	1.60	3.37	850.81	*	143	*	*	*	69	69	---
16	80.0	854.33	0.820	1.64	3.41	854.22	*	143	*	*	*	69	69	---
17	85.0	857.72	0.840	1.68	3.45	857.67	*	143	*	*	*	69	69	---
18	90.0	861.21	0.850	1.70	3.47	861.14	*	143	*	*	*	69	69	---
19	95.0	864.57	0.890	1.78	3.55	864.69	*	144	*	*	*	69	69	---
20	100.0	868.21	0.900	1.80	3.57	868.27	*	143	*	*	*	69	69	---
21	105.0	871.64	0.900	1.80	3.57	871.84	*	143	*	*	*	69	69	---
22	110.0	875.24	0.830	1.66	3.43	875.27	*	143	*	*	*	69	69	---
23	115.0	878.60	0.630	1.26	3.00	878.27	*	142	*	*	*	69	69	---
24	120.0	881.44	0.620	1.24	2.97	881.24	*	141	*	*	*	69	69	---
End Time	928													
Run Time	120		Avg DH=	1.60			Avg Ts=	142.92				Avg Tm=	69.00	

Integrated Gas Sampling Data :

Bag No.	2
Bag Vol.	15 liters
Leak Rate	0 cc/min

Filter No.	4Q0863
Nozzle No.	Glass-3
Nozzle Dn.	0.220

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total	
792.3	788.2	750.1	653.2	753.9	743.9	946.1		
645.2	757.1	746.5	653.2	754.4	744.1	923.4		
147.1	31.1	3.6	0.0	-0.5	-0.2	22.7	203.8	

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 3

Project	Hibbing Taconite Company	Meter ID	C-15	Probe ID	10-6	Bar.Press.	29.35	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 3 - Stack 4 SV032	Meter Y	1.0094	Pitot Tube No.	10-6	Stat Press.	-0.7	in. H ₂ O	Pretest 0.000 at 15 in. Hg
Date	09/23/21	Orifice dH@	1.9764	Pitot Cp	0.84	CPM TC	NA	Posttest 0.000 at 5 in. Hg	
Test	4	Run #	3	Liner Type:	Glass	IMP Out TC	TIO-5	Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	TMR /RMP							Posttest Pitot leak Check Neg	PASS @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft ³	Velocity Head DP, in. H ₂ O	Orifice DH in. H ₂ O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft ³	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					
									Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1003													
1	5.0	885.13	0.810	1.63	3.40	885.20	*	142	*	*	*	68	68	---
2	10.0	888.52	0.800	1.61	3.38	888.58	*	143	*	*	*	68	68	---
3	15.0	891.95	0.870	1.75	3.52	892.10	*	143	*	*	*	68	68	---
4	20.0	895.46	0.890	1.79	3.56	895.66	*	143	*	*	*	68	68	---
5	25.0	899.19	0.940	1.89	3.66	899.31	*	143	*	*	*	68	68	---
6	30.0	902.80	0.930	1.87	3.64	902.95	*	143	*	*	*	68	68	---
7	35.0	906.50	0.970	1.95	3.71	906.67	*	143	*	*	*	68	68	---
8	40.0	910.32	1.000	2.01	3.77	910.44	*	143	*	*	*	68	68	---
9	45.0	914.08	0.900	1.81	3.58	914.02	*	143	*	*	*	68	68	---
10	50.0	917.80	0.930	1.87	3.64	917.65	*	143	*	*	*	69	69	---
11	55.0	921.20	0.700	1.41	3.17	920.82	*	143	*	*	*	69	69	---
12	60.0	924.32	0.690	1.39	3.15	923.97	*	142	*	*	*	69	69	---
13	65.0	927.41	0.710	1.43	3.19	927.15	*	143	*	*	*	69	69	---
14	70.0	930.62	0.710	1.43	3.19	930.34	*	143	*	*	*	70	70	---
15	75.0	933.59	0.790	1.59	3.36	933.70	*	145	*	*	*	70	70	---
16	80.0	937.17	0.840	1.69	3.47	937.17	*	145	*	*	*	70	70	---
17	85.0	940.62	0.890	1.79	3.57	940.74	*	144	*	*	*	71	71	---
18	90.0	944.13	0.870	1.75	3.53	944.27	*	146	*	*	*	71	71	---
19	95.0	947.84	0.950	1.91	3.69	947.96	*	145	*	*	*	71	71	---
20	100.0	951.52	0.940	1.89	3.67	951.63	*	146	*	*	*	72	72	---
21	105.0	955.26	0.900	1.81	3.59	955.22	*	148	*	*	*	72	72	---
22	110.0	958.90	0.910	1.83	3.61	958.83	*	148	*	*	*	72	72	---
23	115.0	962.37	0.750	1.52	3.29	962.13	*	144	*	*	*	72	72	---
24	120.0	965.57	0.750	1.52	3.30	965.42	*	142	*	*	*	73	73	---
End Time	1220													
Run Time	120		Avg DH=	1.71			Avg Ts=	143.88				Avg Tm=	69.67	

Integrated Gas Sampling Data :

Bag No.	3
Bag Vol.	15 liters
Leak Rate	0 cc/min

Filter No.	4Q0864
Nozzle No.	Glass-3
Nozzle Dn.	0.220

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	Desiccant	Total	
780.2	824.3	813.1	656.3	729.1	740.0	939.0		
652.5	779.8	805.4	655.9	720.2	737.9	920.1		
127.7	44.5	7.7	0.4	8.9	2.1	18.9	210.2	

* Data Recorded on Field Data Sheet



Modified EPA METHOD 3A-- Instrument Analysis Data Sheet

Project

Sample Locations

HTC
Line 3 STACK 1 (SV029)
Line 3 STACK 3 (SV031)

Analyzer Make / Model / Serial No.

Analyzer O₂ Range (span), %:Analyzer CO₂ Range (span), %:

Servo max 1440
0 - 22.5
0 - 9.5

Test Nos.

Test Date:

Operators

1, 3
9-21-21 Analysis Date: 9-22-21
TAIC

	Cylinder Serial or Lot Number	O ₂ Cert. Conc.	CO ₂ Cert. Conc.
Zero Gas	Nitrogen	0	0
O ₂ / CO ₂ Mid-range	EB0097773	29.5	9.5
O ₂ / CO ₂ High-range	EB0097796	22.5	4.94

PRETEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.0	0	0.0
Mid-range:	9.5	9.5	4.9	4.9
High-range:	22.5	22.5	9.5	9.5

Time of Calibration _____ to _____

INTEGRATED BAG ANALYSIS

Location/Test No.

Run No.

Time Sampled

Time Analyzed

O₂, %CO₂, %

Line 3 STACK 1			Line 3 STACK 3		
1	2	3	1	2	3
9/21/21	9/22	9/22	9/21	9/22	9/22
20.2	20.1	20.1	19.3	19.1	19.1
0.4	0.4	0.4	0.7	0.8	0.8

Time of Analysis: _____ to _____

POSTTEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0	0	0
Mid-range:	9.5	9.5	4.9	4.9
High-range:	22.5	22.5	9.5	9.5

Time of Calibration _____ to _____



Modified EPA METHOD 3A-- Instrument Analysis Data Sheet

Project

Sample Locations

HTC
Line 3 Stack 2 (SU030)
Line 3 Stack 4 (SU032)

Analyzer Make / Model / Serial No.

Analyzer O₂ Range (span), %:Analyzer CO₂ Range (span), %:

Servomex 1440

0 - 22.5

0 - 9.5

Test Nos.

Test Date:

Operators

2, 4
9/22/21, 9/23/21
TAK

Cylinder Serial or Lot Number

O₂ Cert. Conc.CO₂ Cert. Conc.

Zero Gas	Nitrogen	0	0
O ₂ / CO ₂ Mid-range	EB 097773	9.5	9.5
O ₂ / CO ₂ High-range	EB 0097796	22.5	4.94

PRETEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.0	0	0.0
Mid-range:	9.5	9.5	4.94	4.9
High-range:	22.5	22.5	9.5	9.5

Time of Calibration 1623 to 1625

INTEGRATED BAG ANALYSIS

Location/Test No.

Run No.

Time Sampled

Time Analyzed

O₂, %CO₂, %

Stack 2			Stack 4		
1	2	3	1	2	3
9-22-21			9-22-21		
1628			1629		
19.8			18.6		
0.5			0.9		

Time of Analysis: 1627 to 1631

POSTTEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0	0	0
Mid-range:	9.5	9.5	4.94	4.9
High-range:	22.5	22.5	9.5	9.5

Time of Calibration 1632 to 1636



Modified EPA METHOD 3A-- Instrument Analysis Data Sheet

Project

Sample Locations

HIC

Line 3 STACK 2 (SV030)

Line 3 STACK 4 (SV032)

Analyzer Make / Model / Serial No.

Serumen 1440

Analyzer O₂ Range (span), %:

0 - 22.5

Analyzer CO₂ Range (span), %:

0 - 9.5

Test Nos.

2, 4

Test Date:

9/23/21

Analysis Date:

9/23/21

Operators

TAK

	Cylinder Serial or Lot Number	O ₂ Cert. Conc.	CO ₂ Cert. Conc.
Zero Gas	Nitrogen	0	0
O ₂ / CO ₂ Mid-range	EB0097773	9.5	9.5
O ₂ / CO ₂ High-range	EB0097796	22.5	4.94

PRETEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.0	0	0.0
Mid-range:	9.5	9.5	4.94	4.9
High-range:	22.5	22.5	9.5	9.5

Time of Calibration 1245 to 1249

INTEGRATED BAG ANALYSIS

Location/Test No.	STACK 2			STACK 4		
Run No.	1	2	3	1	2	3
Time Sampled						
Time Analyzed	X	1252	1254	X	1256	1258
O ₂ , %		20.0	19.9		18.8	18.8
CO ₂ , %		0.5	0.5		0.9	0.9

Time of Analysis: 1252 to 1258

POSTTEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0	0	0
Mid-range:	9.5	9.5	4.94	4.9X
High-range:	22.5	22.5	9.5	9.5

Time of Calibration 1301 to 1305

Appendix C

Laboratory Reports and Sample Chain of Custody

Results of Gravimetric Particulate Analysis
Pellet Indurating Furnace Line 3 - Stack 1 (SV029)
Test Date: September 22, 2021

Method 5 Particulate Mass Determination

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blanks
Air Filter - Net Particulate Mass	M_{af}	g	0.00984	0.01410	0.01524	0.00000
Probe Wash - Net Residue Mass	M_{pw}	g	0.00699	0.00607	0.00930	0.00000
Probe Wash Volume	V_{pw}	ml	115	100	145	150
Calculations						
Probe Wash Blank Correction Amount $C_{pw} = V_{pw} \times M_{pw(blank)} \div V_{pw(blank)}$	C_{pw}	g	0.00000	0.00000	0.00000	
Probe Wash Final Mass $M_{pwf} = M_{pw} - C_{pw}$	M_{pwf}	g	0.00699	0.00607	0.00930	
Filterable Particulate Matter (PM) Mass $M_{PM} = M_{af} + M_{pwf}$	M_{PM}	g	0.01683	0.02017	0.02454	



LABORATORY REPORT

FILTERABLE PARTICULATE MATTER RESULTS

CLIENT Hibbing Taconite Company
PROJECT NO. 23691428.27 100-400
TEST T1
TEST DATE 9/22/2021
SOURCE ID Pellet Indurating Furnace Line 3 - Stack 1 (SV029)
SAMPLING LOCATION Stack **SAMPLES COLLECTED BY** BAW

AIR FILTERS: 4: Quartz **ANALYZED ON:** 9/22 **ANALYSIS PERFORMED BY** ROB

Run	Filter ID	Description	Gross Weight	Date/Time	Tare Weight	Date/Time	Uncorrected Net Mass (g)
R1	4Q0793	Red particulate	0.79627	9/26/2021 13:19	0.78648	3/8/2021 14:49	0.00984
			0.79630	9/28/2021 19:21	0.78641	3/9/2021 14:46	
R2	4Q0794	Red particulate	0.80333	9/26/2021 13:20	0.78932	3/8/2021 14:50	0.01410
			0.80359	9/28/2021 19:19	0.78940	3/9/2021 15:20	
R3	4Q0795	Red particulate	0.80143	9/26/2021 13:21	0.78623	3/8/2021 14:51	0.01524
			0.80153	9/28/2021 19:18	0.78626	3/9/2021 15:19	
Filter Blank	4Q0865	No visible particulate	0.80402	9/26/2021 13:17	0.80407	3/11/2021 16:43	0.00000
			0.80406	9/28/2021 19:22	0.80401	3/12/2021 11:32	

PROBE RINSE: ACETONE

Run	Beaker ID	Description	Gross Weight	Date/Time	Tare Weight	Date/Time	Uncorrected Net Mass (g)	Solvent Volume (ml)	Evidence of Sample Loss?
R1	T1R1	Brown particulate, filter media	126.15333	9/28/2021 12:05	126.14630	9/24/2021 15:59	0.00699	115	No
			126.15346	9/28/2021 18:53	126.14651	9/26/2021 10:15			
R2	T1R2	Red-brown particulate	123.98896	9/28/2021 12:06	123.98275	9/24/2021 16:02	0.00607	100	No
			123.98900	9/28/2021 18:52	123.98308	9/26/2021 10:13			
R3	T1R3	Red-brown particulate	121.78624	9/28/2021 12:07	121.77672	9/24/2021 16:04	0.00930	145	No
			121.78615	9/28/2021 18:51	121.77707	9/26/2021 10:12			
Acetone Reagent Blank	T4R0	No visible residue	121.57549	9/28/2021 12:02	121.57534	9/24/2021 16:19	0.00000	150	No
			121.57552	9/28/2021 18:39	121.57567	9/26/2021 9:41			

REMARKS

Results of Gravimetric Particulate Analysis
Pellet Indurating Furnace Line 3 - Stack 2 (SV030)
Test Date: September 23, 2021

Method 5 Particulate Mass Determination

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blanks
Air Filter - Net Particulate Mass	M_{af}	g	0.01440	0.01442	0.01810	0.00000
Probe Wash - Net Residue Mass	M_{pw}	g	0.00858	0.00795	0.01215	0.00000
Probe Wash Volume	V_{pw}	ml	145	100	125	150
Calculations						
Probe Wash Blank Correction Amount $C_{pw} = V_{pw} \times M_{pw(blank)} \div V_{pw(blank)}$	C_{pw}	g	0.00000	0.00000	0.00000	
Probe Wash Final Mass $M_{pwf} = M_{pw} - C_{pw}$	M_{pwf}	g	0.00858	0.00795	0.01215	
Filterable Particulate Matter (PM) Mass $M_{PM} = M_{af} + M_{pwf}$	M_{PM}	g	0.02298	0.02237	0.03025	



LABORATORY REPORT

FILTERABLE PARTICULATE MATTER RESULTS

CLIENT Hibbing Taconite Company
PROJECT NO. 23691428.27 100-400
TEST T2
TEST DATE 9/23/2021
SOURCE ID Pellet Indurating Furnace Line 3 - Stack 2 (SV030)
SAMPLING LOCATION Stack **SAMPLES COLLECTED BY** BAW

AIR FILTERS: 4: Quartz **ANALYZED ON:** 9/22 **ANALYSIS PERFORMED BY** ROB

Run	Filter ID	Description	Gross Weight	Date/Time	Tare Weight	Date/Time	Uncorrected Net Mass (g)
R1	4Q0799	Red particulate	0.80266	9/26/2021 13:23	0.78837	3/8/2021 15:36	0.01440
			0.80305	9/28/2021 19:16	0.78855	3/9/2021 14:44	
R2	4Q0800	Red particulate	0.80608	9/26/2021 13:24	0.79190	3/8/2021 15:49	0.01442
			0.80646	9/28/2021 19:14	0.79180	3/9/2021 15:59	
R3	4Q0861	Red particulate	0.81981	9/26/2021 13:25	0.80176	3/11/2021 16:49	0.01810
			0.81987	9/28/2021 19:13	0.80172	3/12/2021 11:41	
Filter Blank	4Q0865	No visible particulate	0.80402	9/26/2021 13:17	0.80407	3/11/2021 16:43	0.00000
			0.80406	9/28/2021 19:22	0.80401	3/12/2021 11:32	

PROBE RINSE: ACETONE

Run	Beaker ID	Description	Gross Weight	Date/Time	Tare Weight	Date/Time	Uncorrected Net Mass (g)	Solvent Volume (ml)	Evidence of Sample Loss?
R1	T2R1	Red-brown particulate	125.53298	9/28/2021 12:08	125.52421	9/24/2021 16:07	0.00858	145	No
			125.53295	9/28/2021 18:50	125.52455	9/26/2021 9:55			
R2	T2R2	Red-brown particulate, filter media	124.15106	9/28/2021 12:09	124.14293	9/24/2021 16:09	0.00795	100	No
			124.15100	9/28/2021 18:50	124.14322	9/26/2021 9:54			
R3	T2R3	Red-brown particulate	120.22961	9/28/2021 12:10	120.21720	9/24/2021 16:09	0.01215	125	No
			120.22951	9/28/2021 18:49	120.21762	9/26/2021 10:08			
Acetone Reagent Blank	T4R0	No visible residue	121.57549	9/28/2021 12:02	121.57534	9/24/2021 16:19	0.00000	150	No
			121.57552	9/28/2021 18:39	121.57567	9/26/2021 9:41			

REMARKS

Results of Gravimetric Particulate Analysis
Pellet Indurating Furnace Line 3 - Stack 3 (SV031)
Test Date: September 22, 2021

Method 5 Particulate Mass Determination

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blanks
Air Filter - Net Particulate Mass	M_{af}	g	0.01066	0.01548	0.01480	0.00000
Probe Wash - Net Residue Mass	M_{pw}	g	0.01000	0.00837	0.00713	0.00000
Probe Wash Volume	V_{pw}	ml	185	140	125	150
Calculations						
Probe Wash Blank Correction Amount $C_{pw} = V_{pw} \times M_{pw(blank)} \div V_{pw(blank)}$	C_{pw}	g	0.00000	0.00000	0.00000	
Probe Wash Final Mass $M_{pwf} = M_{pw} - C_{pw}$	M_{pwf}	g	0.01000	0.00837	0.00713	
Filterable Particulate Matter (PM) Mass $M_{PM} = M_{af} + M_{pwf}$	M_{PM}	g	0.02066	0.02385	0.02193	



LABORATORY REPORT

FILTERABLE PARTICULATE MATTER RESULTS

CLIENT Hibbing Taconite Company
PROJECT NO. 23691428.27 100-400
TEST T3
TEST DATE 9/22/2021
SOURCE ID Pellet Indurating Furnace Line 3 - Stack 3 (SV031)
SAMPLING LOCATION Stack **SAMPLES COLLECTED BY** BAW

AIR FILTERS: 4: Quartz **ANALYZED ON:** 9/22 **ANALYSIS PERFORMED BY** ROB

Run	Filter ID	Description	Gross Weight	Date/Time	Tare Weight	Date/Time	Uncorrected Net Mass (g)
R1	4Q0796	Red particulate	0.79963	9/26/2021 13:26	0.78895	3/8/2021 14:52	0.01066
			0.79965	9/28/2021 19:11	0.78901	3/9/2021 15:18	
R2	4Q0797	Red particulate	0.80335	9/26/2021 13:27	0.78784	3/8/2021 14:53	0.01548
			0.80344	9/28/2021 19:09	0.78799	3/9/2021 15:17	
R3	4Q0798	Red particulate	0.80888	9/26/2021 13:28	0.79412	3/8/2021 14:54	0.01480
			0.80896	9/28/2021 19:08	0.79413	3/9/2021 15:15	
Filter Blank	4Q0865	No visible particulate	0.80402	9/26/2021 13:17	0.80407	3/11/2021 16:43	0.00000
			0.80406	9/28/2021 19:22	0.80401	3/12/2021 11:32	

PROBE RINSE: ACETONE

Run	Beaker ID	Description	Gross Weight	Date/Time	Tare Weight	Date/Time	Uncorrected Net Mass (g)	Solvent Volume (ml)	Evidence of Sample Loss?
R1	T3R1	Red-brown particulate	126.59113	9/28/2021 12:11	126.58105	9/24/2021 16:11	0.01000	185	No
			126.59131	9/28/2021 18:48	126.58139	9/26/2021 10:04			
R2	T3R2	Red-brown particulate	121.41971	9/28/2021 12:12	121.41118	9/24/2021 16:11	0.00837	140	No
			121.41980	9/28/2021 18:47	121.41158	9/26/2021 10:01			
R3	T3R3	Red-brown particulate, filter media	124.01758	9/28/2021 12:13	124.01025	9/24/2021 16:12	0.00713	125	No
			124.01767	9/28/2021 18:46	124.01073	9/26/2021 9:50			
Acetone Reagent Blank	T4R0	No visible residue	121.57549	9/28/2021 12:02	121.57534	9/24/2021 16:19	0.00000	150	No
			121.57552	9/28/2021 18:39	121.57567	9/26/2021 9:41			

REMARKS

Results of Gravimetric Particulate Analysis
Pellet Indurating Furnace Line 3 - Stack 4 (SV032)
Test Date: September 23, 2021

Method 5 Particulate Mass Determination

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blanks
Air Filter - Net Particulate Mass	M_{af}	g	0.01589	0.01590	0.02549	0.00000
Probe Wash - Net Residue Mass	M_{pw}	g	0.00903	0.00601	0.01270	0.00000
Probe Wash Volume	V_{pw}	ml	155	100	145	150
Calculations						
Probe Wash Blank Correction Amount $C_{pw} = V_{pw} \times M_{pw(blank)} \div V_{pw(blank)}$	C_{pw}	g	0.00000	0.00000	0.00000	
Probe Wash Final Mass $M_{pwf} = M_{pw} - C_{pw}$	M_{pwf}	g	0.00903	0.00601	0.01270	
Filterable Particulate Matter (PM) Mass $M_{PM} = M_{af} + M_{pwf}$	M_{PM}	g	0.02493	0.02191	0.03819	



LABORATORY REPORT

FILTERABLE PARTICULATE MATTER RESULTS

CLIENT Hibbing Taconite Company
PROJECT NO. 23691428.27 100-400
TEST T4
TEST DATE 9/23/2021
SOURCE ID Pellet Indurating Furnace Line 3 - Stack 4 (SV032)
SAMPLING LOCATION Stack **SAMPLES COLLECTED BY** BAW

AIR FILTERS: 4: Quartz **ANALYZED ON:** 9/22 **ANALYSIS PERFORMED BY** ROB

Run	Filter ID	Description	Gross Weight	Date/Time	Tare Weight	Date/Time	Uncorrected Net Mass (g)
R1	4Q0862	Red particulate	0.81514	9/26/2021 13:29	0.79925	3/11/2021 16:51	0.01589
			0.81512	9/28/2021 19:06	0.79922	3/12/2021 11:43	
R2	4Q0863	Red particulate	0.82950	9/26/2021 13:30	0.81363	3/11/2021 16:52	0.01590
			0.82949	9/28/2021 19:03	0.81357	3/12/2021 11:44	
R3	4Q0864	Red particulate	0.82581	9/26/2021 13:31	0.80038	3/11/2021 16:53	0.02549
			0.82589	9/28/2021 19:01	0.80034	3/12/2021 11:45	
Filter Blank	4Q0865	No visible particulate	0.80402	9/26/2021 13:17	0.80407	3/11/2021 16:43	0.00000
			0.80406	9/28/2021 19:22	0.80401	3/12/2021 11:32	

PROBE RINSE: ACETONE

Run	Beaker ID	Description	Gross Weight	Date/Time	Tare Weight	Date/Time	Uncorrected Net Mass (g)	Solvent Volume (ml)	Evidence of Sample Loss?
R1	T4R1	Red-brown particulate, filter media	120.26018	9/28/2021 12:14	120.25104	9/24/2021 16:15	0.00903	155	No
			120.26030	9/28/2021 18:45	120.25138	9/26/2021 9:38			
R2	T4R2	Red-brown particulate, filter media	123.87136	9/28/2021 12:15	123.86528	9/24/2021 16:17	0.00601	100	No
			123.87155	9/28/2021 18:44	123.86561	9/26/2021 9:44			
R3	T4R3	Red-brown particulate	122.74877	9/28/2021 12:17	122.73588	9/24/2021 16:18	0.01270	145	No
			122.74875	9/28/2021 18:43	122.73624	9/26/2021 9:46			
Acetone Reagent Blank	T4R0	No visible residue	121.57549	9/28/2021 12:02	121.57534	9/24/2021 16:19	0.00000	150	No
			121.57552	9/28/2021 18:39	121.57567	9/26/2021 9:41			

REMARKS

Barr Engineering

5150 W. 76th Street
Edina, MN 55439

Project Number: 21033

Lead & Mercury

EPA Method 29 Analysis

Analytical Report
37446



Element One, Inc.
6319-D Carolina Beach Rd., Wilmington, NC 28412
910-793-0128 FAX: 910-792-6853 e1lab@e1lab.com

The following data for Analytical Report 37446
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

A handwritten signature in black ink, appearing to read 'Katie Gattis', with a large, stylized loop at the end.

Katie Gattis, Quality Assurance Officer
October 11, 2021

Report Reviewed and Finalized by:

A handwritten signature in black ink, appearing to read 'Ken Smith', with a large, stylized loop at the end.

Ken Smith, Laboratory Director
October 11, 2021

SUMMARY OF RESULTS

elementOne

Certification: NJ NELAP NC009
37446 Barr Engineering M29 Report Packet
Page 3 of 44

Summary of Analysis

Stack 1 - Summary of Method 29 Mercury Analysis

Run Number		Average Total Catch, µg	Front Half µg	5% HNO ₃ / 10% H ₂ O ₂ µg	Empty Impinger µg	KMnO ₄ µg	HCl µg
Stack 1-M29-R1	#1	1.57	< 0.1	0.492	< 0.2	< 0.6	1.09
	#2		< 0.1	0.496	< 0.2	< 0.6	1.07
Stack 1-M29-R2	#1	2.62	< 0.1	0.958	< 0.2	< 0.6	1.69
	#2		< 0.1	0.963	< 0.2	< 0.6	1.62
Stack 1-M29-R2 dup	#1	2.58	< 0.1	0.972	< 0.2	< 0.6	1.66
	#2		< 0.1	0.975	< 0.2	< 0.6	1.55
Stack 1-M29-R3	#1	3.37	< 0.1	1.01	< 0.2	0.621	1.80
	#2		< 0.1	1.00	< 0.2	0.580	1.73

Front Half - Stack 1 - Summary of Method 29 Metals Analysis

Element	Stack 1-M29-R1 e37446-1 FH Total µg	Stack 1-M29-R2 e37446-2 FH Total µg	Stack 1-M29-R2 e37446-2 FH dup Total µg	Stack 1-M29-R3 e37446-3 FH Total µg
Lead	19.1	24.0	23.9	24.5

Back Half - Stack 1 - Summary of Method 29 Metals Analysis

Element	Stack 1-M29-R1 e37446-1 BH Total µg	Stack 1-M29-R2 e37446-2 BH Total µg	Stack 1-M29-R2 e37446-2 BH dup Total µg	Stack 1-M29-R3 e37446-3 BH Total µg
Lead	4.17	2.55	2.68	4.45

Summary of Analysis

Stack 2 - Summary of Method 29 Mercury Analysis

Run Number		Average Total Catch, µg	Front Half µg	5% HNO ₃ / 10% H ₂ O ₂ µg	Empty Impinger µg	KMnO ₄ µg	HCl µg
Stack 2-M29-R1	#1	5.78	< 0.1	1.43	< 0.2	0.817	3.57
	#2		< 0.1	1.44	< 0.2	0.783	3.52
Stack 2-M29-R2	#1	5.99	< 0.1	1.59	< 0.2	0.784	3.71
	#2		< 0.1	1.60	< 0.2	0.720	3.58
Stack 2-M29-R2 dup	#1	6.23	< 0.1	1.65	< 0.2	0.788	3.82
	#2		< 0.1	1.66	< 0.2	0.763	3.78
Stack 2-M29-R3	#1	6.07	< 0.1	1.34	< 0.2	2.08	2.69
	#2		< 0.1	1.35	< 0.2	2.03	2.64

Front Half - Stack 2 - Summary of Method 29 Metals Analysis

Element	Stack 2-M29-R1 e37446-4 FH Total µg	Stack 2-M29-R2 e37446-5 FH Total µg	Stack 2-M29-R2 e37446-5 FH dup Total µg	Stack 2-M29-R3 e37446-6 FH Total µg
Lead	31.3	22.5	22.5	24.0

Back Half - Stack 2 - Summary of Method 29 Metals Analysis

Element	Stack 2-M29-R1 e37446-4 BH Total µg	Stack 2-M29-R2 e37446-5 BH Total µg	Stack 2-M29-R2 e37446-5 BH dup Total µg	Stack 2-M29-R3 e37446-6 BH Total µg
Lead	2.52	2.94	2.96	2.68

Summary of Analysis

Stack 3 - Summary of Method 29 Mercury Analysis

Run Number		Average Total Catch, µg	Front Half µg	5% HNO ₃ / 10% H ₂ O ₂ µg	Empty Impinger µg	KMnO ₄ µg	HCl µg
Stack 3-M29-R1	#1	6.74	< 0.1	1.53	< 0.2	1.85	3.41
	#2		< 0.1	1.54	< 0.2	1.77	3.38
Stack 3-M29-R2	#1	9.92	< 0.1	2.16	< 0.2	0.825	6.98
	#2		< 0.1	2.14	< 0.2	0.814	6.93
Stack 3-M29-R2 dup	#1	9.85	< 0.1	2.10	< 0.2	0.804	6.99
	#2		< 0.1	2.12	< 0.2	0.756	6.94
Stack 3-M29-R3	#1	9.99	< 0.1	1.86	< 0.2	1.90	6.26
	#2		< 0.1	1.87	< 0.2	1.87	6.22

Front Half - Stack 3 - Summary of Method 29 Metals Analysis

Element	Stack 3-M29-R1 e37446-7 FH Total µg	Stack 3-M29-R2 e37446-8 FH Total µg	Stack 3-M29-R2 e37446-8 FH dup Total µg	Stack 3-M29-R3 e37446-9 FH Total µg
Lead	26.2	33.1	32.9	32.0

Back Half - Stack 3 - Summary of Method 29 Metals Analysis

Element	Stack 3-M29-R1 e37446-7 BH Total µg	Stack 3-M29-R2 e37446-8 BH Total µg	Stack 3-M29-R2 e37446-8 BH dup Total µg	Stack 3-M29-R3 e37446-9 BH Total µg
Lead	6.45	6.58	6.69	3.51

Summary of Analysis

Stack 4 - Summary of Method 29 Mercury Analysis

Run Number		Average Total Catch, µg	Front Half µg	5% HNO ₃ / 10% H ₂ O ₂ µg	Empty Impinger µg	KMnO ₄ µg	HCl µg
Stack 4-M29-R1	#1	15.1	< 0.1	3.29	< 0.2	5.40	6.51
	#2		< 0.1	3.30	< 0.2	5.26	6.39
Stack 4-M29-R2	#1	15.4	< 0.1	3.11	< 0.2	2.31	10.1
	#2		< 0.1	3.09	< 0.2	2.28	9.87
Stack 4-M29-R2 dup	#1	15.4	< 0.1	3.08	< 0.2	2.35	9.98
	#2		< 0.1	3.10	< 0.2	2.29	9.92
Stack 4-M29-R3	#1	17.0	< 0.1	3.77	< 0.2	9.24	4.10
	#2		< 0.1	3.79	< 0.2	9.06	4.07
Reagent Blank	#1	< 0.5	< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.2	< 0.2	< 0.5	< 0.4

Front Half - Stack 4 - Summary of Method 29 Metals Analysis

Element	Stack 4-M29-R1 e37446-10 FH Total µg	Stack 4-M29-R2 e37446-11 FH Total µg	Stack 4-M29-R2 e37446-11 FH dup Total µg	Stack 4-M29-R3 e37446-12 FH Total µg
Lead	41.4	32.7	32.6	35.6

Back Half - Stack 4 - Summary of Method 29 Metals Analysis

Element	Stack 4-M29-R1 e37446-10 BH Total µg	Stack 4-M29-R2 e37446-11 BH Total µg	Stack 4-M29-R2 e37446-11 BH dup Total µg	Stack 4-M29-R3 e37446-12 BH Total µg
Lead	5.86	4.17	4.16	4.90

Blanks - Summary of Method 29 Metals Analysis

Element	Reagent Blank e37446-13 FH Total µg	Reagent Blank e37446-13 BH Total µg
Lead	0.610	< 0.1

elementOne

ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	Barr Engineering	Element One #:	37446
Client ID:	23/69-1428.27 100 400	Analyst:	RMH, DBW
Method:	Method 29	Dates Received:	09/30-10/01/21
Analytes:	Pb & Hg	Dates Analyzed:	10/04-08/21

Summary of Analysis

The Method 29 samples were digested, prepared, and analyzed according to Method 29 protocol. Samples were analyzed for mercury on a PerkinElmer FIMS-100 CVAA mercury analyzer. The samples were analyzed for lead on a PerkinElmer Nexlon 350X ICP-MS.

Detection Limits

The FIMS-100 CVAA instrument reporting limit for mercury was 0.004 µg per aliquot analyzed. The ICP-MS instrument reporting limit was 1.0µg/L for lead.

Analysis QA/QC

Duplicate analyses relative percent difference (RPD), spike sample recovery, and second source calibration verification data are summarized in the Quality Control Section. All QA/QC data was within criteria of the method.

Additional Comments

The reported results have not been corrected for any blank values or spike recovery values. The reported results relate only to the items tested or calibrated.

QUALITY CONTROL SUMMARY

Summary of Quality Control Data

Mercury Duplicate Injection RPD

(Method 29 QC limits: < 10% for RPD)

Run Number	Front Half	5% HNO ₃ / 10% H ₂ O ₂	Empty Imp	KMnO ₄	HCl
Stack 1-M29-R1	NA	0.8%	NA	NA	2.3%
Stack 1-M29-R2	NA	0.5%	NA	NA	4.7%
Stack 1-M29-R2 dup	NA	0.3%	NA	NA	6.9%
Stack 1-M29-R3	NA	0.4%	NA	6.8%	4.0%
Stack 2-M29-R1	NA	0.4%	NA	4.2%	1.5%
Stack 2-M29-R2	NA	0.4%	NA	8.4%	3.4%
Stack 2-M29-R2 dup	NA	0.1%	NA	3.3%	1.1%
Stack 2-M29-R3	NA	0.7%	NA	2.8%	1.9%
Stack 3-M29-R1	NA	0.2%	NA	4.6%	0.7%
Stack 3-M29-R2	NA	0.9%	NA	1.3%	0.7%
Stack 3-M29-R2 dup	NA	1.2%	NA	6.1%	0.7%
Stack 3-M29-R3	NA	0.5%	NA	1.4%	0.8%
Stack 4-M29-R1	NA	0.3%	NA	2.6%	1.9%
Stack 4-M29-R2	NA	0.5%	NA	1.3%	2.0%
Stack 4-M29-R2 dup	NA	0.6%	NA	2.6%	0.7%
Stack 4-M29-R3	NA	0.4%	NA	2.0%	0.6%
Reagent Blank	NA	NA	NA	NA	NA

Mercury Duplicate Analysis RPD

(Method 29 QC limits: < 20% for RPD)

Run Number	Front Half	5% HNO ₃ / 10% H ₂ O ₂	Empty Imp	KMnO ₄	HCl
Stack 1-M29-R2 dup	NA	1.4%	NA	NA	3.3%
Stack 2-M29-R2 dup	NA	3.6%	NA	3.1%	4.1%
Stack 3-M29-R2 dup	NA	1.9%	NA	4.9%	0.1%
Stack 4-M29-R2 dup	NA	0.3%	NA	1.0%	0.2%

Summary of Quality Control Data

Mercury Spike Recoveries

(Method 29 QC limits: 75-125% for Spike Recoveries)

Run Number		Front Half	5% HNO ₃ / 10% H ₂ O ₂	Empty Imp	KMnO ₄	HCl
-----	-----	-----	-----	-----	-----	-----
Stack 1-M29-R3	#1	94%	91%	92%	94%	97%
	#2	93%	90%	91%	93%	95%
Stack 2-M29-R3	#1	98%	95%	91%	94%	107%
	#2	97%	94%	91%	90%	106%
Stack 3-M29-R3	#1	99%	96%	93%	83%	106%
	#2	95%	96%	93%	80%	104%
Stack 4-M29-R3	#1	103%	96%	95%	95%	104%
	#2	100%	95%	94%	93%	103%

Summary of Quality Control Data

Metals Duplicate Analysis RPD

(Method 29 QC limits: < 20% for RPD)

Element	Stack 1-M29-R2 Front Half RPD	Stack 2-M29-R2 Front Half RPD	Stack 3-M29-R2 Front Half RPD	Stack 4-M29-R2 Front Half RPD
Lead	0.6%	0.1%	0.4%	0.0%

Element	Stack 1-M29-R2 Back Half RPD	Stack 2-M29-R2 Back Half RPD	Stack 3-M29-R2 Back Half RPD	Stack 4-M29-R2 Back Half RPD
Lead	4.9%	0.6%	1.7%	0.4%

Metals Analysis Spike Recoveries

(Method 29 QC limits: 75-125% for Spike Recoveries)

Element	Stack 1-M29-R3 Front Half Recovery	Stack 2-M29-R3 Front Half Recovery	Stack 3-M29-R3 Front Half Recovery	Stack 4-M29-R3 Front Half Recovery
Lead	111%	104%	99%	105%

Element	Stack 1-M29-R3 Back Half Recovery	Stack 2-M29-R3 Back Half Recovery	Stack 3-M29-R3 Back Half Recovery	Stack 4-M29-R3 Back Half Recovery
Lead	105%	106%	116%	124%

Second Source Calibration Check Recoveries

(Method 29 QC limits: $\pm 10\%$ for Second Source Continuing Check Standard*)

Element	1 ppb	50 ppb	100 ppb*	125 ppb
Lead	105%	111%	104%	103%

SAMPLE CUSTODY

Barr Engineering Co. Chain of Custody

Request for Laboratory Analytical Services

37446
 COC Number: **Nº 10525**
 COC 1 of 2

Report Results To	Check One:		Send Invoice To	Project Number <u>23169-1928.27-100000</u>																																																																																																																											
	<input type="checkbox"/> Barr Engineering Co. 3128 14th Avenue East Hibbing, MN 55746 (218) 262-8600 Project Contact: <u>Tom Leier</u> (Print Name)			<input checked="" type="checkbox"/> Barr Engineering Co. 5150 West 76th Street Minneapolis, MN 55439-2330 (952) 832-2600 Project Contact: <u>TLeier@barr.com</u> (email)		Barr Engineering Co. Attn: Accounts Payable 4300 Marketplace Drive, Minneapolis, MN 55435-4803 Ph. (952) 832-2600 Invoice to: <u>AccountsPayableInvoices@barr.com</u>																																																																																																																									
Special Instructions and/or specific regulatory requirements: <u>Hg and Pb reported</u> <u>FH and BH reported separately</u>			Requested Due Date: <input checked="" type="checkbox"/> Standard Turn Around Time <input type="checkbox"/> Rush (mm/dd/yyyy)		METHOD SAMPLE FRACTION FH Aqueous Filter FH Nitric Imp 1-3 Rinse Imp 4 Rinse Imp 5-6 Rinse HCl Rinse Total No. of Containers																																																																																																																										
Sample Identification	Date/Time Collected	Media I.D. #	Type Grab Comp. QC	<table border="1"> <thead> <tr> <th>Method 29</th> <th>Method 5</th> <th>FH Aqueous</th> <th>Filter</th> <th>FH Nitric</th> <th>Imp 1-3 Rinse</th> <th>Imp 4 Rinse</th> <th>Imp 5-6 Rinse</th> <th>HCl Rinse</th> <th>Total No. of Containers</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>1. Stack 1 R1</td> <td>9/21/21</td> <td>4Q0793</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td>Per Tom via</td> </tr> <tr> <td>2. Stack 1 R2</td> <td>9/22/21</td> <td>4Q0794</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td>probe, MS</td> </tr> <tr> <td>3. Stack 1 R3</td> <td>9/22/21</td> <td>4Q0795</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td>completed</td> </tr> <tr> <td>4. Stack 2 R1</td> <td>9/22/21</td> <td>4Q0799</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td>by client.</td> </tr> <tr> <td>5. Stack 2 R2</td> <td>9/23/21</td> <td>4Q0800</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td>- via 10/1/21</td> </tr> <tr> <td>6. Stack 2 R3</td> <td>9/23/21</td> <td>4Q0861</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td></td> </tr> <tr> <td>7. Stack 3 R1</td> <td>9/21/21</td> <td>4Q0796</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td></td> </tr> <tr> <td>8. Stack 3 R2</td> <td>9/22/21</td> <td>4Q0797</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td></td> </tr> <tr> <td>9. Stack 3 R3</td> <td>9/22/21</td> <td>4Q0798</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td></td> </tr> <tr> <td>10. Stack 4 R1</td> <td>9/22/21</td> <td>4Q0862</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>7</td> <td></td> </tr> </tbody> </table>			Method 29	Method 5	FH Aqueous	Filter	FH Nitric	Imp 1-3 Rinse	Imp 4 Rinse	Imp 5-6 Rinse	HCl Rinse	Total No. of Containers	Remarks	1. Stack 1 R1	9/21/21	4Q0793	X	X	X	X	X	X	7	Per Tom via	2. Stack 1 R2	9/22/21	4Q0794	X	X	X	X	X	X	7	probe, MS	3. Stack 1 R3	9/22/21	4Q0795	X	X	X	X	X	X	7	completed	4. Stack 2 R1	9/22/21	4Q0799	X	X	X	X	X	X	7	by client.	5. Stack 2 R2	9/23/21	4Q0800	X	X	X	X	X	X	7	- via 10/1/21	6. Stack 2 R3	9/23/21	4Q0861	X	X	X	X	X	X	7		7. Stack 3 R1	9/21/21	4Q0796	X	X	X	X	X	X	7		8. Stack 3 R2	9/22/21	4Q0797	X	X	X	X	X	X	7		9. Stack 3 R3	9/22/21	4Q0798	X	X	X	X	X	X	7		10. Stack 4 R1	9/22/21	4Q0862	X	X	X	X	X	X	7	
Method 29	Method 5	FH Aqueous	Filter	FH Nitric	Imp 1-3 Rinse	Imp 4 Rinse	Imp 5-6 Rinse	HCl Rinse	Total No. of Containers	Remarks																																																																																																																					
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Chain of Custody			Collected by (Print Name): <u>Ben Wiltse</u> Collector's Signature: <u>[Signature]</u> Date/Time: <u>9/23/21 1330</u> Barr Laboratory: <input checked="" type="checkbox"/> Minneapolis <input type="checkbox"/> Hibbing External Laboratory: <u>Element One</u> Method of Shipment: <input type="checkbox"/> Sampler <input type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/> Other:		Relinquished by: <u>[Signature]</u> Received by: <u>[Signature]</u> Date/Time: <u>9/23 1230</u> Date/Time: <u>9/29/21 09:50</u> Date/Time: <u>9/30/21 1200</u> Date/Time: <u>10/1/21 1215</u> Sample Condition upon Receipt: <input type="checkbox"/> Acceptable <input type="checkbox"/> Other (explain)																																																																																																																										

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy Samples received in good condition. No empty containers

Barr Engineering Co. Chain of Custody

Request for Laboratory Analytical Services

37446

COC Number: **Nº 10524**
 COC 2 of 2

Report Results To	Check One:		Project Number <u>23/69-1428.27-100400</u>	
	<input type="checkbox"/> Barr Engineering Co. 3128 14th Avenue East Hibbing, MN 55746 (218) 262-8600	<input checked="" type="checkbox"/> Barr Engineering Co. 5150 West 76th Street Minneapolis, MN 55439-2330 (952) 832-2600	Barr Engineering Co. Attn: Accounts Payable 4300 Marketplace Drive, Minneapolis, MN 55435-4803 Ph. (952) 832-2600 Invoice to: AccountsPayableInvoices@barr.com	
Project Contact: <u>Tom Leier</u> (Print Name)		Project Contact: <u>TL@barr.com</u> (email)		
Special Instructions and/or specific regulatory requirements: <u>Hg and Pb reported</u> <u>Ft and Bt reported separately</u>		Requested Due Date: <input checked="" type="checkbox"/> Standard Turn Around Time <input type="checkbox"/> Rush (mm/dd/yyyy)		
Sample Identification	Date/Time Collected	Media I.D. #	Type Grab Comp QC	METHOD Method 29 Method 5 FT Acetone Filter FT Nitric Imp 15 Rinse Imp 4 Rinse Imp 5-6 Rinse HCl Rinse Total No. of Containers Remarks
1. Stack 4 R2	9/23/21	4Q0863	X	X X
2. Stack 4 R3	9/23/21	4Q0864	X	X X
3. Acetone Blank	9/22/21			X X X
4. Filter Blank	9/21/21	4Q0865		X X X
5. DI H2O Blank	9/21/21			X X
6. 0.1 N HNO3 Blank	9/21/21			X X
7. 5% HNO3 / 10% H2O2 Blank	9/21/21			X X
8. 4% KMnO4 / 10% H2SO4 Blank	9/21/21			X X
9. 8N HCl Blank	9/21/21			X X
10.				
Chain of Custody	Collected by (Print Name): <u>Ben Wilkse</u>		Relinquished by:	
	Collector's Signature: <u>[Signature]</u>		Received by: <u>[Signature]</u>	
Barr Laboratory: <input checked="" type="checkbox"/> Minneapolis <input type="checkbox"/> Hibbing		Date/Time: <u>9/23/21 1330</u>		Date/Time: <u>9/23/21 1200</u>
External Laboratory: <u>Element One</u>		Sample Condition upon Receipt: <input type="checkbox"/> Acceptable <input type="checkbox"/> Other (explain) <u>10-15-21 1215</u>		
Method of Shipment: <input type="checkbox"/> Sampler <input type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/> Other:				

Appendix D

Calibration Data



Routine Dry Gas Meter Calibration

Control Module: C-5
DGM S/N : 949932
Date : 9/9/2021
Technician : RMP

Leak checks
Negative 0.0 15 in. Hg
Positive : 0.0 > 5 in. W.C

Barometric Press. : 29.20
Previous Y : 1.0084
Previous dH@ : 1.9031

Orifice Diff Pressure, in. W.C.	Wet Test Volume, Ft ³	Dry Gas Meter Temp, °F		Wet Test Meter Temp, °F	Dry Gas Volume Ft ³	Elapsed Time of Cal. Point		Meter Coefficient Y	Orifice Coefficient dH@
		Inlet	Outlet						
Nominal 0.50	Initial 3808.00	Initial 85.0	Initial 80.0	Initial 73.0	Initial 1065.240				
Actual 0.50	Final 3813.00	Final 83.0	Final 80.0	Final 73.5	Final 1070.320	Minutes 12	Sec. 30.25		
	Total 5.00	Average 84.0	Average 80.0	Average 73.3	Total 5.080	Minutes 12.50		0.9991	1.7923
		82.0	Tm						
Nominal 1.00	Initial 3795.00	Initial 88.0	Initial 80.0	Initial 72.5	Initial 1052.070				
Actual 1.00	Final 3807.00	Final 85.0	Final 80.0	Final 73.0	Final 1064.230	Minutes 21	Sec. 38.06		
	Total 12.00	Average 86.5	Average 80.0	Average 72.8	Total 12.160	21.63		1.0038	1.8552
		83.3	Tm						
Nominal 2.00	Initial 3788.00	Initial 90.0	Initial 80.0	Initial 72.5	Initial 1044.990				
Actual 2.00	Final 3794.00	Final 88.0	Final 80.0	Final 72.5	Final 1051.060	Minutes 7	Sec. 44.53		
	Total 6.00	Average 89.0	Average 80.0	Average 72.5	Total 6.070	7.74		1.0057	1.8945
		84.5	Tm						
Nominal 3.00	Initial 3742.00	Initial 84.0	Initial 75.0	Initial 72.5	Initial 998.990				
Actual 3.00	Final 3764.00	Final 88.0	Final 78.0	Final 72.5	Final 1020.990	Minutes 22	Sec. 56.44		
	Total 22.00	Average 86.0	Average 76.5	Average 72.5	Total 22.000	22.94		1.0088	1.8670
		81.3	Tm						
Nominal 4.00	Initial 3765.00	Initial 88.0	Initial 78.0	Initial 72.5	Initial 1021.990				
Actual 4.00	Final 3787.00	Final 90.0	Final 80.0	Final 72.5	Final 1043.990	Minutes 20	Sec. 3.66		
	Total 22.00	Average 89.0	Average 79.0	Average 72.5	Total 22.000	20.06		1.0114	1.8939
		84.0	Tm						
Average								1.0058	1.8606

Reviewed By: *David Herbst*

**Routine Dry Gas Meter Calibration**Control Module: C-15DGM S/N : SN19112844Date : 8/31/2021Technician : AJW4

Leak checks

Negative 0.0 15 in. Hg
Positive : 0.0 > 5 in. W.CBarometric Press. : 29.05Previous Y : 1.0120Previous dH@ : 1.9644

Orifice Diff Pressure, in. W.C.	Wet Test Volume, Ft³	Dry Gas Meter Temp, °F		Wet Test Meter Temp, °F	Dry Gas Volume Ft³	Elapsed Time of Cal. Point		Meter Coefficient Y	Orifice Coefficient dH@
		Inlet	Outlet			Minutes	Sec.		
Nominal 0.50	Initial 346.50	Initial 75.0	Initial 75.0	Initial 71.0	Initial 618.020			1.0142	1.9271
Actual	Final 353.50	Final 75.0	Final 75.0	Final 71.0	Final 624.965	Minutes 18	Sec. 3.87		
0.50	Total 7.00	Average 75.0	Average 75.0	Average 71.0	Total 6.945	Minutes 18.06			
		75.0	Tm						
Nominal 1.00	Initial 341.00	Initial 75.0	Initial 75.0	Initial 71.0	Initial 612.570			1.0131	1.9807
Actual	Final 346.00	Final 75.0	Final 75.0	Final 71.0	Final 617.530	Minutes 9	Sec. 15		
1.00	Total 5.00	Average 75.0	Average 75.0	Average 71.0	Total 4.960	9.25			
		75.0	Tm						
Nominal 2.00	Initial 312.00	Initial 71.0	Initial 71.0	Initial 71.0	Initial 583.880			1.0121	1.9332
Actual	Final 317.00	Final 72.0	Final 72.0	Final 71.0	Final 588.800	Minutes 6	Sec. 26.44		
2.00	Total 5.00	Average 71.5	Average 71.5	Average 71.0	Total 4.920	6.44			
		71.5	Tm						
Nominal 3.00	Initial 318.00	Initial 72.0	Initial 72.0	Initial 71.0	Initial 589.770			1.0053	2.0282
Actual	Final 327.00	Final 73.0	Final 73.0	Final 71.0	Final 598.680	Minutes 9	Sec. 42.28		
3.00	Total 9.00	Average 72.5	Average 72.5	Average 71.0	Total 8.910	9.70			
		72.5	Tm						
Nominal 4.00	Initial 328.00	Initial 73.0	Initial 73.0	Initial 71.0	Initial 599.670			1.0021	2.0128
Actual	Final 340.00	Final 75.0	Final 75.0	Final 72.0	Final 611.580	Minutes 11	Sec. 10.12		
4.00	Total 12.00	Average 74.0	Average 74.0	Average 71.5	Total 11.910	11.17			
		74.0	Tm						
Average								1.0094	1.9764

Reviewed By:

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)
Alternative Method 5 Post-Test Calibration
Pellet Indurating Furnace Line 3 - Stack 1 (SV029)
Control Module C-5

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	9/21/2021	9/22/2021	9/22/2021
Test period	-	-	925 - 1100	804 - 1010	1050 - 1256
Total run time	t	min	81	120	120
Total sample volume measured by dry gas meter	V _m	acf	59.0	85.7	86.3
Average dry gas meter temp	T _m	°F	70.5	75.1	81.5
Absolute average dry gas meter temp	T _m	°R	530.2	534.8	541.2
Barometric pressure	P _b	inches Hg	29.3	29.5	29.5
Conversion factor (29.92/528)(0.75) ²	---	(in Hg/°R) cfm ²	0.0319	0.0319	0.0319
Average orifice meter differential	Δ H _{avg}	in. H ₂ O	1.70	1.67	1.67
Orifice meter calibration coefficient	Δ H _@	in. H ₂ O	1.86	1.86	1.86
Dry molecular weight of stack gas	M _d	lb/lb-mole	28.87	28.87	28.87
Dry molecular weight of air	---	lb/lb-mole	29.00	29.00	29.00
Specific gravity of mercury	---	Dimensionless	13.60	13.60	13.60
Average of the Sq. Root of the Δ H's	(√ΔH) _{avg}	---	1.30	1.29	1.29

$$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 T_m}{\Delta H @ \left(P_b + \frac{\Delta H_{avg}}{13.6} \right) P_b} \left(\frac{29}{M_d} \right) (\sqrt{\Delta H})_{avg}}$$

Method 5 Eq.5-15

Dry gas meter calibration check value	Y _{qa}	Dimensionless	0.9963	1.0079	1.0086
Dry gas meter calibration factor	Y	Dimensionless	1.0058	1.0058	1.0058

Average of Y _{qa} 's from test run series	1.0043
Dry gas meter calibration factor	1.0058
% difference between average Y _{qa} 's and Y (must be within ± 5%)	0.15%

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)
Alternative Method 5 Post-Test Calibration
Pellet Indurating Furnace Line 3 - Stack 2 (SV030)
Control Module C-5

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	9/22/2021	9/23/2021	9/23/2021
Test period	-	-	1340 - 1545	722 - 926	1003 - 1220
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V _m	acf	88.8	84.4	85.0
Average dry gas meter temp	T _m	°F	85.5	75.4	76.1
Absolute average dry gas meter temp	T _m	°R	545.1	535.1	535.7
Barometric pressure	P _b	inches Hg	29.5	29.4	29.4
Conversion factor (29.92/528)(0.75) ²	---	(in Hg/°R) cfm ²	0.0319	0.0319	0.0319
Average orifice meter differential	Δ H _{avg}	in. H ₂ O	1.76	1.61	1.64
Orifice meter calibration coefficient	Δ H _@	in. H ₂ O	1.86	1.86	1.86
Dry molecular weight of stack gas	M _d	lb/lb-mole	28.87	28.88	28.88
Dry molecular weight of air	---	lb/lb-mole	29.00	29.00	29.00
Specific gravity of mercury	---	Dimensionless	13.60	13.60	13.60
Average of the Sq. Root of the Δ H's	(√ΔH) _{avg}	---	1.33	1.27	1.28

$$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 T_m}{\Delta H @ \left(P_b + \frac{\Delta H_{avg}}{13.6} \right) P_b} \left(\frac{29}{M_d} \right) (\sqrt{\Delta H})_{avg}}$$

Method 5 Eq.5-15

Dry gas meter calibration check value	Y _{qa}	Dimensionless	1.0082	1.0078	1.0102
Dry gas meter calibration factor	Y	Dimensionless	1.0058	1.0058	1.0058

Average of Y _{qa} 's from test run series	1.0088
Dry gas meter calibration factor	1.0058
% difference between average Y _{qa} 's and Y (must be within ± 5%)	-0.29%

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)
Alternative Method 5 Post-Test Calibration
Pellet Indurating Furnace Line 3 - Stack 3 (SV031)
Control Module C-15

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	9/21/2021	9/22/2021	9/22/2021
Test period	-	-	925 - 1100	804 - 1010	1050 - 1256
Total run time	t	min	81	120	120
Total sample volume measured by dry gas meter	V _m	acf	52.6	78.6	78.6
Average dry gas meter temp	T _m	°F	63.9	76.0	78.6
Absolute average dry gas meter temp	T _m	°R	523.6	535.7	538.3
Barometric pressure	P _b	inches Hg	29.3	29.5	29.5
Conversion factor (29.92/528)(0.75) ²	---	(in Hg/°R) cfm ²	0.0319	0.0319	0.0319
Average orifice meter differential	Δ H _{avg}	in. H ₂ O	1.50	1.50	1.49
Orifice meter calibration coefficient	Δ H _@	in. H ₂ O	1.98	1.98	1.98
Dry molecular weight of stack gas	M _d	lb/lb-mole	28.88	28.89	28.89
Dry molecular weight of air	---	lb/lb-mole	29.00	29.00	29.00
Specific gravity of mercury	---	Dimensionless	13.60	13.60	13.60
Average of the Sq. Root of the Δ H's	(√ΔH) _{avg}	---	1.22	1.22	1.22

$$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 T_m}{\Delta H @ \left(P_b + \frac{\Delta H_{avg}}{13.6} \right) P_b} \left(\frac{29}{M_d} \right) (\sqrt{\Delta H})_{avg}}$$

Method 5 Eq.5-15

Dry gas meter calibration check value	Y _{qa}	Dimensionless	1.0125	1.0096	1.0097
Dry gas meter calibration factor	Y	Dimensionless	1.0094	1.0094	1.0094

Average of Y _{qa} 's from test run series	1.0106
Dry gas meter calibration factor	1.0094
% difference between average Y _{qa} 's and Y (must be within ± 5%)	-0.12%

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)
Alternative Method 5 Post-Test Calibration
Pellet Indurating Furnace Line 3 - Stack 4 (SV032)
Control Module C-15

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	9/22/2021	9/23/2021	9/23/2021
Test period	-	-	1340 - 1545	722 - 928	1003 - 1220
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V _m	acf	86.1	80.9	83.8
Average dry gas meter temp	T _m	°F	80.4	69.0	69.7
Absolute average dry gas meter temp	T _m	°R	540.1	528.7	529.3
Barometric pressure	P _b	inches Hg	29.5	29.4	29.4
Conversion factor (29.92/528)(0.75) ²	---	(in Hg/°R) cfm ²	0.0319	0.0319	0.0319
Average orifice meter differential	Δ H _{avg}	in. H ₂ O	1.79	1.60	1.71
Orifice meter calibration coefficient	Δ H _@	in. H ₂ O	1.98	1.98	1.98
Dry molecular weight of stack gas	M _d	lb/lb-mole	28.89	28.90	28.90
Dry molecular weight of air	---	lb/lb-mole	29.00	29.00	29.00
Specific gravity of mercury	---	Dimensionless	13.60	13.60	13.60
Average of the Sq. Root of the Δ H's	(√ΔH) _{avg}	---	1.33	1.26	1.31

$$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 T_m}{\Delta H @ \left(P_b + \frac{\Delta H_{avg}}{13.6} \right) P_b} \left(\frac{29}{M_d} \right) (\sqrt{\Delta H})_{avg}}$$

Method 5 Eq.5-15

Dry gas meter calibration check value	Y _{qa}	Dimensionless	1.0115	1.0088	1.0098
Dry gas meter calibration factor	Y	Dimensionless	1.0094	1.0094	1.0094

Average of Y _{qa} 's from test run series	1.0100
Dry gas meter calibration factor	1.0094
% difference between average Y _{qa} 's and Y (must be within ± 5%)	-0.06%

Meter Pyrometer Calibration

Meter I.D.		C-5				
Temperature						
Calibrator Used CL-3512-A #4		TCSIM4				
DATE		1/15/2021				
TECHNICIAN		TAK				
Thermocouple I.D.		T.C. 1	T.C. 2	T.C. 3	T.C. 4	T.C. 5
Reference °F	Acceptable Range	** If not within Acceptable Range, unit not to be used within range at which failure occurred.				
1950	1932 to 1968	1936				1935
1800	1784 to 1816	1786				1785
1600	1585 to 1615	1589				1588
1400	1387 to 1413	1389				1389
1200	1188 to 1212	1193				1191
1000	990 to 1010	995				995
900	890 to 910	896				895
800	791 to 809	797				796
700	692 to 708	698				697
600	593 to 607	597				596
500	493 to 507	496	496	495		495
400	394 to 406	397	397	397		397
300	295 to 305	299	299	299		299
200	196 to 204	201	201	201		200
150	146 to 154	150	150	150	149	150
100	96 to 104	100	100	100	99	99
50	47 to 53	50	50	50	50	50
0	-3 to 3	3			2	2

Pass/Fail based on +/- 0.75% of Rankine value

Fail indicated by cell highlighting

Reviewed By: *Matt Kistner*

Meter Pyrometer Calibration

Meter I.D.		C-15				
Temperature						
Calibrator Used CL-3512-A #4		TCSIM4				
DATE		1/27/2021				
TECHNICIAN		BAW				
Thermocouple I.D.		T.C. 1	T.C. 2	T.C. 3	T.C. 4	T.C. 5
Reference °F	Acceptable Range	** If not within Acceptable Range, unit not to be used within range at which failure occurred.				
1950	1932 to 1968	1951				1951
1800	1784 to 1816	1800				1799
1600	1585 to 1615	1602				1602
1400	1387 to 1413	1400				1400
1200	1188 to 1212	1203				1203
1000	990 to 1010	1002				1002
900	890 to 910	902				902
800	791 to 809	802				802
700	692 to 708	702				702
600	593 to 607	601				601
500	493 to 507	498	500	499		499
400	394 to 406	399	400	400		400
300	295 to 305	301	300	301		301
200	196 to 204	201	201	201		201
150	146 to 154	150	150	150	149	150
100	96 to 104	100	100	100	99	100
50	47 to 53	50	50	50	49	50
0	-3 to 3	2			1	2

Pass/Fail based on +/- 0.75% of Rankine value

Fail indicated by cell highlighting

Reviewed By: *Tom Kulinski*



THERMOCOUPLE CALIBRATION

Meter In THERMOCOUPLE ID C5-I
Cal Date: 1/15/2021

CALIBRATION TECHNICIAN: MTP

REFERENCE STANDARDS	TRACEABILITY		DATE	LABORATORY
Hart Scientific 9103-A s/n A1B289	Report No. T19-1212-TN-2		12/12/2019	NBS Calibrations
Fluke 9144 s/n B5A077	Report No. T19-1212-TN-3		12/12/2019	NBS Calibrations
Temperature Calibration Points	20	70	150	
Reference Deg F (To)	20	70	150	
Probe Temp (deg F)	21.6	70.4	149.1	
Difference (degrees)	1.6	0.4	0.9	
TC Meets Method 5 Specifications: (± 2.0 °F)				
	YES	YES	YES	

Reviewed by:

02/08/2021



THERMOCOUPLE CALIBRATION

Meter Out

THERMOCOUPLE ID

C5-O

Cal Date:

1/15/2021

CALIBRATION TECHNICIAN:

MTP

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

TRACEABILITY

Report No. T19-1212-TN-2

Report No. T19-1212-TN-3

DATE

12/12/2019

12/12/2019

LABORATORY

NBS Calibrations

NBS Calibrations

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.1	70.8	149.5
Difference (degrees)	1.1	0.8	0.5
TC Meets Method 5 Specifications: (± 2.0 °F)	YES	YES	YES

Reviewed by:

02/08/2021



THERMOCOUPLE CALIBRATION

Meter Out

THERMOCOUPLE ID C15-O

Cal Date: 1/27/2021

CALIBRATION TECHNICIAN: TAK

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

TRACEABILITY

Report No. T19-1212-TN-2

Report No. T19-1212-TN-3

DATE

12/12/2019

12/12/2019

LABORATORY

NBS Calibrations

NBS Calibrations

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.8	70.7	149.0
Difference (degrees)	1.8	0.7	1.0

TC Meets Method 5 Specifications: (± 2.0 °F)	YES	YES	YES
---	-----	-----	-----

Reviewed by:

02/08/2021



THERMOCOUPLE CALIBRATION

THERMOCOUPLE ID 10-5

Cal Date: 1/25/2021

Method 5 Probe

CALIBRATION TECHNICIAN: RMP

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

TRACEABILITY

Report No. T19-1212-TN-2

Report No. T19-1212-TN-3

DATE

12/12/2019

12/12/2019

LABORATORY

NBS Calibrations

NBS Calibrations

Temperature Calibration Points

32

212

400

650

Ambient

Reference Deg F (To)

32

212

400

650

70

Probe Temp (deg F)

33.6

210

397

647

71

Reference Temp (deg R) deg F + 460

492

672

860

1110

530

Probe Temp (deg R), deg F + 460

493.6

670

857

1107

531

Difference (degrees)

-1.6

2

3

3

-1

% Diff Abs. T

0.3%

0.3%

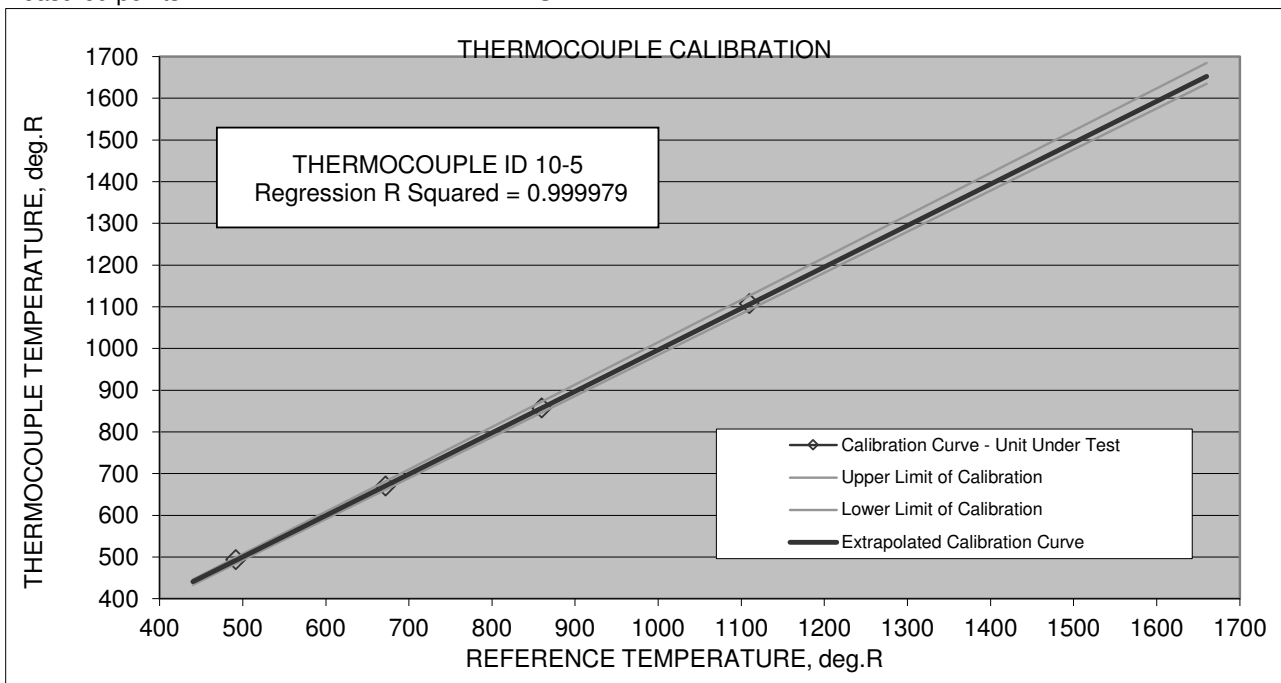
0.3%

0.3%

0.2%

Is difference less than 1.5% at all measured points?

YES



Are extrapolated limits less than 1.5%?

YES

FAHRENHEIT
CALIBRATION RANGE
-20 1200

If not acceptable, describe corrective action:

Reviewed by:



THERMOCOUPLE CALIBRATION

THERMOCOUPLE ID 10-6

Cal Date: 1/25/2021

Method 5 Probe

CALIBRATION TECHNICIAN: RMP

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

TRACEABILITY

Report No. T19-1212-TN-2

Report No. T19-1212-TN-3

DATE

12/12/2019

12/12/2019

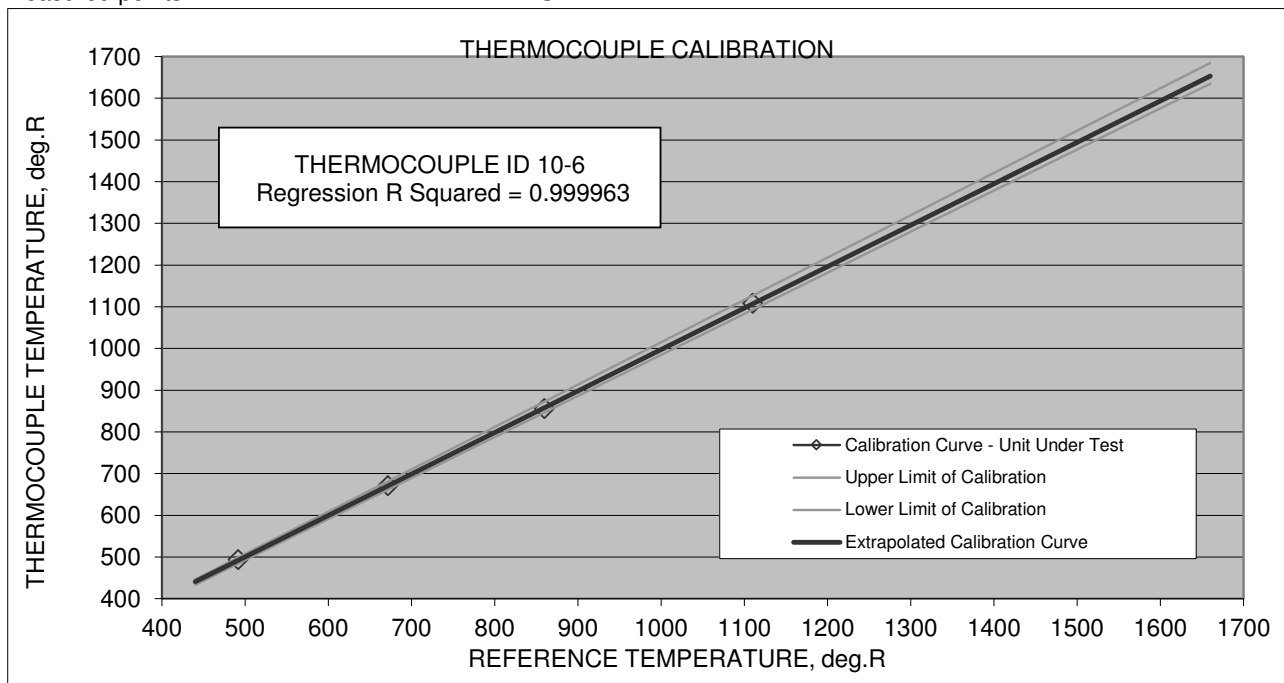
LABORATORY

NBS Calibrations

NBS Calibrations

Temperature Calibration Points

	32	212	400	650	Ambient
Reference Deg F (To)	32	212	400	650	70
Probe Temp (deg F)	33.4	211	396	648	70.9
Reference Temp (deg R) deg F + 460	492	672	860	1110	530
Probe Temp (deg R), deg F + 460	493.4	671	856	1108	530.9
Difference (degrees)	-1.4	1	4	2	-0.9
% Diff Abs. T	0.3%	0.1%	0.5%	0.2%	0.2%
Is difference less than 1.5% at all measured points?	YES				



Are extrapolated limits less than 1.5%?

YES

FAHRENHEIT
CALIBRATION RANGE
-20 1200

If not acceptable, describe corrective action:

Reviewed by:



THERMOCOUPLE CALIBRATION

Impinger Outlet

THERMOCOUPLE ID TIO-5

Cal Date: 1/15/2021

Umbilical 300-3

CALIBRATION TECHNICIAN: MTP

REFERENCE STANDARDS

TRACEABILITY

DATE

LABORATORY

Hart Scientific 9103-A s/n A1B289

Report No. T19-1212-TN-2

12/12/2019

NBS Calibrations

Fluke 9144 s/n B5A077

Report No. T19-1212-TN-3

12/12/2019

NBS Calibrations

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.8	70.8	150.6
Difference (degrees)	1.8	0.8	0.6

TC Meets Method 5 Specifications: (± 2.0 °F)	YES	YES	YES
---	-----	-----	-----

Reviewed by:

02/08/2021



S-Type Pitot Tube Geometry Check

Pitot Tube

Number: 10-5

Length: 10'

Function: M-5 Probe Free

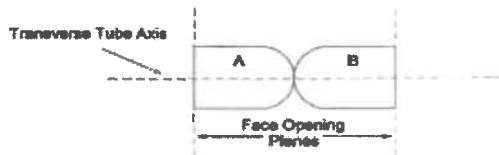
Inspection Date: 1/25/21

Technician: RMP

1. Are face openings perpendicular to tube axis?

☒ YES (go to 2)

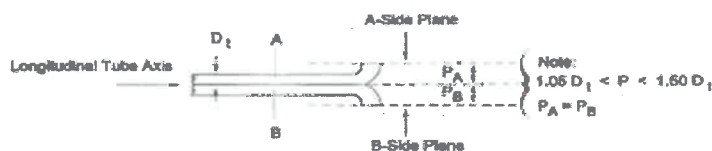
☐ NO (go to 1a)



2. Are face openings parallel to longitudinal axis?

☒ YES (go to 3)

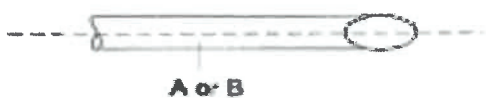
☐ NO (go to 2a)



3. Are legs of equal length?

☒ YES (go to 4)

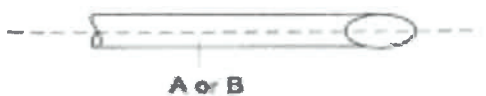
☐ NO (go to 3a)



4. Are center-lines of legs coincident?

☒ YES (go to 5)

☐ NO (go to 4a)



5. Does this pitot tube pass all of the above criteria?

☒ YES

☐ NO

1a. If NO, is angle less than 10°?

☐ YES (go to 2)

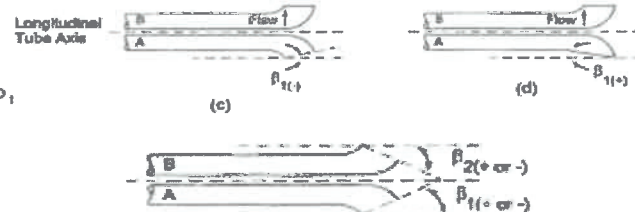
☐ NO (discontinue use)



2a. If NO, is angle less than 5°?

☐ YES (go to 3)

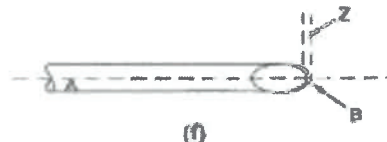
☐ NO (discontinue use)



3a. If NO, is difference less than 1/8 inch?

☐ YES (go to 4)

☐ NO (discontinue use)



4a. If NO, are center-lines of face openings less than 1/32 inch?

☐ YES (go to 5)

☐ NO (discontinue use)



I certify that the pitot tube meets or exceeds all specifications and criteria listed in 40 CFR Part 60, Appendix A, EPA Method 2, and is assigned a pitot tube certification factor of 0.84.

Technician Signature: [Signature]

Reviewed by: [Signature]



S-Type Pitot Tube Geometry Check

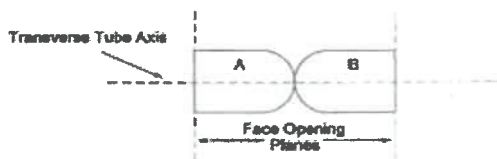
Pitot Tube
Number: 10.6
Length: 10'
Function: M-5 Probe / Free

Inspection Date: 1/25/27
Technician: RMP

1. Are face openings perpendicular to tube axis?

☒ YES (go to 2)

☐ NO (go to 1a)



1a. If NO, is angle less than 10°?

☐ YES (go to 2)

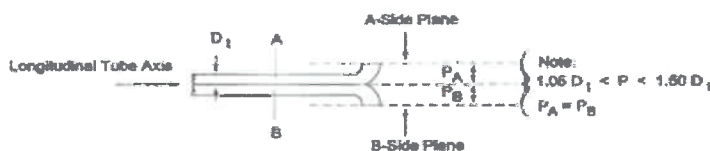
☐ NO (discontinue use)



2. Are face openings parallel to longitudinal axis?

☒ YES (go to 3)

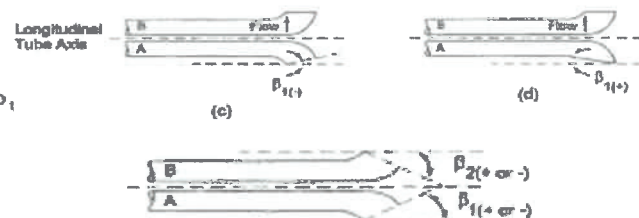
☐ NO (go to 2a)



2a. If NO, is angle less than 5°?

☐ YES (go to 3)

☐ NO (discontinue use)



3. Are legs of equal length?

☒ YES (go to 4)

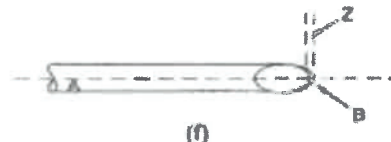
☐ NO (go to 3a)



3a. If NO, is difference less than 1/8 inch?

☐ YES (go to 4)

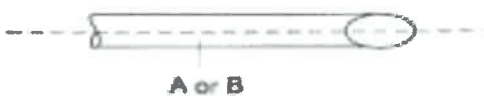
☐ NO (discontinue use)



4. Are center-lines of legs coincident?

☒ YES (go to 5)

☐ NO (go to 4a)



4a. If NO, are center-lines of face openings less than 1/32 inch?

☐ YES (go to 5)

☐ NO (discontinue use)



5. Does this pitot tube pass all of the above criteria?

☒ YES

☐ NO

I certify that the pitot tube meets or exceeds all specifications and criteria listed in 40 CFR Part 60, Appendix A, EPA Method 2, and is assigned a pitot tube certification factor of 0.94.

Technician Signature: [Signature]

Reviewed by: [Signature]

Nozzle Calibration
Pellet Indurating Furnace Line 3 - Stack 1 (SV029)

Nozzle Calibration
Nozzle No.

Glass-1

Used for Runs:

1

 -

3

Point Measurement, inches	
1	0.218
2	0.218
3	0.218
Average	0.218

Test Date 9/21-22/2021
Date Measured: 9/21/2021
Technician: TMR

Nozzle Calibration
Pellet Indurating Furnace Line 3 - Stack 2 (SV030)

Nozzle Calibration
Nozzle No.

Glass-1

 Used for Runs:

1

 -

3

Point Measurement, inches	
1	0.218
2	0.218
3	0.218
Average	0.218

Test Date 9/22-23/2021
Date Measured: 9/21/2021
Technician: TMR

Nozzle Calibration
Pellet Indurating Furnace Line 3 - Stack 3 (SV031)

Nozzle Calibration

Nozzle No.

Glass-3

Used for Runs:

1

 -

3

Point Measurement, inches

1	0.220
2	0.220
3	0.220
Average	0.220

Test Date 9/21-22/2021
Date Measured: 9/21/2021
Technician: TMR

Nozzle Calibration
Pellet Indurating Furnace Line 3 - Stack 4 (SV032)

Nozzle Calibration

Nozzle No.

Glass-3

Used for Runs:

1

 -

3

Point Measurement, inches

1	0.220
2	0.220
3	0.220
Average	0.220

Test Date 9/22-23/2021

Date Measured: 9/21/2021

Technician: TMR

Method 4 Balance Check
Pellet Indurating Furnace Line 3 - Stacks 1 (SV029) and 3 (SV031)

Class II Weight Amount =	1000.0
Balance Response=	999.8
Difference	0.2
Pass	PASS

Test Date 9/21-22/2021
Date Measured: 9/21/2021
Technician: TMR

Method 4 Balance Check
Pellet Indurating Furnace Line 3 - Stacks 1 (SV029) and 3 (SV031)

Class II Weight Amount =	1000.0
Balance Response=	999.8
Difference	0.2
Pass	PASS

Test Date 9/21-22/2021
Date Measured: 9/22/2021
Technician: TMR

Method 4 Balance Check
Pellet Indurating Furnace Line 3 - Stacks 2 (SV030) and 4 (SV032)

EPA Method 4 Balance Check

Class II Weight Amount =	1000.0
Balance Response=	999.8
Difference	0.2
Pass	PASS

Test Date 9/22/2021
Date Measured: 9/22/2021
Technician: TMR

Method 4 Balance Check
Pellet Indurating Furnace Line 3 - Stacks 2 (SV030) and 4 (SV032)

EPA Method 4 Balance Check

Class II Weight Amount =	1000.0
Balance Response=	999.8
Difference	0.2
Pass	PASS

Test Date 9/23/2021
Date Measured: 9/23/2021
Technician: TMR



Field Barometer Calibration
Calibration to PRINCO Mercury Barometer
Barr Engineering Co. Edina Field Office

			Reference, PRINCO	Field Barometer				
Date	Technician	Observation Time	Station Pressure	ID	Barometric Pressure	Condition	Remarks	Offset tolerance +/- 0.10
9/3/21	TMR	1630	29.06	BA-04	29.05	In Calibration	As Found	-0.01
9/14/21	TMR	1500	29.13	BA-04	29.10	In Calibration	As Found	-0.03
9/30/21	TMR	1200	29.20	BA-04	29.20	In Calibration	As Found	0.00



Red Ball Technical Gas Service
555 Craig Kennedy Way
Shreveport, LA 71107
800-551-8150
PGVP Vendor ID # G12019

EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

Cylinder Number: EB0097796
Product ID Number: 127199
Cylinder Pressure: 1900 PSIG
COA #: EB0097796.20190305-0
Customer PO. NO.:
Customer:

Certification Date: 03/13/2019
Expiration Date: 03/11/2027
MFG Facility: - Shreveport - LA
Lot Number: EB0097796.20190305
Tracking Number: B1945918
Previous Certification Dates:

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

Certified Concentration(s)

Component	Concentration	Uncertainty	Analytical Principle	Assayed On
Carbon Dioxide	4.94 %	±0.04 %	NDIR	03/13/2019
Oxygen	22.5 %	±0.11 %	MPA	03/11/2019
Nitrogen	Balance			

Analytical Measurement Data Available Online.

Reference Standard(s)

Serial Number	Lot	Expiration	Type	Balance	Component	Concentration	Uncertainty(%)	NIST Reference
EB0032246	EB0032246.20170209	08/05/2025	GMIS	N2	O2	24 %	0.502	071001
EB0087453	EB0087453.20170424	11/25/2025	GMIS	N2	CO2	9.51 %	0.724	C1309410.01
EB0087609	EB0087609.20170424	05/14/2026	GMIS	N2	CO2	5.01 %	0.778	101001

Analytical Instrumentation

Component	Principle	Make	Model	Serial	MPC Date
O2	MPA	Thermo	410i	1162980025	02/11/2019
CO2	NDIR	Thermo	410i	1162980025	03/04/2019

SMART-CERT



This is to certify the gases referenced have been calibrated/tested, and verified to meet the defined specifications. This calibration/test was performed using Gases or Scales that are traceable through National Institute of Standards and Technology (NIST) to the International System of Units (SI). The basis of compliance stated is a comparison of the measurement parameters to the specified or required calibration/testing process. The expanded uncertainties use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from Red Ball Technical Gas Services. If not included, the uncertainty of calibrations are available upon request and were taken into account when determining pass or fail.

Amisha Jewitt

Amisha Jewitt
Analytical Chemist
Assay Laboratory: Red Ball TGS
Version 02-J, Revised on 2018-09-17



Red Ball Technical Gas Service
555 Craig Kennedy Way
Shreveport, LA 71107
800-551-8150
PGVP Vendor ID # G12020

EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

Cylinder Number: EB0097773
Product ID Number: 126786
Cylinder Pressure: 1900 PSIG
COA #: EB0097773.20200203-0
Customer PO. NO.:
Customer:

Certification Date: 02/13/2020
Expiration Date: 02/11/2028
MFG Facility: - Shreveport - LA
Lot Number: EB0097773.20200203
Tracking Number: B1945925
Previous Certification Dates:

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

Certified Concentration(s)

Component	Concentration	Uncertainty	Analytical Principle	Assayed On
Carbon Dioxide	9.48 %	±0.03 %	NDIR	02/07/2020
Oxygen	9.52 %	±0.05 %	MPA	02/13/2020
Nitrogen	Balance			

Analytical Measurement Data Available Online.

Reference Standard(s)

Serial Number	Lot	Expiration	Type	Balance	Component	Concentration	Uncertainty(%)	NIST Reference
EB0007908	EB0007908.20190327	06/18/2027	GMIS	N2	CO2	9.5 %	0.191	C1579010.02
EB0044492	EB0044492.20190405	12/03/2027	GMIS	N2	O2	20 %	0.498	2659a
EB0097445	EB0097445.20190408	12/03/2027	GMIS	N2	O2	9.32 %	0.254	2659a

Analytical Instrumentation

Component	Principle	Make	Model	Serial	MPC Date
CO2	NDIR	Thermo	410i	1162980025	01/24/2020
O2	MPA	Thermo	410i	1162980025	02/10/2020

SMART-CERT



This is to certify the gases referenced have been calibrated/tested, and verified to meet the defined specifications. This calibration/test was performed using Gases or Scales that are traceable through National Institute of Standards and Technology (NIST) to the International System of Units (SI). The basis of compliance stated is a comparison of the measurement parameters to the specified or required calibration/testing process. The expanded uncertainties use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from Red Ball Technical Gas Services. If not included, the uncertainty of calibrations are available upon request and were taken into account when determining pass or fail.

Jasmine Godfrey

Jasmine Godfrey
Analytical Chemist
Assay Laboratory: Red Ball TGS
Version 02-J, Revised on 2018-09-17

Appendix E

Process Operating Data



**Minnesota Pollution
Control Agency**

520 Lafayette Road
St. Paul, MN 55155-4194

Air Performance Test Form

Operating Data Summary for Process Sources

Facility Information (please print)

Company name: Hibbing Taconite Company

Equipment ID No: SV029

Test date(s): 09/21/2021, 09/22/2021

Equipment and Operating Data

- Process equipment description: Furnace Line 3, Scrubber House 1
- Were the process and control equipment operated consistent with normal procedures? ☒ Yes ☐ No If no, explain
- Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e., units per hour, pounds per hour, pressure, air flow, etc.
- Date(s) and procedure(s) of last maintenance/cleaning within 6 months:
☐ Remains unchanged from information provided in test plan
3/29/2021 Water Flow Verify, 4/7/2021 Diff Pressure Calibration, 4/7/2021 Demist Panel Cleaning
- Process rate (amount of raw material or finished product per hour, wet or dry basis) while combusting (list fuel type(s) and ratios as appropriate):

Process Parameter: list type and units	Run 1	Run 2	Run 3	Average
Feed Rate, DLTPH	363	367	367	365
Feed Rate, DSTPH	407	411	409	409
Fuel Input (list units): MCF/hour	138	130	129	132
Heat Input (10⁶ British thermal units/hour)	148	138	137	141

- Summarize control equipment operating data documented during testing. Values reported should reflect maximum, minimum, averages, or as approved in the test plan. (See test plan and approval letter)

Examples of APC equipment and parameters generally monitored. Monitor as in test plan and/or approval letter.

- **Scrubber** (list type of scrubber): ΔP (in. w.c.) and feed rate (gpm and psig)
- **Baghouse, Cyclone, and Multi-clone:** ΔP (in. w.c.)
- **Catalytic Incinerator:** ($^{\circ}F_{in}$, $^{\circ}F_{out}$) and Thermal Incinerator: ($^{\circ}F_{temperature}$)
- **ESP:** Number and identity of operating field(s)

APC and parameter monitored	Run 1	Run 2	Run 3	Average
Wet Scrubber Pressure Drop Minimum, in. w.c	4.5	4.3	4.2	4.3
Wet Scrubber Pressure Drop Maximum, in. w.c	4.6	4.3	4.2	4.4
Wet Scrubber Pressure Drop Average, in. w.c	4.5	4.3	4.2	4.3
Wet Scrubber Water Flow Rate Minimum, gpm	413	410	409	411
Wet Scrubber Water Flow Rate Maximum, gpm	414	413	411	413
Wet Scrubber Water Flow Rate Average, gpm	413	412	410	412

List pollutant & averaging basis.--should reflect permit	Run 1	Run 1	Run 1	Average
Continuous Opacity Monitor(list hourly average):				
Monitor (list averaging basis):				
Monitor (list averaging basis):				

Abbreviations: APC=air pollution control
lbs.=pounds

gpm.=gallons per minute
psig=pressure per square inch gauge

in. w.c.=inches of water column
 ΔP =pressure drop

Note: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report.



**Minnesota Pollution
Control Agency**

520 Lafayette Road
St. Paul, MN 55155-4194

Air Performance Test Form

Operating Data Summary for Process Sources

Facility Information (please print)

Company name: Hibbing Taconite Company

Equipment ID No: SV031

Test date(s): 09/21/2021, 09/22/2021

Equipment and Operating Data

- Process equipment description: Furnace Line 3, Scrubber House 3
- Were the process and control equipment operated consistent with normal procedures? ☒ Yes ☐ No If no, explain
- Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e., units per hour, pounds per hour, pressure, air flow, etc.
- Date(s) and procedure(s) of last maintenance/cleaning within 6 months:
☐ Remains unchanged from information provided in test plan
3/29/2021 Water Flow Verify, 4/7/2021 Diff Pressure Calibration, 4/7/2021 Demist Panel Cleaning
- Process rate (amount of raw material or finished product per hour, wet or dry basis) while combusting (list fuel type(s) and ratios as appropriate):

Process Parameter: list type and units	Run 1	Run 2	Run 3	Average
Feed Rate DLTPH	363	367	365	365
Feed Rate DSTPH	407	411	409	409
Fuel Input (list units): MCF/hr	138	130	129	132
Heat Input (10⁶ British thermal units/hour)	148	138	137	141

- Summarize control equipment operating data documented during testing. Values reported should reflect maximum, minimum, averages, or as approved in the test plan. (See test plan and approval letter)

Examples of APC equipment and parameters generally monitored. Monitor as in test plan and/or approval letter.

- **Scrubber** (list type of scrubber): ΔP (in. w.c.) and feed rate (gpm and psig)
- **Baghouse, Cyclone, and Multi-clone:** ΔP (in. w.c.)
- **Catalytic Incinerator:** ($^{\circ}F_{in}$, $^{\circ}F_{out}$) and Thermal Incinerator: ($^{\circ}F_{temperature}$)
- **ESP:** Number and identity of operating field(s)

APC and parameter monitored	Run 1	Run 2	Run 3	Average
Wet Scrubber Pressure Drop Minimum, in. w.c	4.5	4.3	4.3	4.4
Wet Scrubber Pressure Drop Maximum, in. w.c	4.6	4.4	4.4	4.4
Wet Scrubber Pressure Drop Average, in. w.c	4.6	4.3	4.4	4.4
Wet Scrubber Water Flow Rate Minimum, gpm	435	425	426	428
Wet Scrubber Water Flow Rate Maximum, gpm	436	429	428	431
Wet Scrubber Water Flow Rate Average, gpm	435	427	427	430

List pollutant & averaging basis.--should reflect permit	Run 1	Run 1	Run 1	Average
Continuous Opacity Monitor(list hourly average):				
Monitor (list averaging basis):				
Monitor (list averaging basis):				

Abbreviations: APC=air pollution control
lbs.=pounds

gpm.=gallons per minute
psig=pressure per square inch gauge

in. w.c.=inches of water column
 ΔP =pressure drop

Note: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report.

Throughput
wltph > dltph > dstph

Furnace Stacks Line #3

Minimum	
Run 1	
Tag	\\HTPIDAP01\ADBI5160
Start	9/21/2021 9:25
End	9/21/2021 11:00

21-Sep-21 09:25:00	472
21-Sep-21 09:40:00	505
21-Sep-21 09:55:00	496
21-Sep-21 10:10:00	492
21-Sep-21 10:25:00	499
21-Sep-21 10:40:00	484

Average 491

Maximum	
Run 1	
Tag	\\HTPI\DAPO1\ADBI5160
Start	9/21/2021 9:25
End	9/21/2021 11:00

21-Sep-21 09:25:00	523
21-Sep-21 09:40:00	530
21-Sep-21 09:55:00	532
21-Sep-21 10:10:00	532
21-Sep-21 10:25:00	531
21-Sep-21 10:40:00	516

Average	528
---------	-----

Average	
Run 1	
Tag	\\HTPIDAP01\ADBI5160
Start	9/21/2021 9:25
End	9/21/2021 11:00

21-Sep-21 09:25:00	508
21-Sep-21 09:40:00	517
21-Sep-21 09:55:00	515
21-Sep-21 10:10:00	515
21-Sep-21 10:25:00	514
21-Sep-21 10:40:00	501

Average 363 dltpb
407 dshtp

Minimum	
Run 2	
Tag	\\HTPIDAP01\ADBI5160
Start	9/22/2021 8:04
End	9/22/2021 10:10

22-Sep-21 08:04:00	499
22-Sep-21 08:19:00	506
22-Sep-21 08:34:00	498
22-Sep-21 08:49:00	505
22-Sep-21 09:04:00	503
22-Sep-21 09:19:00	498
22-Sep-21 09:34:00	503
22-Sep-21 09:49:00	508

Average 502

Maximum	
Run 2	
Tag	\\HTPI\DAPO1\ADBI5160
Start	9/22/2021 8:04
End	9/22/2021 10:10

22-Sep-21 08:04:00	533
22-Sep-21 08:19:00	533
22-Sep-21 08:34:00	527
22-Sep-21 08:49:00	538
22-Sep-21 09:04:00	528
22-Sep-21 09:19:00	527
22-Sep-21 09:34:00	523
22-Sep-21 09:49:00	534

Average	530
----------------	-----

Average	
Run 2	
Tag	\\HTPIDAP01\ADBI5160
Start	9/22/2021 8:04
End	9/22/2021 10:10

22-Sep-21 08:04:00	515
22-Sep-21 08:19:00	514
22-Sep-21 08:34:00	516
22-Sep-21 08:49:00	519
22-Sep-21 09:04:00	514
22-Sep-21 09:19:00	516
22-Sep-21 09:34:00	517
22-Sep-21 09:49:00	519

Average 367 dltp
411 dshtp

Minimum	
Run 3	
Tag	\\HTPIDAP01\ADBI5160
Start	9/22/2021 10:50
End	9/22/2021 12:56

22-Sep-21 10:50:00	494
22-Sep-21 11:05:00	510
22-Sep-21 11:20:00	492
22-Sep-21 11:35:00	508
22-Sep-21 11:50:00	496
22-Sep-21 12:05:00	508
22-Sep-21 12:20:00	493
22-Sep-21 12:35:00	503

Average 501

Maximum	
Run 3	
Tag	\\HTPIDAP01\ADBI5160
Start	9/22/2021 10:50
End	9/22/2021 12:56

22-Sep-21 10:50:00	535
22-Sep-21 11:05:00	527
22-Sep-21 11:20:00	525
22-Sep-21 11:35:00	521
22-Sep-21 11:50:00	524
22-Sep-21 12:05:00	530
22-Sep-21 12:20:00	529
22-Sep-21 12:35:00	535

Average 528

Average	
Run 3	
Tag	\\HTPIDAP01\ADBI5160
Start	9/22/2021 10:50
End	9/22/2021 12:56

22-Sep-21 10:50:00	516
22-Sep-21 11:05:00	515
22-Sep-21 11:20:00	514
22-Sep-21 11:35:00	513
22-Sep-21 11:50:00	515
22-Sep-21 12:05:00	517
22-Sep-21 12:20:00	513
22-Sep-21 12:35:00	516

Average 365 dltp
409 dshtp

Average 365 dltp
409 dshtp

Mill Line #7
Mill Input
wtlph > dltp > dstph

Furnace Stacks Line #3		Natural Gas Usage	
North Chamber		North Chamber	
Run 1		Run 2	
Tag	\\HTPIDAP01\ADBI5109	Tag	\\HTPIDAP01\ADBI5109
Start	9/21/2021 9:25	Start	9/22/2021 8:04
End	9/21/2021 11:00	End	9/22/2021 10:10
21-Sep-21 09:25:00	69	22-Sep-21 08:04:00	66
21-Sep-21 09:40:00	70	22-Sep-21 08:19:00	65
21-Sep-21 09:55:00	70	22-Sep-21 08:34:00	65
21-Sep-21 10:10:00	70	22-Sep-21 08:49:00	66
21-Sep-21 10:25:00	70	22-Sep-21 09:04:00	66
21-Sep-21 10:40:00	70	22-Sep-21 09:19:00	66
		22-Sep-21 09:34:00	65
		22-Sep-21 09:49:00	66
Average	70	Average	66
South Chamber		South Chamber	
Run 1		Run 2	
Tag	\\HTPIDAP01\ADBI5108	Tag	\\HTPIDAP01\ADBI5108
Start	9/21/2021 9:25	Start	9/22/2021 8:04
End	9/21/2021 11:00	End	9/22/2021 10:10
21-Sep-21 09:25:00	68	22-Sep-21 08:04:00	65
21-Sep-21 09:40:00	69	22-Sep-21 08:19:00	65
21-Sep-21 09:55:00	68	22-Sep-21 08:34:00	65
21-Sep-21 10:10:00	68	22-Sep-21 08:49:00	65
21-Sep-21 10:25:00	68	22-Sep-21 09:04:00	65
21-Sep-21 10:40:00	68	22-Sep-21 09:19:00	65
		22-Sep-21 09:34:00	64
		22-Sep-21 09:49:00	64
Average	68	Average	65
Total (MCF/hr)	138	Total (MCF/hr)	130
Heat Content (MMBtu/MCF)	1.068	Heat Content (MMBtu/MCF)	1.063
Heat Input (MMBtu/hr)	148	Heat Input (MMBtu/hr)	138
North Chamber		North Chamber	
Run 3		Run 3	
Tag	\\HTPIDAP01\ADBI5109	Tag	\\HTPIDAP01\ADBI5109
Start	9/22/2021 10:50	Start	9/22/2021 10:50
End	9/22/2021 12:56	End	9/22/2021 12:56
22-Sep-21 10:50:00	66	22-Sep-21 10:50:00	66
22-Sep-21 11:05:00	66	22-Sep-21 11:05:00	66
22-Sep-21 11:20:00	66	22-Sep-21 11:20:00	66
22-Sep-21 11:35:00	65	22-Sep-21 11:35:00	65
22-Sep-21 11:50:00	65	22-Sep-21 11:50:00	65
22-Sep-21 12:05:00	65	22-Sep-21 12:05:00	65
22-Sep-21 12:20:00	65	22-Sep-21 12:20:00	65
22-Sep-21 12:35:00	64	22-Sep-21 12:35:00	64
Average	65	Average	65
Total Average	67	Total Average	67
South Chamber		South Chamber	
Run 3		Run 3	
Tag	\\HTPIDAP01\ADBI5108	Tag	\\HTPIDAP01\ADBI5108
Start	9/22/2021 10:50	Start	9/22/2021 10:50
End	9/22/2021 12:56	End	9/22/2021 12:56
22-Sep-21 10:50:00	64	22-Sep-21 10:50:00	64
22-Sep-21 11:05:00	64	22-Sep-21 11:05:00	64
22-Sep-21 11:20:00	64	22-Sep-21 11:20:00	64
22-Sep-21 11:35:00	63	22-Sep-21 11:35:00	63
22-Sep-21 11:50:00	64	22-Sep-21 11:50:00	64
22-Sep-21 12:05:00	64	22-Sep-21 12:05:00	64
22-Sep-21 12:20:00	63	22-Sep-21 12:20:00	63
22-Sep-21 12:35:00	63	22-Sep-21 12:35:00	63
Average	64	Average	64
Total Average	65	Total Average	65
Total (MCF/hr)	129	Total (MCF/hr)	132
Heat Content (MMBtu/MCF)	1.063	Heat Content (MMBtu/MCF)	1.06
Heat Input (MMBtu/hr)	137	Heat Input (MMBtu/hr)	141

Pressure Drop - Inches of Water Column

Furnace Stacks Line #3

SV029 - SH 1

Minimum
Run 1
Tag \\HTPIDAP01\ADBI5709
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	4.5
21-Sep-21 09:40:00	4.6
21-Sep-21 09:55:00	4.5
21-Sep-21 10:10:00	4.5
21-Sep-21 10:25:00	4.5
21-Sep-21 10:40:00	4.5

Average 4.5

Maximum
Run 1
Tag \\HTPIDAP01\ADBI5709
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	4.6
21-Sep-21 09:40:00	4.6
21-Sep-21 09:55:00	4.6
21-Sep-21 10:10:00	4.6
21-Sep-21 10:25:00	4.5
21-Sep-21 10:40:00	4.6

Average 4.6

Average
Run 1
Tag \\HTPIDAP01\ADBI5709
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	4.6
21-Sep-21 09:40:00	4.6
21-Sep-21 09:55:00	4.5
21-Sep-21 10:10:00	4.5
21-Sep-21 10:25:00	4.5
21-Sep-21 10:40:00	4.6

Average 4.5

Minimum
Run 2
Tag \\HTPIDAP01\ADBI5709
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	4.3
22-Sep-21 08:19:00	4.3
22-Sep-21 08:34:00	4.3
22-Sep-21 08:49:00	4.3
22-Sep-21 09:04:00	4.2
22-Sep-21 09:19:00	4.2
22-Sep-21 09:34:00	4.2
22-Sep-21 09:49:00	4.3

Average 4.3

Maximum
Run 2
Tag \\HTPIDAP01\ADBI5709
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	4.3
22-Sep-21 08:19:00	4.3
22-Sep-21 08:34:00	4.3
22-Sep-21 08:49:00	4.3
22-Sep-21 09:04:00	4.3
22-Sep-21 09:19:00	4.2
22-Sep-21 09:34:00	4.3
22-Sep-21 09:49:00	4.3

Average 4.3

Average
Run 2
Tag \\HTPIDAP01\ADBI5709
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	4.3
22-Sep-21 08:19:00	4.3
22-Sep-21 08:34:00	4.3
22-Sep-21 08:49:00	4.3
22-Sep-21 09:04:00	4.3
22-Sep-21 09:19:00	4.2
22-Sep-21 09:34:00	4.3
22-Sep-21 09:49:00	4.3

Average 4.3

Minimum
Run 3
Tag \\HTPIDAP01\ADBI5709
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	4.2
22-Sep-21 11:05:00	4.2
22-Sep-21 11:20:00	4.2
22-Sep-21 11:35:00	4.2
22-Sep-21 11:50:00	4.1
22-Sep-21 12:05:00	4.2
22-Sep-21 12:20:00	4.2
22-Sep-21 12:35:00	4.2

Average 4.2 **Total Average** 4.3

Maximum
Run 3
Tag \\HTPIDAP01\ADBI5709
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	4.2
22-Sep-21 11:05:00	4.3
22-Sep-21 11:20:00	4.3
22-Sep-21 11:35:00	4.2
22-Sep-21 11:50:00	4.2
22-Sep-21 12:05:00	4.2
22-Sep-21 12:20:00	4.2
22-Sep-21 12:35:00	4.2

Average 4.2 **Total Average** 4.4

Average
Run 3
Tag \\HTPIDAP01\ADBI5709
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	4.2
22-Sep-21 11:05:00	4.2
22-Sep-21 11:20:00	4.2
22-Sep-21 11:35:00	4.2
22-Sep-21 11:50:00	4.2
22-Sep-21 12:05:00	4.2
22-Sep-21 12:20:00	4.2
22-Sep-21 12:35:00	4.2

Average 4.2 **Total Average** 4.3

Pressure Drop - Inches of Water Column

Furnace Stacks Line #3

SV031 - SH 3

Minimum
Run 1
Tag \\HTPIDAP01\ADBI5715
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	4.6
21-Sep-21 09:40:00	4.6
21-Sep-21 09:55:00	4.5
21-Sep-21 10:10:00	4.5
21-Sep-21 10:25:00	4.5
21-Sep-21 10:40:00	4.6

Average 4.5

Maximum
Run 1
Tag \\HTPIDAP01\ADBI5715
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	4.6
21-Sep-21 09:40:00	4.6
21-Sep-21 09:55:00	4.6
21-Sep-21 10:10:00	4.5
21-Sep-21 10:25:00	4.6
21-Sep-21 10:40:00	4.6

Average 4.6

Average
Run 1
Tag \\HTPIDAP01\ADBI5715
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	4.6
21-Sep-21 09:40:00	4.6
21-Sep-21 09:55:00	4.5
21-Sep-21 10:10:00	4.5
21-Sep-21 10:25:00	4.5
21-Sep-21 10:40:00	4.6

Average 4.6

Minimum
Run 2
Tag \\HTPIDAP01\ADBI5715
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	4.3
22-Sep-21 08:19:00	4.3
22-Sep-21 08:34:00	4.3
22-Sep-21 08:49:00	4.4
22-Sep-21 09:04:00	4.3
22-Sep-21 09:19:00	4.3
22-Sep-21 09:34:00	4.3
22-Sep-21 09:49:00	4.4

Average 4.3

Maximum
Run 2
Tag \\HTPIDAP01\ADBI5715
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	4.4
22-Sep-21 08:19:00	4.4
22-Sep-21 08:34:00	4.4
22-Sep-21 08:49:00	4.4
22-Sep-21 09:04:00	4.4
22-Sep-21 09:19:00	4.3
22-Sep-21 09:34:00	4.4
22-Sep-21 09:49:00	4.5

Average 4.4

Average
Run 2
Tag \\HTPIDAP01\ADBI5715
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	4.3
22-Sep-21 08:19:00	4.4
22-Sep-21 08:34:00	4.3
22-Sep-21 08:49:00	4.4
22-Sep-21 09:04:00	4.3
22-Sep-21 09:19:00	4.3
22-Sep-21 09:34:00	4.4
22-Sep-21 09:49:00	4.4

Average 4.3

Minimum
Run 3
Tag \\HTPIDAP01\ADBI5715
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	4.3
22-Sep-21 11:05:00	4.3
22-Sep-21 11:20:00	4.3
22-Sep-21 11:35:00	4.4
22-Sep-21 11:50:00	4.3
22-Sep-21 12:05:00	4.3
22-Sep-21 12:20:00	4.3
22-Sep-21 12:35:00	4.3

Average 4.3 **Total Average** 4.4

Maximum
Run 3
Tag \\HTPIDAP01\ADBI5715
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	4.4
22-Sep-21 11:05:00	4.4
22-Sep-21 11:20:00	4.4
22-Sep-21 11:35:00	4.4
22-Sep-21 11:50:00	4.4
22-Sep-21 12:05:00	4.4
22-Sep-21 12:20:00	4.4
22-Sep-21 12:35:00	4.4

Average 4.4 **Total Average** 4.4

Average
Run 3
Tag \\HTPIDAP01\ADBI5715
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	4.4
22-Sep-21 11:05:00	4.3
22-Sep-21 11:20:00	4.3
22-Sep-21 11:35:00	4.4
22-Sep-21 11:50:00	4.4
22-Sep-21 12:05:00	4.3
22-Sep-21 12:20:00	4.3
22-Sep-21 12:35:00	4.4

Average 4.4 **Total Average** 4.4

Water Flow - Gpm

Furnace Stacks Line #3

SV029 - SH 1

Minimum
Run 1
Tag \\HTPIDAP01\ADBI5711
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	413
21-Sep-21 09:40:00	413
21-Sep-21 09:55:00	412
21-Sep-21 10:10:00	413
21-Sep-21 10:25:00	414
21-Sep-21 10:40:00	413

Average 413

Maximum
Run 1
Tag \\HTPIDAP01\ADBI5711
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	414
21-Sep-21 09:40:00	414
21-Sep-21 09:55:00	413
21-Sep-21 10:10:00	414
21-Sep-21 10:25:00	414
21-Sep-21 10:40:00	414

Average 414

Average
Run 1
Tag \\HTPIDAP01\ADBI5711
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	413
21-Sep-21 09:40:00	414
21-Sep-21 09:55:00	413
21-Sep-21 10:10:00	414
21-Sep-21 10:25:00	414
21-Sep-21 10:40:00	413

Average 413

Minimum
Run 2
Tag \\HTPIDAP01\ADBI5711
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	410
22-Sep-21 08:19:00	410
22-Sep-21 08:34:00	410
22-Sep-21 08:49:00	407
22-Sep-21 09:04:00	411
22-Sep-21 09:19:00	412
22-Sep-21 09:34:00	411
22-Sep-21 09:49:00	410

Average 410

Maximum
Run 2
Tag \\HTPIDAP01\ADBI5711
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	413
22-Sep-21 08:19:00	411
22-Sep-21 08:34:00	412
22-Sep-21 08:49:00	411
22-Sep-21 09:04:00	415
22-Sep-21 09:19:00	414
22-Sep-21 09:34:00	414
22-Sep-21 09:49:00	411

Average 413

Average
Run 2
Tag \\HTPIDAP01\ADBI5711
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	412
22-Sep-21 08:19:00	411
22-Sep-21 08:34:00	411
22-Sep-21 08:49:00	409
22-Sep-21 09:04:00	414
22-Sep-21 09:19:00	413
22-Sep-21 09:34:00	412
22-Sep-21 09:49:00	410

Average 412

Minimum
Run 3
Tag \\HTPIDAP01\ADBI5711
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	409
22-Sep-21 11:05:00	409
22-Sep-21 11:20:00	410
22-Sep-21 11:35:00	412
22-Sep-21 11:50:00	411
22-Sep-21 12:05:00	411
22-Sep-21 12:20:00	405
22-Sep-21 12:35:00	404

Average 409 **Total Average** 411

Maximum
Run 3
Tag \\HTPIDAP01\ADBI5711
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	414
22-Sep-21 11:05:00	412
22-Sep-21 11:20:00	413
22-Sep-21 11:35:00	413
22-Sep-21 11:50:00	412
22-Sep-21 12:05:00	411
22-Sep-21 12:20:00	411
22-Sep-21 12:35:00	405

Average 411 **Total Average** 413

Average
Run 3
Tag \\HTPIDAP01\ADBI5711
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	412
22-Sep-21 11:05:00	410
22-Sep-21 11:20:00	412
22-Sep-21 11:35:00	412
22-Sep-21 11:50:00	411
22-Sep-21 12:05:00	411
22-Sep-21 12:20:00	407
22-Sep-21 12:35:00	404

Average 410 **Total Average** 412

Water Flow - Gpm

Furnace Stacks Line #3

SV031 - SH 3

Minimum
Run 1
Tag \\HTPIDAP01\ADBI5717
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	435
21-Sep-21 09:40:00	435
21-Sep-21 09:55:00	434
21-Sep-21 10:10:00	436
21-Sep-21 10:25:00	434
21-Sep-21 10:40:00	434

Average 435

Maximum
Run 1
Tag \\HTPIDAP01\ADBI5717
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	435
21-Sep-21 09:40:00	435
21-Sep-21 09:55:00	436
21-Sep-21 10:10:00	437
21-Sep-21 10:25:00	436
21-Sep-21 10:40:00	434

Average 436

Average
Run 1
Tag \\HTPIDAP01\ADBI5717
Start 9/21/2021 9:25
End 9/21/2021 11:00

21-Sep-21 09:25:00	435
21-Sep-21 09:40:00	435
21-Sep-21 09:55:00	435
21-Sep-21 10:10:00	437
21-Sep-21 10:25:00	435
21-Sep-21 10:40:00	434

Average 435

Minimum
Run 2
Tag \\HTPIDAP01\ADBI5717
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	420
22-Sep-21 08:19:00	424
22-Sep-21 08:34:00	424
22-Sep-21 08:49:00	424
22-Sep-21 09:04:00	426
22-Sep-21 09:19:00	426
22-Sep-21 09:34:00	427
22-Sep-21 09:49:00	427

Average 425

Maximum
Run 2
Tag \\HTPIDAP01\ADBI5717
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	424
22-Sep-21 08:19:00	428
22-Sep-21 08:34:00	427
22-Sep-21 08:49:00	434
22-Sep-21 09:04:00	434
22-Sep-21 09:19:00	427
22-Sep-21 09:34:00	429
22-Sep-21 09:49:00	429

Average 429

Average
Run 2
Tag \\HTPIDAP01\ADBI5717
Start 9/22/2021 8:04
End 9/22/2021 10:10

22-Sep-21 08:04:00	422
22-Sep-21 08:19:00	427
22-Sep-21 08:34:00	426
22-Sep-21 08:49:00	428
22-Sep-21 09:04:00	429
22-Sep-21 09:19:00	426
22-Sep-21 09:34:00	428
22-Sep-21 09:49:00	428

Average 427

Minimum
Run 3
Tag \\HTPIDAP01\ADBI5717
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	429
22-Sep-21 11:05:00	426
22-Sep-21 11:20:00	426
22-Sep-21 11:35:00	428
22-Sep-21 11:50:00	428
22-Sep-21 12:05:00	427
22-Sep-21 12:20:00	422
22-Sep-21 12:35:00	422

Average 426 **Total Average** 428

Maximum
Run 3
Tag \\HTPIDAP01\ADBI5717
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	431
22-Sep-21 11:05:00	431
22-Sep-21 11:20:00	428
22-Sep-21 11:35:00	429
22-Sep-21 11:50:00	429
22-Sep-21 12:05:00	429
22-Sep-21 12:20:00	427
22-Sep-21 12:35:00	422

Average 428 **Total Average** 431

Average
Run 3
Tag \\HTPIDAP01\ADBI5717
Start 9/22/2021 10:50
End 9/22/2021 12:56

22-Sep-21 10:50:00	430
22-Sep-21 11:05:00	430
22-Sep-21 11:20:00	427
22-Sep-21 11:35:00	428
22-Sep-21 11:50:00	428
22-Sep-21 12:05:00	428
22-Sep-21 12:20:00	425
22-Sep-21 12:35:00	422

Average 427 **Total Average** 430



**Minnesota Pollution
Control Agency**

520 Lafayette Road
St. Paul, MN 55155-4194

Air Performance Test Form

Operating Data Summary for Process Sources

Facility Information (please print)

Company name: Hibbing Taconite Company

Equipment ID No: SV030

Test date(s): 9/22/2021

Equipment and Operating Data

- Process equipment description: Furnace Line 3, Scrubber House 2
- Were the process and control equipment operated consistent with normal procedures? ☒ Yes ☐ No If no, explain
- Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e., units per hour, pounds per hour, pressure, air flow, etc.
- Date(s) and procedure(s) of last maintenance/cleaning within 6 months:
☐ Remains unchanged from information provided in test plan
3/29/2021 Water Flow Verify, 4/7/2021 Diff Pressure Calibration, 4/7/2021 Demist Panel Cleaning, 4/8/2021 Maintenance PM
- Process rate (amount of raw material or finished product per hour, wet or dry basis) while combusting (list fuel type(s) and ratios as appropriate):

Process Parameter: list type and units	Run 1	Run 2	Run 3	Average
Feed Rate, DLTPH	365	366	359	363
Feed Rate, DSTPH	409	410	402	407
Fuel Input (list units): MCF/hour	128	128	128	128
Heat Input (10⁶ British thermal units/hour)	136	135	134	135

- Summarize control equipment operating data documented during testing. Values reported should reflect maximum, minimum, averages, or as approved in the test plan. (See test plan and approval letter)

Examples of APC equipment and parameters generally monitored. Monitor as in test plan and/or approval letter.

- **Scrubber** (list type of scrubber): ΔP (in. w.c.) and feed rate (gpm and psig)
- **Catalytic Incinerator** : ($^{\circ}F_{in}$, $^{\circ}F_{out}$) and Thermal Incinerator: ($^{\circ}F_{temperature}$)
- **Baghouse, Cyclone, and Multi-clone**: ΔP (in. w.c.)
- **ESP**: Number and identity of operating field(s)

APC and parameter monitored	Run 1	Run 2	Run 3	Average
Wet Scrubber Pressure Drop Minimum, in. w.c	4.8	4.8	4.7	4.8
Wet Scrubber Pressure Drop Maximum, in. w.c	4.8	4.9	4.8	4.8
Wet Scrubber Pressure Drop Average, in. w.c	4.8	4.8	4.7	4.8
Wet Scrubber Water Flow Rate Minimum, gpm	391	393	391	392
Wet Scrubber Water Flow Rate Maximum, gpm	394	395	394	394
Wet Scrubber Water Flow Rate Average, gpm	392	394	393	393

List pollutant & averaging basis.--should reflect permit	Run 1	Run 1	Run 1	Average
Continuous Opacity Monitor(list hourly average):				
Monitor (list averaging basis):				
Monitor (list averaging basis):				

Abbreviations: APC=air pollution control
lbs.=pounds

gpm.=gallons per minute
psig=pressure per square inch gauge

in. w.c.=inches of water column
 ΔP =pressure drop

Note: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report.



**Minnesota Pollution
Control Agency**

520 Lafayette Road
St. Paul, MN 55155-4194

Air Performance Test Form

Operating Data Summary for Process Sources

Facility Information (please print)

Company name: Hibbing Taconite Company

Equipment ID No: SV032

Test date(s): 9/22/2021

Equipment and Operating Data

- Process equipment description: Furnace Line 3, Scrubber House 4
- Were the process and control equipment operated consistent with normal procedures? ☒ Yes ☐ No If no, explain
- Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e., units per hour, pounds per hour, pressure, air flow, etc.
- Date(s) and procedure(s) of last maintenance/cleaning within 6 months:
☐ Remains unchanged from information provided in test plan
3/29/2021 Water Flow Verify, 4/7/2021 Diff Pressure Calibration, 4/7/2021 Demist Panel Cleaning
- Process rate (amount of raw material or finished product per hour, wet or dry basis) while combusting (list fuel type(s) and ratios as appropriate):

Process Parameter: list type and units	Run 1	Run 2	Run 3	Average
Feed Rate, DLTPH	365	366	359	363
Feed Rate, DSTPH	409	410	402	407
Fuel Input (list units):	128	128	128	128
Heat Input (10⁶ British thermal units/hour)	136	135	134	135

- Summarize control equipment operating data documented during testing. Values reported should reflect maximum, minimum, averages, or as approved in the test plan. (See test plan and approval letter)

Examples of APC equipment and parameters generally monitored. Monitor as in test plan and/or approval letter.

- **Scrubber** (list type of scrubber): ΔP (in. w.c.) and feed rate (gpm and psig)
- **Baghouse, Cyclone, and Multi-clone:** ΔP (in. w.c.)
- **Catalytic Incinerator:** ($^{\circ}F_{in}$, $^{\circ}F_{out}$) and Thermal Incinerator: ($^{\circ}F_{temperature}$)
- **ESP:** Number and identity of operating field(s)

APC and parameter monitored	Run 1	Run 2	Run 3	Average
Wet Scrubber Pressure Drop Minimum, in. w.c	4.3	4.1	4.2	4.2
Wet Scrubber Pressure Drop Maximum, in. w.c	4.4	4.2	4.4	4.3
Wet Scrubber Pressure Drop Average, in. w.c	4.4	4.2	4.3	4.3
Wet Scrubber Water Flow Rate Minimum, gpm	391	391	390	391
Wet Scrubber Water Flow Rate Maximum, gpm	394	392	394	393
Wet Scrubber Water Flow Rate Average, gpm	393	391	392	392

List pollutant & averaging basis.--should reflect permit	Run 1	Run 1	Run 1	Average
Continuous Opacity Monitor(list hourly average):				
Monitor (list averaging basis):				
Monitor (list averaging basis):				

Abbreviations: APC=air pollution control
lbs.=pounds

gpm.=gallons per minute
psig=pressure per square inch gauge

in. w.c.=inches of water column
 ΔP =pressure drop

Note: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report.

Throughput
wltph > dltp > dshtp

Furnace Stacks Line #3

Minimum		Minimum		Minimum	
Run 1		Run 2		Run 3	
Tag	\\HTPIDAP01\ADBI5160	Tag	\\HTPIDAP01\ADBI5160	Tag	\\HTPIDAP01\ADBI5160
Start	9/22/2021 13:40	Start	9/23/2021 7:22	Start	9/23/2021 10:03
End	9/22/2021 15:45	End	9/23/2021 9:28	End	9/23/2021 12:20
22-Sep-21 13:40:00	503	23-Sep-21 07:22:00	506	23-Sep-21 10:03:00	499
22-Sep-21 13:55:00	500	23-Sep-21 07:37:00	504	23-Sep-21 10:18:00	498
22-Sep-21 14:10:00	497	23-Sep-21 07:52:00	505	23-Sep-21 10:33:00	499
22-Sep-21 14:25:00	497	23-Sep-21 08:07:00	500	23-Sep-21 10:48:00	485
22-Sep-21 14:40:00	496	23-Sep-21 08:22:00	501	23-Sep-21 11:03:00	422
22-Sep-21 14:55:00	499	23-Sep-21 08:37:00	504	23-Sep-21 11:18:00	484
22-Sep-21 15:10:00	499	23-Sep-21 08:52:00	500	23-Sep-21 11:33:00	499
22-Sep-21 15:25:00	499	23-Sep-21 09:07:00	506	23-Sep-21 11:48:00	494
				23-Sep-21 12:03:00	488
Average	499	Average	503	Average	485
Maximum		Maximum		Maximum	
Run 1		Run 2		Run 3	
Tag	\\HTPIDAP01\ADBI5160	Tag	\\HTPIDAP01\ADBI5160	Tag	\\HTPIDAP01\ADBI5160
Start	9/22/2021 13:40	Start	9/23/2021 7:22	Start	9/23/2021 10:03
End	9/22/2021 15:45	End	9/23/2021 9:28	End	9/23/2021 12:20
22-Sep-21 13:40:00	529	23-Sep-21 07:22:00	526	23-Sep-21 10:03:00	524
22-Sep-21 13:55:00	525	23-Sep-21 07:37:00	527	23-Sep-21 10:18:00	519
22-Sep-21 14:10:00	535	23-Sep-21 07:52:00	530	23-Sep-21 10:33:00	525
22-Sep-21 14:25:00	528	23-Sep-21 08:07:00	531	23-Sep-21 10:48:00	531
22-Sep-21 14:40:00	528	23-Sep-21 08:22:00	517	23-Sep-21 11:03:00	507
22-Sep-21 14:55:00	525	23-Sep-21 08:37:00	540	23-Sep-21 11:18:00	527
22-Sep-21 15:10:00	530	23-Sep-21 08:52:00	531	23-Sep-21 11:33:00	530
22-Sep-21 15:25:00	524	23-Sep-21 09:07:00	525	23-Sep-21 11:48:00	520
				23-Sep-21 12:03:00	516
Average	528	Average	528	Average	522
Average		Average		Average	
Run 1		Run 2		Run 3	
Tag	\\HTPIDAP01\ADBI5160	Tag	\\HTPIDAP01\ADBI5160	Tag	\\HTPIDAP01\ADBI5160
Start	9/22/2021 13:40	Start	9/23/2021 7:22	Start	9/23/2021 10:03
End	9/22/2021 15:45	End	9/23/2021 9:28	End	9/23/2021 12:20
22-Sep-21 13:40:00	517	23-Sep-21 07:22:00	519	23-Sep-21 10:03:00	509
22-Sep-21 13:55:00	514	23-Sep-21 07:37:00	517	23-Sep-21 10:18:00	508
22-Sep-21 14:10:00	514	23-Sep-21 07:52:00	515	23-Sep-21 10:33:00	512
22-Sep-21 14:25:00	516	23-Sep-21 08:07:00	517	23-Sep-21 10:48:00	508
22-Sep-21 14:40:00	513	23-Sep-21 08:22:00	509	23-Sep-21 11:03:00	480
22-Sep-21 14:55:00	514	23-Sep-21 08:37:00	519	23-Sep-21 11:18:00	509
22-Sep-21 15:10:00	512	23-Sep-21 08:52:00	513	23-Sep-21 11:33:00	511
22-Sep-21 15:25:00	513	23-Sep-21 09:07:00	514	23-Sep-21 11:48:00	505
				23-Sep-21 12:03:00	503.1194049
Average	365 dltp 409 dshtp	Average	366 dltp 410 dshtp	Average	359 dltp 402 dshtp
				Average	363 dltp 407 dshtp

wltp > dltp > dstph

Furnace Stacks Line #3		Natural Gas Usage	
North Chamber		North Chamber	
Run 1		Run 2	
Tag	\\HTPIDAP01\ADBI5109	Tag	\\HTPIDAP01\ADBI5109
Start	9/22/2021 13:40	Start	9/23/2021 7:22
End	9/22/2021 15:45	End	9/23/2021 9:28
22-Sep-21 13:40:00	65	23-Sep-21 07:22:00	66
22-Sep-21 13:55:00	66	23-Sep-21 07:37:00	65
22-Sep-21 14:10:00	65	23-Sep-21 07:52:00	66
22-Sep-21 14:25:00	65	23-Sep-21 08:07:00	66
22-Sep-21 14:40:00	65	23-Sep-21 08:22:00	66
22-Sep-21 14:55:00	65	23-Sep-21 08:37:00	67
22-Sep-21 15:10:00	66	23-Sep-21 08:52:00	66
22-Sep-21 15:25:00	65	23-Sep-21 09:07:00	66
Average	65	Average	66
South Chamber		South Chamber	
Run 1		Run 2	
Tag	\\HTPIDAP01\ADBI5108	Tag	\\HTPIDAP01\ADBI5108
Start	9/22/2021 13:40	Start	9/23/2021 7:22
End	9/22/2021 15:45	End	9/23/2021 9:28
22-Sep-21 13:40:00	63	23-Sep-21 07:22:00	62
22-Sep-21 13:55:00	62	23-Sep-21 07:37:00	62
22-Sep-21 14:10:00	63	23-Sep-21 07:52:00	63
22-Sep-21 14:25:00	63	23-Sep-21 08:07:00	62
22-Sep-21 14:40:00	63	23-Sep-21 08:22:00	63
22-Sep-21 14:55:00	63	23-Sep-21 08:37:00	62
22-Sep-21 15:10:00	63	23-Sep-21 08:52:00	62
22-Sep-21 15:25:00	63	23-Sep-21 09:07:00	62
Average	63	Average	62
Total (MCF/hr)	128	Total (MCF/hr)	128
Heat Content (MMBtu/MCF)	1.063	Heat Content (MMBtu/MCF)	1.052
Heat Input (MMBtu/hr)	136	Heat Input (MMBtu/hr)	135
North Chamber		North Chamber	
Run 3		Run 3	
Tag	\\HTPIDAP01\ADBI5109	Tag	\\HTPIDAP01\ADBI5109
Start	9/23/2021 10:03	Start	9/23/2021 10:03
End	9/23/2021 12:20	End	9/23/2021 12:20
23-Sep-21 10:03:00	65	23-Sep-21 10:03:00	65
23-Sep-21 10:18:00	66	23-Sep-21 10:18:00	66
23-Sep-21 10:33:00	67	23-Sep-21 10:33:00	67
23-Sep-21 10:48:00	66	23-Sep-21 10:48:00	66
23-Sep-21 11:03:00	68	23-Sep-21 11:03:00	67
23-Sep-21 11:18:00	67	23-Sep-21 11:18:00	66
23-Sep-21 11:33:00	66	23-Sep-21 11:33:00	65
23-Sep-21 11:48:00	65	23-Sep-21 11:48:00	61.28561431
23-Sep-21 12:03:00	61.28561431	23-Sep-21 12:03:00	61.28561431
Average	66	Average	66
Total (MCF/hr)	128	Total (MCF/hr)	128
Heat Content (MMBtu/MCF)	1.052	Heat Content (MMBtu/MCF)	1.06
Heat Input (MMBtu/hr)	134	Heat Input (MMBtu/hr)	135

Pressure Drop - Inches of Water Column

Furnace Stacks Line #3 SV030 Scrubber House 2

Minimum
Run 1
Tag \\HTPIDAP01\ADBI5712
Start 9/22/2021 13:40
End 9/22/2021 15:45

22-Sep-21 13:40:00	4.8
22-Sep-21 13:55:00	4.8
22-Sep-21 14:10:00	4.8
22-Sep-21 14:25:00	4.8
22-Sep-21 14:40:00	4.8
22-Sep-21 14:55:00	4.8
22-Sep-21 15:10:00	4.8
22-Sep-21 15:25:00	4.8

Average 4.8

Maximum
Run 1
Tag \\HTPIDAP01\ADBI5712
Start 9/22/2021 13:40
End 9/22/2021 15:45

22-Sep-21 13:40:00	4.8
22-Sep-21 13:55:00	4.9
22-Sep-21 14:10:00	4.8
22-Sep-21 14:25:00	4.9
22-Sep-21 14:40:00	4.8
22-Sep-21 14:55:00	4.9
22-Sep-21 15:10:00	4.8
22-Sep-21 15:25:00	4.9

Average 4.8

Average
Run 1
Tag \\HTPIDAP01\ADBI5712
Start 9/22/2021 13:40
End 9/22/2021 15:45

22-Sep-21 13:40:00	4.8
22-Sep-21 13:55:00	4.9
22-Sep-21 14:10:00	4.8
22-Sep-21 14:25:00	4.8
22-Sep-21 14:40:00	4.8
22-Sep-21 14:55:00	4.8
22-Sep-21 15:10:00	4.8
22-Sep-21 15:25:00	4.8

Average 4.8

Minimum
Run 2
Tag \\HTPIDAP01\ADBI5712
Start 9/23/2021 7:22
End 9/23/2021 9:26

23-Sep-21 07:22:00	4.8
23-Sep-21 07:37:00	4.8
23-Sep-21 07:52:00	4.8
23-Sep-21 08:07:00	4.8
23-Sep-21 08:22:00	4.9
23-Sep-21 08:37:00	4.8
23-Sep-21 08:52:00	4.8
23-Sep-21 09:07:00	4.8

Average 4.8

Maximum
Run 2
Tag \\HTPIDAP01\ADBI5712
Start 9/23/2021 7:22
End 9/23/2021 9:26

23-Sep-21 07:22:00	4.8
23-Sep-21 07:37:00	4.9
23-Sep-21 07:52:00	4.9
23-Sep-21 08:07:00	4.9
23-Sep-21 08:22:00	4.9
23-Sep-21 08:37:00	4.9
23-Sep-21 08:52:00	4.8
23-Sep-21 09:07:00	4.8

Average 4.9

Average
Run 2
Tag \\HTPIDAP01\ADBI5712
Start 9/23/2021 7:22
End 9/23/2021 9:26

23-Sep-21 07:22:00	4.8
23-Sep-21 07:37:00	4.8
23-Sep-21 07:52:00	4.8
23-Sep-21 08:07:00	4.9
23-Sep-21 08:22:00	4.9
23-Sep-21 08:37:00	4.8
23-Sep-21 08:52:00	4.8
23-Sep-21 09:07:00	4.8

Average 4.8

Minimum
Run 3
Tag \\HTPIDAP01\ADBI5712
Start 9/23/2021 10:03
End 9/23/2021 12:20

23-Sep-21 10:03:00	4.8
23-Sep-21 10:18:00	4.8
23-Sep-21 10:33:00	4.8
23-Sep-21 10:48:00	4.8
23-Sep-21 11:03:00	4.7
23-Sep-21 11:18:00	4.7
23-Sep-21 11:33:00	4.6
23-Sep-21 11:48:00	4.3
23-Sep-21 12:03:00	4.5

Average 4.7 **Total Average** 4.8

Maximum
Run 3
Tag \\HTPIDAP01\ADBI5712
Start 9/23/2021 10:03
End 9/23/2021 12:20

23-Sep-21 10:03:00	4.8
23-Sep-21 10:18:00	4.8
23-Sep-21 10:33:00	4.8
23-Sep-21 10:48:00	4.8
23-Sep-21 11:03:00	4.8
23-Sep-21 11:18:00	4.8
23-Sep-21 11:33:00	4.8
23-Sep-21 11:48:00	4.6
23-Sep-21 12:03:00	4.9

Average 4.8 **Total Average** 4.8

Average
Run 3
Tag \\HTPIDAP01\ADBI5712
Start 9/23/2021 10:03
End 9/23/2021 12:20

23-Sep-21 10:03:00	4.8
23-Sep-21 10:18:00	4.8
23-Sep-21 10:33:00	4.8
23-Sep-21 10:48:00	4.8
23-Sep-21 11:03:00	4.8
23-Sep-21 11:18:00	4.7
23-Sep-21 11:33:00	4.7
23-Sep-21 11:48:00	4.4
23-Sep-21 12:03:00	4.7

Average 4.7 **Total Average** 4.8

Furnace Stacks Line #3 SV030 Scrubber House 2**Minimum****Run 1**

Tag \\HTPIDAP01\ADBI5714
Start 9/22/2021 13:40
End 9/22/2021 15:45

22-Sep-21 13:40:00	395
22-Sep-21 13:55:00	395
22-Sep-21 14:10:00	396
22-Sep-21 14:25:00	395
22-Sep-21 14:40:00	394
22-Sep-21 14:55:00	383
22-Sep-21 15:10:00	384
22-Sep-21 15:25:00	387

Average 391

Maximum**Run 1**

Tag \\HTPIDAP01\ADBI5714
Start 9/22/2021 13:40
End 9/22/2021 15:45

22-Sep-21 13:40:00	396
22-Sep-21 13:55:00	396
22-Sep-21 14:10:00	396
22-Sep-21 14:25:00	396
22-Sep-21 14:40:00	396
22-Sep-21 14:55:00	396
22-Sep-21 15:10:00	387
22-Sep-21 15:25:00	390

Average 394

Average**Run 1**

Tag \\HTPIDAP01\ADBI5714
Start 9/22/2021 13:40
End 9/22/2021 15:45

22-Sep-21 13:40:00	395
22-Sep-21 13:55:00	395
22-Sep-21 14:10:00	396
22-Sep-21 14:25:00	396
22-Sep-21 14:40:00	394
22-Sep-21 14:55:00	389
22-Sep-21 15:10:00	386
22-Sep-21 15:25:00	388

Average 392

Minimum**Run 2**

Tag \\HTPIDAP01\ADBI5714
Start 9/23/2021 7:22
End 9/23/2021 9:26

23-Sep-21 07:22:00	395
23-Sep-21 07:37:00	394
23-Sep-21 07:52:00	394
23-Sep-21 08:07:00	394
23-Sep-21 08:22:00	395
23-Sep-21 08:37:00	390
23-Sep-21 08:52:00	388
23-Sep-21 09:07:00	390

Average 393

Maximum**Run 2**

Tag \\HTPIDAP01\ADBI5714
Start 9/23/2021 7:22
End 9/23/2021 9:26

23-Sep-21 07:22:00	396
23-Sep-21 07:37:00	395
23-Sep-21 07:52:00	394
23-Sep-21 08:07:00	396
23-Sep-21 08:22:00	397
23-Sep-21 08:37:00	395
23-Sep-21 08:52:00	390
23-Sep-21 09:07:00	395

Average 395

Average**Run 2**

Tag \\HTPIDAP01\ADBI5714
Start 9/23/2021 7:22
End 9/23/2021 9:26

23-Sep-21 07:22:00	395
23-Sep-21 07:37:00	395
23-Sep-21 07:52:00	394
23-Sep-21 08:07:00	395
23-Sep-21 08:22:00	396
23-Sep-21 08:37:00	393
23-Sep-21 08:52:00	389
23-Sep-21 09:07:00	392

Average 394

Minimum**Run 3**

Tag \\HTPIDAP01\ADBI5714
Start 9/23/2021 10:03
End 9/23/2021 12:20

23-Sep-21 10:03:00	395
23-Sep-21 10:18:00	393
23-Sep-21 10:33:00	393
23-Sep-21 10:48:00	392
23-Sep-21 11:03:00	390
23-Sep-21 11:18:00	387
23-Sep-21 11:33:00	385
23-Sep-21 11:48:00	391
23-Sep-21 12:03:00	395

Average 391 **Total Average** 392

Maximum**Run 3**

Tag \\HTPIDAP01\ADBI5714
Start 9/23/2021 10:03
End 9/23/2021 12:20

23-Sep-21 10:03:00	396
23-Sep-21 10:18:00	395
23-Sep-21 10:33:00	393
23-Sep-21 10:48:00	393
23-Sep-21 11:03:00	392
23-Sep-21 11:18:00	390
23-Sep-21 11:33:00	391
23-Sep-21 11:48:00	400
23-Sep-21 12:03:00	397

Average 394 **Total Average** 394

Average**Run 3**

Tag \\HTPIDAP01\ADBI5714
Start 9/23/2021 10:03
End 9/23/2021 12:20

23-Sep-21 10:03:00	396
23-Sep-21 10:18:00	395
23-Sep-21 10:33:00	393
23-Sep-21 10:48:00	393
23-Sep-21 11:03:00	392
23-Sep-21 11:18:00	389
23-Sep-21 11:33:00	387
23-Sep-21 11:48:00	397
23-Sep-21 12:03:00	396

Average 393 **Total Average** 393

Pressure Drop - Inches of Water Column

Furnace Stacks Line #3

SV032- Scrubber House 4

Minimum
Run 1
Tag \\HTPIDAP01\ADBI5718
Start 9/22/2021 13:40
End 9/22/2021 15:45

22-Sep-21 13:40:00	4.3
22-Sep-21 13:55:00	4.3
22-Sep-21 14:10:00	4.3
22-Sep-21 14:25:00	4.3
22-Sep-21 14:40:00	4.4
22-Sep-21 14:55:00	4.3
22-Sep-21 15:10:00	4.3
22-Sep-21 15:25:00	4.3

Average 4.3

Maximum
Run 1
Tag \\HTPIDAP01\ADBI5718
Start 9/22/2021 13:40
End 9/22/2021 15:45

22-Sep-21 13:40:00	4.4
22-Sep-21 13:55:00	4.4
22-Sep-21 14:10:00	4.4
22-Sep-21 14:25:00	4.4
22-Sep-21 14:40:00	4.5
22-Sep-21 14:55:00	4.4
22-Sep-21 15:10:00	4.3
22-Sep-21 15:25:00	4.5

Average 4.4

Average
Run 1
Tag \\HTPIDAP01\ADBI5718
Start 9/22/2021 13:40
End 9/22/2021 15:45

22-Sep-21 13:40:00	4.4
22-Sep-21 13:55:00	4.4
22-Sep-21 14:10:00	4.3
22-Sep-21 14:25:00	4.3
22-Sep-21 14:40:00	4.4
22-Sep-21 14:55:00	4.3
22-Sep-21 15:10:00	4.3
22-Sep-21 15:25:00	4.4

Average 4.4

Minimum
Run 2
Tag \\HTPIDAP01\ADBI5718
Start 9/23/2021 7:22
End 9/23/2021 9:28

23-Sep-21 07:22:00	4.1
23-Sep-21 07:37:00	4.1
23-Sep-21 07:52:00	4.1
23-Sep-21 08:07:00	4.1
23-Sep-21 08:22:00	4.1
23-Sep-21 08:37:00	4.1
23-Sep-21 08:52:00	4.1
23-Sep-21 09:07:00	4.2

Average 4.1

Maximum
Run 2
Tag \\HTPIDAP01\ADBI5718
Start 9/23/2021 7:22
End 9/23/2021 9:28

23-Sep-21 07:22:00	4.2
23-Sep-21 07:37:00	4.2
23-Sep-21 07:52:00	4.2
23-Sep-21 08:07:00	4.1
23-Sep-21 08:22:00	4.2
23-Sep-21 08:37:00	4.2
23-Sep-21 08:52:00	4.2
23-Sep-21 09:07:00	4.2

Average 4.2

Average
Run 2
Tag \\HTPIDAP01\ADBI5718
Start 9/23/2021 7:22
End 9/23/2021 9:28

23-Sep-21 07:22:00	4.1
23-Sep-21 07:37:00	4.1
23-Sep-21 07:52:00	4.2
23-Sep-21 08:07:00	4.1
23-Sep-21 08:22:00	4.1
23-Sep-21 08:37:00	4.2
23-Sep-21 08:52:00	4.2
23-Sep-21 09:07:00	4.2

Average 4.2

Minimum
Run 3
Tag \\HTPIDAP01\ADBI5718
Start 9/23/2021 10:03
End 9/23/2021 12:20

23-Sep-21 10:03:00	4.3
23-Sep-21 10:18:00	4.3
23-Sep-21 10:33:00	4.3
23-Sep-21 10:48:00	4.3
23-Sep-21 11:03:00	4.2
23-Sep-21 11:18:00	4.2
23-Sep-21 11:33:00	4.2
23-Sep-21 11:48:00	3.8
23-Sep-21 12:03:00	4.0

Average 4.2 **Total Average** 4.2

Maximum
Run 3
Tag \\HTPIDAP01\ADBI5718
Start 9/23/2021 10:03
End 9/23/2021 12:20

23-Sep-21 10:03:00	4.4
23-Sep-21 10:18:00	4.4
23-Sep-21 10:33:00	4.3
23-Sep-21 10:48:00	4.4
23-Sep-21 11:03:00	4.3
23-Sep-21 11:18:00	4.3
23-Sep-21 11:33:00	4.3
23-Sep-21 11:48:00	4.2
23-Sep-21 12:03:00	4.5

Average 4.4 **Total Average** 4.3

Average
Run 3
Tag \\HTPIDAP01\ADBI5718
Start 9/23/2021 10:03
End 9/23/2021 12:20

23-Sep-21 10:03:00	4.4
23-Sep-21 10:18:00	4.3
23-Sep-21 10:33:00	4.3
23-Sep-21 10:48:00	4.3
23-Sep-21 11:03:00	4.3
23-Sep-21 11:18:00	4.3
23-Sep-21 11:33:00	4.3
23-Sep-21 11:48:00	4.0
23-Sep-21 12:03:00	4.3

Average 4.3 **Total Average** 4.3

Furnace Stacks Line #3

SV032- Scrubber House 4

Minimum**Run 1****Tag** \\HTPIDAP01\ADBI5720**Start** 9/22/2021 13:40**End** 9/22/2021 15:45

22-Sep-21 13:40:00	396
22-Sep-21 13:55:00	396
22-Sep-21 14:10:00	396
22-Sep-21 14:25:00	396
22-Sep-21 14:40:00	390
22-Sep-21 14:55:00	386
22-Sep-21 15:10:00	385
22-Sep-21 15:25:00	385

Average 391**Maximum****Run 1****Tag** \\HTPIDAP01\ADBI5720**Start** 9/22/2021 13:40**End** 9/22/2021 15:45

22-Sep-21 13:40:00	399
22-Sep-21 13:55:00	397
22-Sep-21 14:10:00	397
22-Sep-21 14:25:00	397
22-Sep-21 14:40:00	396
22-Sep-21 14:55:00	390
22-Sep-21 15:10:00	387
22-Sep-21 15:25:00	390

Average 394**Average****Run 1****Tag** \\HTPIDAP01\ADBI5720**Start** 9/22/2021 13:40**End** 9/22/2021 15:45

22-Sep-21 13:40:00	398
22-Sep-21 13:55:00	397
22-Sep-21 14:10:00	397
22-Sep-21 14:25:00	396
22-Sep-21 14:40:00	394
22-Sep-21 14:55:00	387
22-Sep-21 15:10:00	386
22-Sep-21 15:25:00	387

Average 393**Minimum****Run 2****Tag** \\HTPIDAP01\ADBI5720**Start** 9/23/2021 7:22**End** 9/23/2021 9:28

23-Sep-21 07:22:00	392
23-Sep-21 07:37:00	391
23-Sep-21 07:52:00	392
23-Sep-21 08:07:00	390
23-Sep-21 08:22:00	391
23-Sep-21 08:37:00	391
23-Sep-21 08:52:00	389
23-Sep-21 09:07:00	389

Average 391**Maximum****Run 2****Tag** \\HTPIDAP01\ADBI5720**Start** 9/23/2021 7:22**End** 9/23/2021 9:28

23-Sep-21 07:22:00	393
23-Sep-21 07:37:00	392
23-Sep-21 07:52:00	393
23-Sep-21 08:07:00	392
23-Sep-21 08:22:00	392
23-Sep-21 08:37:00	392
23-Sep-21 08:52:00	392
23-Sep-21 09:07:00	391

Average 392**Average****Run 2****Tag** \\HTPIDAP01\ADBI5720**Start** 9/23/2021 7:22**End** 9/23/2021 9:28

23-Sep-21 07:22:00	392
23-Sep-21 07:37:00	392
23-Sep-21 07:52:00	392
23-Sep-21 08:07:00	391
23-Sep-21 08:22:00	392
23-Sep-21 08:37:00	392
23-Sep-21 08:52:00	390
23-Sep-21 09:07:00	389

Average 391**Minimum****Run 3****Tag** \\HTPIDAP01\ADBI5720**Start** 9/23/2021 10:03**End** 9/23/2021 12:20

23-Sep-21 10:03:00	392
23-Sep-21 10:18:00	392
23-Sep-21 10:33:00	392
23-Sep-21 10:48:00	391
23-Sep-21 11:03:00	391
23-Sep-21 11:18:00	391
23-Sep-21 11:33:00	386
23-Sep-21 11:48:00	387
23-Sep-21 12:03:00	390

Average 390 **Total Average** 391**Maximum****Run 3****Tag** \\HTPIDAP01\ADBI5720**Start** 9/23/2021 10:03**End** 9/23/2021 12:20

23-Sep-21 10:03:00	393
23-Sep-21 10:18:00	393
23-Sep-21 10:33:00	393
23-Sep-21 10:48:00	392
23-Sep-21 11:03:00	394
23-Sep-21 11:18:00	397
23-Sep-21 11:33:00	391
23-Sep-21 11:48:00	396
23-Sep-21 12:03:00	395

Average 394 **Total Average** 393**Average****Run 3****Tag** \\HTPIDAP01\ADBI5720**Start** 9/23/2021 10:03**End** 9/23/2021 12:20

23-Sep-21 10:03:00	392
23-Sep-21 10:18:00	392
23-Sep-21 10:33:00	392
23-Sep-21 10:48:00	391
23-Sep-21 11:03:00	392
23-Sep-21 11:18:00	395
23-Sep-21 11:33:00	388
23-Sep-21 11:48:00	392
23-Sep-21 12:03:00	393

Average 392 **Total Average** 392

Appendix F

Stack Test Plan

Andrew J. Wilcox

From: Thomas Leier
Sent: Wednesday, October 13, 2021 9:07 AM
To: Andrew J. Wilcox
Subject: Fwd: Test Plan Approval - Pellet Machine Discharge Line 2 and 3

Follow Up Flag: Follow up
Flag Status: Flagged

Get [Outlook for iOS](#)

From: Niemi, Tasha M <Tasha.Niemi@clevelandcliffs.com>
Sent: Monday, September 20, 2021 8:50:39 AM
To: Place, Andrew (MPCA) <andrew.place@state.mn.us>; Damyanovich, Jennifer L <Jennifer.Damyanovich@clevelandcliffs.com>
Cc: Thomas Leier <TLeier@barr.com>; Ekholm, Corie A <Corie.Ekholm@clevelandcliffs.com>
Subject: RE: Test Plan Approval - Pellet Machine Discharge Line 2 and 3

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Good morning Andy,

To recap our phone call this morning, we plan to add on MACT testing for Furnace Line 3 during our mercury test this week. In addition, we are going to remove Pellet Machine Discharge Line 2 and 3 from the testing line up. With the approval of the EPA Alternative Monitoring Plan, we will submit a supplement to our previous stack test on these two lines that were performed in August 2020 with the limit calculations. One final note as a clarification to the TPAL, we do intend to test Pellet Machine Discharge Line 1 for Title V as well. Please let me know if you have any questions.

Thank you,
Tasha

From: Place, Andrew (MPCA) <andrew.place@state.mn.us>
Sent: Friday, September 17, 2021 11:40 AM
To: Damyanovich, Jennifer L <Jennifer.Damyanovich@clevelandcliffs.com>
Cc: 'tleier@barr.com' <tleier@barr.com>; Niemi, Tasha M <Tasha.Niemi@clevelandcliffs.com>
Subject: [EXTERNAL] RE: Test Plan Approval - Pellet Machine Discharge Line 2 and 3

Include a copy of the Test Plan and this Test Plan Approval Email in the Final Report

Test Plan Approval Letter

Facility: Hibbing Taconite Company
Address: 4950 County Highway 5 North, Hibbing, MN 55746
Contact Person/Phone: Jennifer Damyanovich, Environmental Representative

Test Date: September 20, 2021
Test Plan Submittal Date: July 22, 2021
Pretest Meeting Date: September 15, 2021
Agency Interest ID: 1146
Units to be Tested:

Group 4 (COMG 3)

Phase I Hearth Layer Bin (EU018/SV017/CE018; EQUI 93/STRU 24/TREA 24)
Phase I Hearth Layer Feed (EU018/SV019/CE020; EQUI 93/STRU 26/TREA 21)
Phase II Hearth Layer Bin (EU019/SV018/CE019; EQUI 94/STRU 25/TREA 20)
Phase II Hearth Layer Feed (EU019/SV020/CE021; EQUI 94/STRU 27/TREA 25)
Pellet Machine Discharge Line 1 (EU023/SV033/CE037; EQUI 98/STRU 40/TREA 39)
Pellet Machine Discharge Line 2 (EU024/SV034/CE038; EQUI 99/STRU 41/TREA 40)
Pellet Machine Discharge Line 3 (EU025/SV035/CE039; EQUI 100/STRU 42/TREA 41)
Pellet Hearth Layer Screening (EU026/SV036/CE040; EQUI 101/STRU 43/TREA 42)
Pellet Transfer House (EU027/SV037/CE041; EQUI 102/STRU 44/TREA 43)

Group 5 (COMG 5)

Limestone Storage Silo (EU033/SV043/CE044; EQUI 107/STRU 54/TREA 52)

Line No 3 Indurating Furnace (EU022/SV029 – SV032/CE032-CE035; EQUI 97/STRU 36-39/ TREA 36-39)

Your test plan has been approved by the Minnesota Pollution Control Agency (MPCA) as follows:

Shortened notification period approved

Test plan approved with the following provisions:

1. Two test plans are covered by this approval.
2. Group 4 Pellet Handling Sources are being tested to demonstrate compliance with the MACT and establish fan amperage limits.
3. The Limestone Storage Silo is being tested to for compliance with Title V particulate limits
4. Line No 3 Pellet Indurating Furnace is being tested for Mercury and Lead for emissions inventory purposes. Method 29 will be used to collect results for both metals
5. The MACT now requires fan amperage for operating limits to be set by January 28, 2022 rather than pressure drop. Hibbing Taconite has submitted an alternative monitoring plan to the EPA outlining a modification to how the limit would be calculated based on rates during the test. Amperage will be recorded however operating limits will not be set prior to a decision from EPA. Pressure drop will continue to be the limit condition until then.
6. Include in the executive summary of the test report an updated calculation of the affected source groups' flow weighted averages based on the results of this test.
7. Operating limits will not need to be adjusted for units are operated within 20% of the current operating limit.
8. The emission rate will only be applied to the tested unit for recalculation of the flow weighted average. Other sources within the representative group will continue to have their previous test results for that unit applied.
9. Within the test report, supply a summary of the tested units current MACT operating limits either based on previous testing or as a result of this test.
10. Include in the final test report all process and pollution control equipment operating data collected at 15 minute intervals (minimum) and averaged for each test run and test. This information must be clear easily understood by individuals not familiar with the process. All information needed to show process operating rate and pollution control equipment compliant operation must be included. A link to reporting forms can be found below.

11. An acceptable report must comply with Minn. Rule 7017.2035 PERFORMANCE TEST REPORTING REQUIREMENTS. Use of the PTRCC form will help assure that a complete test report is submitted to the MPCA.

In the event of a failure:

Please be aware that enforcement action will be taken for performance test failures, indicating emissions above applicable limits, which can include a monetary penalty. Upon discovery of the test failure, the Regulated Party must take immediate action to reduce emissions to remain in compliance with its permitted limits. The actions taken should be documented, as they will become part of the record of corrective actions. If a monetary penalty is required, the amount of time from the date of the failed test to the date of the passed test, or other compliance demonstration, will be taken into consideration. It is in the Regulated Party's best interest to demonstrate compliance with its permitted emissions limits through a passed retest or other compliance demonstration as soon as possible after a failed test.

All periods of noncompliance with emission limits must be reported to the MPCA, this includes any periods of engineering tests. The requirements outlined under the Notification of Deviations Endangering Human Health or the Environment, Minn. R. 7019.1000, subp. 1., shall be followed. This information should also be clearly stated and readily available in the executive summary of the test report.

The following forms are available at <http://www.pca.state.mn.us/jsrid16>

Operating Data Summary – Combustion Sources

Operating Data Summary – Process Sources

Operating Data Summary – Asphalt Plants

Report Certifications Form

Performance Test Report Completeness Criteria (PTRCC)

(Preferred) Electronic copies of the test report submitted to SubmitStackTest.PCA@state.mn.us

If an electronic copy of the complete test report is submitted the paper and CD copies are not required. Please follow requirements outlined in Method 1 of the document found at this link:

<https://www.pca.state.mn.us/sites/default/files/aq1-39.pdf>

Hard Copy Performance Test Reports and Microfiche or CD Copy submittals will be addressed to:

Air Quality Compliance Tracking Coordinator

Industrial Division

Minnesota Pollution Control Agency

520 Lafayette Road North

St. Paul, Minnesota 55155-4194

Andy Place | State Program Administrator

Minnesota Pollution Control Agency (MPCA)

Industrial Division

520 Lafayette Road No. | St. Paul, Minnesota | 55155-4194

651-757-2652

Email | andrew.place@state.mn.us

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TEST PLAN FOR
TACONITE PROCESSING FACILITY

HIBBING TACONITE COMPANY
HIBBING, MINNESOTA

Date test plan created/revised: July 21, 2021

Scheduled test date(s): Week of September 20, 2021

PART I: General Information

Facility contact person and address: Jennifer Damyanovich
Environmental Representative
Hibbing Taconite Company
4950 County Highway 5 North
Hibbing, Minnesota 55746
(218) 262-6849
Jennifer.Damyanovich@clevelandcliffs.com

Name and address of emission facility: Hibbing Taconite Company
4950 County Highway 5 North
Hibbing, Minnesota 55746

Agency Interest ID: 1146
Air Emission Permit Number: 13700061-007

Testing Company and Contact: Tom Leier
4300 MarketPointe Drive
Suite 200
Barr Engineering Company
(952) 832-2967 (952) 832-2601 (fax)
tleier@barr.com

Reason the emission unit is to be tested:

Conduct mercury emissions testing from the Line No. 1 Pellet Indurating Furnace (EU020, SV021-SV024) to support the requirements set forth in Minnesota (MN) Rule 7007.0502 [Mercury Emissions Reduction Plan] and update lead emission factors. All four stacks will be tested independently (not simultaneously).

Test Location Drawings:

Diagrams of the sampling locations, giving all relevant dimensions, will be provided in the test report for this project or upon request.

PART II: Testing Requirements

The tables below give a summary of the pollutants to be tested and test methods.

Source Description Stack Vent and Other Associated Nos.	Pollutant Tested and Applicable Emission Limit	Limitation Basis of Pollutant Tested	Specific Methods/Procedures Required Citation
Line No 1 Pellet Indurating Furnace (EU020) (SV021-SV024)	Mercury/Lead	MN Rule 7007.0502 subp. 6.A	40 CFR Part 60, Appendix A EPA Methods 1-4 EPA Method 29 3 120-minute runs at each stack vent

Part III: Operating Conditions

Parameters that will be monitored during the test include, but are not limited to the following:

Pellet Indurating Furnace Line 1 (EU020) – Pellet Induration Process

Material Process Rate	430 Dry Short Tons Per Hour (DSTPH)	Material throughput recorded every 15 minutes during test runs
Fuel Usage –Natural Gas	Heat Input, MMBtu/hr	Fuel usage determined for each test run.

Pellet Indurating Furnace Line 1 (EU020)

Control Equip/Stack Vent Number	Control Equipment Description	Monitoring
Scrubber House 1 CE022/SV021	Venturi Rod Deck Wet Scrubber	Venturi Wet Scrubber – 2 hour average of continuous pressure drop readings across the venturi and water flow rate.
Scrubber House 1 CE023/SV022	Venturi Rod Deck Wet Scrubber	Venturi Wet Scrubber – 2 hour average of continuous pressure drop readings across the venturi and water flow rate.
Scrubber House 1 CE024/SV023	Venturi Rod Deck Wet Scrubber	Venturi Wet Scrubber – 2 hour average of continuous pressure drop readings across the venturi and water flow rate.
Scrubber House 1 CE025/SV024	Venturi Rod Deck Wet Scrubber	Venturi Wet Scrubber – 2 hour average of continuous pressure drop readings across the venturi and water flow rate.

Part IV: Test Methods

All tests will be performed using the following USEPA reference test methods.

Test Method	
Method 1	Sample and Velocity Traverses for Stationary Sources. (determined once at each stack vent)
Method 2	Determination of Stack Gas Velocity and Volumetric Flow Rate. One determination concurrent with each Method 5 sample test run.
Method 3A/3B (modified)	Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources. An integrated gas sample will be collected during each Method 5 sample test run and analyzed using a calibrated oxygen and carbon dioxide analyzer or Fyrite system
Method 4	Determination of Moisture Content in Stack Gases. One determination concurrent with each Method 5 test run.
Method 29	Determination of Metals Emissions from Stationary Sources. Three runs per test with a sampling time equal to or greater than 120 minutes per run with an approximate sample rate of 0.75 scfm. Post-test meter calibrations will be done using the alternative procedure listed in EPA Method 5. Samples will only be analyzed for mercury and lead for an emission factor update.

Part V: Continuous Emissions Monitors

No CEMS are germane to this testing event.

Part VI: Other

The emissions will be reported in pounds per hour (lb/hr). A copy of the report will be submitted on or before 60 days after completion of the last test date of the mobilization (instead of 45 days, due to the complexity of the analysis of the samples).

Testing schedule: Week of September 20, 2021

Mobilization	Description
Monday September 20	Travel/Setup Test Equipment
Tuesday September 21	Test SV021 and SV023
Wednesday September 22	Test SV022 and SV024
Thursday September 23	Travel/Demobilize/Contingency

This test plan serves as the request for performance audit material from the responsible enforcement authority. If audit samples are provided, they will be analyzed during the performance test.

Test plans and report submittals will be addressed to:

Marc Severin
Performance Test Coordinator
Compliance and Enforcement Section - Industrial Division
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155-4194

Closing Remarks

A pretest meeting will be scheduled at least 7 days in advance of the testing mobilizations. At the preference of the MPCA, Hibbing Taconite requests that the pretest meeting is held via teleconference. If there are questions or comments about the information provided in this test plan, please contact me by telephone or e-mail.



Jennifer Damyanovich
Environmental Representative
Hibbing Taconite Company

C. Tom Leier – Barr Engineering Co.

Appendix G

Project Participants and Contact Information

Project Participants and Contact Information

Minnesota Pollution Control Agency

Andrew Place – State Program Administrator

Hibbing Taconite Company

Tasha Niemi – Environmental Manager

Corie Ekholm – Section Manager Technical Services

Jennifer Damyanovich – Environmental Representative

Barr Engineering Co.

Tim Russell – Vice President/Chemical Engineer

Tom Kuchinski – Vice President/Stack Testing Services Coordinator

Tom Leier – Project Manager/ Senior Air Quality Technician

Ryan Pantzke – Senior Air Quality Technician

Ben Wiltse – Senior Air Quality Technician

CONTACT INFORMATION

MPCA	Hibbing Taconite Company	Barr Engineering Co.
Andrew Place State Program Administrator Compliance and Enforcement Section— Industrial Division Minnesota Pollution Control Agency 520 Lafayette Rd. N. Saint Paul, Minnesota 55155 (651) 757-2652 andrew.place@state.mn.us	Jennifer Damyanovich Environmental Representative 4950 County Highway 5 North Hibbing, MN 55746 (218) 262-6849 Jennifer.Damyanovich@Clevelandcliffs.com	Tom Leier Sr. Air Quality Technician Barr Engineering Company 4300 MarketPointe Drive Suite 200 Minneapolis, MN 55345 (952) 832-2967 TLeier@barr.com