

**Results of the June 9-10, 2015 Mercury Emission Tests
Performed at Hibbing Taconite Company's Taconite
Facility Located in Hibbing, Minnesota**

Pellet Indurating Furnace Line 1

SV021-SV024

MPCA AQD File No. 541

Air Emissions Permit No. 13700061-007

Barr Project No. 23/69-1428.50

Prepared for
Hibbing Taconite Company
Hibbing, Minnesota

August 2015



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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



John Rooney
Air Quality Technician
Barr Engineering Company

08/05/15

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. analyzed metals samples. A signed laboratory report is provided in this report.



Matthew Morrison
Air Quality Technician
Barr Engineering Company

8/5/15

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
Supervisor/Senior Air Quality Technician
Barr Engineering Company

8/5/15

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.

Julie C. Lucas

Julie Lucas
Environmental Manager
Hibbing Taconite Co.

8/5/15

Date

Executive Summary

Barr Engineering Company performed mercury emissions tests June 9-10, 2015 at the Hibbing Taconite Company's facility located in Hibbing, Minnesota. Mercury emissions tests were performed on the Pellet Indurating Furnace Line 1 waste gas stacks (SV021-SV024) to satisfy the Minnesota Rule 7019.3050 mercury emission inventory testing requirement. Stack vent identification numbers, emission unit identification numbers and test results are presented in Table ES-1.

Table ES-1 Executive Summary Table

Mercury Test Parameter EPA Methods 1,2,3,4 and 29	Average Test Results				Total
	Pellet Indurating Furnace Line 1 (SV021)	Pellet Indurating Furnace Line 1 (SV022)	Pellet Indurating Furnace Line 1 (SV023)	Pellet Indurating Furnace Line 1 (SV024)	Pellet Indurating Furnace Line 1 (EU020)
Stack Vent Number	SV021	SV022	SV023	SV024	-
Test Date	June 9, 2015	June 10, 2015	June 9, 2015	June 10, 2015	-
Total Mercury Emission Rate, lb/hr					
Hg	0.0019	0.0019	0.0020	0.0019	0.0077

1.0 Introduction

Barr Engineering Company performed mercury emissions performance tests at Hibbing Taconite Company's taconite facility located in Hibbing, Minnesota. Mercury emissions tests were performed on the Pellet Indurating Furnace Line 1 waste gas stacks (SV021-SV024) to satisfy the Minnesota Rule 7019.3050 mercury emission inventory testing requirement.

A stack test plan was submitted by email to the Minnesota Pollution Control Agency (MPCA) on May 25, 2015 and was discussed in a pre-test meeting on June 1, 2015. Copies of the test plan, test plan approval letter, and associated correspondence are provided in Appendix F. The MPCA approval letter incorrectly lists reporting units for mercury as pounds per million British thermal units (lb/MMBtu). The mercury emission rates are reported in pounds per hour (lb/hr).

The testing was performed June 9-10, 2015 by Tom Kuchinski, Matt Kistner, John Rooney, and Richard Skibsted of Barr Engineering Company. Corie Ekholm of Hibbing Taconite Company provided the coordination of the test team with facility operations. The stack testing was not witnessed by a representative of the MPCA. A list of project participants is provided in Appendix G.

Each test consisted of three 120-minute runs to measure mercury emissions according to U.S. EPA Methods 29. Stack vents SV021 and SV023 were tested simultaneously on June 9, 2015. Stack vents SV022 and SV024 were tested simultaneously on June 10, 2015. A determination of filterable particulate matter for Taconite MACT compliance was made using the same sample system. The particulate results are reported separately.

Table 1-1 provides identification information for the sources tested.

Table 1-1 Emission Source Information

Source/Emissions Unit (Plant or process descriptor)	Emission Unit	Control Equipment	Stack Vent	Applicable Rules
Pellet Indurating Furnace Line 1	EU020	CE022	SV021	MN Rule 7019.3050
Pellet Indurating Furnace Line 1	EU020	CE023	SV022	
Pellet Indurating Furnace Line 1	EU020	CE024	SV023	
Pellet Indurating Furnace Line 1	EU020	CE025	SV024	

2.0 Results

2.1 Pellet Indurating Furnace Line 1 (SV021)

Results of the June 9, 2015 mercury tests are provided in Table 1. The average emission rate of total mercury is 0.0019 pounds per hour (lb/hr). There was a 10 minute delay during Run 3 to correct a problem with probe heating equipment on SV023 stack.

2.2 Pellet Indurating Furnace Line 1 (SV022)

Results of the June 10, 2015 mercury tests are provided in Table 2. The average emission rate of total mercury is 0.0019 pounds per hour (lb/hr). There was a 232-minute delay during Run 1 due to low tonnage on Line 1.

2.3 Pellet Indurating Furnace Line 1 (SV023)

Results of the June 9, 2015 mercury tests are provided in Table 3. The average emission rate of total mercury is 0.0020 pounds per hour (lb/hr). There was a 10 minute delay during Run 3 to correct a problem with probe heating equipment.

2.4 Pellet Indurating Furnace Line 1 (SV024)

Results of the June 10, 2015 mercury tests are provided in Table 4. The average emission rate of total mercury is 0.0019 pounds per hour (lb/hr). There was a 232-minute delay during Run 1 due to low tonnage on Line 1.

2.5 Pellet Indurating Furnace Line 1 (EU020)

The average emission rate of total mercury for the Line 1 Pellet Indurating Furnace is 0.0077 pounds per hour (lb/hr).

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

3.0 Process Description

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

The Pellet Indurating Furnace Line 1 (EU020) is a straight grate induration furnace with four emission points; SV021, SV022, SV023, and SV024. Particulate 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 presented in the MPCA operating data forms 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 1 (SV021-SV024)	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 EPA Method 3A. An integrated sample of dry stack gas was collected in a Tedlar bag during each test run. The stack gas was then analyzed for oxygen and carbon dioxide concentrations using a Servomex Model 1440 analyzer calibrated with EPA protocol gases. Instrument calibration and stack gas analysis data are located in Appendix B. Calibration gas certifications are provided in Appendix D.

Stack gas moisture content was determined by the performance of U.S. EPA Method 4, in conjunction with the EPA Method 29 tests.

Mercury was determined following EPA Method 29 in conjunction with the EPA Method 5 testing. All glassware used for the testing was prepared as directed by the method. All reagents were prepared at Barr's laboratory except for the acidified potassium permanganate solution which was prepared on-site daily prior to sampling.

Samples were analyzed by Element One, Inc. of Wilmington, North Carolina. A complete laboratory report along with chain of custody is located in Appendix C. Mercury levels in all reagent blanks were below analytical detection limits. No blank corrections were performed. Sample fractions reported at the analytical detection limit are included in the total mass of the sample.

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

Tables

TABLE 1
EPA METHOD 29 TEST RESULTS
Pellet Indurating Furnace Line 1 (SV021)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	6/9/2015	6/9/2015	6/9/2015	---
Test Period	825 - 1033	1155 - 1420	1525 - 1744	---
Test Duration, min.	120	120	120	120
Meter Volume, dscf	87.58	86.07	86.26	86.63
Volumetric Airflow Rate, dscfm	177,000	175,000	176,000	176,000
Mercury Concentration, µg/dscf				
Filterable Mercury	< 0.0011	< 0.0012	< 0.0012	< 0.0012
Vapor Phase Mercury	0.073	0.087	0.087	0.082
Total Mercury	0.075	0.088	0.088	0.084
Mercury Emission Rate, lb/hr				
Filterable Mercury	< 0.000027	< 0.000027	< 0.000027	< 0.000027
Vapor Phase Mercury	0.0017	0.0020	0.0020	0.0019
Total Mercury	0.0017	0.0020	0.0020	0.0019
Process Data				
Fired Pellet Production Rate, LTPH	377	378	377	377
Emission Factors				
Total Mercury lb/LT Fired Pellet	4.64E-06	5.42E-06	5.41E-06	5.15E-06

Note: The "<" sign indicates the mass is below method detection limits. All calculations use the detection limit for concentration and emission determinations.

TABLE 2
EPA METHOD 29 TEST RESULTS
Pellet Indurating Furnace Line 1 (SV022)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	6/10/2015	6/10/2015	6/10/2015	---
Test Period	825 - 1421	1510 - 1719	1755 - 2003	---
Test Duration, min.	120	120	120	120
Meter Volume, dscf	86.92	88.73	87.77	87.80
Volumetric Airflow Rate, dscfm	178,000	179,000	177,000	178,000
Mercury Concentration, µg/dscf				
Filterable Mercury	< 0.0012	< 0.0011	< 0.0011	< 0.0011
Vapor Phase Mercury	0.074	0.086	0.077	0.079
Total Mercury	0.075	0.087	0.078	0.080
Mercury Emission Rate, lb/hr				
Filterable Mercury	< 0.000027	< 0.000027	< 0.000027	< 0.000027
Vapor Phase Mercury	0.0017	0.0020	0.0018	0.0019
Total Mercury	0.0018	0.0021	0.0018	0.0019
Process Data				
Fired Pellet Production Rate, LTPH	388	390	391	390
Emission Factors				
Total Mercury lb/LT Fired Pellet	4.56E-06	5.29E-06	4.66E-06	4.84E-06

Note: The "<" sign indicates the mass is below method detection limits. All calculations use the detection limit for concentration and emission determinations.

TABLE 3
EPA METHOD 29 TEST RESULTS
Pellet Indurating Furnace Line 1 (SV023)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	6/9/2015	6/9/2015	6/9/2015	---
Test Period	825 - 1033	1155 - 1420	1525 - 1744	---
Test Duration, min.	120	120	120	120
Meter Volume, dscf	88.54	87.22	84.14	86.63
Volumetric Airflow Rate, dscfm	165,000	161,000	157,000	161,000
Mercury Concentration, µg/dscf				
Filterable Mercury	< 0.0011	< 0.0011	< 0.0012	< 0.0012
Vapor Phase Mercury	0.066	0.097	0.114	0.092
Total Mercury	0.067	0.098	0.115	0.093
Mercury Emission Rate, lb/hr				
Filterable Mercury	< 0.000025	< 0.000024	< 0.000025	< 0.000025
Vapor Phase Mercury	0.0014	0.0021	0.0024	0.0020
Total Mercury	0.0015	0.0021	0.0024	0.0020
Process Data				
Fired Pellet Production Rate, LTPH	377	378	377	377
Emission Factors				
Total Mercury lb/LT Fired Pellet	3.9E-06	5.5E-06	6.3E-06	5.2E-06

Note: The "<" sign indicates the mass is below method detection limits. All calculations use the detection limit for concentration and emission determinations.

TABLE 4
EPA METHOD 29 TEST RESULTS
Pellet Indurating Furnace Line 1 (SV024)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	6/10/2015	6/10/2015	6/10/2015	---
Test Period	825 - 1421	1510 - 1719	1755 - 2003	---
Test Duration, min.	120	120	120	120
Meter Volume, dscf	76.92	77.78	79.34	78.02
Volumetric Airflow Rate, dscfm	143,000	144,000	148,000	145,000
Mercury Concentration, µg/dscf				
Filterable Mercury	< 0.0013	< 0.0013	< 0.0013	< 0.0013
Vapor Phase Mercury	0.105	0.110	0.076	0.097
Total Mercury	0.107	0.111	0.078	0.098
Mercury Emission Rate, lb/hr				
Filterable Mercury	< 0.000025	< 0.000024	< 0.000025	< 0.000025
Vapor Phase Mercury	0.0020	0.0021	0.0015	0.0019
Total Mercury	0.0020	0.0021	0.0015	0.0019
Process Data				
Fired Pellet Production Rate, LTPH	388	390	391	390
Emission Factors				
Total Mercury lb/LT Fired Pellet	5.2E-06	5.4E-06	3.9E-06	4.8E-06

Note: The "<" sign indicates the mass is below method detection limits. All calculations use the detection limit for concentration and emission determinations.

TABLE 5

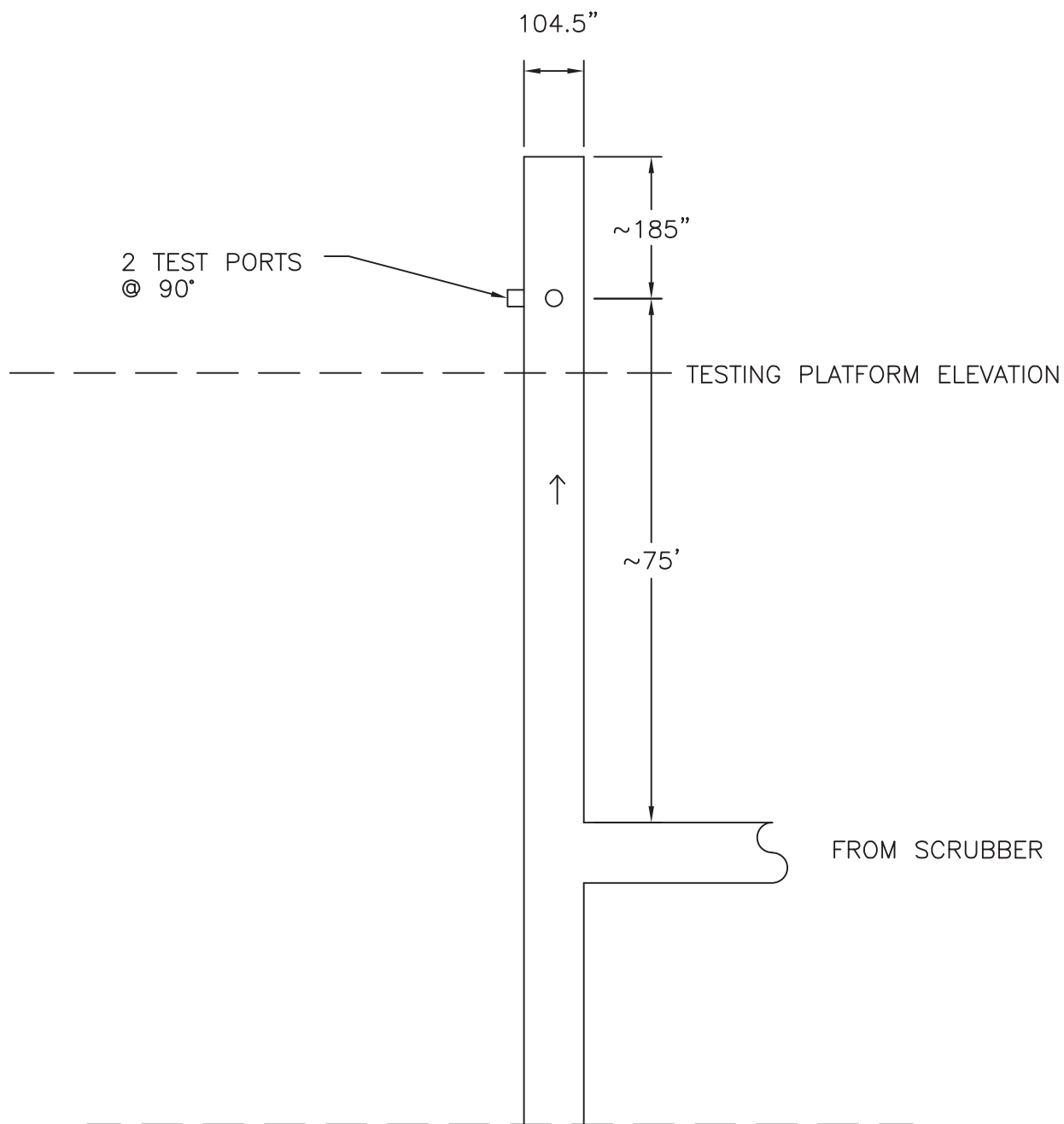
EPA METHOD 29 TEST RESULTS

Pellet Indurating Furnace Line 1 (SV021-SV024)

Parameter	SV021	SV022	SV023	SV024	Total
Mercury Emission Rate, lb/hr					
Filterable Mercury	< 0.000027	< 0.000027	< 0.000025	< 0.000025	< 0.000103
Vapor Phase Mercury	0.0019	0.0019	0.0020	0.0019	0.0076
Total Mercury	0.0019	0.0019	0.0020	0.0019	0.0077

Note: The "<" sign indicates the mass is below method detection limits. All calculations use the detection limit for concentration and emission determinations.

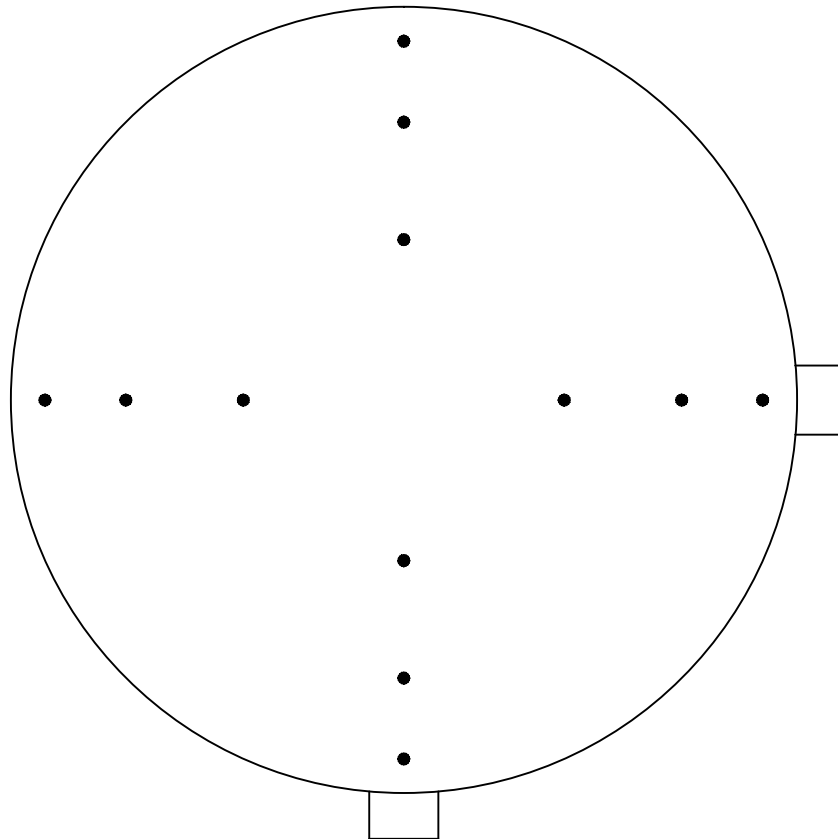
Figures



TEST PORT LOCATIONS
HIBBING TACONITE COMPANY
HIBBING, MINNESOTA
PELLET INDURATING FURNACE LINE NO 1
(SV021,022,023,024), (EU020), (CE022,023,024,025)

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 NO 1
(SV021,022,023,024), (EU020), (CE022,023,024,025)

NOT TO SCALE

FIGURE 2

Appendices

Appendix A

Report Calculations and Nomenclature

Determination of Metals Emissions
EPA Method 29

Pellet Indurating Furnace Line 1 (SV021)
Test 1
Performance Testing on June 9, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3			
Test Date	-	-	6/9/2015	6/9/2015	6/9/2015			
Test Period	-	-	825 - 1033	1155 - 1420	1525 - 1744			
Run Time	Θ	min	120	120	120			
Oxygen Concentration, % dry	O ₂ %	%	19.74	19.61	19.81			
Dry Volumetric Flowrate at Standard Conditions	Qd	dscfm	177.354	175.151	175.561			
Meter Volume at Standard Conditions	Vmstd	cubic feet	87.58	86.07	86.26			
Sample Loadings (From Lab Results)								
			Front Half	Back Half	Front Half	Back Half	Front Half	Back Half
Mercury ⁽¹⁾	MHg _m MHg _{bh}	µg	< 0.1	6.425	< 0.1	7.508	< 0.1	7.475
Total Mercury ⁽²⁾	MHg _t	µg	6.525		7.608		7.575	
Calculated Data	Symbol	Units	Run 1		Run 2		Run 3	
Mercury Concentration: $C = MHg / (Vmstd)$								
Front Half (Filterable) Mercury	C _(HgFH)	µg/dscf	< 0.0011		< 0.0012		< 0.0012	
Back Half Mercury	C _(HgBH)	µg/dscf	0.0734		0.0872		0.0867	
Total Mercury Concentration	C _(Hg)	µg/dscf	0.0745		0.0884		0.0878	
Mercury Emission Rates: $E = MHg \times 2.2046 \times 10^{-9} \text{ lb/µg} / Vmstd\text{-ft}^3 \times Qd \times 60$								
Front Half (Filterable) Mercury	E _(HgFH)	lb/hr	< 0.000027		< 0.000027		< 0.000027	
Back Half Mercury	E _(HgBH)	lb/hr	0.0017		0.0020		0.0020	
Total Mercury	E _(Hg)	lb/hr	0.0017		0.0020		0.0020	

Note: The "<" sign indicates the mass is below method detection limits. All calculations use the detection limit for concentration and emission determinations.

(1) EPA Method 29 does not include calculations and/or specifications for blank correcting the front half and back half Hg mass independently, therefore the Total Mercury Mass may not necessarily be equal to (MHg_{fh}+MHg_{bh}).

Determination of Volumetric Air Flow Rate, Gas Composition, and Moisture Content

EPA Methods 2, 3, 4, 5, & 29

Pellet Indurating Furnace Line 1 (SV021)

Test 1

Performance Testing on June 9, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	6/9/2015	6/9/2015	6/9/2015
Test Period	-	-	825 - 1033	1155 - 1420	1525 - 1744
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	28.06	28.06	28.06
Stack Static Pressure	Pg	in. H ₂ O	-0.70	-0.70	-0.70
Average Stack Temperature	Tsf	degrees F	103	101	106
Actual Dry Gas Meter Volume	Vm	cubic feet	94.87	94.86	97.06
Dry Gas Meter Calibration Factor	Y	-	0.9906	0.9906	0.9906
Average Orifice Meter Pressure Drop	DH	in H ₂ O	1.98	1.98	2.03
Average Meter Temperature	Tmf	degrees F	74	83	95
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) ^{0.5}	-	0.998	0.987	0.992
Volume of Water Vapor Condensed in Impingers	Vwc	ml	112	117	115
Mass of Water Vapor Collected in Desiccant	Vwsg	g	21	20	19
Orsat Results, Dry Basis					
Oxygen	%O ₂	%v/v	19.7	19.6	19.8
Carbon Dioxide	%CO ₂	%v/v	0.54	0.55	0.46
Nitrogen + Carbon Monoxide	%N ₂ + %CO	%v/v	79.7	79.8	79.7
Nozzle Diameter	Dn	inches	0.213	0.213	0.213
Run Time	theta	minutes	120	120	120
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature Tsr = Tsf + 460	Tsr	degrees R	563	561	566
Stack Pressure Ps = Pbar + Pg / 13.6	Ps	in. Hg	28.01	28.01	28.01
Duct Area A = 3.14 x D ² / (4 x 144) or A = L x W / 144	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions Vmstd = 17.64 x Vm x Y x ((Pbar + (DH / 13.6)) / (Tmf + 460))	Vmstd	cubic feet	87.58	86.07	86.26
Average Moisture Content of Stack Gas MC = ((0.04707 x Vwc + 0.04715 x Vwsg) / ((0.04707 x Vwc + 0.04715 x Vwsg) + (Vmstd)) x 100	MC	% Vol	6.65	6.97	6.83
Molecular Weight of Stack Gas, dry Md = (0.44 x %CO ₂) + (0.32 x %O ₂) + (0.28 x (%N ₂ + %CO))	Md	lb/lbmol	28.88	28.87	28.87
Molecular Weight of Stack Gas, wet Ms = Md x (1 - (MC/100)) + 18 x (MC/100)	Ms	lb/lbmol	28.15	28.11	28.12
Average Stack Gas Velocity Vs = 85.49 x Cp x (dP) ^{0.5} x ((Tsr / (Ps x Ms)) ^{0.5})	Vs	ft/sec	60.61	59.82	60.35
Actual Volumetric Air Flow Rate Qa = 60 x Vs x A	Qa	acfm	216,582	213,777	215,682
Volumetric Air Flow Rate at Standard Conditions Qs = Qa x (528 / (Ts + 460)) x (Ps / 29.92)	Qs	scfm	189,987	188,278	188,431
Dry Volumetric Air Flow Rate at Standard Conditions Qd = Qa x (1 - (MC / 100)) x (528 / Tsr) x (Ps / 29.92)	Qd	dscfm	177,354	175,151	175,561
Nozzle Cross-Sectional Area An = (3.14 x Dn ²) / (4 x 144)	An	sq. ft	0.000247	0.000247	0.000247
Isokinetic Variation I = (0.0945 x Tsr x Vmstd) / (Ps x Vs x An x theta x (1 - (MC / 100)))	I	%	99.1	98.6	98.6

Determination of Metals Emissions
EPA Method 29

Pellet Indurating Furnace Line 1 (SV022)
Test 2
Performance Testing on June 10, 2015

Performance Testing on June 10, 2015									
Input Data	Symbol	Units	Run 1		Run 2		Run 3		
Test Date	-	-	6/10/2015		6/10/2015		6/10/2015		
Test Period	-	-	825 - 1421		1510 - 1719		1755 - 2003		
Run Time	Θ	min	120		120		120		
Oxygen Concentration, % dry	O ₂ %	%	19.45		19.38		19.38		
Dry Volumetric Flowrate at Standard Conditions	Qd	dscfm	177,593		179,497		176,642		
Meter Volume at Standard Conditions	Vmstd	cubic feet	86.92		88.73		87.77		
Sample Loadings (From Lab Results)									
			Front Half	Back Half	Front Half	Back Half	Front Half	Back Half	
Mercury ⁽¹⁾	MHg _m MHg _{bh}	µg	< 0.1	6.445	< 0.1	7.615	< 0.1	6.745	
Total Mercury ⁽²⁾	MHg _t	µg	6.545		7.715		6.845		
Calculated Data	Symbol	Units	Run 1		Run 2		Run 3		
Mercury Concentration: $C = MHg / (Vmstd)$									
Front Half (Filterable) Mercury	C _(HgFH)	µg/dscf	< 0.0012		< 0.0011		< 0.0011		
Back Half Mercury	C _(HgBH)	µg/dscf	0.0742		0.0858		0.0769		
Total Mercury Concentration	C _(Hg)	µg/dscf	0.0753		0.0870		0.0780		
Mercury Emission Rates: $E = MHg \times 2.2046 \times 10^{-9} \text{ lb/} \mu\text{g} / Vmstd\text{-ft}^3 \times Qd \times 60$									
Front Half (Filterable) Mercury	E _(HgFH)	lb/hr	< 0.000027		< 0.000027		< 0.000027		
Back Half Mercury	E _(HgBH)	lb/hr	0.00174		0.00204		0.00180		
Total Mercury	E _(Hg)	lb/hr	0.00177		0.00206		0.00182		

Note: The "<" sign indicates the mass is below method detection limits. All calculations use the detection limit for concentration and emission determinations.

(1) EPA Method 29 does not include calculations and/or specifications for blank correcting the front half and back half Hg mass independently, therefore the Total Mercury Mass may not necessarily be equal to (MHg_{fh}+MHg_{bh}).

Determination of Volumetric Air Flow Rate, Gas Composition, and Moisture Content

EPA Methods 2, 3, 4, 5, & 29

Pellet Indurating Furnace Line 1 (SV022)

Test 2

Performance Testing on June 10, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	6/10/2015	6/10/2015	6/10/2015
Test Period	-	-	825 - 1421	1510 - 1719	1755 - 2003
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	28.09	28.09	28.09
Stack Static Pressure	Pg	in. H ₂ O	-0.67	-0.67	-0.67
Average Stack Temperature	Tsf	degrees F	105	106	107
Actual Dry Gas Meter Volume	Vm	cubic feet	93.96	97.76	96.46
Dry Gas Meter Calibration Factor	Y	-	0.9906	0.9906	0.9906
Average Orifice Meter Pressure Drop	DH	in H ₂ O	1.96	2.04	1.98
Average Meter Temperature	Tmf	degrees F	73	84	82
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) ^{0.5}	-	1.005	1.016	1.001
Volume of Water Vapor Condensed in Impingers	Vwc	ml	123	121	125
Mass of Water Vapor Collected in Desiccant	Vwsg	g	19	22	20
Orsat Results, Dry Basis					
Oxygen	%O ₂	%v/v	19.5	19.4	19.4
Carbon Dioxide	%CO ₂	%v/v	0.56	0.56	0.52
Nitrogen + Carbon Monoxide	%N ₂ + %CO	%v/v	80.0	80.1	80.1
Nozzle Diameter	Dn	inches	0.213	0.213	0.213
Run Time	theta	minutes	120	120	120
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature Tsr = Tsf + 460	Tsr	degrees R	565	566	567
Stack Pressure Ps = Pbar + Pg / 13.6	Ps	in. Hg	28.04	28.04	28.04
Duct Area A = 3.14 x D ² / (4 x 144) or A = L x W / 144	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions Vmstd = 17.64 x Vm x Y x ((Pbar + (DH / 13.6)) / (Tmf + 460))	Vmstd	cubic feet	86.92	88.73	87.77
Average Moisture Content of Stack Gas MC = ((0.04707 x Vwc + 0.04715 x Vwsg) / ((0.04707 x Vwc + 0.04715 x Vwsg) + (Vmstd)) x 100	MC	% Vol	7.13	7.04	7.20
Molecular Weight of Stack Gas, dry Md = (0.44 x %CO ₂) + (0.32 x %O ₂) + (0.28 x (%N ₂ + %CO))	Md	lb/lbmol	28.87	28.86	28.86
Molecular Weight of Stack Gas, wet Ms = Md x (1 - (MC/100)) + 18 x (MC/100)	Ms	lb/lbmol	28.09	28.10	28.08
Average Stack Gas Velocity Vs = 85.49 x Cp x (dP) ^{0.5} x ((Tsr/(Ps x Ms)) ^{0.5})	Vs	ft/sec	61.09	61.83	61.01
Actual Volumetric Air Flow Rate Qa = 60 x Vs x A	Qa	acfm	218,317	220,972	218,017
Volumetric Air Flow Rate at Standard Conditions Qs = Qa x (528 / (Ts + 460)) x (Ps / 29.92)	Qs	scfm	191,234	193,089	190,353
Dry Volumetric Air Flow Rate at Standard Conditions Qd = Qa x (1 - (MC / 100)) x (528 / Tsr) x (Ps / 29.92)	Qd	dscfm	177,593	179,497	176,642
Nozzle Cross-Sectional Area An = (3.14 x Dn ²) / (4 x 144)	An	sq. ft	0.000247	0.000247	0.000247
Isokinetic Variation I = (0.0945 x Tsr x Vmstd) / (Ps x Vs x An x theta x (1 - (MC / 100)))	I	%	98.2	99.2	99.7

Determination of Metals Emissions
EPA Method 29

Pellet Indurating Furnace Line 1 (SV023)
Test 3
Performance Testing on June 9, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3			
Test Date	-	-	6/9/2015	6/9/2015	6/9/2015			
Test Period	-	-	825 - 1033	1155 - 1420	1525 - 1744			
Run Time	Θ	min	120	120	120			
Oxygen Concentration, % dry	O ₂ %	%	19.37	19.41	19.34			
Dry Volumetric Flowrate at Standard Conditions	Qd	dscfm	164,662	161,357	156,997			
Meter Volume at Standard Conditions	Vmstd	cubic feet	88.54	87.22	84.14			
Sample Loadings (From Lab Results)								
			Front Half	Back Half	Front Half	Back Half	Front Half	Back Half
Mercury ⁽¹⁾	MHg _m MHg _{bh}	µg	< 0.1	5.838	< 0.1	8.417	< 0.1	9.571
Total Mercury ⁽²⁾	MHg _t	µg	5.938		8.517		9.671	
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3			
Mercury Concentration: $C = MHg / (Vmstd)$								
Front Half (Filterable) Mercury	C _(HgFH)	µg/dscf	< 0.0011	< 0.0011	< 0.0012			
Back Half Mercury	C _(HgBH)	µg/dscf	0.0659	0.0965	0.1137			
Total Mercury Concentration	C _(Hg)	µg/dscf	0.0671	0.0977	0.1149			
Mercury Emission Rates: $E = MHg \times 2.2046 \times 10^{-9} \text{ lb/}\mu\text{g} / Vmstd\text{-ft}^3 \times Qd \times 60$								
Front Half (Filterable) Mercury	E _(HgFH)	lb/hr	< 0.000025	< 0.000024	< 0.000025			
Back Half Mercury	E _(HgBH)	lb/hr	0.0014	0.0021	0.0024			
Total Mercury	E _(Hg)	lb/hr	0.0015	0.0021	0.0024			

Note: The "<" sign indicates the mass is below method detection limits. All calculations use the detection limit for concentration and emission determinations.

(1) EPA Method 29 does not include calculations and/or specifications for blank correcting the front half and back half Hg mass independently, therefore the Total Mercury Mass may not necessarily be equal to (MHg_{fh}+MHg_{bh}).

Determination of Volumetric Air Flow Rate, Gas Composition, and Moisture Content

EPA Methods 2, 3, 4, 5, & 29

Pellet Indurating Furnace Line 1 (SV023)

Test 3

Performance Testing on June 9, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	6/9/2015	6/9/2015	6/9/2015
Test Period	-	-	825 - 1033	1155 - 1420	1525 - 1744
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	28.06	28.06	28.06
Stack Static Pressure	Pg	in. H ₂ O	-0.65	-0.65	-0.65
Average Stack Temperature	Tsf	degrees F	115	117	117
Actual Dry Gas Meter Volume	Vm	cubic feet	96.39	96.59	94.68
Dry Gas Meter Calibration Factor	Y	-	0.992	0.992	0.992
Average Orifice Meter Pressure Drop	DH	in H ₂ O	1.99	1.93	1.85
Average Meter Temperature	Tmf	degrees F	77	87	95
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) ^{0.5}	-	0.958	0.938	0.914
Volume of Water Vapor Condensed in Impingers	Vwc	ml	170	163	155
Mass of Water Vapor Collected in Desiccant	Vwsg	g	21	19	23
Orsat Results, Dry Basis					
Oxygen	%O ₂	%v/v	19.4	19.4	19.3
Carbon Dioxide	%CO ₂	%v/v	0.57	0.59	0.62
Nitrogen + Carbon Monoxide	%N ₂ + %CO	%v/v	80.1	80.0	80.0
Nozzle Diameter	Dn	inches	0.222	0.222	0.222
Run Time	theta	minutes	120	120	120
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature Tsr = Tsf + 460	Tsr	degrees R	575	577	577
Stack Pressure Ps = Pbar + Pg / 13.6	Ps	in. Hg	28.01	28.01	28.01
Duct Area A = 3.14 x D ² / (4 x 144) or A = L x W / 144	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions Vmstd = 17.64 x Vm x Y x ((Pbar + (DH / 13.6)) / (Tmf + 460))	Vmstd	cubic feet	88.54	87.22	84.14
Average Moisture Content of Stack Gas MC = ((0.04707 x Vwc + 0.04715 x Vwsg) / ((0.04707 x Vwc + 0.04715 x Vwsg) + (Vmstd)) x 100	MC	% Vol	9.24	8.95	9.04
Molecular Weight of Stack Gas, dry Md = (0.44 x %CO ₂) + (0.32 x %O ₂) + (0.28 x (%N ₂ + %CO))	Md	lb/lbmol	28.87	28.87	28.87
Molecular Weight of Stack Gas, wet Ms = Md x (1 - (MC/100)) + 18 x (MC/100)	Ms	lb/lbmol	27.86	27.90	27.89
Average Stack Gas Velocity Vs = 85.49 x Cp x (dP) ^{0.5} x ((Tsr/(Ps x Ms)) ^{0.5})	Vs	ft/sec	59.02	57.92	56.39
Actual Volumetric Air Flow Rate Qa = 60 x Vs x A	Qa	acfm	210,927	206,983	201,515
Volumetric Air Flow Rate at Standard Conditions Qs = Qa x (528 / (Ts + 460)) x (Ps / 29.92)	Qs	scfm	181,428	177,226	172,606
Dry Volumetric Air Flow Rate at Standard Conditions Qd = Qa x (1 - (MC / 100)) x (528 / Tsr) x (Ps / 29.92)	Qd	dscfm	164,662	161,357	156,997
Nozzle Cross-Sectional Area An = (3.14 x Dn ²) / (4 x 144)	An	sq. ft	0.000269	0.000269	0.000269
Isokinetic Variation I = (0.0945 x Tsr x Vmstd) / (Ps x Vs x An x theta x (1 - (MC / 100)))	I	%	99.4	99.9	99.0

Determination of Metals Emissions
EPA Method 29

Pellet Indurating Furnace Line 1 (SV024)
Test 4
Performance Testing on June 10, 2015

Performance Testing on June 10, 2015								
Input Data	Symbol	Units	Run 1		Run 2		Run 3	
Test Date	-	-	6/10/2015		6/10/2015		6/10/2015	
Test Period	-	-	825 - 1421		1510 - 1719		1755 - 2003	
Run Time	Θ	min	120		120		120	
Oxygen Concentration, % dry	O ₂ %	%	19.33		19.25		19.25	
Dry Volumetric Flowrate at Standard Conditions	Qd	dscfm	142,555		144,059		147,747	
Meter Volume at Standard Conditions	Vmstd	cubic feet	76.92		77.78		79.34	
Sample Loadings (From Lab Results)								
			Front Half	Back Half	Front Half	Back Half	Front Half	Back Half
Mercury ⁽¹⁾	MHg _m MHg _{bh}	µg	< 0.1	8.105	< 0.1	8.535	< 0.1	6.065
Total Mercury ⁽²⁾	MHg _t	µg	8.205		8.635		6.165	
Calculated Data	Symbol	Units	Run 1		Run 2		Run 3	
Mercury Concentration: $C = MHg / (Vmstd)$								
Front Half (Filterable) Mercury	C _(HgFH)	µg/dscf	< 0.0013		< 0.0013		< 0.0013	
Back Half Mercury	C _(HgBH)	µg/dscf	0.105		0.110		0.076	
Total Mercury Concentration	C _(Hg)	µg/dscf	0.107		0.111		0.078	
Mercury Emission Rates: $E = MHg \times 2.2046 \times 10^{-9} \text{ lb/}\mu\text{g} / Vmstd\text{-ft}^3 \times Qd \times 60$								
Front Half (Filterable) Mercury	E _(HgFH)	lb/hr	< 0.000025		< 0.000024		< 0.000025	
Back Half Mercury	E _(HgBH)	lb/hr	0.00199		0.00209		0.00149	
Total Mercury	E _(Hg)	lb/hr	0.00201		0.00212		0.00152	

Note: The "<" sign indicates the mass is below method detection limits. All calculations use the detection limit for concentration and emission determinations.

(1) EPA Method 29 does not include calculations and/or specifications for blank correcting the front half and back half Hg mass independently, therefore the Total Mercury Mass may not necessarily be equal to (MHg_{fh}+MHg_{bh}).

Determination of Volumetric Air Flow Rate, Gas Composition, and Moisture Content

EPA Methods 2, 3, 4, 5, & 29

Pellet Indurating Furnace Line 1 (SV024)

Test 4

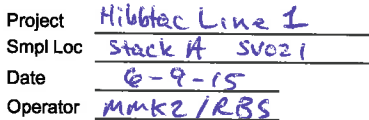
Performance Testing on June 10, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	6/10/2015	6/10/2015	6/10/2015
Test Period	-	-	825 - 1421	1510 - 1719	1755 - 2003
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	28.09	28.09	28.09
Stack Static Pressure	Pg	in. H ₂ O	-0.47	-0.47	-0.47
Average Stack Temperature	Tsf	degrees F	115	116	115
Actual Dry Gas Meter Volume	Vm	cubic feet	84.28	86.24	87.33
Dry Gas Meter Calibration Factor	Y	-	0.992	0.992	0.992
Average Orifice Meter Pressure Drop	DH	in H ₂ O	1.49	1.55	1.62
Average Meter Temperature	Tmf	degrees F	81	87	83
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) ^{0.5}	-	0.833	0.845	0.866
Volume of Water Vapor Condensed in Impingers	Vwc	ml	162	169	175
Mass of Water Vapor Collected in Desiccant	Vwsg	g	16	16	16
Orsat Results, Dry Basis					
Oxygen	%O ₂	%v/v	19.3	19.3	19.3
Carbon Dioxide	%CO ₂	%v/v	0.69	0.68	0.66
Nitrogen + Carbon Monoxide	%N ₂ + %CO	%v/v	80.0	80.1	80.1
Nozzle Diameter	Dn	inches	0.222	0.222	0.222
Run Time	theta	minutes	120	120	120
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature Tsr = Tsf + 460	Tsr	degrees R	575	576	575
Stack Pressure Ps = Pbar + Pg / 13.6	Ps	in. Hg	28.06	28.06	28.06
Duct Area A = 3.14 x D ² / (4 x 144) or A = L x W / 144	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions Vmstd = 17.64 x Vm x Y x ((Pbar + (DH / 13.6)) / (Tmf + 460))	Vmstd	cubic feet	76.92	77.78	79.34
Average Moisture Content of Stack Gas MC = ((0.04707 x Vwc + 0.04715 x Vwsg) / ((0.04707 x Vwc + 0.04715 x Vwsg) + (Vmstd)) x 100	MC	% Vol	9.80	10.04	10.14
Molecular Weight of Stack Gas, dry Md = (0.44 x %CO ₂) + (0.32 x %O ₂) + (0.28 x (%N ₂ + %CO))	Md	lb/lbmol	28.88	28.88	28.88
Molecular Weight of Stack Gas, wet Ms = Md x (1 - (MC/100)) + 18 x (MC/100)	Ms	lb/lbmol	27.82	27.79	27.77
Average Stack Gas Velocity Vs = 85.49 x Cp x (dP) ^{0.5} x ((Tsr/(Ps x Ms)) ^{0.5})	Vs	ft/sec	51.34	52.12	53.46
Actual Volumetric Air Flow Rate Qa = 60 x Vs x A	Qa	acfm	183,453	186,274	191,030
Volumetric Air Flow Rate at Standard Conditions Qs = Qa x (528 / (Ts + 460)) x (Ps / 29.92)	Qs	scfm	158,040	160,145	164,412
Dry Volumetric Air Flow Rate at Standard Conditions Qd = Qa x (1 - (MC / 100)) x (528 / Tsr) x (Ps / 29.92)	Qd	dscfm	142,555	144,059	147,747
Nozzle Cross-Sectional Area An = (3.14 x Dn ²) / (4 x 144)	An	sq. ft	0.000269	0.000269	0.000269
Isokinetic Variation I = (0.0945 x Tsr x Vmstd) / (Ps x Vs x An x theta x (1 - (MC / 100)))	I	%	99.7	99.8	99.2

Appendix B

Field Data Sheets

EPA METHOD 2 FIELD DATA SHEET



Meter y 0.9906 Bar. Pres 28.06 in Hg
 ΔH @ 1.9182 Stat. Pres 0.70 in H₂O
 Cp 0.84 Probe Length 10 ft
 P 16 Liner Type: ☒ Glass ☐ S.S. ☐ Other

Sample Train Leak Rate (cfm)			
Run 1		Run 2	
Pretest	0.00 at 10 in Hg	Pretest	0.00 at 10 in Hg
Posttest	0.00 at 7 in Hg	Posttest	0.00 at 10 in Hg
Pilot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input checked="" type="checkbox"/>	Pilot (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			
A-	6	5	488.99	0.93	1.82	3.5	104	250	250	57	67	67	584.19	0.80	1.59	5.0	101	250	250	60	73	74
	6	10	492.79	0.93	1.82	3.5	104	251	251	52	70	68	587.69	0.80	1.59	5.0	103	251	250	58	75	75
	5	15	496.56	1.00	1.96	4.0	105	250	251	52	73	69	591.07	0.94	1.88	6.0	101	250	250	55	78	75
	5	20	500.49	1.00	1.97	4.0	104	250	250	52	74	70	594.85	0.94	1.88	6.0	100	252	250	57	81	76
	4	25	504.40	1.10	2.17	4.0	103	248	249	52	75	70	598.69	1.00	2.01	7.0	101	248	250	59	83	77
	4	30	508.53	1.10	2.17	4.0	104	249	248	52	76	71	602.68	1.00	2.02	7.0	99	251	249	41	84	79
	3	35	512.70	1.15	2.28	4.5	104	244	247	53	76	71	606.72	1.10	2.23	7.5	99	249	250	60	86	80
	3	40	516.93	1.15	2.28	4.5	102	251	251	53	77	72	610.95	1.10	2.21	7.5	100	250	249	61	86	81
	2	45	521.16	1.10	2.18	4.5	103	250	253	54	77	72	615.11	1.10	2.20	7.5	102	251	250	61	87	82
	2	50	525.35	1.10	2.18	4.5	103	250	249	55	77	72	619.50	1.10	2.21	7.5	102	249	249	62	88	83
	1	55	529.50	0.89	1.77	3.5	103	250	251	55	78	73	623.75	0.80	1.61	5.5	101	250	250	61	88	83
	1	60	533.31	0.86	1.71	3.5	102	250	250	56	78	73	627.46	0.79	1.59	5.5	100	249	250	62	87	84
B-	6	65	537.01	0.83	1.65	3.5	104	250	249	57	73	72	630.88	0.88	1.80	6.0	102	249	249	65	84	84
	6	70	540.71	0.82	1.62	3.5	104	250	250	54	76	72	634.61	0.89	1.81	6.0	103	250	250	58	85	84
	5	75	544.27	0.91	1.81	3.5	103	249	250	56	76	72	638.40	0.89	1.81	6.0	103	250	251	56	86	84
	5	80	548.05	0.97	1.92	4.0	104	250	250	56	77	73	642.42	1.10	2.24	7.5	102	249	250	56	87	84
	4	85	551.87	1.00	1.99	4.0	103	249	249	57	77	73	646.50	1.00	2.04	7.0	102	251	251	58	88	85
	4	90	555.03	1.00	1.98	4.0	104	251	252	58	78	73	650.70	0.98	2.00	7.0	103	250	250	58	88	84
	3	95	559.82	1.00	1.98	4.0	104	251	252	58	78	73	654.75	0.98	2.00	7.0	103	250	250	58	88	84
	3	95	563.97	1.10	2.28	4.5	104	250	249	59	78	73	658.99	1.10	2.25	7.5	102	249	250	58	88	84
	3	100	568.13	1.10	2.19	4.5	103	251	251	59	77	73	663.25	1.10	2.25	7.5	101	251	252	59	87	84
	2	105	572.29	1.10	2.18	4.5	104	250	250	62	78	74	667.62	1.10	2.25	7.5	101	248	249	59	87	84
	2	110	576.44	1.10	2.19	4.5	104	250	251	63	78	74	671.65	1.10	2.25	7.5	101	249	249	60	87	84
	1	115	580.18	0.89	1.77	4.0	103	248	249	63	78	74	675.42	0.83	1.61	5.5	100	250	250	61	87	85
1	120	583.86	0.86	1.72	3.5	102	252	251	64	78	74	679.05	0.81	1.60	6.0	100	250	250	61	86	84	
Σ=		Vm=9487	ΔP=1.98			Ts=93.46						Tm=73.96	Vm=94.86	ΔP=1.98					Ts=101.21			Tm=83.23

	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	67	19.8	7.0	825	1033	A-R1	10L	0.0	4Q0506	Glass	0.213	216.250	177.084
Run 2	74	19.8	7.0	1155	1220	A-R2	10L	0.0	4Q0507	Glass	0.213	213.439	174.877

Nozzle Calibration	
Tech. <u>MARK2</u>	Date <u>6-9-15</u>
Nozzle No. <u>Glass</u>	
1	0.213
2	0.212
3	0.214

MOISTURE RECOVERY:								
Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	754.5	806.9	761.0	684.1	810.0	808.0	925.9	
Initial wt., g	699.8	765.1	751.5	681.1	809.8	807.3	905.3	
Difference	54.7	41.8	9.5	0	0.2	0.7	20.6	132.5

Empty HNO ₃ → Empty RUN 2 ← KMnO ₄							3
1	2	3	4	5	6	Desiccant	Total
765.8	839.7	773.1	773.1	679.5	782.8	961.0	
693.9	801.7	767.1	767.1	677.6	782.8	940.7	
71.9	38.0	6.0	6.0	1.9	0.0	20.3	
							137.2



EPA METHOD 29
FIELD DATA SHEET

Project Habitat Line 1
Smpl Loc Stack A Svc 1
Date 6-9-15
Operator MWK2/ABS

Test No. 1
CM C-8

Runs 3
Pitot No. 10-4
SM

Meter y 0.9906
 ΔH @ 1.9182
Cp 0.84
P

Bar. Pres 28.06 in Hg
Stat. Pres -0.70 in H₂O
Probe Length 10 ft
Liner Type: ☒ Glass ☐ S.S. ☐ Other

Sample Train Leak Rate (cfm)			
Run 3 <u>10</u>		Run 4	
Pretest <u>0.00</u>	at <u>15</u> in Hg	Pretest	at 15 in Hg
Posttest <u>0.00</u>	at <u>15</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"/>	

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		
A-	6	5	678.44																		
	6	10	683.23	0.87	1.77	4.0	105	251	250	65	87	87									
	6	15	682.08	0.88	1.79	4.0	105	251	250	64	89	88									
	5	20	690.97	1.00	2.04	4.5	106	251	250	66	91	89									
	5	25	695.22	1.10	2.25	4.5	105	251	250	66	91	89									
	4	30	699.47	1.10	2.25	4.5	105	249	250	66	93	89									
	4	35	703.77	1.10	2.26	5.0	105	250	250	66	93	90									
	3	40	708.07	1.10	2.25	5.0	106	249	248	66	94	91									
	3	45	712.38	1.10	2.26	5.0	106	249	249	66	94	92									
	2	50	716.72	1.10	2.26	5.0	106	249	251	64	94	92									
B-	2	55	721.00	1.10	2.26	5.0	106	251	252	64	95	92									
	1	60	724.87	0.88	1.81	4.0	105	251	250	63	95	93									
	1	65	728.68	0.87	1.79	4.0	106	252	253	64	95	93									
	6	70	732.34	0.80	1.64	4.0	105	251	250	60	94	94									
	6	75	735.88	0.80	1.64	4.0	106	250	250	61	95	95									
	5	80	739.90	0.94	1.93	4.0	106	250	250	61	95	95									
	5	85	743.74	0.94	1.93	4.0	105	250	250	62	97	96									
	4	90	747.79	1.00	2.06	4.5	105	249	250	63	98	96									
	4	95	751.92	1.00	2.06	4.5	106	248	249	64	99	97									
	3	100	756.16	1.10	2.27	5.0	106	248	250	61	99	97									
Σ=			Vm=7.06		ΔH =2.03	Ts=105.15					Tm=94.67										

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	87	19.8	6.7	1525	1744	A-23	102	0.0	440508	Glass	0.213	215.318	175.265
Run 2													

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	See H-2
2	
3	

MOISTURE RECOVERY:		RUN 3							
Impinger		1	2	3	4	5	6	Desiccant	Total
Final wt., g	760.3	813.7	764.2	686.2	817.8	816.4	910.9		
Initial wt., g	688.6	770.2	755.2	684.7	818.2	816.4	891.9		
Difference	61.7	43.5	9	1.5	-0.4	0.0	19		134.3

RUN 4							
1	2	3	4	5	6	Desiccant	Total



EPA METHOD 5 - FIELD DATA SHEET - RUN 1

Project	Hibbing Taconite Company	Meter ID	C-8	Probe ID	10-4	Bar.Press.	28.06	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV021	Meter Y	0.9906	Pitot Tube No.	10-4	Stat Press.	-0.70	in. H ₂ O	Pretest 0.000 at 10 in. Hg
Date	06/09/15	Orifice dH@	1.9182	Pitot Cp	0.84				Posttest 0.000 at 7 in. Hg
Test	1	Run #	1	Liner Type:	Glass				Pretest Pitot leak Check Pos Pass @ >3" w.c
Operators	MMK2 /RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	0825	488.99												
1	5.0	492.79	0.930	1.82	3.74	492.73	*	104	*	*	*	67	67	7.0
2	10.0	496.56	0.930	1.82	3.74	496.46	*	104	*	*	*	70	68	7.0
3	15.0	500.49	1.000	1.96	3.89	500.35	*	105	*	*	*	73	69	7.0
4	20.0	504.40	1.000	1.97	3.90	504.25	*	104	*	*	*	74	70	7.0
5	25.0	508.53	1.100	2.17	4.11	508.36	*	103	*	*	*	75	70	7.0
6	30.0	512.70	1.100	2.17	4.11	512.47	*	104	*	*	*	76	71	7.0
7	35.0	516.93	1.150	2.28	4.21	516.67	*	104	*	*	*	76	71	7.0
8	40.0	521.16	1.150	2.28	4.21	520.89	*	102	*	*	*	77	72	7.0
9	45.0	525.35	1.100	2.18	4.13	525.01	*	103	*	*	*	77	72	7.0
10	50.0	529.50	1.100	2.18	4.13	529.14	*	103	*	*	*	77	72	7.0
11	55.0	533.31	0.890	1.77	3.71	532.85	*	103	*	*	*	78	73	7.0
12	60.0	537.01	0.860	1.71	3.66	536.50	*	102	*	*	*	78	73	7.0
13	65.0	540.71	0.830	1.65	3.59	540.09	*	104	*	*	*	73	72	7.0
14	70.0	544.27	0.820	1.62	3.55	543.64	*	104	*	*	*	76	72	7.0
15	75.0	548.05	0.910	1.81	3.75	547.39	*	103	*	*	*	76	72	7.0
16	80.0	551.87	0.970	1.92	3.87	551.25	*	104	*	*	*	77	73	7.0
17	85.0	555.03	1.000	1.99	3.94	555.19	*	103	*	*	*	77	73	7.0
18	90.0	559.80	1.000	1.98	3.93	559.12	*	104	*	*	*	78	73	7.0
19	95.0	563.97	1.100	2.18	4.13	563.25	*	104	*	*	*	78	73	7.0
20	100.0	568.13	1.100	2.19	4.13	567.39	*	103	*	*	*	77	73	7.0
21	105.0	572.29	1.100	2.18	4.13	571.51	*	104	*	*	*	78	74	7.0
22	110.0	576.44	1.100	2.19	4.13	575.64	*	104	*	*	*	78	74	7.0
23	115.0	580.18	0.890	1.77	3.72	579.37	*	103	*	*	*	78	74	7.0
24	120.0	583.86	0.860	1.72	3.66	583.03	*	102	*	*	*	78	74	7.0
End Time	1033													
Run Time	120		Avg DH=	1.98			Avg Ts=	103.46				Avg Tm=	73.90	

Integrated Gas Sampling Data :

Bag No.	A-R1	Filter No.	4Q0506
Bag Vol.	10 liters	Nozzle No.	Glass
Leak Rate	0.0 cc/min	Nozzle Dn.	0.213

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	755	807	761	684	810	808	926	
Initial wt., g	695	765	752	684	810	807	905	
Difference	59.7	41.8	9.5	0	0.2	0.7	20.6	132.5

* Data Recorded on Field Data Sheet



EPA METHOD 5 - FIELD DATA SHEET - RUN 2

Project	Hibbing Taconite Company	Meter ID	C-8	Probe ID	10-4	Bar.Press.	28.06	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV021	Meter Y	0.9906	Pitot Tube No.	10-4	Stat Press.	-0.70	in. H ₂ O	Pretest 0.000 at 10 in. Hg
Date	06/09/15	Orifice dH@	1.9182	Pitot Cp	0.84				Posttest 0.000 at 10 in. Hg
Test	1	Run #	2	Liner Type:	Glass				Pretest Pitot leak Check Pos Pass @ >3" w.c
Operators	MMK2 /RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1155	584.19												
1	5.0	587.69	0.800	1.59	3.52	587.71	*	101	*	*	*	73	74	7.0
2	10.0	591.07	0.800	1.59	3.51	591.22	*	103	*	*	*	75	75	7.0
3	15.0	594.85	0.940	1.88	3.82	595.05	*	101	*	*	*	78	75	7.0
4	20.0	598.69	0.940	1.88	3.84	598.88	*	100	*	*	*	81	76	7.0
5	25.0	602.68	1.000	2.01	3.97	602.85	*	101	*	*	*	83	77	7.0
6	30.0	606.72	1.000	2.02	3.99	606.84	*	99	*	*	*	84	79	7.0
7	35.0	610.95	1.100	2.23	4.19	611.04	*	99	*	*	*	86	80	7.0
8	40.0	615.11	1.100	2.21	4.18	615.21	*	100	*	*	*	86	81	7.6
9	45.0	619.50	1.100	2.20	4.17	619.38	*	102	*	*	*	87	82	7.6
10	50.0	623.75	1.100	2.21	4.18	623.56	*	102	*	*	*	88	83	7.6
11	55.0	627.46	0.800	1.61	3.57	627.14	*	101	*	*	*	88	83	7.6
12	60.0	630.88	0.790	1.59	3.55	630.69	*	100	*	*	*	87	84	7.6
13	65.0	634.61	0.880	1.80	3.78	634.47	*	102	*	*	*	84	84	6.7
14	70.0	638.40	0.890	1.81	3.79	638.26	*	103	*	*	*	85	84	6.7
15	75.0	642.42	1.100	2.24	4.22	642.48	*	102	*	*	*	86	84	6.7
16	80.0	646.50	1.000	2.04	4.03	646.51	*	102	*	*	*	87	84	6.7
17	85.0	650.70	1.100	2.24	4.22	650.73	*	103	*	*	*	88	85	6.7
18	90.0	654.75	0.980	2.00	3.99	654.73	*	103	*	*	*	88	84	6.7
19	95.0	658.99	1.100	2.25	4.23	658.96	*	102	*	*	*	88	84	6.7
20	100.0	663.25	1.100	2.25	4.24	663.19	*	101	*	*	*	87	84	6.7
21	105.0	667.62	1.100	2.25	4.23	667.42	*	101	*	*	*	87	84	6.7
22	110.0	671.65	1.100	2.25	4.23	671.65	*	101	*	*	*	87	84	6.7
23	115.0	675.42	0.830	1.70	3.68	675.33	*	100	*	*	*	87	85	6.7
24	120.0	679.05	0.810	1.66	3.64	678.97	*	100	*	*	*	86	84	6.7
End Time	1420													
Run Time	120		Avg DH=	1.98			Avg Ts=	101.21				Avg Tm=	83.23	

Integrated Gas Sampling Data :

Bag No.	A-R2	Filter No.	4Q0507
Bag Vol.	10 liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.213

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	766	840	773	700	773	783	961	
Initial wt., g	694	802	767	698	774	783	941	
Difference	71.9	38	6	1.9	-1.1	0	20.3	137

* Data Recorded on Field Data Sheet



EPA METHOD 5 - FIELD DATA SHEET - RUN 3

Project	Hibbing Taconite Company	Meter ID	C-8	Probe ID	10-4	Bar.Press.	28.06	in. Hg	Sample Train Leak	Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV021	Meter Y	0.9906	Pitot Tube No.	10-4	Stat Press.	-0.70	in. H2O	Pretest	0.000 at 10 in. Hg
Date	06/09/15	Orifice dH@	1.9182	Pitot Cp	0.84				Posttest	0.000 at 7 in. Hg
Test	1	Run #	3	Liner Type:	Glass				Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	MMK2 /RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1525													
1	5.0	683.23	0.870	1.77	3.76	683.20	*	105	*	*	*	87	87	6.7
2	10.0	687.03	0.880	1.79	3.78	686.98	*	105	*	*	*	89	88	6.7
3	15.0	690.97	1.000	2.04	4.04	691.01	*	106	*	*	*	91	89	6.7
4	20.0	695.22	1.100	2.25	4.25	695.26	*	105	*	*	*	91	89	6.7
5	25.0	699.47	1.100	2.25	4.25	699.51	*	105	*	*	*	93	89	6.7
6	30.0	703.77	1.100	2.26	4.26	703.77	*	105	*	*	*	93	90	6.7
7	35.0	708.07	1.100	2.25	4.26	708.02	*	106	*	*	*	94	91	6.7
8	40.0	712.38	1.100	2.26	4.26	712.29	*	106	*	*	*	94	92	6.7
9	45.0	716.72	1.100	2.26	4.27	716.56	*	106	*	*	*	94	92	6.7
10	50.0	721.00	1.100	2.26	4.27	720.82	*	106	*	*	*	95	92	6.7
11	55.0	724.87	0.880	1.81	3.82	724.65	*	105	*	*	*	95	93	6.7
12	60.0	728.69	0.870	1.79	3.80	728.45	*	106	*	*	*	95	93	6.7
13	65.0	732.34	0.800	1.64	3.64	732.09	*	105	*	*	*	94	94	7.0
14	70.0	735.98	0.800	1.64	3.63	735.72	*	106	*	*	*	95	95	7.0
15	75.0	739.80	0.940	1.93	3.95	739.67	*	106	*	*	*	95	95	7.0
16	80.0	743.74	0.940	1.93	3.95	743.62	*	105	*	*	*	97	96	7.0
17	85.0	747.79	1.000	2.06	4.09	747.71	*	105	*	*	*	98	96	7.0
18	90.0	751.92	1.000	2.06	4.09	751.79	*	106	*	*	*	99	97	7.0
19	95.0	756.16	1.100	2.27	4.29	756.08	*	106	*	*	*	99	97	7.0
20	100.0	760.46	1.100	2.26	4.29	760.37	*	107	*	*	*	100	97	7.0
21	105.0	764.73	1.100	2.27	4.30	764.67	*	106	*	*	*	101	98	7.0
22	110.0	768.99	1.100	2.27	4.30	768.97	*	107	*	*	*	102	99	7.0
23	115.0	772.87	0.830	1.72	3.74	772.71	*	107	*	*	*	102	100	7.0
24	120.0	776.50	0.780	1.62	3.63	776.35	*	106	*	*	*	102	100	7.0
End Time	1744													
Run Time	120		Avg DH=	2.03			Avg Ts=	105.75				Avg Tm=	94.67	

Integrated Gas Sampling Data :

Bag No.	A-R2	Filter No.	4Q0508
Bag Vol.	10 liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.213

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	760	814	764	686	818	816	911	
Initial wt., g	699	770	755	685	818	816	892	
Difference	61.7	43.5	9	1.5	-0.4	0	19	134.3

* Data Recorded on Field Data Sheet



EPA METHOD 3A -- Instrument Analysis Data Sheet

Project HTC LINE 1 MACT
Sample Location(s): STACK A, 5V021
Test No: 1
Date: 6/9/15
Operators: SARZ, MMK2

Analyzer Make / Model / Serial No. CAI MODEL 200
Analyzer O₂ Range (span), %: 25
Analyzer CO₂ Range (span), %: 25

	Cylinder Serial No.	O ₂ Cert. Conc.	CO ₂ Cert. Conc.
Zero Gas	LOT # 1010KF14	0	0
O ₂ /CO ₂ Mid-range	CC 102877	10.02	9.98
O ₂ /CO ₂ High-range	CC 99473	22.49	9.91

PRETEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.00	0	0.00
Mid-range:	10.02	10.03	9.91	9.91
High-range:	22.49	22.49	9.98	9.90

Time of Calibration 20:00 to 20:07

INTEGRATED BAG ANALYSIS

Location/Test No.	<u>LINE 1 STACK A</u>		
Run No.	<u>1</u>	<u>2</u>	<u>3</u>
Time Sampled	<u>08:25-10:33</u>	<u>11:55-14:20</u>	<u>15:25-17:44</u>
Time Analyzed	<u>20:08</u>	<u>20:10</u>	<u>20:11</u>
O ₂ , %	<u>19.74</u>	<u>19.61</u>	<u>19.81</u>
CO ₂ , %	<u>0.54</u>	<u>0.55</u>	<u>0.46</u>

POSTTEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	-0.15	0	0.02
Mid-range:	10.02	10.00	9.91	9.79
High-range:	22.49	22.37	9.98	9.82



EPA METHOD 29
FIELD DATA SHEET

Project Hibbree Line 1
Smpl Loc Stack B SVO22
Date 6-10-15
Operator MURK2/RBS

Test No. 2

Runs 1-2

Pitot No. 10-4/10-6

CM C-8

SM

Meter y 0.9906
 ΔH @ 1.9182
Cp 0.84
P

Bar. Pres 28.09 in Hg
Stat. Pres -0.47 in H₂O
Probe Lngth 10 ft
Liner Type: ☒ Glass ☐ S.S. ☐ Other

Sample Train Leak Rate (cfm)			
Run 1 <u>10</u>		Run 2 <u>19</u>	
Pretest <u>0.00</u> at <u>15</u> in Hg		Pretest <u>0.00</u> at <u>15</u> in Hg	
Posttest <u>0.00</u> at <u>8</u> in Hg		Posttest <u>0.00</u> at <u>8</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"/>	

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		
A-	5	776.91										871.29									
	6	780.56	0.88	1.67	4.0	106	251	250	51	62	62	875.21	0.92	1.80	4.5	106	239	250	62	80	81
	10	784.12	0.90	1.71	4.0	106	250	250	48	65	63	878.89	0.90	1.77	4.5	105	241	252	60	81	81
	15	787.99	0.97	1.85	4.0	106	249	248	48	68	64	882.86	1.10	2.16	5.0	106	243	252	58	83	81
	20	791.83	1.00	1.91	4.5	107	251	252	49	69	64	887.01	1.10	2.16	5.0	106	247	252	59	84	82
	25	795.88	1.10	2.10	5.0	107	251	250	49	70	65	891.29	1.10	2.17	5.0	106	244	250	60	84	82
	30	799.96	1.10	2.11	5.0	106	251	251	50	72	66	895.48	1.10	2.17	5.0	106	249	251	62	85	82
	35	804.03	1.10	2.11	5.0	106	250	249	50	72	67	899.89	1.15	2.27	5.5	107	245	250	62	84	82
	40	808.08	1.10	2.12	5.0	105	249	250	52	73	68	904.05	1.15	2.26	5.0	107	247	251	63	85	82
	45	812.15	1.10	2.13	5.0	104	249	252	53	73	68	908.22	1.10	2.17	5.5	106	247	248	63	84	82
	50	816.25	1.10	2.13	5.0	104	250	249	53	73	69	912.35	1.10	2.17	5.5	106	242	250	64	85	82
	55	820.16	1.00	1.93	4.5	104	250	250	54	73	69	916.27	0.87	1.72	5.5	106	254	250	64	85	82
B-	60	824.05	1.00	1.94	4.5	103	251	249	54	72	69	920.08	0.87	1.72	5.0	106	251	251	65	86	83
	65	827.46	0.88	1.70	4.0	104	242	251	56	69	70	924.02	1.00	1.98	5.0	105	250	250	66	83	84
	70	831.23	0.80	1.55	4.0	103	244	249	55	71	70	927.98	0.94	1.95	5.0	106	250	250	62	84	84
	75	834.98	0.94	1.81	4.0	105	245	250	57	78	79	932.09	1.10	2.17	5.5	106	243	251	61	86	84
	80	838.73	0.92	1.80	4.0	105	248	250	52	79	79	936.30	1.10	2.17	5.5	107	251	250	61	86	84
	85	842.82	1.10	2.16	5.0	104	241	250	53	80	80	940.53	1.10	2.17	5.5	107	249	251	60	87	84
	90	846.92	1.10	2.16	5.0	104	246	252	54	80	79	944.77	1.10	2.18	5.5	106	249	250	61	87	84
	95	851.09	1.15	2.26	5.0	104	254	251	54	81	79	949.00	1.10	2.17	5.5	108	250	249	61	87	85
	100	855.26	1.15	2.25	5.0	106	251	250	54	82	80	953.23	1.10	2.18	5.5	107	249	249	61	85	84
	105	859.42	1.10	2.16	5.0	105	247	249	55	82	80	957.44	1.10	2.17	5.5	106	252	250	61	85	84
	110	863.50	1.10	2.16	5.0	105	250	250	55	82	80	961.65	1.10	2.17	5.5	107	250	250	62	85	84
	115	867.21	0.85	1.68	4.0	114	246	250	56	83	80	965.41	0.83	1.64	4.5	106	251	250	62	84	83
0=	120	870.87	0.85	1.67	4.0	105	246	250	56	82	80	969.05	0.80	1.58	4.5	107	250	251	63	84	83
		Vm=83.96	$\Delta H=1.96$			Ts=104.92					Tm=73.35	Vm=97.76	$\Delta H=2.04$			Ts=106.29					Tm=83.67

	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	62	19.6	8.0	825	1421	B-21	10L	0.000	400510	Glass	0.213	218.336	177.604
Run 2	80	19.6	8.0	1510	1719	B-22	10L	0.000	400511	Glass	0.213	220.975	179.500

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	See -
2	E-copy
3	

MOISTURE RECOVERY:	RUN 1							
	1	2	3	4	5	6	Desiccant	Total
Final wt., g	773.0	803.7	762.8	686.5	812.7	812.6	951.5	
Initial wt., g	698.6	765.9	755.0	684.5	812.4	812.4	932.6	
Difference	74.1	37.8	7.8	2.0	0.7	0.2	18.9	141.8

	RUN 2							
	1	2	3	4	5	6	Desiccant	Total
	773.6	801.3	778.0	702.5	768.6	778.1	959.8	
	697.8	801.9	769.0	700.5	770.1	778.1	917.8	
	75.8	35.4	9	2.0	-1.5	0	22	142.7



EPA METHOD 29
FIELD DATA SHEET

Project Hibbico Line 1
Smpl Loc Stack B SV022
Date 6-10-15
Operator MMK2/RBS

Test No. 2
CM C-8

Runs 3
Pitot No. 10-4
SM -

Meter y 0.9906
 ΔH @ 1.9182
Cp 0.84
P -

Bar. Pres 28.09 in Hg
Stat. Pres -0.67 in H₂O
Probe Length 10 ft
Liner Type: ☒ Glass ☐ S.S. ☐ Other

Sample Train Leak Rate (cfm)			
Run 3		Run 4	
Pretest	0.00 at 15 in Hg	Pretest	at 15 in Hg
Posttest	0.00 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				
A	6	5	969.54																				
			973.36	0.89	1.74	3.0	106	251	251	60	80	81											
	6	10	977.15	0.93	1.83	3.0	106	248	250	58	81	82											
	5	15	981.44	1.10	2.16	3.0	107	252	252	58	83	81											
	5	20	985.62	1.10	2.16	3.0	107	249	250	58	84	81											
	4	25	999.81	1.10	2.16	3.0	107	249	250	59	85	81											
	4	30	994.00	1.10	2.16	3.0	107	250	250	59	85	81											
	3	35	998.22	1.10	2.16	3.0	107	251	250	59	86	82											
	3	40	1002.45	1.10	2.17	3.0	107	250	251	59	85	82											
	2	45	1006.67	1.10	2.17	3.0	105	249	250	59	85	82											
2	50	1010.72	1.00	1.97	3.0	106	250	250	60	85	82												
1	55	1014.43	0.81	1.59	2.5	108	250	250	60	85	82												
B	1	60	1018.10	0.83	1.64	2.5	106	251	250	60	84	82											
	6	65	1021.83	0.86	1.69	3.0	107	250	249	57	79	80											
	6	70	1025.57	0.87	1.70	3.0	107	250	251	56	81	81											
	5	75	1029.42	0.94	1.85	3.0	106	250	250	57	83	80											
	5	80	1033.49	0.99	1.94	3.0	107	249	251	58	84	80											
	4	85	1037.64	1.10	2.16	3.0	107	249	250	58	84	80											
	4	90	1041.86	1.10	2.16	3.0	108	248	251	58	84	80											
	3	95	1046.13	1.15	2.26	3.5	107	250	250	59	85	80											
	3	100	1050.42	1.15	2.26	3.5	107	250	249	59	85	80											
	2	105	1054.63	1.10	2.16	3.5	107	250	249	58	84	80											
2	110	1058.93	1.10	2.16	3.5	107	250	250	58	84	80												
1	115	1062.43	0.80	1.57	2.5	107	249	249	59	84	80												
1	120	1066.47	0.83	1.63	2.5	106	249	250	58	84	80												
Σ=			Vm=16.46		$\Delta H=1.99$	Ts=106.75					Tm=82.27					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 3	8.0	19.6	8.0	1755	2003	B-R3	10 L	0.000	480512	Glass	0.213	217.797	176.625
Run 2													

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	See E.
2	Copy
3	

MOISTURE RECOVERY:		RUN 3							
Impinger		1	2	3	4	5	6	Desiccant	Total
Final wt., g		771.3	810.0	762.7	686.6	806.3	810.3	891.4	
Initial wt., g		099.1	768.7	752.8	685.2	806.3	810.2	871.6	
Difference		72.2	41.3	9.9	1.4	0	0.1	19.8	144.7

RUN 4							
1	2	3	4	5	6	Desiccant	Total



EPA METHOD 5 - FIELD DATA SHEET - RUN 1

Project	Hibbing Taconite Company	Meter ID	C-8	Probe ID	10-4	Bar.Press.	28.09	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV022	Meter Y	0.9906	Pitot Tube No.	10-4	Stat Press.	-0.7	in. H ₂ O	Pretest 0.000 at 10 in. Hg
Date	06/10/15	Orifice dH@	1.9182	Pitot Cp	0.84				Posttest 0.000 at 8 in. Hg
Test	2	Run #	1	Liner Type:	Glass				Pretest Pitot leak Check Pos Pass @ >3" w.c
Operators	MMK2 /RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	0825	776.91												
1	5.0	780.56	0.880	1.67	3.57	780.48	*	106	*	*	*	62	62	8.0
2	10.0	784.22	0.900	1.71	3.61	784.08	*	106	*	*	*	65	63	8.0
3	15.0	787.99	0.970	1.85	3.76	787.84	*	106	*	*	*	68	64	8.0
4	20.0	791.83	1.000	1.91	3.83	791.67	*	107	*	*	*	69	64	8.0
5	25.0	795.88	1.100	2.10	4.02	795.69	*	107	*	*	*	70	65	8.0
6	30.0	799.96	1.100	2.11	4.03	799.72	*	106	*	*	*	72	66	8.0
7	35.0	804.03	1.100	2.11	4.04	803.76	*	106	*	*	*	72	67	8.0
8	40.0	808.08	1.100	2.12	4.05	807.81	*	105	*	*	*	73	68	8.0
9	45.0	812.15	1.100	2.13	4.06	811.87	*	104	*	*	*	73	68	8.0
10	50.0	816.25	1.100	2.13	4.06	815.92	*	104	*	*	*	73	69	8.0
11	55.0	820.16	1.000	1.93	3.87	819.80	*	104	*	*	*	73	69	8.0
12	60.0	824.05	1.000	1.94	3.88	823.68	*	103	*	*	*	72	69	8.0
13	65.0	827.66	0.880	1.70	3.63	827.31	*	104	*	*	*	69	70	8.0
14	70.0	831.23	0.800	1.55	3.46	830.77	*	103	*	*	*	71	70	8.0
15	75.0	834.98	0.940	1.81	3.75	834.52	*	105	*	*	*	78	79	8.0
16	80.0	838.73	0.920	1.80	3.77	838.28	*	105	*	*	*	79	79	8.0
17	85.0	842.82	1.100	2.16	4.12	842.41	*	104	*	*	*	80	80	8.0
18	90.0	846.92	1.100	2.16	4.13	846.54	*	104	*	*	*	80	79	8.0
19	95.0	851.09	1.150	2.26	4.22	850.76	*	104	*	*	*	81	79	8.0
20	100.0	855.26	1.150	2.25	4.22	854.98	*	106	*	*	*	82	80	8.0
21	105.0	859.42	1.100	2.16	4.14	859.11	*	105	*	*	*	82	80	8.0
22	110.0	863.50	1.100	2.16	4.14	863.25	*	105	*	*	*	82	80	8.0
23	115.0	867.21	0.850	1.68	3.64	866.89	*	104	*	*	*	83	80	8.0
24	120.0	870.87	0.850	1.67	3.64	870.53	*	105	*	*	*	82	80	8.0
End Time	1421													
Run Time	120		Avg DH=	1.96			Avg Ts=	104.92				Avg Tm=	73.35	

Integrated Gas Sampling Data :

Bag No.	B-R1	Filter No.	4Q0510
Bag Vol.	--- liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.213

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	773	804	763	687	813	813	952	
Initial wt., g	699	766	755	685	812	812	933	
Difference	74.4	37.8	7.8	2	0.7	0.2	18.9	141.8

* Data Recorded on Field Data Sheet



EPA METHOD 5 - FIELD DATA SHEET - RUN 2

Project	Hibbing Taconite Company	Meter ID	C-8	Probe ID	10-6	Bar.Press.	28.09	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV022	Meter Y	0.9906	Pitot Tube No.	10-6	Stat Press.	-0.7	in. H ₂ O	Pretest 0.000 at 10 in. Hg
Date	06/10/15	Orifice dH@	1.9182	Pitot Cp	0.84				Posttest 0.000 at 8 in. Hg
Test	2	Run #	2	Liner Type:	Glass				Pretest Pitot leak Check Pos Pass @ >3" w.c
Operators	MMK2 /RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1510	871.29												
1	5.0	875.21	0.920	1.80	3.77	875.06	*	106	*	*	*	80	81	8.0
2	10.0	878.89	0.900	1.77	3.74	878.80	*	105	*	*	*	81	81	8.0
3	15.0	882.86	1.100	2.16	4.13	882.93	*	106	*	*	*	83	81	8.0
4	20.0	887.01	1.100	2.16	4.14	887.07	*	106	*	*	*	84	82	8.0
5	25.0	891.24	1.100	2.17	4.15	891.22	*	106	*	*	*	84	82	8.0
6	30.0	895.48	1.100	2.17	4.15	895.37	*	106	*	*	*	85	82	8.0
7	35.0	899.89	1.150	2.27	4.24	899.61	*	107	*	*	*	84	82	8.0
8	40.0	904.05	1.150	2.26	4.24	903.85	*	107	*	*	*	85	82	8.0
9	45.0	908.22	1.100	2.17	4.15	908.00	*	106	*	*	*	84	82	8.0
10	50.0	912.35	1.100	2.17	4.15	912.15	*	106	*	*	*	85	82	8.0
11	55.0	916.27	0.870	1.72	3.69	915.84	*	106	*	*	*	85	82	8.0
12	60.0	920.03	0.870	1.72	3.69	919.53	*	106	*	*	*	86	83	8.0
13	65.0	924.02	1.000	1.98	3.97	923.50	*	105	*	*	*	83	84	8.0
14	70.0	927.88	0.940	1.85	3.84	927.34	*	106	*	*	*	84	84	8.0
15	75.0	932.09	1.100	2.17	4.16	931.49	*	106	*	*	*	86	84	8.0
16	80.0	936.30	1.100	2.17	4.16	935.65	*	107	*	*	*	86	84	8.0
17	85.0	940.53	1.100	2.17	4.16	939.81	*	107	*	*	*	87	84	8.0
18	90.0	944.77	1.100	2.18	4.17	943.98	*	106	*	*	*	87	84	8.0
19	95.0	949.00	1.100	2.17	4.16	948.14	*	108	*	*	*	87	85	8.0
20	100.0	953.23	1.100	2.18	4.17	952.30	*	107	*	*	*	85	84	8.0
21	105.0	957.44	1.100	2.17	4.16	956.46	*	106	*	*	*	85	84	8.0
22	110.0	961.65	1.100	2.17	4.16	960.62	*	107	*	*	*	85	84	8.0
23	115.0	965.41	0.830	1.64	3.61	964.23	*	106	*	*	*	84	83	8.0
24	120.0	969.05	0.800	1.58	3.54	967.77	*	107	*	*	*	84	83	8.0
End Time	1719													
Run Time	120		Avg DH=	2.04			Avg Ts=	106.29				Avg Tm=	83.71	

Integrated Gas Sampling Data :

Bag No.	B-R2	Filter No.	4Q0511
Bag Vol.	10 liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.213

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	774	840	778	703	769	778	940	
Initial wt., g	698	805	769	701	770	778	918	
Difference	75.8	35.4	9	2	-1.5	0	22	142.7

* Data Recorded on Field Data Sheet



EPA METHOD 5 - FIELD DATA SHEET - RUN 3

Project	Hibbing Taconite Company	Meter ID	C-8	Probe ID	10-4	Bar.Press.	28.09	in. Hg	Sample Train Leak	Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV022	Meter Y	0.9906	Pitot Tube No.	10-4	Stat Press.	-0.7	in. H ₂ O	Pretest	0.000 at 10 in. Hg
Date	06/10/15	Orifice dH@	1.9182	Pitot Cp	0.84				Posttest	0.000 at 5 in. Hg
Test	2	Run #	3	Liner Type:	Glass				Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	MMK2 /RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1755	969.54												
1	5.0	973.36	0.890	1.74	3.71	973.25	*	106	*	*	*	80	81	8.0
2	10.0	977.25	0.930	1.83	3.80	977.05	*	106	*	*	*	81	82	8.0
3	15.0	981.44	1.100	2.16	4.13	981.18	*	107	*	*	*	83	81	8.0
4	20.0	985.62	1.100	2.16	4.14	985.32	*	107	*	*	*	84	81	8.0
5	25.0	989.81	1.100	2.16	4.14	989.46	*	107	*	*	*	85	81	8.0
6	30.0	994.00	1.100	2.16	4.14	993.60	*	107	*	*	*	85	81	8.0
7	35.0	998.22	1.100	2.16	4.14	997.74	*	107	*	*	*	86	82	8.0
8	40.0	1002.45	1.100	2.17	4.15	1001.90	*	107	*	*	*	85	82	8.0
9	45.0	1006.67	1.100	2.17	4.16	1006.05	*	105	*	*	*	85	82	8.0
10	50.0	1010.72	1.000	1.97	3.96	1010.01	*	106	*	*	*	85	82	8.0
11	55.0	1014.43	0.810	1.59	3.56	1013.57	*	108	*	*	*	85	82	8.0
12	60.0	1018.10	0.830	1.64	3.61	1017.17	*	106	*	*	*	84	82	8.0
13	65.0	1021.83	0.860	1.69	3.66	1020.84	*	107	*	*	*	79	80	8.0
14	70.0	1025.57	0.870	1.70	3.66	1024.50	*	107	*	*	*	81	81	8.0
15	75.0	1029.42	0.940	1.85	3.82	1028.32	*	106	*	*	*	83	80	8.0
16	80.0	1033.44	0.990	1.94	3.92	1032.24	*	107	*	*	*	84	80	8.0
17	85.0	1037.64	1.100	2.16	4.14	1036.38	*	107	*	*	*	84	80	8.0
18	90.0	1041.86	1.100	2.16	4.13	1040.51	*	108	*	*	*	84	80	8.0
19	95.0	1046.13	1.150	2.26	4.23	1044.74	*	107	*	*	*	85	80	8.0
20	100.0	1050.42	1.150	2.26	4.23	1048.97	*	107	*	*	*	85	80	8.0
21	105.0	1054.63	1.100	2.16	4.14	1053.11	*	107	*	*	*	84	80	8.0
22	110.0	1058.83	1.100	2.16	4.14	1057.25	*	107	*	*	*	84	80	8.0
23	115.0	1062.43	0.800	1.57	3.53	1060.78	*	107	*	*	*	84	80	8.0
24	120.0	1066.00	0.830	1.63	3.60	1064.37	*	106	*	*	*	84	80	8.0
End Time	2003													
Run Time	120		Avg DH=	1.98			Avg Ts=	106.75				Avg Tm=	82.27	

Integrated Gas Sampling Data :

Bag No.	B-R2	Filter No.	4Q0512
Bag Vol.	10 liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.213

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	771	810	763	687	806	810	891	
Initial wt., g	699	769	753	685	806	810	872	
Difference	72.2	41.3	9.9	1.4	0	0.1	19.8	144.7

* Data Recorded on Field Data Sheet



EPA METHOD 3A -- Instrument Analysis Data Sheet

Project HIL LINE1 MACT
Sample Location(s): STACK B, SUZZ
Test No: 2
Date: 6/10/15
Operators: JARZ, MMKZ

Analyzer Make / Model / Serial No. CAI MODEL 200
Analyzer O₂ Range (span), %: 25
Analyzer CO₂ Range (span), %: 25

	Cylinder Serial No.	O ₂ Cert. Conc.		CO ₂ Cert. Conc.	
		O ₂ Cert. Conc.		CO ₂ Cert. Conc.	
Zero Gas	LOT # 1010 XF14	0		0	
O ₂ /CO ₂ Mid-range	CC 102877	10.02		9.98	
O ₂ /CO ₂ High-range	CC 99473	22.49		4.91	

PRETEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.01	0	0.02
Mid-range:	10.02	9.89	4.91	4.85
High-range:	22.47	22.48	9.98	9.98

Time of Calibration _____ to _____

INTEGRATED BAG ANALYSIS

Location/Test No.	<u>LINE1, STACK B</u>		
Run No.	<u>1</u>	<u>2</u>	<u>3</u>
Time Sampled	<u>08:25 - 14:21</u>	<u>15:10 - 17:19</u>	<u>17:55 - 20:03</u>
Time Analyzed	<u>10:11 p.m.</u>	<u>10:12 p.m.</u>	<u>10:13 p.m.</u>
O ₂ , %	<u>19.45</u>	<u>19.38</u>	<u>19.38</u>
CO ₂ , %	<u>0.56</u>	<u>0.56</u>	<u>0.52</u>

POSTTEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.02	0	0.06
Mid-range:	10.02	9.85	4.91	4.87
High-range:	22.47	22.48	9.98	10.01

EPA METHOD 2 FIELD DATA SHEET



EPA METHOD 29
FIELD DATA SHEET

Project HTC MACT r Hg
Smpl Loc LINE 1 STAKES SU023 Test No. 3
Date 6/4/15
Operator JARZ CM C-2

Meter 0.9920
ΔH @ 1.8
Cp 0.84
P 1.5

Bar. Pres 28.00 in Hg
Stat. Pres 9.65 in H₂O
Probe Lngth 10 ft
Liner Type: ☒ Glass ☐ S.S. ☐ Other

Sample Train Leak Rate (cfm)			
Run 1		Run 2	
Pretest	<u>0.00</u> at 15 in Hg	Pretest	<u>0.00</u> at 15 in Hg
Posttest	<u>0.00</u> at <u>8</u> in Hg	Posttest	<u>0.01</u> at <u>7</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"/>

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	Impngnr Outlet								Probe	Filter	Impngnr Outlet		
A-	5	603.265	0.84	1.9	5	119	255	252	61	73	72	700.19	0.77	1.7	5	119	252	249	66	78	78
	6	607.10	0.84	1.9	5	119	252	246	62	75	74	703.91	0.77	1.7	5	118	250	266	64	79	78
	10	611.00	0.84	1.9	5	116	250	244	60	71	74	707.60	0.77	1.7	5	119	251	250	64	82	79
	15	615.05	0.96	2.1	5	120	246	250	60	79	75	713.20	0.83	1.8	5	119	268	252	64	88	82
	20	619.15	0.96	2.1	5	116	249	246	59	80	75	715.20	0.83	1.8	5	119	245	252	63	89	83
	25	623.15	0.92	2.0	5	117	248	245	59	80	75	719.06	0.83	1.8	5	119	261	251	63	89	82
	30	627.06	0.90	1.9	5	113	243	243	59	80	75	723.04	0.85	1.9	5	117	250	250	63	90	84
	35	631.34	1.0	2.4	5	112	248	245	58	80	75	727.30	1.0	2.2	6	117	250	254	63	91	84
	40	635.66	1.1	2.4	5	111	251	247	57	81	76	731.60	1.0	2.2	6	116	250	251	63	90	85
	45	639.90	1.0	2.2	5	112	249	248	59	80	76	735.94	1.0	2.2	6	114	250	250	63	91	85
	50	644.18	1.0	2.2	5	110	250	249	60	80	76	740.25	1.0	2.2	6	113	236	250	64	91	86
	55	647.80	0.80	1.7	5	111	252	249	60	80	76	744.60	0.78	1.7	5	113	266	250	64	90	86
B-	60	651.74	0.78	1.7	5	111	254	253	62	77	75	748.03	0.75	1.7	5	119	268	240	65	87	86
	65	655.41	0.73	1.7	5	118	256	250	58	78	75	751.55	0.87	1.9	5	119	228	250	64	89	87
	70	658.93	0.72	1.5	5	117	251	249	60	79	75	755.85	0.87	1.9	5	119	241	251	65	87	87
	75	662.63	0.80	1.71	5	117	251	249	60	79	75	759.89	0.90	2.0	6	118	251	249	65	91	87
	80	666.40	0.82	1.76	5	117	251	249	60	79	75	763.42	0.92	2.0	6	118	252	249	65	91	87
	85	670.29	0.90	1.93	5	117	250	247	64	81	76	768.00	0.93	2.0	6	120	250	251	66	90	87
	90	674.25	0.87	1.9	5	114	247	248	65	81	76	772.03	0.90	2.0	6	117	249	250	66	90	87
	95	678.54	1.1	2.4	6	113	249	247	60	81	76	776.35	1.0	2.2	6	122	251	248	63	90	87
	100	683.00	1.1	2.4	6	113	250	253	57	80	76	780.63	1.0	2.2	6	117	249	251	62	89	86
	105	687.43	1.1	2.4	6	113	250	253	57	80	76	785.00	0.96	2.1	6	116	243	247	62	89	86
	110	691.77	1.0	2.2	6	113	250	250	57	81	77	789.10	0.96	2.1	6	115	248	249	62	89	87
	115	695.70	0.88	1.9	5	113	251	253	58	81	77	792.99	0.75	1.7	5	112	254	253	63	89	86
	120	699.655	0.88	1.9	5	113	251	253	58	81	77	796.785	0.75	1.7	5	112	254	253	63	89	86
Σ		Vm=96.39	ΔH=1.99			Ts=114.71					Tm=77.33	Vm=96.59	ΔH=1.93			Ts=117.33					Tm=86.56

Port 1

Port A

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
71	19.2	9.0%	08:25	10:33	C-R1	8L	NA	400516	222-1	0.222	210.332	164.197
78	19.2	9.0%	11:55	14:20	C-R2	8L	NA	400517	222-1	0.222	210.337	164.178

Nozzle Calibration	
Tech. JARZ	Date 6/4/15
Nozzle No.	222-1
1	0.222
2	0.222
3	0.221

MOISTURE RECOVERY:		RUN 1							
Impinger		1	2	3	4	5	6	Desiccant	Total
Final wt., g		765.7	772.3	780.4	665.2	768.5	774.0	938.1	
Initial wt., g		666.8	737.4	749.5	601.2	747.5	772.6	917.0	
Difference		78.9	54.9	10.9	4.0	0.8	1.4	21.1	191.5

MOISTURE RECOVERY:		RUN 2							
Impinger		1	2	3	4	5	6	Desiccant	Total
Final wt., g		779.9	862.6	884.2	657.6	813.3	812.7	962.3	
Initial wt., g		660.8	800.7	771.5	657.1	810.8	811.0	947.5	
Difference		89.1	54.9	12.7	2.5	2.5	1.7	18.8	182.2

* JARZ 6/4/15



EPA METHOD 29
FIELD DATA SHEET

Project HTC
Smpl Loc LIVE 1 STACKS
Date 6/4/15 SV023
Operator JARZ

Test No. 3
Run# 3
Pilot No. 10-5
CM C-2 SM NA

Meter 0.9920
 ΔH @ 1.0579
Cp 0.84
P 15

Bar. Pres 28.06 in Hg
Stat. Pres -0.65 in H₂O
Probe Length 10 ft
Liner Type: ☒ Glass ☐ S.S. ☐ Other

Sample Train Leak Rate (cfm)			
Run 3		Run 4	
Pretest	<u>0.00</u> at <u>15</u> in Hg	Pretest	at 15 in Hg
Posttest	<u>0.00</u> at <u>7</u> in Hg	Posttest	at in Hg
Pilot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input type="checkbox"/>	Pilot (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				
		797.045																					
A	6	800.47	0.80	1.8	4	119	249	250	66	91	90												
	6	804.84	0.80	1.8	4	118	253	253	65	92	90												
	5	808.73	0.87	1.9	4	118	248	251	62	93	90												
	5	812.70	0.87	1.9	4	119	248	247	63	93	90												
	4	816.85	0.90	2.0	5	117	251	249	65	95	91												
	4	820.92	0.90	2.0	5	117	250	245	66	95	91												
	3	825.10	0.96	2.1	5	115	250	243	66	94	91												
	3	829.29	0.94	2.1	5	117	248	246	65	95	92												
	2	833.41	0.90	2.0	5	115	250	249	64	95	92												
	2	837.50	0.90	2.0	5	114	258	258	64	96	92												
B	1	841.31	0.76	1.7	4	115	248	249	64	96	93												
	6	845.15	0.78	1.7	4	115	250	250	65	97	93												
	6	848.60	0.72	1.6	4	119	250	253	65	95	94												
	6	852.39	0.68	1.5	4	120	234	252	66	95	94												
	5	855.90	0.70	1.5	4	119	251	247	66	97	95												
	5	859.59	0.72	1.6	4	119	250	252	65	98	95												
	4	863.35	0.83	1.8	4	118	249	247	64	98	95												
	4	867.40	0.85	1.9	4	120	251	251	63	100	95												
	3	871.56	0.94	2.1	4	117	251	251	62	101	96												
	3	875.90	1.0	2.2	4	120	251	252	61	102	96												
	2	880.16	0.93	2.1	5	117	254	250	62	103	97												
	2	884.35	0.95	2.1	5	115	252	249	62	102	97												
	1	888.08	0.70	1.6	4	114	253	251	62	102	97												
	1	891.780	0.70	1.6	4	114	249	250	63	102	97												
Σ=		Vm=		ΔH=1.85		Ts=117.13					Tm=95.21	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	89	19.2	9.0%	15:25	17:44	C-03	8L	N/A	400519	222-1	0.272	200.967	156.570
Run 2													

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

MOISTURE RECOVERY:		RUN 3							
Impinger		1	2	3	4	5	6	Desiccant	Total
Final wt., g	760.7	795.6	779.4	666.4	769.4	774.2	926.7		
Initial wt., g	609.1	741.5	770.6	666.1	769.3	774.0	954.1		
Difference	91.6	54.1	8.8	0.3	0.1	0.2	22.6		172.8

RUN 4							
1	2	3	4	5	6	Desiccant	Total



EPA METHOD 5 - FIELD DATA SHEET - RUN 1

Project	Hibbing Taconite Company	Meter ID	C-2	Probe ID	10-5	Bar.Press.	28.06	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV023	Meter Y	0.9920	Pitot Tube No.	10-5	Stat Press.	-0.65	in. H ₂ O	Pretest 0.000 at 15 in. Hg
Date	06/09/15	Orifice dH@	1.8579	Pitot Cp	0.84				Posttest 0.000 at 8 in. Hg
Test	3	Run #	1	Liner Type:	Glass				Pretest Pitot leak Check Pos Pass @ >3" w.c
Operators	JAR2/RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	0825	603.27												
1	5.0	607.10	0.890	1.88	3.88	607.14	*	119	*	*	*	73	72	9.0
2	10.0	611.00	0.890	1.89	3.89	611.04	*	119	*	*	*	75	74	9.0
3	15.0	615.05	0.960	2.06	4.07	615.10	*	116	*	*	*	77	74	9.0
4	20.0	619.50	0.960	2.05	4.06	619.16	*	120	*	*	*	79	75	9.0
5	25.0	623.15	0.920	1.98	4.00	623.16	*	116	*	*	*	80	75	9.0
6	30.0	627.06	0.900	1.93	3.96	627.12	*	117	*	*	*	80	75	9.0
7	35.0	631.34	1.000	2.16	4.18	631.30	*	113	*	*	*	80	75	9.0
8	40.0	635.66	1.100	2.39	4.39	635.70	*	112	*	*	*	80	75	9.0
9	45.0	639.90	1.000	2.17	4.19	639.89	*	111	*	*	*	81	76	9.0
10	50.0	644.18	1.000	2.17	4.20	644.08	*	112	*	*	*	80	76	9.0
11	55.0	647.80	0.800	1.74	3.76	647.84	*	110	*	*	*	80	76	9.0
12	60.0	651.74	0.780	1.70	3.71	651.55	*	111	*	*	*	80	76	9.0
13	65.0	655.41	0.730	1.59	3.59	655.13	*	111	*	*	*	77	75	9.0
14	70.0	658.93	0.720	1.54	3.53	658.66	*	118	*	*	*	78	75	9.0
15	75.0	662.63	0.800	1.71	3.72	662.38	*	118	*	*	*	79	75	9.0
16	80.0	666.40	0.820	1.76	3.77	666.15	*	117	*	*	*	79	75	9.0
17	85.0	670.29	0.900	1.93	3.95	670.10	*	117	*	*	*	80	76	9.0
18	90.0	674.25	0.870	1.87	3.89	674.00	*	117	*	*	*	81	76	9.0
19	95.0	678.54	1.100	2.38	4.39	678.39	*	114	*	*	*	81	76	9.0
20	100.0	683.00	1.100	2.39	4.40	682.79	*	113	*	*	*	81	76	9.0
21	105.0	687.43	1.100	2.39	4.40	687.18	*	113	*	*	*	80	76	9.0
22	110.0	691.77	1.000	2.17	4.19	691.37	*	113	*	*	*	80	76	9.0
23	115.0	695.70	0.880	1.91	3.93	695.30	*	113	*	*	*	81	77	9.0
24	120.0	699.66	0.880	1.91	3.94	699.24	*	113	*	*	*	81	77	9.0
End Time	1033													
Run Time	120		Avg DH=	1.99			Avg Ts=	114.71				Avg Tm=	77.33	

Integrated Gas Sampling Data :

Bag No.	C-R1	Filter No.	4Q0516
Bag Vol.	8 liters	Nozzle No.	Glass
Leak Rate	0.0 cc/min	Nozzle Dn.	0.222

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	765	792	780	665	768	774	938	
Initial wt., g	667	737	770	661	768	773	917	
Difference	98.4	54.9	10.9	4	0.8	1.4	21.1	191.5

* Data Recorded on Field Data Sheet



EPA METHOD 5 - FIELD DATA SHEET - RUN 2

Project	Hibbing Taconite Company	Meter ID	C-2	Probe ID	10-5	Bar.Press.	28.06	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV023	Meter Y	0.9920	Pitot Tube No.	10-5	Stat Press.	-0.65	in. H ₂ O	Pretest 0.000 at 15 in. Hg
Date	06/09/15	Orifice dH@	1.8579	Pitot Cp	0.84				Posttest 0.010 at 7 in. Hg
Test	3	Run #	2	Liner Type:	Glass				Pretest Pitot leak Check Pos Pass @ >3" w.c
Operators	JAR2 /RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1155	700.19												
1	5.0	703.91	0.770	1.65	3.66	703.85	*	119	*	*	*	78	78	9.0
2	10.0	707.66	0.770	1.65	3.66	707.51	*	118	*	*	*	79	78	9.0
3	15.0	711.30	0.800	1.72	3.73	711.24	*	119	*	*	*	82	79	9.0
4	20.0	715.20	0.830	1.79	3.81	715.05	*	119	*	*	*	88	82	9.0
5	25.0	719.06	0.830	1.80	3.85	718.90	*	119	*	*	*	89	83	9.0
6	30.0	723.04	0.850	1.85	3.90	722.79	*	119	*	*	*	89	82	9.0
7	35.0	727.30	1.000	2.18	4.23	727.03	*	117	*	*	*	90	84	9.0
8	40.0	731.60	1.000	2.19	4.24	731.27	*	117	*	*	*	91	84	9.0
9	45.0	735.94	1.000	2.19	4.25	735.52	*	116	*	*	*	90	85	9.0
10	50.0	740.25	1.000	2.20	4.26	739.78	*	114	*	*	*	91	85	9.0
11	55.0	744.40	0.780	1.72	3.77	743.55	*	113	*	*	*	91	86	9.0
12	60.0	748.03	0.750	1.66	3.70	747.25	*	113	*	*	*	90	86	9.0
13	65.0	751.55	0.870	1.90	3.96	751.21	*	119	*	*	*	87	86	9.0
14	70.0	755.85	0.870	1.90	3.95	755.16	*	119	*	*	*	89	87	9.0
15	75.0	759.89	0.900	1.97	4.03	759.18	*	119	*	*	*	89	87	9.0
16	80.0	763.92	0.920	2.01	4.07	763.26	*	118	*	*	*	91	87	9.0
17	85.0	768.00	0.930	2.04	4.10	767.36	*	119	*	*	*	91	87	9.0
18	90.0	772.03	0.900	1.97	4.03	771.39	*	120	*	*	*	90	87	9.0
19	95.0	776.35	1.000	2.19	4.26	775.64	*	117	*	*	*	90	87	9.0
20	100.0	780.63	1.000	2.17	4.24	779.88	*	122	*	*	*	90	87	9.0
21	105.0	785.00	0.960	2.11	4.17	784.05	*	117	*	*	*	90	87	9.0
22	110.0	789.10	0.960	2.11	4.17	788.22	*	116	*	*	*	89	86	9.0
23	115.0	792.99	0.750	1.65	3.69	791.91	*	115	*	*	*	89	87	9.0
24	120.0	796.79	0.750	1.66	3.70	795.61	*	112	*	*	*	89	86	9.0
End Time	1420													
Run Time	120		Avg DH=	1.93			Avg Ts=	117.33				Avg Tm=	86.56	

Integrated Gas Sampling Data :

Bag No.	C-R2	Filter No.	4Q0517
Bag Vol.	8 liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.222

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	750	863	784	660	813	813	962	
Initial wt., g	661	808	772	657	811	811	944	
Difference	89.1	54.9	12.7	2.5	2.5	1.7	18.8	182.2

* Data Recorded on Field Data Sheet



EPA METHOD 5 - FIELD DATA SHEET - RUN 3

Project	Hibbing Taconite Company	Meter ID	C-2	Probe ID	10-5	Bar.Press.	28.06	in. Hg	Sample Train Leak	Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV023	Meter Y	0.9920	Pitot Tube No.	10-5	Stat Press.	-0.65	in. H2O	Pretest	0.000 at 10 in. Hg
Date	06/09/15	Orifice dH@	1.8579	Pitot Cp	0.84				Posttest	0.000 at 7 in. Hg
Test	3	Run #	3	Liner Type:	Glass				Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	JAR2/RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1525													
1	5.0	800.97	0.800	1.75	3.80	800.90	*	119	*	*	*	91	90	9.0
2	10.0	804.84	0.800	1.76	3.82	804.72	*	118	*	*	*	92	90	9.0
3	15.0	808.73	0.870	1.91	3.98	808.70	*	118	*	*	*	93	90	9.0
4	20.0	812.70	0.870	1.91	3.98	812.68	*	119	*	*	*	93	90	9.0
5	25.0	816.85	0.900	1.99	4.06	816.74	*	117	*	*	*	95	91	9.0
6	30.0	820.92	0.900	1.99	4.07	820.81	*	117	*	*	*	95	91	9.0
7	35.0	825.10	0.960	2.13	4.21	825.02	*	115	*	*	*	94	91	9.0
8	40.0	829.29	0.940	2.08	4.16	829.18	*	117	*	*	*	95	92	9.0
9	45.0	833.41	0.900	2.00	4.08	833.26	*	115	*	*	*	95	92	9.0
10	50.0	837.50	0.900	2.00	4.08	837.35	*	114	*	*	*	96	92	9.0
11	55.0	841.31	0.760	1.69	3.75	841.10	*	115	*	*	*	96	93	9.0
12	60.0	845.15	0.780	1.74	3.81	844.91	*	115	*	*	*	97	93	9.0
13	65.0	848.60	0.720	1.58	3.63	848.54	*	119	*	*	*	95	94	9.4
14	70.0	852.39	0.680	1.49	3.52	852.06	*	120	*	*	*	95	94	9.4
15	75.0	855.90	0.700	1.54	3.58	855.64	*	119	*	*	*	97	95	9.4
16	80.0	859.59	0.720	1.58	3.64	859.28	*	119	*	*	*	98	95	9.4
17	85.0	863.35	0.830	1.83	3.91	863.19	*	118	*	*	*	98	95	9.4
18	90.0	867.40	0.850	1.87	3.95	867.14	*	120	*	*	*	100	95	9.4
19	95.0	871.56	0.940	2.08	4.18	871.32	*	117	*	*	*	101	96	9.4
20	100.0	875.90	1.000	2.21	4.30	875.62	*	120	*	*	*	102	96	9.4
21	105.0	880.16	0.930	2.06	4.16	879.78	*	117	*	*	*	103	97	9.4
22	110.0	884.35	0.950	2.12	4.22	884.01	*	115	*	*	*	102	97	9.4
23	115.0	888.08	0.700	1.56	3.63	887.63	*	114	*	*	*	102	97	9.4
24	120.0	891.78	0.700	1.56	3.63	891.26	*	114	*	*	*	102	97	9.4
End Time	1744													
Run Time	120		Avg DH=	1.85			Avg Ts=	117.13				Avg Tm=	95.21	

Integrated Gas Sampling Data :

Bag No.	C-R2	Filter No.	4Q0519
Bag Vol.	8 liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.222

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	761	796	779	666	769	774	977	
Initial wt., g	669	742	771	666	769	774	954	
Difference	91.6	54.1	8.8	0.3	0.1	0.2	22.6	177.7

* Data Recorded on Field Data Sheet



EPA METHOD 3A -- Instrument Analysis Data Sheet

Project HTC LINE 1, MACT
Sample Location(s): STACK C, 50023
Test No: 3
Date: 6/9/15
Operators: JARZ, MMKZ

Analyzer Make / Model / Serial No. CAI MODEL 200
Analyzer O₂ Range (span), %: 25
Analyzer CO₂ Range (span), %: 25

	Cylinder Serial No.	O ₂ Cert. Conc.	CO ₂ Cert. Conc.
Zero Gas	LOT # 1010XF14	0	0
O ₂ /CO ₂ Mid-range	CC 102877	10.02	9.99
O ₂ /CO ₂ High-range	CC 99473	22.49	4.91

PRETEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.00	0	0.00
Mid-range:	10.02	10.03	4.91	4.91
High-range:	22.49	22.49	9.98	9.90

Time of Calibration _____ to _____

INTEGRATED BAG ANALYSIS

Location/Test No.	LINE 1 STACK C		
Run No.	1	2	3
Time Sampled	08:25-10:33	11:55-14:20	15:25-17:44
Time Analyzed	20:12	20:13	20:14
O ₂ , %	19.37	19.41	19.34
CO ₂ , %	0.57	0.59	0.62

POSTTEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.15	0	0.02
Mid-range:	10.02	10.00	4.91	4.79
High-range:	22.49	22.37	9.98	9.82





EPA METHOD 29
FIELD DATA SHEET

Project HITC LINE 1 MACT
Smpl Loc LINE 1 STACKS
Date 6/10/15
Operator SARE / RBS

Test No. 4

CM 2

Runs 1 - 2

Pitot No. 10-5

SM NA

Meter 0.9920

ΔH @ 1.8579

Cp 0.84

P 13

Bar. Pres 28.09 In Hg

Stat. Pres -0.47 In H₂O

Probe Length 10 ft

Liner Type: ☒ Glass ☐ S.S. ☐ Other

Sample Train Leak Rate (cfm)

Run 1				Run 2			
Pretest	0.00	at 15 in Hg		Pretest	0.00	at 15 in Hg	
Posttest	0.00	at 7 in Hg		Posttest	0.00	at 7 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

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
							Probe	Filter	Impinger Outlet		
A-	5	897.10	0.64	1.3	4	116	256	236	55	72	71
	10	900.43	0.65	1.4	4	114	255	244	52	74	72
	15	903.90	0.72	1.5	4	116	250	252	53	76	73
	20	907.37	0.72	1.5	4	116	254	254	53	79	75
	25	910.80	0.68	1.4	4	116	254	254	53	79	75
	30	914.10	0.60	1.3	4	115	254	252	58	79	75
	35	917.60	0.72	1.5	5	115	252	254	54	80	76
	40	921.07	0.72	1.5	5	115	252	250	54	80	77
	45	924.50	0.68	1.4	5	116	251	250	54	79	77
	50	927.96	0.72	1.5	5	115	251	248	60	79	77
B-	55	931.37	0.64	1.4	5	115	250	251	60	79	77
	60	934.41	0.50	1.1	4	116	250	251	61	79	78
	65	937.65	0.60	1.3	4	114	247	227	66	77	78
	70	940.72	0.50	1.1	4	111	249	231	66	85	84
	75	944.50	0.77	1.7	5	113	252	233	65	84	84
	80	948.10	0.80	1.7	5	113	252	241	65	85	84
	85	952.15	0.86	1.9	5	114	250	230	65	85	84
	90	956.03	0.86	1.9	5	114	252	228	66	86	85
	95	960.20	1.0	2.2	6	114	253	255	66	87	85
	100	963.90	0.70	1.5	5	115	253	252	66	87	85
	105	967.66	0.80	1.7	5	114	252	254	64	87	85
	110	971.38	0.75	1.6	5	115	257	257	65	87	85
	115	975.10	0.70	1.5	5	115	250	247	63	87	85
	120	978.13	0.45	0.97	4	116	249	252	62	87	85
Σ		Vm = 24.26	ΔH = 1.49			Ts = 114.71				Tm = 80.65	

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
							Probe	Filter	Impinger Outlet		
	5	978.745	0.77	1.7	5	115	250	250	68	84	85
	10	982.52	0.77	1.7	5	115	231	253	65	86	85
	15	986.27	0.77	1.7	5	115	251	245	65	87	85
	20	989.83	0.70	1.5	4	116	251	245	65	87	85
	25	993.45	0.75	1.6	4	115	250	255	66	88	86
	30	997.09	0.67	1.4	4	116	249	250	68	88	85
	35	1000.70	0.67	1.4	4	116	247	246	63	89	86
	40	4.66	0.88	1.9	5	116	245	243	62	88	86
	45	8.45	0.95	2.1	5	115	247	250	62	88	86
	50	12.37	0.75	1.6	5	116	252	246	62	89	87
	55	15.82	0.68	1.5	4	116	244	246	64	89	86
	60	18.95	0.45	0.97	4	117	257	243	65	89	86
	65	21.79	0.45	0.97	4	118	250	241	65	89	86
	70	25.10	0.58	1.3	4	115	265	246	67	86	86
	75	28.47	0.64	1.4	4	115	264	247	59	88	87
	80	32.35	0.82	1.8	4	116	257	245	58	89	87
	85	36.18	0.82	1.8	5	116	255	245	58	90	86
	90	39.77	0.70	1.5	4	116	245	253	54	90	87
	95	43.65	0.90	1.9	5	116	253	245	58	90	87
	100	47.70	0.90	1.9	5	116	254	244	59	89	87
	105	51.26	0.65	1.4	5	116	249	244	59	88	86
	110	54.75	0.78	1.7	5	116	253	244	59	88	86
	115	58.50	0.78	1.7	5	116	251	244	59	88	86
	120	61.75	0.60	1.3	5	116	253	245	60	88	86
	Σ	64.985	0.60	1.3	4	116	245	252	60	88	86
Σ		Vm = 115.83	ΔH = 1.55			Ts = 115.83				Tm = 87.19	

	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	70	18.9%	10%	08:25	14:21	D-R1	8L	—	420520	222-1	0.222	183.452	142.554
Run 2	85	18.9%	10%	15:10	17:19	D-A2	8L	—	420521	222-1	0.222	186.259	141.047

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	see
2	E-copy
3	

MOISTURE RECOVERY:		RUN 1							
Impinger		1	2	3	4	5	6	Desiccant	Total
Final wt., g		777.9	783.4	776.8	670.9	773.6	776.6	903.9	
Initial wt., g		669.1	740.3	721.1	669.2	773.0	774.6	888.3	
Difference		108.8	49.1	5.7	1.7	0.6	2.0	15.6	177.5

		RUN 2							
Impinger		1	2	3	4	5	6	Desiccant	Total
Final wt., g		783.5	849.7	778	659.6	814.4	803.6	961.3	
Initial wt., g		664.1	806.9	772	658.9	814.4	804.0	915.3	
Difference		119.4	42.8	6	0.7	0	-0.4	16	184.5



EPA METHOD 29
FIELD DATA SHEET

Project HIL LINE1 MACT
Smpl Loc 50024
Date 6/10/95
Operator JARC / RJS

Test No. 4
CM 2A

Runs 3
Pitot No. 10-5
SM TSN

Meter y 0.9920
 ΔH @ 1.8579
Cp 0.84
P 13

Bar. Pres 28.09 in Hg
Stat. Pres -0.47 in H₂O
Probe Length 10 ft
Liner Type: ☒ Glass ☐ S.S. ☐ Other

Sample Train Leak Rate (cfm)			
Run 3		Run 4	
Pretest	0.00 at 18 in Hg	Pretest	at 15 in Hg
Posttest	0.00 at 6 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		
A-	6	5	69.00	0.85	1.8	4	116	263	249	68	82	82									
	6	10	72.66	0.75	1.6	4	115	257	248	63	82	82									
	5	15	76.56	0.90	1.9	4	115	256	248	62	83	82									
	5	20	80.50	0.90	1.9	4	116	251	246	63	83	82									
	4	25	84.48	0.93	2.0	4	116	247	252	64	85	82									
	4	30	88.26	0.78	1.7	4	116	253	246	65	86	82									
	3	35	92.00	0.80	1.7	4	115	246	253	62	86	82									
	3	40	95.72	0.80	1.7	4	115	252	245	60	86	82									
	2	45	99.40	0.75	1.6	4	115	252	245	59	86	82									
	2	50	102.89	0.65	1.4	4	116	254	244	59	86	82									
B-	1	55	106.17	0.60	1.3	4	115	252	245	58	85	82									
	1	60	109.42	0.60	1.3	4	114	253	245	58	85	82									
	6	65	112.57	0.55	1.2	4	115	239	244	63	81	81									
	6	70	115.70	0.55	1.2	4	115	237	244	56	83	81									
	5	75	119.13	0.67	1.4	4	115	243	246	56	85	81									
	5	80	122.64	0.70	1.5	4	116	246	245	56	86	82									
	4	85	126.03	0.66	1.4	4	115	245	247	57	86	81									
	4	90	129.41	0.66	1.4	4	116	245	250	57	87	82									
	3	95	133.06	0.77	1.7	4	115	245	249	56	86	81									
	3	100	136.70	0.77	1.7	4	115	251	245	57	87	82									
	2	105	140.70	0.86	1.9	4	115	251	245	56	86	82									
	2	110	144.65	0.86	1.9	4	115	251	245	57	85	81									
	1	115	148.48	0.86	1.9	4	115	248	245	57	86	81									
1	120		152.535	0.90	1.9	4	115	252	248	59	86	81									
Σ=		Vm=87.33		$\Delta H=1.62$		Ts=115.21					Tm=83.27	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	83	18.9	17:55	20:03	D-23	8L	—	480522	9175	0.222	191.722	147.748
Run 2			12:04									

Nozzle Calibration	
Tech.	Date
Nozzle No.	
1	See -
2	E copy
3	

MOISTURE RECOVERY:		RUN 3							
Impinger		1	2	3	4	5	6	Desiccant	Total
Final wt., g	793.3	783.1	774.6	670.0	775.0	775.9	938.2		
Initial wt., g	670.6	739.9	769.6	669.3	773.3	774.7	919.6		
Difference	122.7	42.2	8.0	0.7	1.7	1.2	15.6		190.1

RUN 4							
1	2	3	4	5	6	Desiccant	Total

* JARC



EPA METHOD 5 - FIELD DATA SHEET - RUN 1

Project	Hibbing Taconite Company	Meter ID	C-2	Probe ID	10-5	Bar.Press.	28.09	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV024	Meter Y	0.9920	Pitot Tube No.	10-5	Stat Press.	-0.5	in. H2O	Pretest 0.000 at 10 in. Hg
Date	06/10/15	Orifice dH@	1.8579	Pitot Cp	0.84				Posttest 0.000 at 7 in. Hg
Test	4	Run #	1	Liner Type:	Glass				Pretest Pitot leak Check Pos Pass @ >3" w.c
Operators	JAR2/RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	0825	893.85												
1	5.0	897.10	0.640	1.33	3.27	897.12	*	116	*	*	*	72	71	10.0
2	10.0	900.43	0.650	1.36	3.31	900.43	*	114	*	*	*	74	72	10.0
3	15.0	903.90	0.720	1.51	3.49	903.92	*	116	*	*	*	76	73	10.0
4	20.0	907.37	0.720	1.51	3.50	907.41	*	116	*	*	*	79	75	10.0
5	25.0	910.80	0.680	1.44	3.41	910.83	*	116	*	*	*	79	75	10.0
6	30.0	914.10	0.600	1.27	3.21	914.04	*	115	*	*	*	79	75	10.0
7	35.0	917.60	0.720	1.52	3.52	917.55	*	115	*	*	*	80	76	10.0
8	40.0	921.07	0.720	1.53	3.52	921.08	*	115	*	*	*	80	77	10.0
9	45.0	924.50	0.680	1.44	3.42	924.50	*	116	*	*	*	79	77	10.0
10	50.0	927.50	0.720	1.53	3.52	928.02	*	115	*	*	*	79	77	10.0
11	55.0	931.37	0.640	1.36	3.32	931.35	*	115	*	*	*	79	77	10.0
12	60.0	934.41	0.500	1.06	2.93	934.28	*	116	*	*	*	79	78	10.0
13	65.0	937.65	0.600	1.28	3.22	937.50	*	114	*	*	*	77	78	10.0
14	70.0	940.72	0.500	1.07	2.94	940.44	*	111	*	*	*	85	84	10.0
15	75.0	944.50	0.770	1.66	3.69	944.14	*	113	*	*	*	84	84	10.0
16	80.0	948.10	0.800	1.72	3.76	947.90	*	113	*	*	*	85	84	10.0
17	85.0	952.15	0.860	1.85	3.90	951.80	*	114	*	*	*	85	84	10.0
18	90.0	956.03	0.860	1.85	3.90	955.70	*	114	*	*	*	86	85	10.0
19	95.0	960.20	1.000	2.15	4.21	959.91	*	114	*	*	*	87	85	10.0
20	100.0	963.90	0.700	1.51	3.53	963.44	*	115	*	*	*	87	85	10.0
21	105.0	967.66	0.800	1.72	3.77	967.21	*	114	*	*	*	87	85	10.0
22	110.0	971.38	0.750	1.61	3.65	970.86	*	115	*	*	*	87	85	10.0
23	115.0	975.10	0.700	1.51	3.53	974.38	*	115	*	*	*	87	85	10.0
24	120.0	978.13	0.450	0.97	2.82	977.21	*	116	*	*	*	87	85	10.0
End Time	1421													
Run Time	120		Avg DH=	1.49			Avg Ts=	114.71				Avg Tm=	80.65	

Integrated Gas Sampling Data :

Bag No.	D-R1	Filter No.	4Q0520
Bag Vol.	8 liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.222

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	778	783	777	671	774	777	904	
Initial wt., g	669	740	771	669	773	775	888	
Difference	108.8	43.1	5.7	1.7	0.6	2	15.6	177.5

* Data Recorded on Field Data Sheet



EPA METHOD 5 - FIELD DATA SHEET - RUN 2

Project	Hibbing Taconite Company	Meter ID	C-2	Probe ID	10-5	Bar.Press.	28.09	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV024	Meter Y	0.9920	Pitot Tube No.	10-5	Stat Press.	-0.5	in. H ₂ O	Pretest 0.000 at 10 in. Hg
Date	06/10/15	Orifice dH@	1.8579	Pitot Cp	0.84				Posttest 0.000 at 7 in. Hg
Test	4 Run # 2			Liner Type:	Glass				Pretest Pitot leak Check Pos Pass @ >3" w.c
Operators	JAR2 /RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1510	978.75												
1	5.0	982.52	0.770	1.65	3.69	982.44	*	115	*	*	*	84	85	10.0
2	10.0	986.27	0.770	1.65	3.69	986.12	*	115	*	*	*	86	85	10.0
3	15.0	989.83	0.700	1.50	3.52	989.64	*	116	*	*	*	87	85	10.0
4	20.0	993.45	0.750	1.61	3.65	993.29	*	115	*	*	*	88	86	10.0
5	25.0	997.09	0.670	1.44	3.45	996.74	*	116	*	*	*	88	85	10.0
6	30.0	1000.70	0.670	1.44	3.45	1000.19	*	116	*	*	*	89	86	10.0
7	35.0	1004.66	0.880	1.90	3.96	1004.15	*	116	*	*	*	88	86	10.0
8	40.0	1008.65	0.950	2.05	4.11	1008.27	*	115	*	*	*	88	86	10.0
9	45.0	1012.37	0.750	1.61	3.65	1011.92	*	116	*	*	*	89	87	10.0
10	50.0	1015.82	0.680	1.47	3.48	1015.40	*	116	*	*	*	89	86	10.0
11	55.0	1018.95	0.450	0.97	2.83	1018.23	*	117	*	*	*	89	86	10.0
12	60.0	1021.79	0.450	0.97	2.83	1021.06	*	118	*	*	*	89	86	10.0
13	65.0	1025.10	0.580	1.25	3.22	1024.28	*	115	*	*	*	86	86	10.0
14	70.0	1028.47	0.640	1.38	3.37	1027.65	*	115	*	*	*	88	87	10.0
15	75.0	1032.35	0.820	1.77	3.82	1031.47	*	116	*	*	*	89	87	10.0
16	80.0	1036.18	0.820	1.77	3.83	1035.30	*	116	*	*	*	90	86	10.0
17	85.0	1039.77	0.700	1.51	3.54	1038.83	*	116	*	*	*	90	87	10.0
18	90.0	1043.65	0.900	1.94	4.01	1042.85	*	116	*	*	*	90	87	10.0
19	95.0	1047.70	0.900	1.94	4.01	1046.86	*	116	*	*	*	90	87	10.0
20	100.0	1051.26	0.650	1.40	3.41	1050.27	*	116	*	*	*	89	87	10.0
21	105.0	1054.75	0.780	1.68	3.73	1054.00	*	116	*	*	*	88	86	10.0
22	110.0	1058.50	0.780	1.68	3.72	1057.72	*	116	*	*	*	88	86	10.0
23	115.0	1061.75	0.600	1.29	3.27	1060.99	*	116	*	*	*	88	86	10.0
24	120.0	1064.99	0.600	1.29	3.27	1064.26	*	116	*	*	*	88	86	10.0
End Time	1719													
Run Time	120		Avg DH=	1.55			Avg Ts=	115.88				Avg Tm=	87.19	

Integrated Gas Sampling Data :

Bag No.	D-R2	Filter No.	4Q0521
Bag Vol.	--- liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.222

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	784	850	778	660	814	804	961	
Initial wt., g	664	807	772	659	814	804	945	
Difference	119.4	42.8	6	0.7	0	-0.4	16	184.5

* Data Recorded on Field Data Sheet



EPA METHOD 5 - FIELD DATA SHEET - RUN 3

Project	Hibbing Taconite Company	Meter ID	C-2	Probe ID	10-5	Bar.Press.	28.09	in. Hg	Sample Train Leak	Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 1 SV024	Meter Y	0.9920	Pitot Tube No.	10-5	Stat Press.	-0.5	in. H ₂ O	Pretest	0.000 at 10 in. Hg
Date	06/10/15	Orifice dH@	1.8579	Pitot Cp	0.84				Posttest	0.000 at 6 in. Hg
Test	4	Run #	3	Liner Type:	Glass				Pretest Pitot leak Check Pos	PASS @ >3" w.c
Operators	JAR2/RBS								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					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1755	65.21												
1	5.0	69.00	0.850	1.82	3.86	69.07	*	116	*	*	*	82	82	10.0
2	10.0	72.66	0.750	1.60	3.62	72.69	*	115	*	*	*	82	82	10.0
3	15.0	76.56	0.900	1.92	3.97	76.66	*	115	*	*	*	83	82	10.0
4	20.0	80.50	0.900	1.92	3.97	80.63	*	116	*	*	*	83	82	10.0
5	25.0	84.48	0.930	1.99	4.03	84.66	*	116	*	*	*	85	82	10.0
6	30.0	88.26	0.780	1.67	3.70	88.36	*	116	*	*	*	86	82	10.0
7	35.0	92.00	0.800	1.72	3.75	92.12	*	115	*	*	*	86	82	10.0
8	40.0	95.72	0.800	1.72	3.75	95.87	*	115	*	*	*	86	82	10.0
9	45.0	99.40	0.750	1.61	3.64	99.51	*	115	*	*	*	86	82	10.0
10	50.0	102.89	0.650	1.39	3.38	102.89	*	116	*	*	*	86	82	10.0
11	55.0	106.17	0.600	1.29	3.25	106.14	*	115	*	*	*	85	82	10.0
12	60.0	109.42	0.600	1.29	3.25	109.39	*	114	*	*	*	85	82	10.0
13	65.0	112.57	0.550	1.18	3.11	112.51	*	115	*	*	*	81	81	10.0
14	70.0	115.70	0.550	1.17	3.10	115.60	*	115	*	*	*	83	81	10.0
15	75.0	119.13	0.670	1.43	3.42	119.03	*	115	*	*	*	85	81	10.0
16	80.0	122.64	0.700	1.50	3.50	122.53	*	116	*	*	*	86	82	10.0
17	85.0	126.03	0.660	1.42	3.41	125.94	*	115	*	*	*	86	81	10.0
18	90.0	129.41	0.660	1.41	3.40	129.34	*	116	*	*	*	87	82	10.0
19	95.0	133.06	0.770	1.65	3.69	133.03	*	115	*	*	*	86	81	10.0
20	100.0	136.70	0.770	1.65	3.68	136.71	*	115	*	*	*	87	82	10.0
21	105.0	140.70	0.860	1.85	3.90	140.61	*	115	*	*	*	86	82	10.0
22	110.0	144.65	0.860	1.84	3.89	144.50	*	115	*	*	*	85	81	10.0
23	115.0	148.48	0.860	1.84	3.89	148.39	*	115	*	*	*	86	81	10.0
24	120.0	152.54	0.900	1.93	3.98	152.37	*	115	*	*	*	86	81	10.0
End Time	2003													
Run Time	120		Avg DH=	1.62			Avg Ts=	115.25				Avg Tm=	83.31	

Integrated Gas Sampling Data :

Bag No.	D-R2	Filter No.	4Q0522
Bag Vol.	--- liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.222

MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	793	783	775	670	775	776	935	
Initial wt., g	671	740	770	669	773	775	920	
Difference	122.7	43.2	5	0.7	1.7	1.2	15.6	190.1

* Data Recorded on Field Data Sheet



EPA METHOD 3A -- Instrument Analysis Data Sheet

Project HTC LINE 1 MACTSample Location(s): STACK B, SVO2E STACK D, SVO24Test No: 2*4Date: + 6/9/15 6/10/15Operators: JARZ, MMKZAnalyzer Make / Model / Serial No. CAI MODEL 200Analyzer O₂ Range (span), %: 25Analyzer CO₂ Range (span), %: 25* JARZ
6/10/15

	Cylinder Serial No.		
		O ₂ Cert. Conc.	CO ₂ Cert. Conc.
Zero Gas	LOT # 1010X514	0	0
O ₂ /CO ₂ Mid-range	CC 102877	10.02	9.98
O ₂ /CO ₂ High-range	CC 99473	22.49	4.91

PRETEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.01	0	0.02
Mid-range:	10.02	9.99	4.91	4.85
High-range:	22.47	22.48	9.98	9.99

Time of Calibration _____ to _____

INTEGRATED BAG ANALYSIS

Location/Test No. LINE 1, STACK D

Run No.

Time Sampled

Time Analyzed

O₂, %CO₂, %

<u>LINE 1, STACK D</u>		
1	2	3
08:25-14:21	15:10-17:14	17:55-20:03
10:08 pm	10:09 pm	10:10 pm
19.33	19.25	19.25
0.69	0.68	0.66

POSTTEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.02	0	0.06
Mid-range:	10.02	9.85	4.91	4.87
High-range:	22.47	22.48	9.98	10.01

Appendix C

Laboratory Reports and Sample Chain of Custody

Hibbing Taconite Company
Hibbing, Minnesota

Barr Engineering Co.
August 2, 2015

Laboratory Results Summary of EPA Method 29 Mercury Analysis

From Sub-Contracted Mercury Analysis
Pellet Indurating Furnace Line 1 (SV021)

Test 1

Performance Testing on June 9, 2015

Method 29 Mercury Mass Determination

Front Half (Filterable)

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blank (MHg _{fthb})
Analysis #1, Total	--	µg	< 0.1	< 0.1	< 0.1	< 0.1
Analysis #2, Total	--	µg	< 0.1	< 0.1	< 0.1	< 0.1
Front Half Net Mass Hg, Average	MHg _{fthm}	µg	< 0.1	< 0.1	< 0.1	< 0.1

Back Half

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blanks
10% H ₂ O ₂ / 5% HNO ₃						
Analysis #1, Total µg	--	µg	1.64	2.06	2.00	< 0.2
Analysis #2, Total µg	--	µg	1.64	2.06	2.00	< 0.2
Net Mass Average	MHg _{bth2}	µg	1.64	2.06	2.00	< 0.2

Empty Impinger

Analysis #1, Total µg	--	µg	< 0.2	< 0.2	< 0.2	< 0.2
Analysis #2, Total µg	--	µg	< 0.2	< 0.2	< 0.2	< 0.2
Net Mass Average	MHg _{bth3A}	µg	< 0.2	< 0.2	< 0.2	< 0.2

KMnO₄

Analysis #1, Total µg	--	µg	1.09	0.505	0.926	< 0.5
Analysis #2, Total µg	--	µg	1.11	0.531	0.943	< 0.5
Net Mass Average	MHg _{bth3B}	µg	1.10	0.518	0.935	< 0.5

HCl

Analysis #1, Total	--	µg	3.50	4.71	4.28	< 0.4
Analysis #2, Total	--	µg	3.47	4.75	4.40	< 0.4
Net Mass Average	MHg _{bth3C}	µg	3.49	4.73	4.34	< 0.4

Total Back Half Net Mass Hg, Average MHg _{bthm} = M(Hg _{bth2} + Hg _{bth3A} + Hg _{bth3B} + Hg _{bth3C})	MHg _{bthm}	µg	6.43	7.51	7.47	
--	---------------------	----	------	------	------	--

Blank Correction Determination

Back Half Blank MHg _{bthb} = M(Hg _{bth2} + Hg _{bth3A} + Hg _{bth3B} + Hg _{bth3C}) blanks	MHg _{bthb}	µg	0.00			
			5% of the Total Net Mass			MHg _{fthb} + MHg _{bthb}
	--	µg	0.33	0.38	0.38	0.10
Total Blank Correction Amount ⁽¹⁾	MHg _{blank}	µg	0.00	0.00	0.00	

Mercury Mass Determinations

Front Half (Filterable) Mercury Mass MHg _{fth} = MHg _{fthm} - MHg _{fthb}	MHg _{fth}	µg	< 0.1	< 0.1	< 0.1	
Back Half Mercury Mass MHg _{bth} = MHg _{bthm} - MHg _{bthb}	MHg _{bth}	µg	6.43	7.51	7.47	
Final Total Mercury Mass ⁽²⁾ MHg _t = (MHg _{fthm} + MHg _{bthm}) - MHg _{blank}	MHg _t	µg	6.53	7.61	7.57	

Note: The "<" sign indicates the mass is below method detection limits. All calculations forward use the detection limit for concentration and emission determinations and no blank correction is made.

(1) If the total of the measured blank values (MHg_{fthb} + MHg_{bthb}) is in the range of 0.0 to 0.6 µg then use the total; if it exceeds 0.6 µg, use the greater of (I) or (II). (I) 0.6 µg (II) the lesser of (a) (MHg_{fthb} + MHg_{bthb}) or (b) 5% of the sample value.

(2) EPA Method 29 does not include calculations and/or specifications for blank correcting the front half and back half Hg mass independently, therefore the Total Mercury Loading may not necessarily be equal to (MHg_{fth} + MHg_{bth}).

Laboratory Results Summary of EPA Method 29 Mercury Analysis

From Sub-Contracted Mercury Analysis
Pellet Indurating Furnace Line 1 (SV022)

Test 2

Performance Testing on June 10, 2015

Method 29 Mercury Mass Determination

Front Half (Filterable)

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blank (MHg _{fthb})
Analysis #1, Total	--	µg	< 0.1	< 0.1	< 0.1	< 0.1
Analysis #2, Total	--	µg	< 0.1	< 0.1	< 0.1	< 0.1
Front Half Net Mass Hg, Average	MHg _{fthm}	µg	< 0.1	< 0.1	< 0.1	< 0.1

Back Half

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blanks
10% H ₂ O ₂ / 5% HNO ₃						
Analysis #1, Total µg	--	µg	1.53	1.82	1.69	< 0.2
Analysis #2, Total µg	--	µg	1.54	1.87	1.71	< 0.2
Net Mass Average	MHg _{bh2}	µg	1.54	1.85	1.70	< 0.2

Empty Impinger

Analysis #1, Total µg	--	µg	< 0.2	< 0.2	< 0.2	< 0.2
Analysis #2, Total µg	--	µg	< 0.2	< 0.2	< 0.2	< 0.2
Net Mass Average	MHg _{bh3A}	µg	< 0.2	< 0.2	< 0.2	< 0.2

KMnO₄

Analysis #1, Total µg	--	µg	1.24	1.17	2.42	< 0.5
Analysis #2, Total µg	--	µg	1.27	1.21	2.49	< 0.5
Net Mass Average	MHg _{bh3B}	µg	1.26	1.19	2.46	< 0.5

HCl

Analysis #1, Total	--	µg	3.44	4.44	2.39	< 0.4
Analysis #2, Total	--	µg	3.47	4.32	2.39	< 0.4
Net Mass Average	MHg _{bh3C}	µg	3.46	4.38	2.39	< 0.4

Total Back Half Net Mass Hg, Average

MHg _{bhm} = M(Hg _{bh2} +Hg _{bh3A} +Hg _{bh3B} +Hg _{bh3C})	MHg _{bhm}	µg	6.45	7.62	6.75	
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Blank Correction Determination

Back Half Blank	MHg _{bhb}	µg	0.00			
MHg _{bhb} = M(Hg _{bh2} +Hg _{bh3A} +Hg _{bh3B} +Hg _{bh3C}) blanks						
			5% of the Total Net Mass			MHg _{fthb} +MHg _{bhb}
	--	µg	0.33	0.39	0.34	0.10
Total Blank Correction Amount ⁽¹⁾	MHg _{blank}	µg	0.00	0.00	0.00	

Mercury Mass Determinations

Front Half (Filterable) Mercury Mass MHg _{fth} = MHg _{fthm} - MHg _{fthb}	MHg _{fth}	µg	< 0.1	< 0.1	< 0.1	
Back Half Mercury Mass MHg _{bh} = MHg _{bhm} - MHg _{bhb}	MHg _{bh}	µg	6.45	7.62	6.75	
Final Total Mercury Mass ⁽²⁾ MHg _t = (MHg _{fthm} + MHg _{bhm}) - MHg _{blank}	MHg _t	µg	6.55	7.72	6.85	

Note: The "<" sign indicates the mass is below method detection limits. All calculations forward use the detection limit for concentration and emission determinations and no blank correction is made.

(1) If the total of the measured blank values (MHg_{fthb}+MHg_{bhb}) is in the range of 0.0 to 0.6µg then use the total; if it exceeds 0.6µg, use the greater of (I) or (II). (I) 0.6µg (II) the lesser of (a) (MHg_{fthb}+MHg_{bhb}) or (b) 5% of the sample value.

(2) EPA Method 29 does not include calculations and/or specifications for blank correcting the front half and back half Hg mass independently, therefore the Total Mercury Loading may not necessarily be equal to (MHg_{fth}+MHg_{bh}).

Laboratory Results Summary of EPA Method 29 Mercury Analysis

From Sub-Contracted Mercury Analysis
Pellet Indurating Furnace Line 1 (SV023)

Test 3

Performance Testing on June 9, 2015

Method 29 Mercury Mass Determination

Front Half (Filterable)

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blank (MHg _{fthb})
Analysis #1, Total	--	µg	< 0.1	< 0.1	< 0.1	< 0.1
Analysis #2, Total	--	µg	< 0.1	< 0.1	< 0.1	< 0.1
Front Half Net Mass Hg, Average	MHg _{fthm}	µg	< 0.1	< 0.1	< 0.1	< 0.1

Back Half

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blanks
10% H ₂ O ₂ / 5% HNO ₃						
Analysis #1, Total µg	--	µg	0.730	0.531	0.878	< 0.2
Analysis #2, Total µg	--	µg	0.715	0.563	0.893	< 0.2
Net Mass Average	MHg _{bh2}	µg	0.723	0.547	0.886	< 0.2

Empty Impinger

Analysis #1, Total µg	--	µg	< 0.2	< 0.2	< 0.2	< 0.2
Analysis #2, Total µg	--	µg	< 0.2	< 0.2	< 0.2	< 0.2
Net Mass Average	MHg _{bh3A}	µg	< 0.2	< 0.2	< 0.2	< 0.2

KMnO₄

Analysis #1, Total µg	--	µg	2.88	2.17	2.40	< 0.5
Analysis #2, Total µg	--	µg	2.89	2.17	2.44	< 0.5
Net Mass Average	MHg _{bh3B}	µg	2.89	2.17	2.42	< 0.5

HCl

Analysis #1, Total	--	µg	2.04	5.48	6.11	< 0.4
Analysis #2, Total	--	µg	2.02	5.52	6.02	< 0.4
Net Mass Average	MHg _{bh3C}	µg	2.03	5.50	6.07	< 0.4

Total Back Half Net Mass Hg, Average

MHg _{bhm} = M(Hg _{bh2} +Hg _{bh3A} +Hg _{bh3B} +Hg _{bh3C})	MHg _{bhm}	µg	5.84	8.42	9.57	
--	--------------------	----	------	------	------	--

Blank Correction Determination

Back Half Blank	MHg _{bhb}	µg	0.00			
MHg _{bhb} = M(Hg _{bh2} +Hg _{bh3A} +Hg _{bh3B} +Hg _{bh3C}) blanks						
			5% of the Total Net Mass			MHg _{fthb} +MHg _{bhb}
	--	µg	0.30	0.43	0.48	0.10
Total Blank Correction Amount ⁽¹⁾	MHg _{blank}	µg	0.00	0.00	0.00	

Mercury Mass Determinations

Front Half (Filterable) Mercury Mass MHg _{fth} = MHg _{fthm} - MHg _{fthb}	MHg _{fth}	µg	< 0.1	< 0.1	< 0.1	
Back Half Mercury Mass MHg _{bh} = MHg _{bhm} - MHg _{bhb}	MHg _{bh}	µg	5.84	8.42	9.57	
Final Total Mercury Mass ⁽²⁾ MHg _t = (MHg _{fthm} + MHg _{bhm}) - MHg _{blank}	MHg _t	µg	5.94	8.52	9.67	

Note: The "<" sign indicates the mass is below method detection limits. All calculations forward use the detection limit for concentration and emission determinations and no blank correction is made.

(1) If the total of the measured blank values (MHg_{fthb}+MHg_{bhb}) is in the range of 0.0 to 0.6µg then use the total; if it exceeds 0.6µg, use the greater of (I) or (II). (I) 0.6µg (II) the lesser of (a) (MHg_{fthb}+MHg_{bhb}) or (b) 5% of the sample value.

(2) EPA Method 29 does not include calculations and/or specifications for blank correcting the front half and back half Hg mass independently, therefore the Total Mercury Loading may not necessarily be equal to (MHg_{fth}+MHg_{bh}).

Hibbing Taconite Company
Hibbing, Minnesota

Barr Engineering Co.
August 3, 2015

Laboratory Results Summary of EPA Method 29 Mercury Analysis

From Sub-Contracted Mercury Analysis

Pellet Indurating Furnace Line 1 (SV024)

Test 4

Performance Testing on June 10, 2015

Method 29 Mercury Mass Determination

Front Half (Filterable)

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blank (MHg _{fthb})
Analysis #1, Total	--	µg	< 0.1	< 0.1	< 0.1	< 0.1
Analysis #2, Total	--	µg	< 0.1	< 0.1	< 0.1	< 0.1
Front Half Net Mass Hg, Average	MHg _{fthm}	µg	< 0.1	< 0.1	< 0.1	< 0.1

Back Half

Inputs	Symbol	Units	Run 1	Run 2	Run 3	Blanks
10% H ₂ O ₂ / 5% HNO ₃						
Analysis #1, Total µg	--	µg	< 0.5	< 0.5	< 0.5	< 0.2
Analysis #2, Total µg	--	µg	< 0.5	< 0.5	< 0.5	< 0.2
Net Mass Average	MHg _{bh2}	µg	< 0.5	< 0.5	< 0.5	< 0.2

Empty Impinger

Analysis #1, Total µg	--	µg	< 0.2	< 0.2	< 0.2	< 0.2
Analysis #2, Total µg	--	µg	< 0.2	< 0.2	< 0.2	< 0.2
Net Mass Average	MHg _{bh3A}	µg	< 0.2	< 0.2	< 0.2	< 0.2

KMnO₄

Analysis #1, Total µg	--	µg	2.58	2.50	2.33	< 0.5
Analysis #2, Total µg	--	µg	2.61	2.55	2.39	< 0.5
Net Mass Average	MHg _{bh3B}	µg	2.60	2.53	2.36	< 0.5

HCl

Analysis #1, Total	--	µg	4.81	5.32	2.99	< 0.4
Analysis #2, Total	--	µg	4.81	5.30	3.02	< 0.4
Net Mass Average	MHg _{bh3C}	µg	4.81	5.31	3.01	< 0.4

Total Back Half Net Mass Hg, Average

MHg _{bhm} = M(Hg _{bh2} +Hg _{bh3A} +Hg _{bh3B} +Hg _{bh3C})	MHg _{bhm}	µg	8.11	8.54	6.07	
--	--------------------	----	------	------	------	--

Blank Correction Determination

Back Half Blank	MHg _{bhb}	µg	0.00			
MHg _{bhb} = M(Hg _{bh2} +Hg _{bh3A} +Hg _{bh3B} +Hg _{bh3C}) blanks						
			5% of the Total Net Mass			MHg _{fthb} +MHg _{bhb}
	--	µg	0.41	0.43	0.31	0.10
Total Blank Correction Amount ⁽¹⁾	MHg _{blank}	µg	0.00	0.00	0.00	

Mercury Mass Determinations

Front Half (Filterable) Mercury Mass MHg _{fth} = MHg _{fthm} - MHg _{fthb}	MHg _{fth}	µg	< 0.1	< 0.1	< 0.1	
Back Half Mercury Mass MHg _{bh} = MHg _{bhm} - MHg _{bhb}	MHg _{bh}	µg	8.11	8.54	6.07	
Final Total Mercury Mass ⁽²⁾ MHg _t = (MHg _{fthm} + MHg _{bhm}) - MHg _{blank}	MHg _t	µg	8.21	8.64	6.17	

Note: The "<" sign indicates the mass is below method detection limits. All calculations forward use the detection limit for concentration and emission determinations and no blank correction is made.

(1) If the total of the measured blank values (MHg_{fthb}+MHg_{bhb}) is in the range of 0.0 to 0.6µg then use the total; if it exceeds 0.6µg, use the greater of (I) or (II). (I) 0.6µg (II) the lesser of (a) (MHg_{fthb}+MHg_{bhb}) or (b) 5% of the sample value.

(2) EPA Method 29 does not include calculations and/or specifications for blank correcting the front half and back half Hg mass independently, therefore the Total Mercury Loading may not necessarily be equal to (MHg_{fth}+MHg_{bh}).

Barr Engineering

5150 West 76th Street
Edina, MN 55439

Project Number: 23/69-1428.15

Mercury

EPA Method 29 Analysis

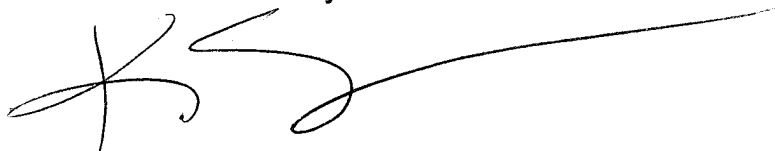
Analytical Report
25086



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

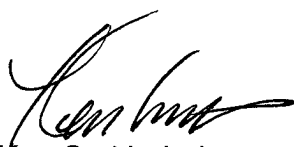
The following data for Analytical Report 25086
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

A handwritten signature in black ink, appearing to be 'KS', with a long horizontal stroke extending to the right.

Katie Strickland, B.S. Chemist
June 30, 2015

Report Reviewed and Finalized By:

A handwritten signature in black ink, appearing to be 'Ken Smith', with a stylized, cursive script.

Ken Smith, Laboratory Director
June 30, 2015

SUMMARY OF RESULTS

Summary of Analysis

SV021 - 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
Run 1	#1	6.22	< 0.1	1.64	< 0.2	1.09	3.50
	#2		< 0.1	1.64	< 0.2	1.11	3.47
Run 2	#1	7.31	< 0.1	2.06	< 0.2	0.505	4.71
	#2		< 0.1	2.06	< 0.2	0.531	4.75
Run 3	#1	7.28	< 0.1	2.00	< 0.2	0.926	4.28
	#2		< 0.1	2.00	< 0.2	0.943	4.40

SV022 - 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
Run 1	#1	6.25	< 0.1	1.53	< 0.2	1.24	3.44
	#2		< 0.1	1.54	< 0.2	1.27	3.47
Run 2	#1	7.41	< 0.1	1.82	< 0.2	1.17	4.44
	#2		< 0.1	1.87	< 0.2	1.21	4.32
Run 3	#1	6.55	< 0.1	1.69	< 0.2	2.42	2.39
	#2		< 0.1	1.71	< 0.2	2.49	2.39

Summary of Analysis

SV023 - 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
-----	---	-----	-----	-----	-----	-----	-----
Run 1	#1	5.64	< 0.1	0.730	< 0.2	2.88	2.04
	#2		< 0.1	0.715	< 0.2	2.89	2.02
Run 2	#1	8.22	< 0.1	0.531	< 0.2	2.17	5.48
	#2		< 0.1	0.563	< 0.2	2.17	5.52
Run 3	#1	9.37	< 0.1	0.878	< 0.2	2.40	6.11
	#2		< 0.1	0.893	< 0.2	2.44	6.02

SV024 - 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
-----	---	-----	-----	-----	-----	-----	-----
Run 1	#1	7.40	< 0.1	< 0.5	< 0.2	2.58	4.81
	#2		< 0.1	< 0.5	< 0.2	2.61	4.81
Run 2	#1	7.83	< 0.1	< 0.5	< 0.2	2.50	5.32
	#2		< 0.1	< 0.5	< 0.2	2.55	5.30
Run 3	#1	5.37	< 0.1	< 0.5	< 0.2	2.33	2.99
	#2		< 0.1	< 0.5	< 0.2	2.39	3.02
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

ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	Barr Engineering	Element One #:	25086
Client ID:	23/69-1428.15	Analyst:	DAM
Method:	Method 29	Dates Received:	06/16/15
Analytes:	Hg	Dates Analyzed:	06/19-22/15

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.

Detection Limits

The FIMS-100 CVAA instrument reporting limit for mercury was 0.004 µg per aliquot analyzed.

Analysis QA/QC

Duplicate analyses relative percent difference (RPD) and spike sample recovery data are summarized in the Quality Control Section. All QA/QC data was within the 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 Analysis RPD

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

Run Number	Front half	5% HNO ₃ / 10% H ₂ O ₂	Empty Impinger	KMnO ₄	HCl
SV021-M29-R1	NA	0.2%	NA	1.6%	0.9%
SV021-M29-R2	NA	0.3%	NA	5.0%	0.7%
SV021-M29-R3	NA	0.2%	NA	1.7%	2.7%
SV022-M29-R1	NA	0.3%	NA	2.3%	0.8%
SV022-M29-R2	NA	2.8%	NA	3.0%	2.9%
SV022-M29-R3	NA	1.1%	NA	2.8%	0.3%
SV023-M29-R1	NA	2.0%	NA	0.6%	0.8%
SV023-M29-R2	NA	5.9%	NA	0.1%	0.6%
SV023-M29-R3	NA	1.7%	NA	1.7%	1.5%
SV024-M29-R1	NA	NA	NA	1.3%	0.0%
SV024-M29-R2	NA	NA	NA	1.9%	0.4%
SV024-M29-R3	NA	NA	NA	2.3%	1.0%
Reagent Blank	NA	NA	NA	NA	NA

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 Impinger	KMnO ₄	HCl
SV021-M29-R3	#1	101%	100%	95%	94%	90%
	#2	103%	100%	96%	94%	92%
SV022-M29-R3	#1	122%	101%	96%	94%	89%
	#2	121%	102%	96%	93%	89%
SV023-M29-R3	#1	108%	103%	93%	94%	82%
	#2	108%	105%	93%	94%	83%
SV024-M29-R3	#1	100%	105%	94%	91%	91%
	#2	99%	105%	95%	93%	91%

SAMPLE CUSTODY

25086

Request for Laboratory Analytical Services N^o 20106

BARR

Check One: <input checked="" type="checkbox"/> Barr Engineering Company 3128 14th Avenue East Hibbing, MN 55435-4803 (218) 262-8600 Attention: <u>Tom Leier</u> 218 262 8679 (Print Name) (Direct Phone No.)		Send Invoice To: Barr Engineering Company Attn: Accounts Payable 4700 West 77th Street Minneapolis, MN 55435-4803 Ph. (952) 832-2600 Fax (952) 832-2601 Barr Project Contact: (Print Name) <u>Ass'ts Payable - Tom Leier</u>		Project Number <u>23 / 69 - 1428.15</u>	
Report Results To: Barr Engineering Company 3128 14th Avenue East Hibbing, MN 55435-4803 (218) 262-8600 Attention: <u>Tom Leier</u> 218 262 8679 (Print Name) (Direct Phone No.)		Special Instructions and/or specific regulatory requirements: (method, limit of detection, etc.) <u>First half for use by Barr</u>			
Sample Identification	Date/Time Collected	Media I.D. #	Type		Remarks
			Grab	Comp	
1. SV021 TIR1	6/9/15	4Q0506	X		7 566
2. TIR2		4Q0507	X		7 133
3. TIR3		4Q0508	X		7 60
4. Reagent Blank TIR0		4Q0509	X		7 PN
5. SV023 T3R1		4Q0516	X		7 528
6. T3R2		4Q0517	X		7 630
7. T3R3		4Q0519	X		7 646
8.					
9.					
10.					

Chain of Custody Collector's Signature: <u>Tom Leier</u> Laboratory: <u>Element 1</u> Method of Shipment: <input type="checkbox"/> Sampler <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> UPS Sample Condition upon Receipt: <input type="checkbox"/> Acceptable <input type="checkbox"/> Other (explain)	Relinquished by: <u>Tom Leier</u> Date/Time: <u>6/9/15</u>	Received by: <u>Tom Leier</u> Date/Time: <u>6/15/15 1430</u>
Received at Lab by: <u>Tom Leier</u> Date/Time: <u>6-16-15 1055</u>	Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy Samples received in good condition. No copy continues.	

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ANALYTICAL DATA

Analytical Calculations

Mercury-

$$\text{Mercury Results } (\mu\text{g}) = \frac{\text{CVAA Results } (\mu\text{g}) * \text{Final Volume (mL)}}{\text{Aliquot (mL)}}$$

Where-

CVAA Results= Raw sample reading (μg)--*Hg-Data Sheet*

Aliquot= Sample Aliquot (Alq.)--*Hg-Data Sheet*

Final Volume=Final Volume (FV)*--*Sample Submission*

* With the exception of the BH fraction where-
=Received Volume (BV)--*Sample Submission*

Analytical Calculations

Spike Recovery-

$$\text{Spike (\%)} = \frac{(\text{Spiked Result } (\mu\text{g/L}) - \text{Sample Result } (\mu\text{g/L}))}{\text{Spike Amount } (\mu\text{g/L})} \times 100$$

Where-

Spike Result = Raw sample concentration (ppb) -- *Hg-Client Printouts*

Sample Result = Raw sample concentration (ppb) -- *Hg-Client Printouts*

Spike Amount-- *Hg-Run Sheet*

Duplicate Analysis RPD-

$$\text{RPD (\%)} = \frac{(\text{Duplicate Result } (\mu\text{g/L}) - \text{Sample Result } (\mu\text{g/L}))}{\text{Average } (\mu\text{g/L})} \times 100$$

Where-

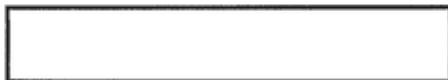
Sample Result and Duplicate Results=Raw sample concentration (ppb) -- *Hg-Client Printouts*

$$\text{Average} = \frac{(\text{Duplicate} + \text{Sample Results})}{2}$$

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AIR TESTING SAMPLE SUBMISSION FORM

Lab ID 25086



Analysis Due Date 06.24.15

QA/QC/Report Due Date 06.26.15

Client	Barr Engineering
Project No	23/69-1428.15

Date Rec	06.16.15
Time Rec	1055

HNO ₃ Lot: 1114020	HF Lot: 5114040	HCl Lot: 97264	Ref. Method: 29
Volume Marked <u>Y</u> N	Volume Loss <u>Y</u> N?		

Sample Identification

1	SV021-M29-R1	4	SV022-M29-R1	7	SV023-M29-R1
2	SV021-M29-R2	5	SV022-M29-R2	8	SV023-M29-R2
	SV021-M29-R2 Duplicate		SV022-M29-R2 Duplicate		SV023-M29-R2 Duplicate
3	SV021-M29-R3	6	SV022-M29-R3	9	SV023-M29-R3
	SV021-M29-R3 Spike		SV022-M29-R3 Spike		SV023-M29-R3 Spike

Analyses Requested

Samples 1-9

Hg

Runs / FB	Fill / Ace (FH)		HNO ₃ (FH)		5% HNO ₃ /10% H ₂ O ₂ (BH)			HNO ₃ (A)		KMnO ₄ (B)		HCl (C)	
	pH <2.0 <u>Y</u> N		pH <2.0 <u>Y</u> N		pH <2.0 <u>Y</u> N			pH <2.0 <u>Y</u> N		pH <2.0 <u>Y</u> N		pH <2.0 <u>Y</u> N	
Lab ID	Fill ID	BV ml	BV ml	FV ml	BV ml	Used	FV ml	BV ml	FV ml	BV ml	FV ml	BV ml	FV ml
1			100	100	400			95	200	390	500	225	400
2.D			100		400			100		440		240	
3.S			100		400			98		400		230	
4			96		400			106		375		230	
5.D			108		416			98		380		230	
6.S			100		420			104		390		230	
7			100		480			98		400		235	
8.D			100		470			106		340		230	
9.S			100		450			98		410		235	

Lab Communications

Lab was spiked with 100ul of Hg std @ 25 ppm (03305-6) Date 6.17.15

PM Analysis completed by Client ---Reconstitute C2 in HNO₃ and combine with FH---06.16.15 LLB

Fractions Received: Runs/FB: C1, C2, C3, C4, C5A, C5B, C5C---RB: C12, C7, C8A, C8B, C9, C10, C11 ---06.16.15 LLB

SS Page 1 of 2

6/17/2015 9:11:44 AM

SS by KELabeled By/Date KE 6.17.15FH Prep By/Date AM 6.19.15BH Prep By/Date AM 6.18.15BH/FH Prep By/Date AM 6.19.15PM Prep By/Date AM 6.19.15A Prep By/Date AM 6.18.15B Prep By/Date AM 6.18.15C Prep By/Date AM 6.19.15ID Verification By / Date AM 6.17.15

Cleaned glassware AM 6.19.15

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25086 Barr Engineering M29 Report Packet

Page 16 of 26



Analysis Due Date 06.24.15

QA/QC/Report Due Date 06.26.15

Client Barr Engineering
Project No 23/69-1428.15

Date Rec 06.16.15
Time Rec 1055

HNO₃ Lot: 114070 HF Lot: 5114040 HCl Lot: 97264
Volume Marked Y/N Volume Loss Y/N? Ref. Method: 29

Sample Identification

10	SV024-M29-R1	13	Reagent Blank
11	SV024-M29-R2		
	SV024-M29-R2 Duplicate		
12	SV024-M29-R3		
	SV024-M29-R3 Spike		

Analyses Requested

Samples 10-13 Hg

Runs / FB	Fill / Ace (FH)		HNO ₃ (FH)		5% HNO ₃ /10% H ₂ O ₂ (BH)			HNO ₃ (A)		KMnO ₄ (B)		HCl (C)	
	pH <2.0 Y / N		pH <2.0 (Y) / N		pH <2.0 (Y) / N			pH <2.0 (Y) / N		pH <2.0 (Y) / N		pH <2.0 (Y) / N	
Lab ID	Fill ID	BV ml	BV ml	FV ml	BV ml	Used	FV ml	BV ml	FV ml	BV ml	FV ml	BV ml	FV ml
10			94	100	450			108	200	390	500	225	400
11.D			108		460			98		400		230	
12.S			100		460			106		390		240	

M-29 Reagent Blank

Lab ID	Fraction			BV, ml	FV, ml	Comments
13	C 7	FH	Acetone Blank			
	C 8A	FH	0.1N HNO ₃	320	100	100 mLs added down
	C 8A	A	0.1N HNO ₃	320		
	C 8B	B	DI H ₂ O	99	100+33	33 mLs of C8B + 100 mLs of C10
	C 9	BH	5% HNO ₃ /10% H ₂ O ₂	200		
	C 10	B	4% KMnO ₄ /10% H ₂ SO ₄	160	100+33	100 mLs of C10 + 33 mLs of C8B
	C 11	C	8N HCl DI H ₂ O	240	400	
	C 12	FH	Filter			

Lab Communications

SS Page 2 of 2

6/17/2015 9:12:50 AM

SS by 2213

Labeled By/Date

FH Prep By/Date DAM 6.19.15

BH Prep By/Date DAM 6.18.15

BH/FH Prep By/Date DAM 6.19.15

PM Prep By/Date

A Prep By/Date DAM 6.18.15

B Prep By/Date DAM 6.18.15

C Prep By/Date DAM 6.19.15

ID Verification By / Date DAM 6.17.15

elementOne

Method 29 Microwave Worksheet

Lab ID # e 25086

Client: Barr

Date Digested: 6.19.15

Initials: DAM

Worksheet Prepared by: DAM

Auto Sample Loc.	Sample Lab ID	Sample Weight (g)	# of filters digested	Spike	Prep Volume (ml)	Weight In Micro / Weight Out Micro	Units
2	25086-LRB		/				
3	-LRB+		/	100% H ₂ SO ₄ 25 ppm			
4	-1		1				
5	-2						
6	-3						
7	-4						
8	-5						
9	-6						
10	-7						
11	-8						
12	-9						
13	-10						
14	-11						
15	-12						
16	-13						
1	cleaning						
H ₂ SO ₄ 25 ppm Lot. 03305-6							
HF Lot. 544040							
HNO ₃ Lot. 1114070							

Element One, Inc. Form 104 - Revision 1.0

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MERCURY BATCH DIGESTION - RUN WORKSHEET

R-999842

Date Prepared/Digested: 6.18.15 Prep By: DM SIF File #: 060915-1
 Block #1 Temperature: Start Time: 5:50 Machine ID: #1
 Block #2 Temperature: 93.47 Stop Time: 8:10 Batch Analyst: DM
 Block #3 Temperature: 91.97 Typed By: DM Verified By: LMW

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
1	Lab BLK (3/ batch)	0		40	40	Standard #1 (for working std) Lot #: 1330904
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 060515-1 by: <u>DM</u>
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 060515-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3): Lot #: 060515-3
7	QC #2= 0.08ug	0.2ml #2 std		40	40	
8	QC #3= 0.08ug	0.2ml #3 std		40	40	Curve prepared by: <u>DM</u>

Initial Review By: DM LMWDate: 6.19.15 Time: 3:29Final QC Review By: LMWDate: 06.22.15 Time: 10:12Comments: 25067-6BH @ 3ml (60)

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike ug
✓9	25068-1B				4	500	
✓10	25068-10 BH				4	630	
11	-1BH				0.25	570	
12	-7BH				0.25	570	
13	-8BH				2	570	
✓14	-8BH D				↓	↓	
✓15	25067-6BH	No Hg detect to report			4	605	
✓16	-6BH				↓	↓	
✓17	25068-6C				4	400	
✓18	-6C				↓	↓	
✓19	25068-1BH				4	400	

NOTES: Lab blanks and spikes must be prepared with each batch digestion**Spike for Hg,** Use calibration working 0.4ug/ml standard at the rate of 0.20ml per 40ml sample.**Digestion chemicals to be added in order at the following rate per 40ml volumes.**H₂SO₄ @ 2.0ml..... HNO₃ @ 1.0ml..... Persulfate @ 3.0ml..... KMnO₄ @ 6.0mlH₂SO₄ Lot # 54270 HNO₃ Lot # 114070 HCl Lot #: 97264Persulfate Lot # 152115-1 KMnO₄ Lot # 060515-4 Hydrox Lot #: 060515-5

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

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MERCURY BATCH DIGESTION - RUN WORKSHEET

SIF File #: 061915-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
✓20	25080-2BA				4	410	
21	-2BA D				↓	↓	
22	-3BA				↓	400	
23	-3BAH				↓	↓	
24	-4BA				↓	400	
25	-5BA				↓	410	
26	-5BA D				↓	↓	
27	-6BA				↓	420	
28	-6BAH				↓	↓	
29	-7BA				↓	480	
30	-8BA				↓	470	
31	-8BAH D				↓	↓	
32	-9BA				↓	450	
33	-9BAH				↓	↓	
34	-10BA				↓	450	
35	-11BA				↓	460	
36	-11BAH D				↓	↓	
37	-12BA				↓	460	
38	-12BAH				↓	↓	
39	-13BA				↓	200	
✓40	25080-1A				↓	200	
41	-2A				↓	↓	
42	-2A D				↓	↓	
43	-3A				↓	↓	
44	-3A H				↓	↓	
45	-4A				↓	↓	
46	-5A				↓	↓	
47	-5A D				↓	↓	
48	-6A				↓	↓	
49	-6A H				↓	↓	
50	-7A				↓	↓	
51	-8A				↓	↓	
52	-8A D				↓	↓	
53	-9A				↓	↓	
54	-9A H				↓	↓	

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MERCURY BATCH DIGESTION - RUN WORKSHEET

SIF File #: 061915-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
✓ 55	25086-10A				4	200	
56	-11A						
57	-11A D						
58	-12A						
59	-12A+						
60	-13A						
✓ 61	25086-1B					500	
62	-2B						
63	-2B D						
64	-3B						
65	-3B+						
66	-4B						
67	-5B						
68	-5B D						
69	-6B						
70	-6B+						
71	-7B						
72	-8B						
73	-8B D						
74	-9B						
75	-9B+						
76	-10B						
77	-11B						
78	-11B D						
79	-12B						
80	-12B+						
81	-13B						
✓ 82	25067-7B						
83	-8B						
84	-8B D						
85	-9B						
86	-9B+						
87	-10B						
88	-11B						
89	-11B D						

SIF File #: 061915-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike μg
✓ 90	25067-12B				4	500	
91	-12B+				↓	↓	
92	-14B				↓	↓	
✓ 93	25085-1B				4	500	
94	-2B				↓	↓	
95	-2BD				↓	↓	
96	-3B				↓	↓	
97	-3B+				↓	↓	
98	-4B				↓	↓	
99	25079				20	↓	
✓ 100	25079				10	↓	
101	24791-23 QC				0.05	5	$TV=10$
102	✓ L/C				1	1	$TV=0.008$
103	25079-D40				20	1	
104							
105							
106							

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MERCURY BATCH DIGESTION - RUN WORKSHEET

Date Prepared/Digested: 6-22-15 Prep By: DAW SIF File #: 062215-1
 Block #1 Temperature: 95.76 Start Time: 9:00 Machine ID: #2
 Block #2 Temperature: 92.04 Stop Time: 10:10 Batch Analyst: DAW
 Block #3 Temperature: Typed By: DAW Verified By: LAU

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
1	Lab BLK (3/ batch)	0		40	40	Standard #1 (for working std) Lot #: <u>1330901</u>
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: <u>062215-1</u> by: <u>DAW</u>
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: <u>062215-2</u>
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3): Lot #: <u>062215-3</u>
7	QC #2= 0.08ug	0.2ml #2 std		40	40	
8	QC #3= 0.08ug	0.2ml #3 std		40	40	Curve prepared by: <u>DAW</u>

Initial Review By: DAW LAUDate: 6-22-15Time: 2:00Final QC Review By: LAUDate: 06-22-15Time: 4:15Comments: 25117-C (TUP) F

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike ug
✓ 9	<u>25085-1C</u>				<u>4</u>	<u>40</u>	
10	<u>-2C</u>						
11	<u>-2CD</u>						
12	<u>-3C</u>						
13	<u>-3CT</u>						
14	<u>-4C</u>						
✓ 15	<u>25067-7C</u>						
16	<u>-8C</u>						
17	<u>-8CD</u>						
18	<u>-9C</u>						
19	<u>-9CT</u>						

NOTES: Lab blanks and spikes must be prepared with each batch digestion**Spike for Hg,** Use calibration working 0.4ug/ml standard at the rate of 0.20ml per 40ml sample.**Digestion chemicals to be added in order at the following rate per 40ml volumes.** H_2SO_4 @ 2.0ml..... HNO_3 @ 1.0ml..... Persulfate @ 3.0ml..... $KMnO_4$ @ 6.0ml H_2SO_4 Lot # 54276 HNO_3 Lot # 1114070 HCl Lot #: 97264Persulfate Lot # 052115-1 $KMnO_4$ Lot # 060515-4 Hydrox Lot #: 060515-5

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

SIF File #: 062215-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
✓20	25067-10C				4	400	
21	-11C				↓	↓	
22	-11CD				↓	↓	
23	-12C				↓	↓	
24	-12C+				↓	↓	
25	-14C				↓	↓	
✓26	25086-LRB	FH			4	100	
27	-LRB	FH+			1.6	↓	
28	-1FH				4	↓	
29	-2FH				↓	↓	
30	-2FHD				↓	↓	
31	-3FH				↓	↓	
32	-3FH+				↓	↓	
33	-4FH				↓	↓	
34	-5FH				↓	↓	
35	-5FHD				↓	↓	
36	-6FH				↓	↓	
37	-6FH+				↓	↓	
38	-7FH				↓	↓	
39	-8FH				↓	↓	
40	-8FHD				↓	↓	
41	-9FH				↓	↓	
42	-9FH+				↓	↓	
43	-10FH				↓	↓	
44	-11FH				↓	↓	
45	-11FHD				↓	↓	
46	-12FH				↓	↓	
47	-12FH+				↓	↓	
48	-13FH				↓	↓	
✓49	25086-1C					400	
50	-2C				↓	↓	
51	-2CD				↓	↓	
52	-3C				↓	↓	
53	-3C+				↓	↓	
54	-4C				↓	↓	

SIF File #: 060215-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike μ g
✓ 55	25086-5C				4	400	
56	-5CD						
57	-6C						
58	-6C+						
59	-7C						
60	-8C						
61	-8CD						
62	-9C						
63	-9C+						
64	-10C						
65	-11C						
66	-11CD						
67	-12C						
68	-12C+						
69	-13C				↓	↓	
70	24791-23 QC				0.05	5	TV=10
71	24791-23 QC				1	1	TV=0.008
72	15116/117-BLK				20	1	
73	-BLK T						
✓ 74	25116-1						
75	-2						
76	-3						
✓ 77	25117-A						
78	-B						
79	-C						
80	-C+				↓	↓	
81							
82							
83							
84							
85							
86							
87							
88							
89							

PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_Rd	Mean_Rt	Units	Alq.	Vol.	Sig 1	Reading-1	Result-1	Sig 2	Reading-2	Result-2
Calib Blank	6/19/2015	10:38:24 AM	8.33E-06			µg			-4.18E-06			2.08E-05		
STD1 = .004ug	6/19/2015	10:40:04 AM	0.0012611			µg			0.0013209			0.0012014		
STD2 = .04ug	6/19/2015	10:41:46 AM	0.0126147			µg			0.0125865			0.0126429		
STD3 = .08ug	6/19/2015	10:43:39 AM	0.0254862			µg			0.0254467			0.0255257		
STD4 = .16ug	6/19/2015	10:45:33 AM	0.0502783			µg			0.0500445			0.0505121		
STD5 = .2ug	6/19/2015	10:47:28 AM	0.0619893			µg			0.0617347			0.0622439		
Reagent Blank	6/19/2015	10:49:21 AM	1.56E-05	4.99E-05	4.99E-05	µg			4.08E-06	1.30E-05	1.30E-05	2.71E-05	8.68E-05	8.68E-05
0.004ug = DL	6/19/2015	10:51:01 AM	0.0012434	0.003981	0.003981	µg			0.001254	0.004015	0.004015	0.0012328	0.0039471	0.0039471
0.080ug = QC STD 2	6/19/2015	10:52:44 AM	0.0249904	0.0800118	0.0800118	µg			0.0249822	0.0799855	0.0799855	0.0249986	0.080038	0.080038
Reagent Blank	6/19/2015	10:54:38 AM	1.01E-05	3.24E-05	3.24E-05	µg			-9.79E-07	-3.13E-06	-3.13E-06	2.12E-05	6.79E-05	6.79E-05
0.004ug = DL	6/19/2015	11:14:40 AM	0.0011939	0.0038226	0.0038226	µg			0.0011897	0.0038091	0.0038091	0.0011981	0.0038361	0.0038361
0.080ug = QC STD 2	6/19/2015	11:16:24 AM	0.0246888	0.0790461	0.0790461	µg			0.0247149	0.0791297	0.0791297	0.0246627	0.0789624	0.0789624
Reagent Blank	6/19/2015	11:18:17 AM	1.00E-05	3.21E-05	3.21E-05	µg			5.09E-06	1.63E-05	1.63E-05	1.49E-05	4.78E-05	4.78E-05
25086- 1 BH	6/19/2015	11:19:57 AM	0.0051285	0.0163699	1.6369923	µg	4	400	0.0051241	0.0163561	1.6356052	0.0051328	0.0163838	1.6383795
25086- 2 BH	6/19/2015	11:21:38 AM	0.006289	0.0200855	2.0587658	µg	4	410	0.0062986	0.0201162	2.0619116	0.0062794	0.0200548	2.0556199
25086- 2 BH DUP	6/19/2015	11:23:18 AM	0.0062234	0.0198757	2.0372566	µg	4	410	0.0061943	0.0197825	2.0277028	0.0062525	0.0199689	2.0468104
25086- 3 BH	6/19/2015	11:25:00 AM	0.0062657	0.0200108	2.0010832	µg	4	400	0.0062602	0.0199933	1.9993292	0.0062711	0.0200284	2.0028372
25086- 3 BH SPK	6/19/2015	11:26:42 AM	0.0312872	0.1001222	10.01222	µg	4	400	0.0312374	0.0999628	9.9962813	0.0313369	0.1002816	10.02816
25086- 4 BH	6/19/2015	11:28:35 AM	0.0048134	0.0153613	1.5361256	µg	4	400	0.0048063	0.0153385	1.5338527	0.0048205	0.015384	1.5383986
25086- 5 BH	6/19/2015	11:30:18 AM	0.0056286	0.0179712	1.8420511	µg	4	410	0.0055502	0.0177202	1.8163193	0.005707	0.0182223	1.8677829
25086- 5 BH DUP	6/19/2015	11:32:01 AM	0.0056692	0.0181011	1.8553614	µg	4	410	0.0056519	0.0180458	1.8496969	0.0056864	0.0181564	1.861026
25086- 6 BH	6/19/2015	11:33:45 AM	0.0050817	0.0162201	1.7031153	µg	4	420	0.0050543	0.0161326	1.6939196	0.005109	0.0163077	1.7123109
25086- 6 BH SPK	6/19/2015	11:35:28 AM	0.0304285	0.097373	10.22417	µg	4	420	0.030413	0.0973234	10.218952	0.030444	0.0974227	10.229387
0.004ug = DL	6/19/2015	11:37:22 AM	0.001202	0.0038485	0.0038485	µg			0.0011993	0.0038399	0.0038399	0.0012047	0.0038572	0.0038572
0.080ug = QC STD 2	6/19/2015	11:39:06 AM	0.0247636	0.0792855	0.0792855	µg			0.0249117	0.0797596	0.0797596	0.0246155	0.0788113	0.0788113
Reagent Blank	6/19/2015	11:40:59 AM	2.90E-05	9.28E-05	9.28E-05	µg			7.73E-06	2.48E-05	2.48E-05	5.03E-05	0.0001609	0.0001609
0.004ug = DL	6/19/2015	12:30:02 PM	0.0013105	0.0041959	0.0041959	µg			0.0013158	0.0042128	0.0042128	0.0013052	0.0041789	0.0041789
0.080ug = QC STD 2	6/19/2015	12:31:45 PM	0.0240698	0.0770642	0.0770642	µg			0.0240467	0.0769904	0.0769904	0.0240928	0.077138	0.077138
0.080ug = QC STD 3	6/19/2015	12:33:42 PM	0.0249104	0.0797557	0.0797557	µg			0.0248147	0.0794493	0.0794493	0.0250061	0.080062	0.080062
Reagent Blank	6/19/2015	12:35:36 PM	0.0001575	0.0005041	0.0005041	µg			7.67E-05	0.0002457	0.0002457	0.0002382	0.0007626	0.0007626
25086- 7 BH	6/19/2015	12:37:18 PM	0.002248	0.006022	0.722645	µg	4	480	0.0022667	0.006082	0.7298399	0.0022292	0.0059621	0.7154501
25086- 8 BH	6/19/2015	12:39:03 PM	0.0018217	0.0046573	0.5472285	µg	4	470	0.0017787	0.0045197	0.5310641	0.0018647	0.0047948	0.5633929
25086- 8 BH DUP	6/19/2015	12:40:49 PM	0.0017574	0.0044515	0.5230542	µg	4	470	0.001764	0.0044725	0.5255136	0.0017509	0.0044306	0.5205948
25086- 9 BH	6/19/2015	12:42:31 PM	0.0028255	0.0078711	0.8854959	µg	4	450	0.0028045	0.0078039	0.8779334	0.0028465	0.0079383	0.8930585
25086- 9 BH SPK	6/19/2015	12:44:10 PM	0.0288008	0.0910363	10.24158	µg	4	450	0.0286429	0.0905308	10.184719	0.0289587	0.0915417	10.29844
25086- 10 BH	6/19/2015	12:46:00 PM	0.0009291	0.0017994	0.2024356	µg	4	450	0.0009403	0.0018352	0.2064572	0.0009179	0.0017637	0.198414
25086- 11 BH	6/19/2015	12:47:40 PM	0.000642	0.0008803	0.101229	µg	4	460	0.0006066	0.0007669	0.0881949	0.0006774	0.0009936	0.1142632
25086- 11 BH DUP	6/19/2015	12:49:20 PM	0.000676	0.000989	0.1137363	µg	4	460	0.0007124	0.0011056	0.127139	0.0006396	0.0008725	0.1003335
25086- 12 BH	6/19/2015	12:51:01 PM	0.0007481	0.0012199	0.1402927	µg	4	460	0.0007656	0.0012761	0.1467494	0.0007306	0.0011638	0.1338359
25086- 12 BH SPK	6/19/2015	12:52:42 PM	0.0266405	0.0841197	9.6737689	µg	4	460	0.0266005	0.0839915	9.659027	0.0266806	0.0842479	9.6885108
0.004ug = DL	6/19/2015	12:56:15 PM	0.0011663	0.0037342	0.0037342	µg			0.0011552	0.0036986	0.0036986	0.0011775	0.0037699	0.0037699
0.080ug = QC STD 2	6/19/2015	12:57:58 PM	0.024409	0.0781504	0.0781504	µg			0.024436	0.0782368	0.0782368	0.024382	0.0780639	0.0780639
Reagent Blank	6/19/2015	12:59:52 PM	7.06E-05	0.0002261	0.0002261	µg			6.69E-05	0.0002141	0.0002141	7.44E-05	0.0002381	0.0002381
25086- 13 BH	6/19/2015	1:01:33 PM	5.95E-05	-0.0009847	-0.0492359	µg	4	200	5.85E-05	-0.0009881	-0.0494032	6.05E-05	-0.0009814	-0.0490686
25086- 1A	6/19/2015	1:03:15 PM	3.05E-05	-0.0010776	-0.0538802	µg	4	200	9.50E-06	-0.0011448	-0.0572401	5.15E-05	-0.0010104	-0.0505203
25086- 2A	6/19/2015	1:04:58 PM	2.22E-05	-0.0011041	-0.0552048	µg	4	200	2.99E-05	-0.0010796	-0.0539801	1.46E-05	-0.0011286	-0.0564295
25086- 2A DUP	6/19/2015	1:06:41 PM	6.22E-05	-0.0009762	-0.0488098	µg	4	200	5.54E-05	-0.0009978	-0.0498887	6.89E-05	-0.0009546	-0.047731
25086- 3A	6/19/2015	1:08:24 PM	7.08E-05	-0.0009485	-0.0474235	µg	4	200	3.86E-05	-0.0010518	-0.0525877	0.0001031	-0.0008452	-0.0422593
25086- 3A SPK	6/19/2015	1:10:07 PM	0.0241961	0.0762933	3.8146659	µg	4	200	0.0241382	0.0761079	3.805396	0.024254	0.0764787	3.8239358
25086- 4A	6/19/2015	1:12:03 PM	3.89E-05	-0.0010508	-0.0525414	µg	4	200	2.13E-05	-0.0011071	-0.0553554	5.64E-05	-0.0009945	-0.0497275
25086- 5A	6/19/2015	1:13:48 PM	3.23E-05	-0.0010719	-0.0535935	µg	4	200	2.97E-05	-0.0010802	-0.0540118	3.49E-05	-0.0010635	-0.0531752
25086- 5A DUP	6/19/2015	1:15:33 PM	9.71E-06	-0.0011441	-0.0572074	µg	4	200	5.77E-06	-0.0011568	-0.0578382	1.36E-05	-0.0011315	-0.0565765
25086- 6A	6/19/2015	1:17:15 PM	2.13E-05	-0.0011071	-0.0553525	µg	4	200	-8.89E-06	-0.0012037	-0.0601848	5.15E-05	-0.0010104	-0.0505203
0.004ug = DL	6/19/2015	1:18:55 PM	0.00113	0.0036178	0.0036178	µg			0.0011133	0.0035644	0.0035644	0.0011467	0.0036713	0.0036713
0.080ug = QC STD 2	6/19/2015	1:20:38 PM	0.0242319	0.0775832	0.0775832	µg			0.0242155	0.0775307	0.0775307	0.0242483	0.0776356	0.0776356
Reagent Blank	6/19/2015	1:22:32 PM	3.37E-05	0.000108	0.000108	µg			2.16E-05	6.92E-05	6.92E-05	4.58E-05	0.0001468	0.0001468
25086- 6A SPK	6/19/2015	1:24:11 PM	0.0243802	0.076883	3.8441488	µg	4	200	0.0243344	0.0767361	3.8368055	0.0244261	0.0770298	3.8514921
25086- 7A	6/19/2015	1:26:01 PM	2.28E-05	-0.0011023	-0.0551159	µg	4	200	8.82E-06	-0.001147	-0.05735	3.67E-05	-0.0010576	-0.0528819
25086- 8A	6/19/2015	1:27:40 PM	2.09E-05	-0.0011083	-0.055415	µg	4	200	2.17E-05	-0.0011056	-0.0552824	2.01E-05	-0.001111	-0.0555476
25086- 8A DUP	6/19/2015	1:29:20 PM	4.99E-05	-0.0010154	-0.0507681	µg	4	200	2.62E-05	-0.0010914	-0.0545708	7.37E-05	-0.0009393	-0.0469653
25086- 9A	6/19/2015	1:31:00 PM	1.86E-05	-0.0011157	-0.0557866	µg	4	200	1.78E-05	-0.0011184	-0.0559185	1.94E-05	-0.0011131	-0.0556548
25086- 9A SPK	6/19/2015	1:32:41 PM	0.0235962	0.0743727	3.7186356	µg	4	200	0.0235646	0.0742717	3.7135827	0.0236278	0.0744738	3.7236885
25086- 10A	6/19/2015	1:34:32 PM	2.50E-05	-0.0010952	-0.0547619	µg	4	200	1.18E-05	-0.0011374	-0.0568701	3.82E-05	-0.0010531	-0.0526537
25086- 11A	6/19/2015	1:36:14 PM	2.85E-05	-0.0010839	-0.0541972	µg	4	200	2.16E-05	-0.0011062	-0.0553106	3.55E-05	-0.0010617	-0.0530838
25086- 11A DUP	6/19/2015	1:37:57 PM	1.57E-05	-0.001125	-0.0562505	µg	4	200	2.28E-05	-0.0011021	-0.0551049	8.53E-06	-0.0011479	-0.0573962
25086- 12A	6/19/2015	1:39:40 PM	1.32E-05	-0.0011329	-0.0566435	µg	4	200	8.10E-06	-0.0011493	-0.0574647	1.84E-05	-0.0011164	-0.0558223
0.004ug = DL	6/19/2015	1:4												

PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_Rd	Mean_Rt	Units	Alq.	Vol.	Sig 1	Reading-1	Result-1	Sig 2	Reading-2	Result-2
25086- 5B DUP	6/19/2015	2:02:12 PM	0.0033406	0.0095204	1.1900443	µg	4	500	0.00333355	0.0095039	1.187989	0.0033457	0.0095368	1.1920997
0.004ug = DL	6/19/2015	2:03:54 PM	0.0011687	0.0037418	0.0037418	µg			0.0011695	0.0037442	0.0037442	0.0011679	0.0037393	0.0037393
0.080ug = QC STD 2	6/19/2015	2:05:37 PM	0.024526	0.0785249	0.0785249	µg			0.0239149	0.0765684	0.0765684	0.0251371	0.0804813	0.0804813
Reagent Blank	6/19/2015	2:07:31 PM	3.23E-05	0.0001034	0.0001034	µg			1.22E-05	3.92E-05	3.92E-05	5.24E-05	0.0001677	0.0001677
25086- 6B	6/19/2015	2:09:12 PM	0.0064945	0.0196183	2.4522853	µg	4	500	0.006408	0.0193413	2.4176632	0.006581	0.0198953	2.4869074
25086- 6B SPK	6/19/2015	2:10:53 PM	0.0299093	0.0945855	11.823182	µg	4	500	0.0300031	0.0948856	11.860703	0.0298156	0.0942853	11.785661
25086- 7B	6/19/2015	2:12:45 PM	0.0075729	0.0230708	2.8838511	µg	4	500	0.0075527	0.0230063	2.8757895	0.007593	0.0231353	2.8919127
25086- 8B	6/19/2015	2:14:27 PM	0.0057817	0.017336	2.1669958	µg	4	500	0.0057836	0.0173422	2.1677704	0.0057797	0.0173298	2.1662213
25086- 8B DUP	6/19/2015	2:16:09 PM	0.0055642	0.0166397	2.0799647	µg	4	500	0.0055537	0.016606	2.0757519	0.0055747	0.0166734	2.0841775
25086- 9B	6/19/2015	2:17:52 PM	0.0064044	0.0193299	2.4162318	µg	4	500	0.0063542	0.019169	2.396123	0.0064547	0.0194907	2.4363406
25086- 9B SPK	6/19/2015	2:19:36 PM	0.0298249	0.0943153	11.789408	µg	4	500	0.0298174	0.0942911	11.786393	0.0298325	0.0943394	11.792424
25086- 10B	6/19/2015	2:21:31 PM	0.0068523	0.0207637	2.5954672	µg	4	500	0.0068098	0.0206277	2.5784632	0.0068948	0.0208998	2.6124712
25086- 11B	6/19/2015	2:23:16 PM	0.0066768	0.0202019	2.5252378	µg	4	500	0.0066154	0.0200053	2.5006667	0.0067382	0.0203985	2.5498089
25086- 11B DUP	6/19/2015	2:24:57 PM	0.0065193	0.0196977	2.4622077	µg	4	500	0.0065454	0.019781	2.4726286	0.0064933	0.0196143	2.4517867
0.004ug = DL	6/19/2015	2:28:17 PM	0.0012119	0.0038803	0.0038803	µg			0.0011936	0.0038214	0.0038214	0.0012303	0.0039391	0.0039391
0.080ug = QC STD 2	6/19/2015	2:30:00 PM	0.0248294	0.0794962	0.0794962	µg			0.0247757	0.0793245	0.0793245	0.024883	0.079668	0.079668
Reagent Blank	6/19/2015	2:31:53 PM	5.00E-05	0.0001601	0.0001601	µg			2.51E-05	8.04E-05	8.04E-05	7.49E-05	0.0002399	0.0002399
25086- 12B	6/19/2015	2:33:32 PM	0.0062623	0.0188747	2.3593323	µg	4	500	0.0061931	0.0186532	2.3316516	0.0063314	0.0190961	2.387013
25086- 12B SPK	6/19/2015	2:35:10 PM	0.0292974	0.0926264	11.578298	µg	4	500	0.0290802	0.0919308	11.491344	0.0295147	0.093322	11.665252
25086- 13B	6/19/2015	2:37:00 PM	4.03E-06	-0.0011623	-0.1452921	µg	4	500	-3.31E-06	-0.0011858	-0.1482297	1.14E-05	-0.0011388	-0.1423545
0.004ug = DL	6/19/2015	2:50:39 PM	0.0011916	0.0038152	0.0038152	µg			0.0011884	0.0038047	0.0038047	0.0011949	0.0038256	0.0038256
0.080ug = QC STD 2	6/19/2015	2:52:22 PM	0.0245999	0.0787614	0.0787614	µg			0.0245778	0.0786908	0.0786908	0.0246219	0.0788321	0.0788321
Reagent Blank	6/19/2015	2:54:16 PM	2.07E-05	6.61E-05	6.61E-05	µg			-6.42E-06	-2.06E-05	-2.06E-05	4.77E-05	0.0001528	0.0001528
Calib Blank	6/22/2015	10:46:34 AM	0.0010347			µg			0.0009914			0.001078		
STD 1= .004 ug	6/22/2015	10:48:14 AM	0.0012866			µg			0.0012989			0.0012743		
STD 2= .04 ug	6/22/2015	10:49:56 AM	0.0139925			µg			0.0140394			0.0139457		
STD 3= .08 ug	6/22/2015	10:51:49 AM	0.0294973			µg			0.0296351			0.0293596		
STD 4= .16 ug	6/22/2015	10:53:43 AM	0.0565733			µg			0.057148			0.0559986		
STD 5= .20 ug	6/22/2015	10:55:38 AM	0.06946			µg			0.0697757			0.0691443		
Reagent Blank	6/22/2015	10:57:31 AM	-7.68E-05	-0.0002184	-0.0002184	µg			-7.81E-05	-0.0002222	-0.0002222	-7.55E-05	-0.0002147	-0.0002147
0.004ug = DL	6/22/2015	11:00:53 AM	0.0014129	0.0040197	0.0040197	µg			0.0013284	0.0037791	0.0037791	0.0014975	0.0042603	0.0042603
0.080ug = QC STD 2	6/22/2015	11:02:36 AM	0.0281811	0.0801736	0.0801736	µg			0.0283346	0.0806101	0.0806101	0.0280277	0.0797371	0.0797371
0.080ug = QC STD 3	6/22/2015	11:04:33 AM	0.0299713	0.0852664	0.0852664	µg			0.0300911	0.0856072	0.0856072	0.0298515	0.0849256	0.0849256
Reagent Blank	6/22/2015	11:06:27 AM	6.33E-06	1.80E-05	1.80E-05	µg			-1.05E-05	-2.99E-05	-2.99E-05	2.32E-05	6.59E-05	6.59E-05
0.004ug = DL	6/22/2015	11:26:07 AM	0.0012974	0.0036909	0.0036909	µg			0.0013871	0.0039463	0.0039463	0.0012076	0.0034355	0.0034355
0.080ug = QC STD 2	6/22/2015	11:27:51 AM	0.0280128	0.0796947	0.0796947	µg			0.0279583	0.0795395	0.0795395	0.0280674	0.0798499	0.0798499
Reagent Blank	6/22/2015	11:29:45 AM	1.10E-05	3.13E-05	3.13E-05	µg			4.92E-05	0.0001399	0.0001399	-2.72E-05	-7.73E-05	-7.73E-05
25086- LRB FH	6/22/2015	11:43:41 AM	-8.56E-05	-2.50E-05	-0.0006254	µg	4	100	-4.11E-05	0.0001014	0.0025348	-0.00013	-0.0001514	-0.0037856
25086- LRB FH SPK	6/22/2015	11:45:25 AM	0.0345268	0.0984451	6.1528164	µg	1.6	100	0.0344668	0.0982743	6.1421454	0.0345868	0.0986158	6.1634874
25086- 1 FH	6/22/2015	11:47:20 AM	0.0005177	0.0016912	0.0422793	µg	4	100	0.0005018	0.001646	0.0411497	0.0005335	0.0017364	0.0434089
0.004ug = DL	6/22/2015	11:49:03 AM	0.0014568	0.0041446	0.0041446	µg			0.0015002	0.0042679	0.0042679	0.0014135	0.0040213	0.0040213
0.080ug = QC STD 2	6/22/2015	11:50:47 AM	0.0274649	0.078136	0.078136	µg			0.0276375	0.0786271	0.0786271	0.0272923	0.0776448	0.0776448
Reagent Blank	6/22/2015	11:52:40 AM	7.31E-06	2.08E-05	2.08E-05	µg			1.65E-05	4.69E-05	4.69E-05	-1.87E-06	-5.32E-06	-5.32E-06
25086- 2 FH	6/22/2015	11:54:23 AM	0.0001718	0.0007073	0.0176825	µg	4	100	0.0001567	0.0006644	0.0166095	0.0001869	0.0007502	0.0187555
25086- 2 FH DUP	6/22/2015	11:56:08 AM	0.0003659	0.0012595	0.0314884	µg	4	100	0.0003797	0.0012986	0.0324647	0.0003522	0.0012205	0.030512
25086- 3 FH	6/22/2015	11:57:54 AM	-3.29E-05	0.0001249	0.0031232	µg	4	100	4.28E-05	0.0003402	0.0085055	-0.0001085	-9.04E-05	-0.0022591
25086- 3 FH SPK	6/22/2015	11:59:36 AM	0.0286013	0.0815875	2.0396863	µg	4	100	0.0282882	0.0806965	2.0174132	0.0289145	0.0824784	2.0619595
25086- 4 FH	6/22/2015	12:01:26 PM	-0.0001137	-0.000105	-0.002625	µg	4	100	-9.37E-05	-4.81E-05	-0.0012023	-0.0001337	-0.0001619	-0.0040477
25086- 5 FH	6/22/2015	12:03:06 PM	5.90E-06	0.0002352	0.0058806	µg	4	100	-1.19E-06	0.0002151	0.0053765	1.30E-05	0.0002554	0.0063847
25086- 5 FH DUP	6/22/2015	12:04:46 PM	-6.08E-05	4.56E-05	0.0011398	µg	4	100	-2.09E-05	0.000159	0.0039758	-0.0001006	-6.78E-05	-0.0016962
25086- 6 FH	6/22/2015	12:06:26 PM	-9.06E-05	-3.94E-05	-0.0009857	µg	4	100	-7.81E-05	-3.61E-06	-9.04E-05	-0.0001032	-7.52E-05	-0.001881
25086- 6 FH SPK	6/22/2015	12:08:07 PM	0.0341804	0.0974596	2.4364901	µg	4	100	0.0343669	0.0979902	2.4497559	0.0339939	0.096929	2.4232242
25086- 7 FH	6/22/2015	12:09:58 PM	-0.000208	-0.0003732	-0.0093311	µg	4	100	-0.0001595	-0.0002355	-0.0058864	-0.0002564	-0.000511	-0.0127759
0.004ug = DL	6/22/2015	12:13:20 PM	0.0013556	0.0038566	0.0038566	µg			0.0013467	0.0038312	0.0038312	0.0013646	0.0038821	0.0038821
0.080ug = QC STD 2	6/22/2015	12:15:04 PM	0.0269464	0.0766608	0.0766608	µg			0.0269229	0.076594	0.076594	0.0269698	0.0767275	0.0767275
Reagent Blank	6/22/2015	12:16:57 PM	8.26E-05	0.0002349	0.0002349	µg			3.67E-05	0.0001043	0.0001043	0.0001284	0.0003654	0.0003654
25086- 8 FH	6/22/2015	12:18:39 PM	-0.0001613	-0.0002405	-0.0060137	µg	4	100	-0.0001893	-0.0003201	-0.0080026	-0.0001334	-0.000161	-0.0040249
25086- 8 FH DUP	6/22/2015	12:20:21 PM	8.96E-05	0.0004734	0.0118346	µg	4	100	4.04E-05	0.0003333	0.0083316	0.0001389	0.0006135	0.0153375
25086- 9 FH	6/22/2015	12:22:03 PM	-2.69E-05	0.000142	0.0035497	µg	4	100	-4.33E-05	9.52E-05	0.002381	-1.04E-05	0.0001887	0.0047184
25086- 9 FH SPK	6/22/2015	12:23:46 PM	0.030229	0.086218	2.1554502	µg	4	100	0.0302466	0.0862682	2.1567054	0.0302113	0.0861678	2.1541951
25086- 10 FH	6/22/2015	12:25:41 PM	2.07E-05	0.0002774	0.0069345	µg	4	100	-1.36E-05	0.0001797	0.0044914	5.51E-05	0.0003751	0.0093776
25086- 11 FH	6/22/2015	12:27:25 PM	9.39E-05	0.0004855	0.0121379	µg	4	100	0.0001025	0.0005101	0.0127527	8.52E-05	0.0004609	0.0115231
25086- 11 FH DUP	6/22/2015	12:29:10 PM	-0.0001541	-0.00022	-0.0054993	µg	4	100	-0.0001246	-0.0001359	-0.0033984	-0.0001836	-0.000304	-0.0076002
25086- 12 FH	6/22/2015	12:30:55 PM	-0.0001539	-0.0002194	-0.005485	µg	4	100	-0.0001173	-0.0001154	-0.0028849	-0.0001905	-0.0003234	-0.0080851
25086- 12 FH SPK	6/22/2015	12:32:41 PM	0.0279797	0.0798188	1.9954708	µg	4	100	0.0281123	0.0801961	2.004902	0.0278471	0.0794416	1.9860395
25086- 13 FH	6/22/2015	12:34:33 PM	-0.0001735	-0.0002753	-0.0068824	µg	4	100	-0.0001815	-0.0002978	-0.0074444	-0.0001656	-0.0002528	-0.0063204
0.004ug = DL	6/22													

PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_Rd	Mean_Rt	Units	Alq.	Vol.	Sig 1	Reading-1	Result-1	Sig 2	Reading-2	Result-2
25086- 6C SPK	6/22/2015	12:58:05 PM	0.0334365	0.0953433	9.5343305	µg	4	400	0.0334255	0.095312	9.5312001	0.0334475	0.0953746	9.5374609
0.004ug = DL	6/22/2015	1:01:39 PM	0.0013632	0.0038782	0.0038782	µg			0.0013743	0.0039097	0.0039097	0.0013521	0.0038467	0.0038467
0.080ug = QC STD 2	6/22/2015	1:03:22 PM	0.0260604	0.0741404	0.0741404	µg			0.0260127	0.0740045	0.0740045	0.0261082	0.0742762	0.0742762
Reagent Blank	6/22/2015	1:05:15 PM	-1.81E-05	-5.14E-05	-5.14E-05	µg			-3.86E-05	-0.0001099	-0.0001099	2.51E-06	7.15E-06	7.15E-06
25086- 7C	6/22/2015	1:06:58 PM	0.0070673	0.0203246	2.0324561	µg	4	400	0.0070966	0.0204079	2.0407851	0.0070381	0.0202413	2.0241272
25086- 8C	6/22/2015	1:08:42 PM	0.019264	0.0550234	5.5023376	µg	4	400	0.0192024	0.0548482	5.484822	0.0193256	0.0551985	5.5198532
25086- 8C DUP	6/22/2015	1:10:37 PM	0.018848	0.0538399	5.3839914	µg	4	400	0.0186751	0.0533479	5.3347855	0.019021	0.054332	5.4331972
25086- 9C	6/22/2015	1:12:32 PM	0.0212418	0.06065	6.0649998	µg	4	400	0.0214061	0.0611175	6.1117482	0.0210775	0.0601825	6.0182514
25086- 9C SPK	6/22/2015	1:14:24 PM	0.0444793	0.1267593	12.675935	µg	4	400	0.0442902	0.1262213	12.622126	0.0446685	0.1272974	12.729744
25086- 10C	6/22/2015	1:16:13 PM	0.0168171	0.0480621	4.80621	µg	4	400	0.016816	0.0480589	4.8058874	0.0168183	0.0480653	4.8065327
25086- 11C	6/22/2015	1:18:03 PM	0.0185871	0.0530975	5.3097451	µg	4	400	0.0186226	0.0531985	5.3198537	0.0185515	0.0529964	5.2996364
25086- 11C DUP	6/22/2015	1:19:53 PM	0.0181342	0.051809	5.1809002	µg	4	400	0.0180297	0.0515119	5.1511924	0.0182386	0.0521061	5.2106081
25086- 12C	6/22/2015	1:21:44 PM	0.0104948	0.0300754	3.0075449	µg	4	400	0.0104404	0.0299207	2.992073	0.0105492	0.0302302	3.0230169
25086- 12C SPK	6/22/2015	1:23:34 PM	0.0361447	0.1030479	10.304787	µg	4	400	0.0362022	0.1032115	10.32115	0.0360872	0.1028842	10.288424
0.004ug = DL	6/22/2015	1:25:26 PM	0.0012674	0.0036056	0.0036056	µg			0.0012935	0.0036798	0.0036798	0.0012413	0.0035314	0.0035314
0.080ug = QC STD 2	6/22/2015	1:27:09 PM	0.0260077	0.0739902	0.0739902	µg			0.0259279	0.0737633	0.0737633	0.0260874	0.0742171	0.0742171
Reagent Blank	6/22/2015	1:29:03 PM	1.24E-05	3.52E-05	3.52E-05	µg			1.24E-05	3.52E-05	3.52E-05	1.24E-05	3.52E-05	3.52E-05
25086- 13C	6/22/2015	1:30:43 PM	-6.19E-05	4.24E-05	0.0042429	µg	4	400	-5.29E-05	6.78E-05	0.006784	-7.08E-05	1.70E-05	0.0017018
0.004ug = DL	6/22/2015	1:49:49 PM	0.0014373	0.004089	0.004089	µg			0.0013985	0.0039786	0.0039786	0.0014761	0.0041993	0.0041993
0.080ug = QC STD 2	6/22/2015	1:51:32 PM	0.0256648	0.0730149	0.0730149	µg			0.0257395	0.0732272	0.0732272	0.0255902	0.0728025	0.0728025
Reagent Blank	6/22/2015	1:53:25 PM	-1.75E-05	-4.97E-05	-4.97E-05	µg			-3.79E-05	-0.0001078	-0.0001078	2.97E-06	8.46E-06	8.46E-06

Appendix D

Calibration Data



Routine Dry Gas Meter Calibration

Control Module: C-8 Leak checks Barometric Press. -- 28.41
Date: 05/26/15 Negative Pass >5 W.C. Previous Y -- 0.9982
Technician: MJN Positive - Pass > in.Hg Previous Delta H -- 1.9476

Orifice Diff Pressure H	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						
Nominal 0.500	Initial 1553.50	Initial 80.0	Initial 77.0	Initial 73.0	Initial 380.640			0.9956	1.8627
Actual 0.50	Final 1558.50	Final 79.0	Final 77.0	Final 73.0	Final 385.705	Minutes 12	SEC 33.65		
	Total 5.00	Average 79.5	Average 77.0	Average 73.0	Total 5.065	Minutes 12.56			
		78.3							
Nominal 1.000	Initial 1547.50	Initial 81.0	Initial 77.0	Initial 73.0	Initial 374.540			0.9928	1.8755
Actual 1.00	Final 1552.50	Final 81.0	Final 77.0	Final 73.0	Final 379.620	Minutes 8.0	SEC 54.74		
	Total 5.00	Average 81.0	Average 77.0	Average 73.0	Total 5.080	8.91			
		79.0 Tm							
Nominal 2.000	Initial 1526.00	Initial 80.0	Initial 76.0	Initial 73.5	Initial 352.710			0.9905	1.9580
Actual 2.00	Final 1546.00	Final 82.0	Final 77.0	Final 73.0	Final 373.005	Minutes 25	SEC 43.93		
	Total 20.00	Average 81.0	Average 76.5	Average 73.3	Total 20.295	25.73			
		78.8 Tm							
Nominal 3.000	Initial 1560.00	Initial 80.0	Initial 77.0	Initial 73.0	Initial 387.225			0.9903	1.9450
Actual 3.00	Final 1566.00	Final 82.0	Final 77.0	Final 73.0	Final 393.305	Minutes 6.0	SEC 17.28		
	Total 6.00	Average 81.0	Average 77.0	Average 73.0	Total 6.080	6.29			
		79.0 Tm							
Nominal 4.000	Initial 1568.00	Initial 82.0	Initial 77.0	Initial 73.0	Initial 395.350			0.9840	1.9502
Actual 4.00	Final 1579.00	Final 83.0	Final 78.0	Final 73.0	Final 406.560	Minutes 10.0	SEC 0.09		
	Total 11.00	Average 82.5	Average 77.5	Average 73.0	Total 11.210	10.00			
		80.0 Tm		Average				0.9906	1.9182

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)
Alternative Method 5 Post-Test Calibration
Pellet Indurating Furnace Line 1 (SV021)
Control Module C-8
Test 1
Performance Testing on June 9, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	6/9/2015	6/9/2015	6/9/2015
Test period	-	-	825 - 1033	1155 - 1420	1525 - 1744
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V _m	acf	94.9	94.9	97.1
Absolute average dry gas meter temp	T _m	°F	73.9	83.2	94.7
Absolute average dry gas meter temp	T _m	°R	533.6	542.9	554.3
Barometric pressure	P _b	inches Hg	28.1	28.1	28.1
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	1.98	1.98	2.03
Orifice meter calibration coefficient	Δ H _@	in. H ₂ O	1.92	1.92	1.92
Dry molecular weight of stack gas	M _d	lb/lb-mole	28.88	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
Dry gas meter calibration check value	Y _{qa}	Dimensionless	1.0004	1.0091	1.0087
Dry gas meter calibration factor	Y	Dimensionless	0.9906	0.9906	0.9906
Average of Y _{qa} 's from test run series	1.0061	$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 \cdot T_m}{\Delta H_{@} (P_b + \frac{\Delta h_{avg}}{13.6})} \frac{29}{M_d}} \cdot (\sqrt{\Delta h_{avg}})$			
Dry gas meter calibration factor	0.9906				
% difference between average Y _{qa} 's and Y (must be within ± 5%)	-1.56%				

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)
Alternative Method 5 Post-Test Calibration
Pellet Indurating Furnace Line 1 (SV022)
Control Module C-8
Test 2
Performance Testing on June 10, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	6/10/2015	6/10/2015	6/10/2015
Test period	-	-	825 - 1421	1510 - 1719	1755 - 2003
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V _m	acf	94.0	97.8	96.5
Absolute average dry gas meter temp	T _m	°F	73.4	83.7	82.3
Absolute average dry gas meter temp	T _m	°R	533.0	543.4	541.9
Barometric pressure	P _b	inches Hg	28.1	28.1	28.1
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	1.96	2.04	1.98
Orifice meter calibration coefficient	Δ H _@	in. H ₂ O	1.92	1.92	1.92
Dry molecular weight of stack gas	M _d	lb/lb-mole	28.87	28.86	28.86
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
Dry gas meter calibration check value	Y _{qa}	Dimensionless	1.0044	0.9943	0.9910
Dry gas meter calibration factor	Y	Dimensionless	0.9906	0.9906	0.9906
Average of Y _{qa} 's from test run series	0.9966	$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 \cdot T_m}{\Delta H_{@} (P_b + \frac{\Delta h_{avg}}{13.6})} \frac{29}{M_d}} \cdot (\sqrt{\Delta h_{avg}})$			
Dry gas meter calibration factor	0.9906				
% difference between average Y _{qa} 's and Y (must be within ± 5%)	-0.60%				



THERMOCOUPLE CALIBRATION

Meter In THERMOCOUPLE ID T-C8-I
Cal Date: 12/31/2014

CALIBRATION TECHNICIAN: DAH

REFERENCE STANDARDS	TRACEABILITY		DATE	LABORATORY
Hart Scientific 9103-A s/n A1B289	Report No. B4116012		12/27/2013	Hart Scientific
Hart Scientific 9140 s/n A1B086	Report No. T10-0105-1		12/18/2013	Hart Scientific
Temperature Calibration Points	20	70	150	
Reference Deg F (To)	20	70	150	
Probe Temp (deg F)	22.0	70.0	149.0	
Difference (degrees)	2.0	0.0	1.0	
TC Meets Method 5 Specifications: (± 5.4 °F)				
	YES	YES	YES	

Technician signature

QA signature



THERMOCOUPLE CALIBRATION

Meter Out

THERMOCOUPLE ID T-C8-O

Cal Date: 12/31/2014

CALIBRATION TECHNICIAN: DAH

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Hart Scientific 9140 s/n A1B086

TRACEABILITY

Report No. B4116012

Report No. T10-0105-1

DATE

12/27/2013

12/18/2013

LABORATORY

Hart Scientific

Hart Scientific

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.0	70.0	149.0
Difference (degrees)	1.0	0.0	1.0

TC Meets Method 5 Specifications: (± 5.4 °F)	YES	YES	YES
---	-----	-----	-----

Technician signature

QA signature



PYROMETER CALIBRATION

Pyrometer Number: C-8 Date: 12/23/2014
Pyrometer Reference: CL-300-100F Technician: DAH

Reference (°F)	Reference (°C)	Pyrometer ° F	
		Reading	Pass/Fail
1000	538	1002	Pass
950	510	952	Pass
900	482	899	Pass
850	454	851	Pass
800	427	801	Pass
750	399	752	Pass
700	371	699	Pass
650	343	651	Pass
600	316	600	Pass
550	288	549	Pass
500	260	498	Pass
450	232	447	Pass
400	204	398	Pass
350	177	348	Pass
300	149	299	Pass
250	121	250	Pass
200	93	199	Pass
150	67	148	Pass
100	38	97	Pass
50	10	48	Pass
0	-18	0	Pass
-50	-46	-51	Pass

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

Technician signature *David Herber*
QA signature: *[Signature]*



Routine Dry Gas Meter Calibration

Control Module: C-2 Leak checks Barometric Press. -- 29.41
Date: 06/05/15 Negative Pass >5 W.C. Previous Y -- 0.9955
Technician: JAR2 Positive - Pass > in.Hg Previous Delta H -- 1.8379

Orifice Diff Pressure H	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						
Nominal 0.500	Initial 8083.00	Initial 84.0	Initial 79.0	Initial 71.5	Initial 576.940			0.9950	1.7020
Actual 0.50	Final 8089.00	Final 83.0	Final 78.0	Final 71.5	Final 583.070	Minutes 14	SEC 43.28		
	Total 6.00	Average 83.5	Average 78.5	Average 71.5	Total 6.130	Minutes 14.72			
		81.0							
Nominal 1.000	Initial 8077.00	Initial 86.0	Initial 79.0	Initial 71.5	Initial 570.805			0.9953	1.8423
Actual 1.00	Final 8082.00	Final 85.0	Final 78.0	Final 71.5	Final 575.915	Minutes 9.0	SEC 1.51		
	Total 5.00	Average 85.5	Average 78.5	Average 71.5	Total 5.110	9.03			
		82.0 Tm							
Nominal 2.000	Initial 8062.00	Initial 87.0	Initial 76.0	Initial 72.0	Initial 555.500			0.9982	1.9103
Actual 2.00	Final 8067.00	Final 88.0	Final 78.0	Final 72.0	Final 560.580	Minutes 6	SEC 29		
	Total 5.00	Average 87.5	Average 77.0	Average 72.0	Total 5.080	6.48			
		82.3 Tm							
Nominal 3.000	Initial 8090.00	Initial 85.0	Initial 79.0	Initial 71.5	Initial 584.105			0.9860	1.9084
Actual 3.00	Final 8096.00	Final 87.0	Final 79.0	Final 71.5	Final 590.270	Minutes 6.0	SEC 22.02		
	Total 6.00	Average 86.0	Average 79.0	Average 71.5	Total 6.165	6.37			
		82.5 Tm							
Nominal 4.000	Initial 8098.00	Initial 88.0	Initial 79.0	Initial 71.5	Initial 592.300			0.9854	1.9267
Actual 4.00	Final 8108.00	Final 87.0	Final 79.0	Final 71.5	Final 602.570	Minutes 9.0	SEC 14.04		
	Total 10.00	Average 87.5	Average 79.0	Average 71.5	Total 10.270	9.23			
		83.3 Tm		Average				0.9920	1.8579

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)
Alternative Method 5 Post-Test Calibration
Pellet Indurating Furnace Line 1 (SV023)
Control Module C-2
Test 3
Performance Testing on June 9, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	6/9/2015	6/9/2015	6/9/2015
Test period	-	-	825 - 1033	1155 - 1420	1525 - 1744
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V _m	acf	96.4	96.6	94.7
Absolute average dry gas meter temp	T _m	°F	77.3	86.6	95.2
Absolute average dry gas meter temp	T _m	°R	537.0	546.2	554.9
Barometric pressure	P _b	inches Hg	28.1	28.1	28.1
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	1.99	1.93	1.85
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
Dry gas meter calibration check value	Y _{qa}	Dimensionless	1.0054	0.9970	1.0046
Dry gas meter calibration factor	Y	Dimensionless	0.9920	0.9920	0.9920
Average of Y _{qa} 's from test run series	1.0023	$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 \cdot T_m}{\Delta H_{@} (P_b + \frac{\Delta h_{avg}}{13.6})} \frac{29}{M_d}} \cdot (\sqrt{\Delta h_{avg}})$			
Dry gas meter calibration factor	0.9920				
% difference between average Y _{qa} 's and Y (must be within ± 5%)	-1.04%				

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)
Alternative Method 5 Post-Test Calibration
Pellet Indurating Furnace Line 1 (SV024)
Control Module C-2
Test 4
Performance Testing on June 10, 2015

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	6/10/2015	6/10/2015	6/10/2015
Test period	-	-	825 - 1421	1510 - 1719	1755 - 2003
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V _m	acf	84.3	86.2	87.3
Absolute average dry gas meter temp	T _m	°F	80.6	87.2	83.3
Absolute average dry gas meter temp	T _m	°R	540.3	546.9	543.0
Barometric pressure	P _b	inches Hg	28.1	28.1	28.1
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	1.49	1.55	1.62
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	28.88	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
Dry gas meter calibration check value	Y _{qa}	Dimensionless	0.9988	1.0012	1.0065
Dry gas meter calibration factor	Y	Dimensionless	0.9920	0.9920	0.9920
Average of Y _{qa} 's from test run series	1.0022	$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 \cdot T_m}{\Delta H_{@} (P_b + \frac{\Delta h_{avg}}{13.6})} \frac{29}{M_d}} \cdot (\sqrt{\Delta h_{avg}})$			
Dry gas meter calibration factor	0.9920				
% difference between average Y _{qa} 's and Y (must be within ± 5%)	-1.03%				



THERMOCOUPLE CALIBRATION

Meter In THERMOCOUPLE ID T-C2-I
Cal Date: 1/13/2015

CALIBRATION TECHNICIAN: RBS

REFERENCE STANDARDS	TRACEABILITY	DATE	LABORATORY
Hart Scientific 9103-A s/n A1B289	Report No. B4116012	1/16/2014	Hart Scientific
Hart Scientific 9140 s/n A1B086	Report No. T10-0105-1	12/18/2013	Hart Scientific
Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.0	71.0	150.0
Difference (degrees)	1.0	1.0	0.0
TC Meets Method 5 Specifications: (± 5.4 °F)	YES	YES	YES

Technician signature

QA signature



THERMOCOUPLE CALIBRATION

Meter Out

THERMOCOUPLE ID T-C2-O

Cal Date: 1/13/2015

CALIBRATION TECHNICIAN: RBS

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Hart Scientific 9140 s/n A1B086

TRACEABILITY

Report No. B4116012

Report No. T10-0105-1

DATE

1/16/2014

12/18/2013

LABORATORY

Hart Scientific

Hart Scientific

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.0	70.0	150.0
Difference (degrees)	1.0	0.0	0.0
TC Meets Method 5 Specifications: (± 5.4 °F)			

Technician signature

QA signature



PYROMETER CALIBRATION

Pyrometer Number: C-2 Date: 1-19-15
Pyrometer Reference: CL-3512-A Technician: RBS

Reference (°F)	Reference (°C)	Pyrometer ° F	
		Reading	Pass/Fail
1000	538	1002	Pass
950	510	954	Pass
900	482	902	Pass
850	454	853	Pass
800	427	802	Pass
750	399	750	Pass
700	371	702	Pass
650	343	653	Pass
600	316	601	Pass
550	288	551	Pass
500	260	498	Pass
450	232	452	Pass
400	204	397	Pass
350	177	351	Pass
300	149	299	Pass
250	121	253	Pass
200	93	198	Pass
150	67	151	Pass
100	38	96	Pass
50	10	48	Pass
0	-18	-1	Pass
-50	-46	-50	Pass

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

Technician signature:

QA signature:

BARR

S-Type Pitot Tube Geometry Check

Pitot Tube Number: 10-4

Inspection Date: 1-9-15

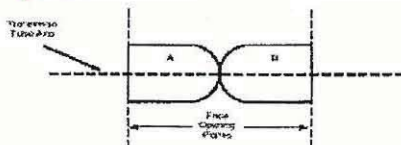
Length: 10 ft

Technician: DAH

Function: M-5 Probe / Free

1. Are face openings perpendicular to tube axis?

☒ YES (go to 2) ☐ NO (go to 1a)



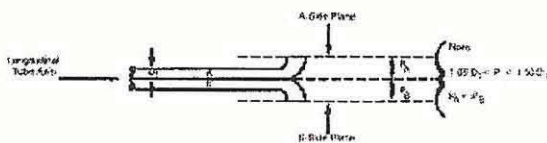
1a. If NO, is angle less than 10°?

☐ YES (go to 2) ☐ NO (discontinue use)



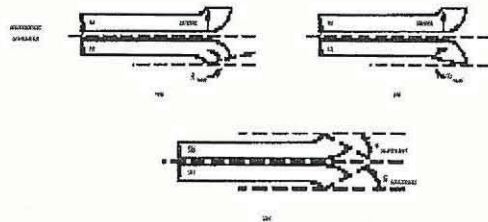
2. Are face openings parallel to longitudinal axis?

☒ YES (go to 3) ☐ NO (go to 2a)



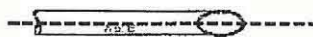
2a. If NO, is angle less than 5°?

☐ YES (go to 3) ☐ NO (discontinue use)



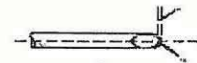
3. Are legs of equal length?

☒ YES (go to 4) ☐ NO (go to 3a)



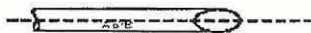
3a. If NO, is difference less than 1/8 inch?

☐ YES (go to 4) ☐ NO (discontinue use)



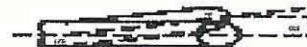
4. Are center-lines of legs coincident?

☒ 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

Technician Signature: DAH

QA Signature: [Signature]



THERMOCOUPLE CALIBRATION

THERMOCOUPLE ID 10-4

Cal Date: 12/23/2014

Probe

CALIBRATION TECHNICIAN: RBS

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Hart Scientific 9140 s/n A1B086

TRACEABILITY

Report No. B4116012

Report No. T10-0105-1

DATE

1/16/2014

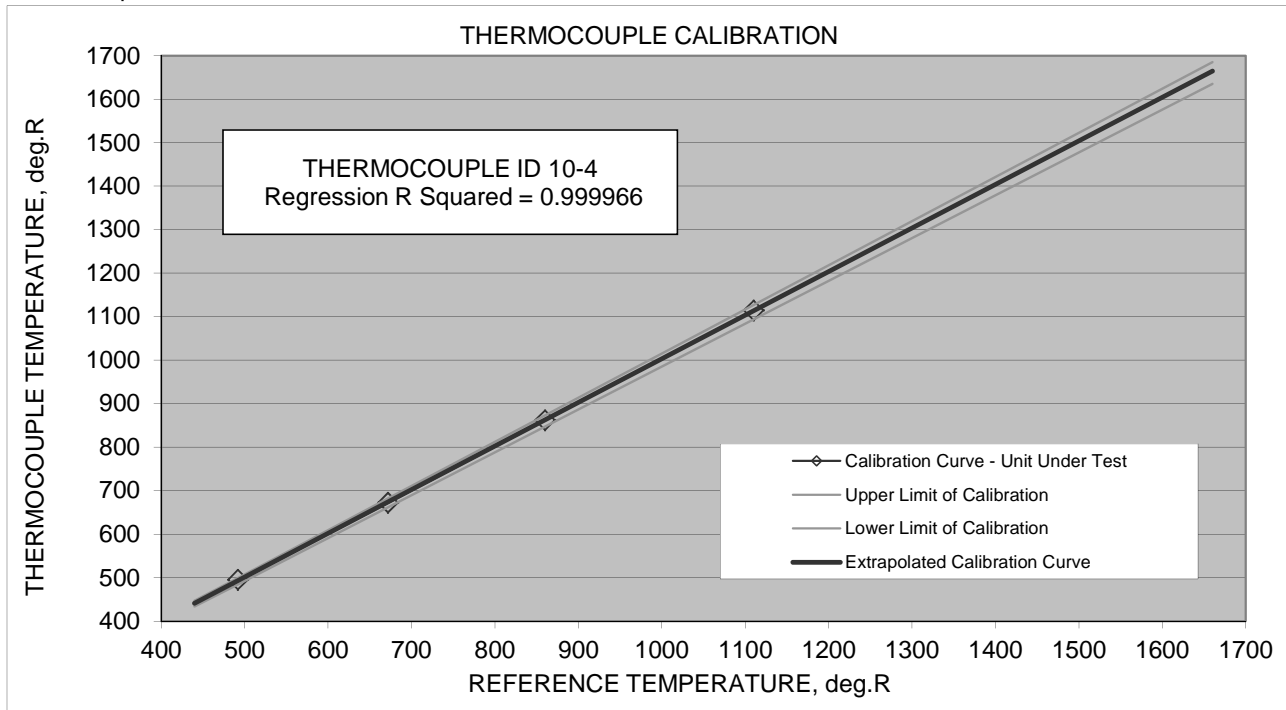
12/18/2013

LABORATORY

Hart Scientific

Hart Scientific

Temperature Calibration Points	32	212	400	650	Ambient
Reference Deg F (To)	32	212	400	650	70
Probe Temp (deg F)	35	212	402	654	70
Reference Temp (deg R) deg F + 460	492	672	860	1110	530
Probe Temp (deg R), deg F + 460	495	672	862	1114	530
Difference (degrees)	-3	0	-2	-4	0
% Diff Abs. T	0.6%	0.0%	0.2%	0.4%	0.0%
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:

Technician signature

QA signature

BARR

S-Type Pitot Tube Geometry Check

Pitot Tube Number: 10-5

Inspection Date: 1/20/15

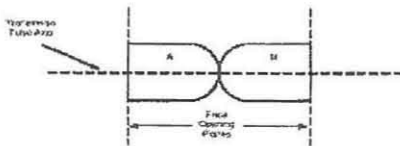
Length: 10 ft

Technician: BAW

Function: M-5 Probe / Free

1. Are face openings perpendicular to tube axis?

☒ YES (go to 2) ☐ NO (go to 1a)



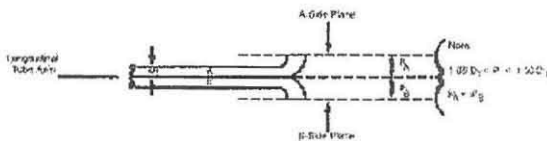
1a. If NO, is angle less than 10°?

☐ YES (go to 2) ☐ NO (discontinue use)



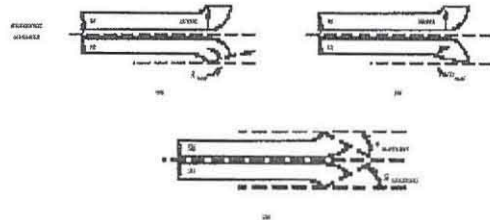
2. Are face openings parallel to longitudinal axis?

☒ YES (go to 3) ☐ NO (go to 2a)



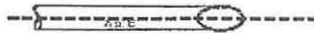
2a. If NO, is angle less than 5°?

☐ YES (go to 3) ☐ NO (discontinue use)



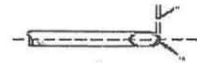
3. Are legs of equal length?

☒ YES (go to 4) ☐ NO (go to 3a)



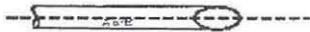
3a. If NO, is difference less than 1/8 inch?

☐ YES (go to 4) ☐ NO (discontinue use)



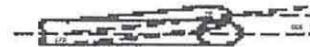
4. Are center-lines of legs coincident?

☒ 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

Technician Signature: BAW

QA Signature: BAW



THERMOCOUPLE CALIBRATION

THERMOCOUPLE ID 10-5

Cal Date: 12/23/2014

Probe

CALIBRATION TECHNICIAN: RBS

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Hart Scientific 9140 s/n A1B086

TRACEABILITY

Report No. B4116012

Report No. T10-0105-1

DATE

1/16/2014

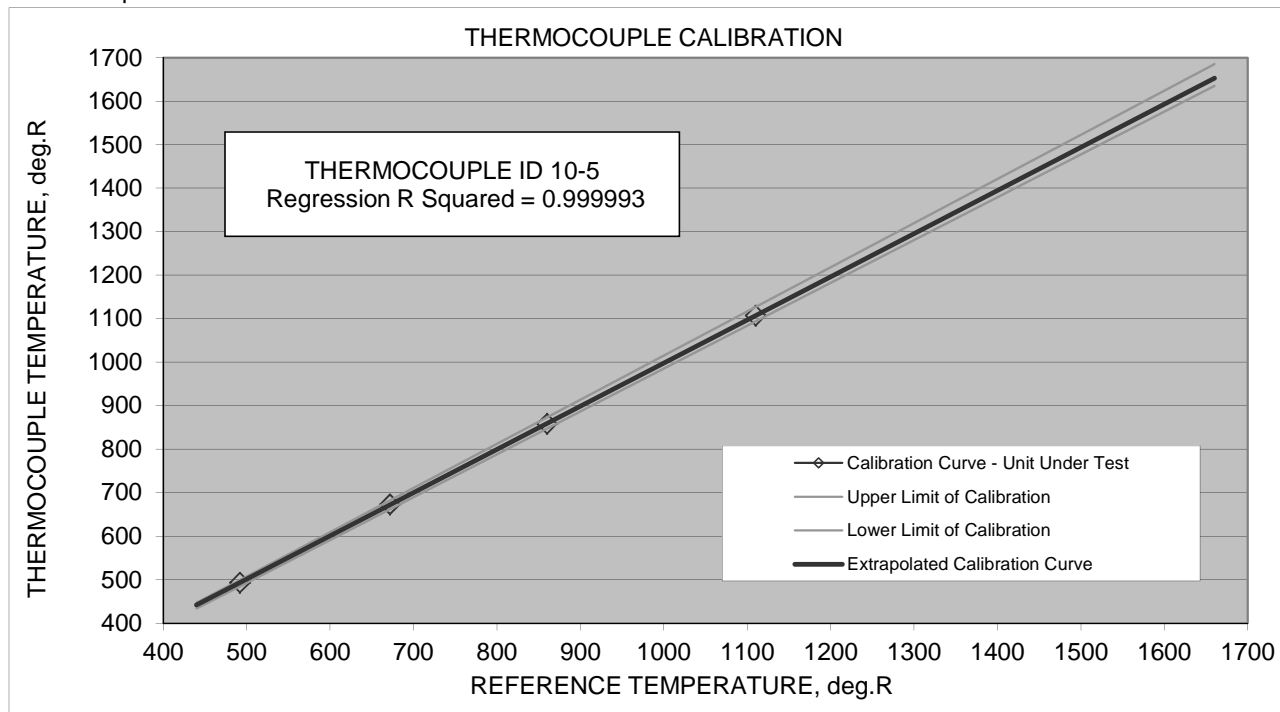
12/18/2013

LABORATORY

Hart Scientific

Hart Scientific

Temperature Calibration Points	32	212	400	650	Ambient
Reference Deg F (To)	32	212	400	650	70
Probe Temp (deg F)	33	213	398	647	69
Reference Temp (deg R) deg F + 460	492	672	860	1110	530
Probe Temp (deg R), deg F + 460	493	673	858	1107	529
Difference (degrees)	-1	-1	2	3	1
% Diff Abs. T	0.2%	0.1%	0.2%	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:

Technician signature

QA signature



S-Type Pitot Tube Geometry Check

Pitot Tube Number: 10-6

Length: 10 ft

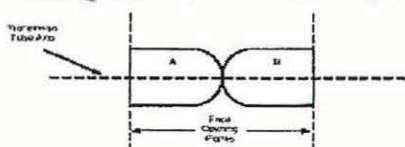
Function: M-5 Probe / Free

Inspection Date: 1-9-15

Technician: DAH

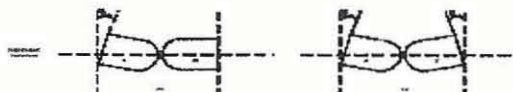
1. Are face openings perpendicular to tube axis?

☒ YES (go to 2) ☐ NO (go to 1a)



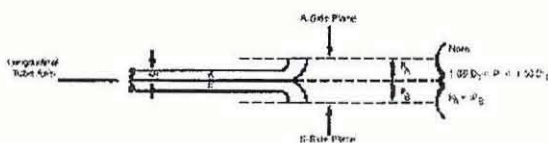
1a. If NO, is angle less than 10°?

☐ YES (go to 2) ☐ NO (discontinue use)



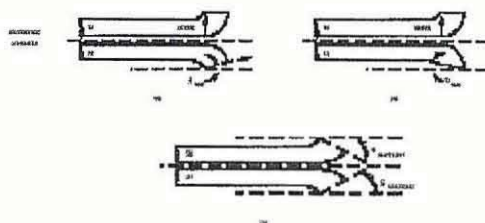
2. Are face openings parallel to longitudinal axis?

☒ YES (go to 3) ☐ NO (go to 2a)



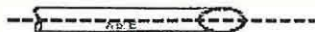
2a. If NO, is angle less than 5°?

☐ YES (go to 3) ☐ NO (discontinue use)



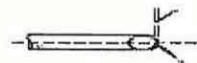
3. Are legs of equal length?

☒ YES (go to 4) ☐ NO (go to 3a)



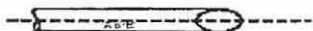
3a. If NO, is difference less than 1/8 inch?

☐ YES (go to 4) ☐ NO (discontinue use)



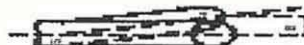
4. Are center-lines of legs coincident?

☒ 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

Technician Signature: DAH

QA Signature: DAH



THERMOCOUPLE CALIBRATION

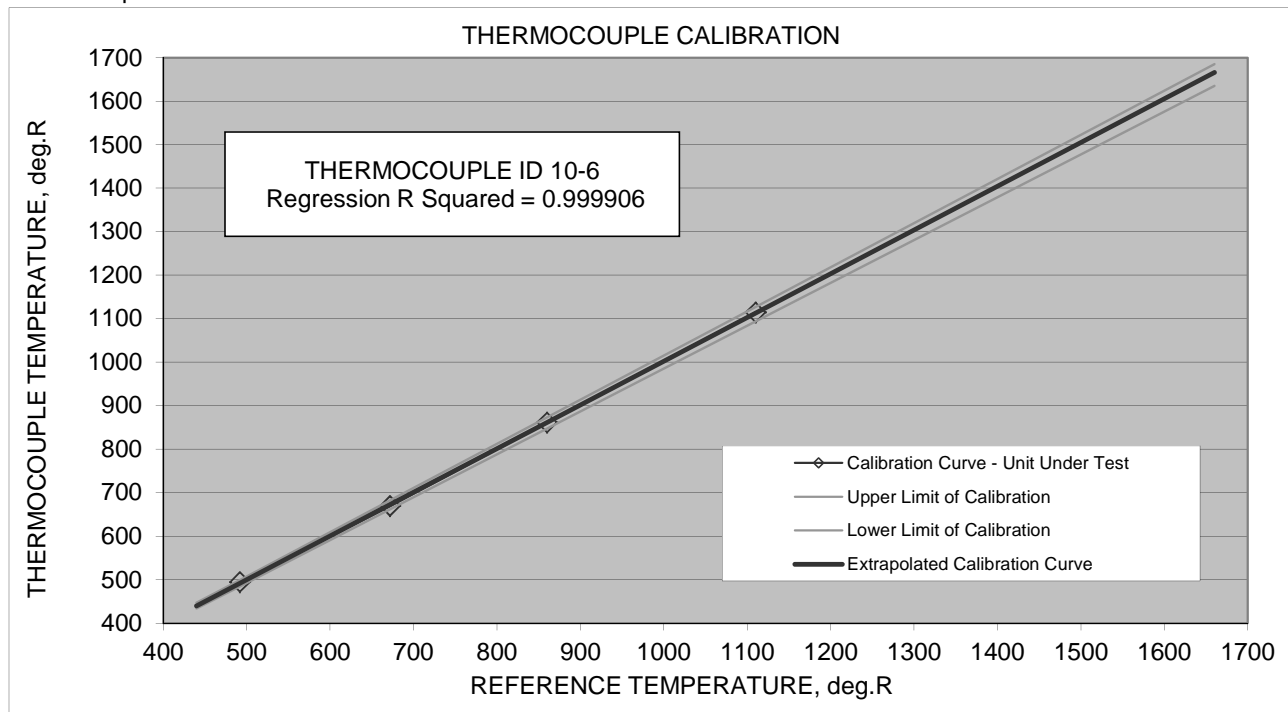
THERMOCOUPLE ID 10-6

Cal Date: 12/23/2014

Probe

CALIBRATION TECHNICIAN: RBS

REFERENCE STANDARDS	TRACEABILITY		DATE	LABORATORY	
Hart Scientific 9103-A s/n A1B289	Report No. B4116012		1/16/2014	Hart Scientific	
Hart Scientific 9140 s/n A1B086	Report No. T10-0105-1		12/18/2013	Hart Scientific	
Temperature Calibration Points	32	212	400	650	Ambient
Reference Deg F (To)	32	212	400	650	70
Probe Temp (deg F)	34	209	401	654	70
Reference Temp (deg R) deg F + 460	492	672	860	1110	530
Probe Temp (deg R), deg F + 460	494	669	861	1114	530
Difference (degrees)	-2	3	-1	-4	0
% Diff Abs. T	0.4%	0.4%	0.1%	0.4%	0.0%
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:

Technician signature

QA signature



THERMOCOUPLE CALIBRATION

Impinger Outlet

THERMOCOUPLE ID TIO-1260

Cal Date: 12/31/2014

Umbilical UM-100-2

CALIBRATION TECHNICIAN: RBS

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Hart Scientific 9140 s/n A1B086

TRACEABILITY

Report No. B4116012

Report No. T10-0105-1

DATE

12/27/2013

12/18/2013

LABORATORY

Hart Scientific

Hart Scientific

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.0	71.0	149.0
Difference (degrees)	1.0	1.0	1.0
TC Meets Method 5 Specifications: (± 2.0 °F)			

Technician signature

QA signature

Nozzle Calibration
Pellet Indurating Furnace Line 1 (SV021)
Test 1

Nozzle Calibration

Nozzle No.

Glass

Used for Runs:

1

 -

3

Point Measurement, inches

1	0.213
2	0.212
3	0.214
Average	0.213

Test Date 6/9/2015

Date Measured: 6/9/2015

Technician: MMK2

Signature: *Matt Kistner*

Hibbing Taconite Company
Hibbing, Minnesota

Barr Engineering Co.
July 7, 2015

Nozzle Calibration
Pellet Indurating Furnace Line 1 (SV022)
Test 2

Nozzle Calibration

Nozzle No.

Glass

Used for Runs:

1

 -

3

Point Measurement, inches

1	0.213
2	0.212
3	0.214
Average	0.213

Test Date 6/10/2015

Date Measured: 6/9/2015

Technician: MMK2

Signature *Matt Kistner*

Nozzle Calibration
Pellet Indurating Furnace Line 1 (SV023)
Test 3

Nozzle Calibration

Nozzle No.

Glass

Used for Runs:

1

 -

3


Point Measurement, inches

1	0.222
2	0.222
3	0.221
Average	0.222

Test Date 6/9/2015

Date Measured: 6/9/2015

Technician: JAR2

Signature: 

Nozzle Calibration
Pellet Indurating Furnace Line 1 (SV024)
Test 4

Nozzle Calibration

Nozzle No.

Glass

Used for Runs:

1

 -

3

Point Measurement, inches

1	0.222
2	0.222
3	0.221
Average	0.222

Test Date 6/9/2015

Date Measured: 6/10/2015

Technician: JAR2

Signature: 

UMBILICAL CALIBRATION

Umbilical ID: UM-100-2

Date: 12/29/2014

Pyrometer Reference: CL-300-1000F

Technician: RMP

TC 1			TC 2			TC 5		
Reference (°F)	Pyrometer ° F		Reference (°F)	Pyrometer ° F		Reference (°F)	Pyrometer ° F	
	Reading	Pass/Fail		Reading	Pass/Fail		Reading	Pass/Fail
1000	999	Pass	500	499	Pass	1000	999	Pass
900	899	Pass	400	399	Pass	900	899	Pass
800	800	Pass	300	300	Pass	800	800	Pass
700	701	Pass	200	201	Pass	700	701	Pass
600	601	Pass	150	152	Pass	600	601	Pass
500	499	Pass	100	101	Pass	500	499	Pass
400	399	Pass	50	51	Pass	400	399	Pass
300	300	Pass	TC 3			300	300	Pass
200	200	Pass	Reference (°F)	Pyrometer ° F		200	200	Pass
150	152	Pass		Reading	Pass/Fail	150	152	Pass
100	100	Pass	500	499	Pass	100	101	Pass
50	51	Pass	400	399	Pass	50	51	Pass
0	0	Pass	300	300	Pass	0	0	Pass
-50	-48	Pass	200	200	Pass	-50	-48	Pass
Pyrometer used: D-16			150	152	Pass			
			100	101	Pass			
			50	51	Pass			
			TC 4					
			Reference (°F)	Pyrometer ° F				
				Reading	Pass/Fail			
			150	152	Pass			
			100	101	Pass			
			50	51	Pass			
			0	0	Pass			
			-50	-48	Pass			

Pyrometer used: D-16

Side	Press. In H2O	Vac. In. H2O	Leak(Y/N)
Positive	4.0	4.0	N
Negative	4.0	4.0	N


Are all thermocouple leads functioning properly?
Are pitot lines blocked?


(Y/N)

Y

N

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

Technician signature: 

QA signature: 



THERMOCOUPLE CALIBRATION

Impinger Outlet

THERMOCOUPLE ID TIO-1260

Cal Date: 12/31/2014

Umbilical UM-100-2

CALIBRATION TECHNICIAN: RBS

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Hart Scientific 9140 s/n A1B086

TRACEABILITY

Report No. B4116012

Report No. T10-0105-1

DATE

12/27/2013

12/18/2013

LABORATORY

Hart Scientific

Hart Scientific

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.0	71.0	149.0
Difference (degrees)	1.0	1.0	1.0
TC Meets Method 5 Specifications: (± 2.0 °F)			

Technician signature

QA signature



UMBILICAL CALIBRATION

Umbilical ID: UM-200-3 Date: 1/2/2015
 Pyrometer Reference: CL-300-1000F Technician: RMP

TC 1 - Stack Temp			TC 2 - Probe Temp			TC 5		
Reference (°F)	Pyrometer ° F		Reference (°F)	Pyrometer ° F		Reference (°F)	Pyrometer ° F	
	Reading	Pass/Fail		Reading	Pass/Fail		Reading	Pass/Fail
1000	1000	Pass	500	499	Pass	1000	1000	Pass
900	900	Pass	400	400	Pass	900	900	Pass
800	800	Pass	300	301	Pass	800	800	Pass
700	701	Pass	200	201	Pass	700	701	Pass
600	601	Pass	150	152	Pass	600	601	Pass
500	500	Pass	100	101	Pass	500	500	Pass
400	400	Pass	50	51	Pass	400	400	Pass
300	300	Pass	TC 3 Oven Temp			300	301	Pass
200	201	Pass	Reference (°F)	Pyrometer ° F		200	201	Pass
150	152	Pass		Reading	Pass/Fail	150	152	Pass
100	101	Pass	500	500	Pass	100	101	Pass
50	51	Pass	400	400	Pass	50	51	Pass
0	0	Pass	300	301	Pass	0	0	Pass
-50	-48	Pass	200	201	Pass	-50	-48	Pass
			150	152	Pass			
			100	101	Pass			
			50	51	Pass			
			TC 4 - Filter Temp					
			Reference (°F)	Pyrometer ° F				
				Reading	Pass/Fail			
			150	152	Pass			
			100	101	Pass			
			50	52	Pass			
			0	1	Pass			
			-50	-47	Pass			

Pyrometer used: D-16

Are all thermocouple leads functioning properly?
 Are pitot lines blocked?

(Y/N)
 Y
 N

Pitot Line Leak Check

Side	Press. In H2O	Vac. In. H2O	Leak(Y/N)
Positive	4.0	4.0	N
Negative	4.0	4.0	N

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

Technician signature:



THERMOCOUPLE CALIBRATION

Impinger Outlet

THERMOCOUPLE ID TIO-1253

Cal Date: 1/2/2015

Umbilical 200-2

CALIBRATION TECHNICIAN: RBS

REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Hart Scientific 9140 s/n A1B086

TRACEABILITY

Report No. B4116012

Report No. T10-0105-1

DATE

12/27/2013

12/18/2013

LABORATORY

Hart Scientific

Hart Scientific

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.0	70.0	150.0
Difference (degrees)	1.0	0.0	0.0
TC Meets Method 5 Specifications: (± 2.0 °F)			

Technician signature

QA signature



Specialty Gases of America, Inc.
6055 Brent Drive
Toledo, OH 43611
Tel: +1 (419) 729-7732
Fax: +1 (419) 729-2411

10/23/2014

TOLL GAS & WELDING SUPPLY
3005 NIAGARA LANE NORTH
PLYMOUTH, MN 554470000

Work Order No. **29061356**
Customer Reference No. **401700**

Product Lot/Batch No. **1010XF14**
Product Part No. **NI 5.5CE-AS**

CERTIFICATE OF ANALYSIS
Nitrogen, 5.5 Continuous Emission Monitoring Zero

Analytes	Specification	Analytical Results	Analytical Principle	Analytical Accuracy
Nitrogen	99.9995%	99.9995%	N	N/A
Oxides of Nitrogen	< 0.1 ppm	< 0.1 ppm	L	± 15%
Sulfur Dioxide	< 0.1 ppm	ND	L	± 15%
Total Hydrocarbons	< 0.1 ppm	ND	L	± 15%
Carbon Monoxide	< 0.5 ppm	ND	L	± 15%
Carbon Dioxide	< 1 ppm	ND	L	± 10%
Oxygen	< 0.5 ppm	< 0.5 ppm	W	± 15%
Water	< 2 ppm	0.3 ppm	P	± 10%

Analytical Instruments: **MKS~2031 FTIR~~**
Delta F~SF30555S~~
Panametrics~MISPE~~

Cylinder Style: **AS**
Cylinder Pressure @70F: **2015 psig**
Cylinder Volume: **142 ft3**
Valve Outlet Connection: **580**

Filling Method: **Temperature/Pressure**
Date of Fill: **10/10/2014**
Expiration Date: **10/14/2019**

Cylinder No(s): **EB0048748, EB0048755, EB0048856, EB0048209, EB0048750, EB0048784**

QA Reviewer: **Joshua Jones**

QA Reviewer: **Kyle Osborne**

This analysis of the product described herein was prepared by Specialty Gases of America, Inc. using instruments whose calibration is certified using Specialty Gases of America, Inc. Reference Materials. Specialty Gases of America, Inc. Reference Materials are prepared either by weights traceable to the National Institute of Standards and Technology (NIST), Measurement Canada or by using NIST Standard Reference Materials where available.

Note: All expressions for concentration (e.g., % or ppm) are for gas phase, by volume (e.g., ppmv) unless otherwise noted.

Key to Analytical Techniques:

A	Flame Ionization with Methanizer	B	Gas Chromatography with Discharge Ionization Detector	C	Gas Chromatography with Electrolytic Conductivity Detector	D	Gas Chromatography with Flame Ionization Detector
E	Gas Chromatography with Flame Photometric Detector	F	Gas Chromatography with Helium Ionization Detector	G	Gas Chromatography with Methanizer Carbonizer	H	Gas Chromatography with Photoionization Detector
I	Gas Chromatography with Reduction Gas Analyzer	J	Gas Chromatography with Thermal Conductivity Detector	K	Binary Gas Analyzer with Thermal Conductivity Detector	L	Infrared - FTIR or NDIR
M	Mass Spectrometry - MS or GC/MS	N	By Difference of Typical Impurities	O	Paramagnetic	P	Specific Water Analyzer
Q	Total Hydrocarbon Analyzer	R	Wet Chemical	S	Detector Tube	T	Odor
U	Chemiluminescence	V	Gravimetric	W	Electrolytic Cell/Electrochemical	X	UV Spectrometry
Y	Vendor Analysis						

IMPORTANT

The information contained herein has been prepared at your request by personnel within Specialty Gases of America, Inc.. While we believe the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall liability of Specialty Gases of America, Inc. arising out of the use of the information contained herein exceed the fee established for providing such information.

Report Of Analysis
EPA Protocol Gas Mixtures

BARR01

TO: Barr Engineering Co
Attn: Benjamin Wiltse
5150 West 76th Street
Edina, MN 55439-2900
(952) 832-2885

REPORT NO: 65434-01

REPORT DATE: September 9, 2014

CUSTOMER PO NO: BAW08182014

CYLINDER NUMBER: CC102877

CYLINDER SIZE: 150A (141 std cu ft)

CYLINDER PRESSURE: 2000 psig

COMPONENT	CONCENTRATION (v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD		ANALYZER MAKE, MODEL, S/N, DETECTION	REPLICATE ANALYSIS DATA
Carbon dioxide	9.98 ± 0.1 %	GMIS	SRM 1674b	Varian Model 3400	8/28/2014
			Samp#: 7-H-39	Serial # 10680	9.98 %
			Cyl#: CC116770	Thermal Conductivity	9.99 %
			7.99 ± 0.08 %	Gas Chromotography	9.98 %
			Exp: 3/18/2022	Exp: 6/17/2019	LAST CAL DATE: 8/28/2014 \bar{x} : 9.98 %
Oxygen	10.02 ± 0.08 %	GMIS	SRM 2658a	Varian Model 3800	9/4/2014
			Samp#: 72-D-37	Serial # None	10.08 %
			Cyl#: CC51181	Thermal Conductivity	9.99 %
			10.06 ± 0.05 %	Gas Chromotography	10.00 %
			Exp: 5/6/2021	Exp: 6/1/2017	LAST CAL DATE: 8/19/2014 \bar{x} : 10.02 %
Nitrogen	Balance				

CERTIFICATION DATE: August 28, 2014

EPA EXPIRATION DATE: August 29, 2022

ppm = μ mole/mole

% = mole-%

 \bar{x} = EPA weighted mean

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA600/R-12/531, dated May 2012.

The above analyses should not be used if the cylinder pressure is less than 100 psig.

ANALYST:

M.S. Calhoun

APPROVED:

J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

Report Of Analysis
EPA Protocol Gas Mixtures

BARR01

TO: Barr Engineering Co
Attn: Benjamin Wiltse
5150 West 76th Street
Edina, MN 55439-2900
(952) 832-2885

REPORT NO: 65320-01

REPORT DATE: August 13, 2014

CUSTOMER PO NO: BAW07172014

CYLINDER NUMBER: CC99473

CYLINDER SIZE: 150A (141 std cu ft)

CYLINDER PRESSURE: 2000 psig

COMPONENT	CONCENTRATION (v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	REPLICATE ANALYSIS DATA
Carbon dioxide	4.91 ± 0.05 %	GMIS SRM 1674b Samp#: 7-H-39 Cyl#: CC116770 7.99 ± 0.08 % Exp: 3/18/2022	Varian Model 3400	<u>8/7/2014</u>
			Serial # 10680	4.92 %
			Thermal Conductivity	4.91 %
			Gas Chromotography	4.91 %
			LAST CAL DATE: 8/7/2014	\bar{x} : 4.91 %
Oxygen	22.47 ± 0.28 %	GMIS SRM 2659a Samp#: 71-D-23 Cyl#: CC88824 24.92 ± 0.25 % Exp: 2/25/2021	Varian Model 3800	<u>8/12/2014</u>
			Serial # None	22.55 %
			Thermal Conductivity	22.37 %
			Gas Chromotography	22.50 %
			LAST CAL DATE: 7/16/2014	\bar{x} : 22.47 %
Nitrogen	Balance			

CERTIFICATION DATE: August 7, 2014

EPA EXPIRATION DATE: August 8, 2022

ppm = μ mole/mole

% = mole-%

 \bar{x} = EPA weighted mean

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA600/R-12/531, dated May 2012.

The above analyses should not be used if the cylinder pressure is less than 100 psig.

ANALYST:

M.S. Calhoun

APPROVED:

J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

Field Barometer Calibration
 Calibration to PRINCO Mercury Barometer
 Barr Engineering Company Edina Field Office

		Reference PRINCO		Field Barometer					
Date	Technician	Observation Time	Station Pressure	ID	Time	Barometric Pressure	Condition	Remarks	Offset tolerance +/- 0.10
4/2/15	JAR2	1100	28.96	BA-27	0100	28.94	In Calibration	As Found	-0.02
7/9/15	JAR2	0900	29.25	BA-27	0900	29.21	In Calibration	As Found	-0.04

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: SV021

Test date(s): 6/9/15

Equipment and Operating Data

- Process equipment description: Line No 1 Pellet Indurating Furnace 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
1/24/15 Repair nozzles and sprays; 3/2/15 Repair holes in scrubber house, 4/16/15 repair pressure reading; 1/16/15 changeout scrubber house drains; 1/14/15 transmitter calibration; 1/17/15 clean demist panels; 1/24/15 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	377	378	377	377
Feed Rate, DSTPH	423	423	422	423
Fuel Input (list units): MCF/hr	102	101	105	103
Heat Input (10⁶ British thermal units/hour)	110	108	113	110

- 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	4.2	4.2	4.2
Wet Scrubber Pressure Drop Maximum, in. w.c	4.5	4.5	4.4	4.5
Wet Scrubber Pressure Drop Average, in. w.c	4.4	4.3	4.3	4.3
Wet Scrubber Water Flow Rate Minimum, gpm	433	441	440	438
Wet Scrubber Water Flow Rate Maximum, gpm	447	458	460	455
Wet Scrubber Water Flow Rate Average, gpm	441	450	449	447
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.

aq-f6-05
5/1/07



**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: SV023

Test date(s): 6/9/15

Equipment and Operating Data

- Process equipment description: Line No 1 Pellet Indurating Furnace 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
1/24/15 replace spray nozzles; 3/2/15 Repair holes in scrubber house; 1/14/15 transmitter calibration; 1/17/15 clean demist panels; 1/24/15 maintenance PM; 1/30/15 reline scrubber house
- 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	377	378	377	377
Feed Rate, DSTPH	423	423	422	423
Fuel Input (list units): MCF	102	101	105	103
Heat Input (10⁶ British thermal units/hour)	110	108	113	111

- 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	4.5	4.3	4.3	4.4
Wet Scrubber Pressure Drop Maximum, in. w.c	4.8	4.8	4.7	4.8
Wet Scrubber Pressure Drop Average, in. w.c	4.6	4.6	4.5	4.6
Wet Scrubber Water Flow Rate Minimum, gpm	441	443	449	444
Wet Scrubber Water Flow Rate Maximum, gpm	445	452	454	450
Wet Scrubber Water Flow Rate Average, gpm	443	448	452	447

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.

aq-f6-05
5/1/07

Throughput
wltph > dltp > dstph

Furnace Stacks Line #1

Minimum		Minimum		Minimum	
Run 1		Run 2		Run 3	
Tag	ADBI1160	Tag	ADBI1160	Tag	ADBI1160
Start	6/9/2015 8:25	Start	6/9/2015 11:55	Start	6/9/2015 15:25
End	6/9/2015 10:33	End	6/9/2015 14:20	End	6/9/2015 17:44
09-Jun-15 08:25:00	482.5870667	09-Jun-15 11:55:00	436.9008484	09-Jun-15 15:25:00	462.3166504
09-Jun-15 08:40:00	477.5332031	09-Jun-15 12:10:00	466.3450928	09-Jun-15 15:40:00	470.8313293
09-Jun-15 08:55:00	477.0937195	09-Jun-15 12:25:00	481.8363037	09-Jun-15 15:55:00	469.5861816
09-Jun-15 09:10:00	463.9463501	09-Jun-15 12:40:00	455.2485657	09-Jun-15 16:10:00	480.5179138
09-Jun-15 09:25:00	458.2149658	09-Jun-15 12:55:00	489.2889099	09-Jun-15 16:25:00	482.7701721
09-Jun-15 09:40:00	479.7181166	09-Jun-15 13:10:00	476.12323	09-Jun-15 16:40:00	463.2505188
09-Jun-15 09:55:00	470.5383606	09-Jun-15 13:25:00	469.8242188	09-Jun-15 16:55:00	465.7774658
09-Jun-15 10:10:00	467.3705139	09-Jun-15 13:40:00	472.3328247	09-Jun-15 17:10:00	463.3603821
		09-Jun-15 13:55:00	471.8567505	09-Jun-15 17:25:00	460.7785339
Average	472.125287	Average	468.8618605	Average	468.7987942
Maximum		Maximum		Maximum	
Run 1		Run 2		Run 3	
Tag	ADBI1160	Tag	ADBI1160	Tag	ADBI1160
Start	6/9/2015 8:25	Start	6/9/2015 11:55	Start	6/9/2015 15:25
End	6/9/2015 10:33	End	6/9/2015 14:20	End	6/9/2015 17:44
09-Jun-15 08:25:00	533.2539063	09-Jun-15 11:55:00	518.4951172	09-Jun-15 15:25:00	517.5795898
09-Jun-15 08:40:00	517.4147949	09-Jun-15 12:10:00	513.2581787	09-Jun-15 15:40:00	526.4421387
09-Jun-15 08:55:00	513.8074951	09-Jun-15 12:25:00	524.8490601	09-Jun-15 15:55:00	524.0801839
09-Jun-15 09:10:00	522.87146	09-Jun-15 12:40:00	514.0638428	09-Jun-15 16:10:00	514.7962646
09-Jun-15 09:25:00	510.9875793	09-Jun-15 12:55:00	542.0981445	09-Jun-15 16:25:00	522.6517334
09-Jun-15 09:40:00	517.4147949	09-Jun-15 13:10:00	515.6752319	09-Jun-15 16:40:00	528.12677
09-Jun-15 09:55:00	513.1117749	09-Jun-15 13:25:00	517.854248	09-Jun-15 16:55:00	514.0089111
09-Jun-15 10:10:00	520.4727173	09-Jun-15 13:40:00	524.4096069	09-Jun-15 17:10:00	501.0995789
		09-Jun-15 13:55:00	512.7820435	09-Jun-15 17:25:00	514.0272217
Average	518.6668153	Average	520.3872748	Average	518.0902658
Average		Average		Average	
Run 1		Run 2		Run 3	
Tag	ADBI1160	Tag	ADBI1160	Tag	ADBI1160
Start	6/9/2015 8:25	Start	6/9/2015 11:55	Start	6/9/2015 15:25
End	6/9/2015 10:33	End	6/9/2015 14:20	End	6/9/2015 17:44
09-Jun-15 08:25:00	497.3738915	09-Jun-15 11:55:00	493.3926227	09-Jun-15 15:25:00	498.0480319
09-Jun-15 08:40:00	497.5097975	09-Jun-15 12:10:00	492.51338	09-Jun-15 15:40:00	496.937171
09-Jun-15 08:55:00	498.9164406	09-Jun-15 12:25:00	500.9741625	09-Jun-15 15:55:00	495.2896962
09-Jun-15 09:10:00	500.3221872	09-Jun-15 12:40:00	491.5281554	09-Jun-15 16:10:00	496.9643222
09-Jun-15 09:25:00	488.5399428	09-Jun-15 12:55:00	507.6587736	09-Jun-15 16:25:00	497.2249857
09-Jun-15 09:40:00	498.4185886	09-Jun-15 13:10:00	497.7630614	09-Jun-15 16:40:00	501.8763611
09-Jun-15 09:55:00	493.5135419	09-Jun-15 13:25:00	497.3810124	09-Jun-15 16:55:00	491.7038829
09-Jun-15 10:10:00	496.4135775	09-Jun-15 13:40:00	503.5965716	09-Jun-15 17:10:00	486.8667094
		09-Jun-15 13:55:00	491.0924138	09-Jun-15 17:25:00	494.3911426
Average	377 dltp 423 dshtp	Average	378 dltp 423 dshtp	Average	377 dltp 422 dshtp
				Average	377 dltp 423 dshtp

Line 1 Furnace
Natural Gas Usage

Furnace Stacks Line #1

Natural Gas Usage

North Chamber

Run 1

Tag ADBI1109
Start 6/9/2015 8:25
End 6/9/2015 10:33

09-Jun-15 08:25:00 48.43697646
09-Jun-15 08:40:00 48.43852896
09-Jun-15 08:55:00 48.44008146
09-Jun-15 09:10:00 48.44163396
09-Jun-15 09:25:00 48.44318646
09-Jun-15 09:40:00 48.44473896
09-Jun-15 09:55:00 48.44629146
09-Jun-15 10:10:00 48.44784396

Average 48

North Chamber

Run 2

Tag ADBI1109
Start 6/9/2015 11:55
End 6/9/2015 14:20

09-Jun-15 11:55:00 48.45871146
09-Jun-15 12:10:00 48.46026396
09-Jun-15 12:25:00 48.46181645
09-Jun-15 12:40:00 48.46336895
09-Jun-15 12:55:00 48.46492145
09-Jun-15 13:10:00 48.46647395
09-Jun-15 13:25:00 48.46802645
09-Jun-15 13:40:00 48.46957895
09-Jun-15 13:55:00 48.47113145

Average 48

North Chamber

Run 3

Tag ADBI1109
Start 6/9/2015 15:25
End 6/9/2015 17:44

09-Jun-15 15:25:00 53.43619136
09-Jun-15 15:40:00 56.8783981
09-Jun-15 15:55:00 58.59066462
09-Jun-15 16:10:00 58.96890648
09-Jun-15 16:25:00 59.20528722
09-Jun-15 16:40:00 58.67317724
09-Jun-15 16:55:00 59.02964653
09-Jun-15 17:10:00 59.27326495
09-Jun-15 17:25:00 59.11016406

Average 58 **Total Average** 52

South Chamber

Run 1

Tag ADBI1108
Start 6/9/2015 8:25
End 6/9/2015 10:33

09-Jun-15 08:25:00 53.9571908
09-Jun-15 08:40:00 54.32784353
09-Jun-15 08:55:00 53.81839553
09-Jun-15 09:10:00 53.88769046
09-Jun-15 09:25:00 54.54572972
09-Jun-15 09:40:00 54.13071816
09-Jun-15 09:55:00 53.99224056
09-Jun-15 10:10:00 53.0694208

Average 54

South Chamber

Run 2

Tag ADBI1108
Start 6/9/2015 11:55
End 6/9/2015 14:20

09-Jun-15 11:55:00 52.39456119
09-Jun-15 12:10:00 52.30468673
09-Jun-15 12:25:00 52.2355098
09-Jun-15 12:40:00 53.03541373
09-Jun-15 12:55:00 51.30850124
09-Jun-15 13:10:00 50.53954478
09-Jun-15 13:25:00 51.92993931
09-Jun-15 13:40:00 53.21850808
09-Jun-15 13:55:00 52.53417463

Average 52

South Chamber

Run 3

Tag ADBI1108
Start 6/9/2015 15:25
End 6/9/2015 17:44

09-Jun-15 15:25:00 49.29652185
09-Jun-15 15:40:00 49.14879971
09-Jun-15 15:55:00 48.32625863
09-Jun-15 16:10:00 46.94470848
09-Jun-15 16:25:00 45.92834709
09-Jun-15 16:40:00 44.34855012
09-Jun-15 16:55:00 44.32832221
09-Jun-15 17:10:00 46.54410995
09-Jun-15 17:25:00 46.24640025

Average 47 **Total Average** 51

Total (MCF/hr) 102

Heat Content
(MMBtu/MCF) 1.077

Heat Input
(MMBtu/hr) 110

Total (MCF/hr) 101

Heat Content
(MMBtu/MCF) 1.077

Heat Input
(MMBtu/hr) 108

Total (MCF/hr) 105 **Total (MCF/hr)** 103

Heat Content
(MMBtu/MCF) 1.077 Heat Content
(MMBtu/MCF) 1.08

Heat Input
(MMBtu/hr) 113 Heat Input
(MMBtu/hr) 111

Pressure Drop - Inches of Water Column

Furnace Stacks Line #1

SV021

Minimum**Run 1**

Tag	ADBI1709
Start	6/9/2015 8:25
End	6/9/2015 10:33

09-Jun-15 08:25:00	4.311169624
09-Jun-15 08:40:00	4.339208603
09-Jun-15 08:55:00	4.425898552
09-Jun-15 09:10:00	4.266810427
09-Jun-15 09:25:00	4.193007469
09-Jun-15 09:40:00	4.360666275
09-Jun-15 09:55:00	4.222476482
09-Jun-15 10:10:00	4.021915913

Average	4.3
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Maximum**Run 1**

Tag	ADBI1709
Start	6/9/2015 8:25
End	6/9/2015 10:33

09-Jun-15 08:25:00	4.548638344
09-Jun-15 08:40:00	4.491485917
09-Jun-15 08:55:00	4.629892349
09-Jun-15 09:10:00	4.515581653
09-Jun-15 09:25:00	4.464808941
09-Jun-15 09:40:00	4.528610706
09-Jun-15 09:55:00	4.693694115
09-Jun-15 10:10:00	4.507963946

Average	4.5
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Average**Run 1**

Tag	ADBI1709
Start	6/9/2015 8:25
End	6/9/2015 10:33

09-Jun-15 08:25:00	4.436342942
09-Jun-15 08:40:00	4.414767194
09-Jun-15 08:55:00	4.535413859
09-Jun-15 09:10:00	4.388081936
09-Jun-15 09:25:00	4.342218974
09-Jun-15 09:40:00	4.428763029
09-Jun-15 09:55:00	4.482315743
09-Jun-15 10:10:00	4.313611563

Average	4.4
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Minimum**Run 2**

Tag	ADBI1709
Start	6/9/2015 11:55
End	6/9/2015 14:20

09-Jun-15 11:55:00	4.144146544
09-Jun-15 12:10:00	4.073700905
09-Jun-15 12:25:00	4.36321434
09-Jun-15 12:40:00	4.221045971
09-Jun-15 12:55:00	4.143225193
09-Jun-15 13:10:00	4.221045971
09-Jun-15 13:25:00	4.320897102
09-Jun-15 13:40:00	4.343500137
09-Jun-15 13:55:00	4.273117065

Average	4.2
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Maximum**Run 2**

Tag	ADBI1709
Start	6/9/2015 11:55
End	6/9/2015 14:20

09-Jun-15 11:55:00	4.395571232
09-Jun-15 12:10:00	4.374685287
09-Jun-15 12:25:00	4.371824265
09-Jun-15 12:40:00	4.36321434
09-Jun-15 12:55:00	4.523174763
09-Jun-15 13:10:00	4.626173019
09-Jun-15 13:25:00	4.541874209
09-Jun-15 13:40:00	4.487411499
09-Jun-15 13:55:00	4.457450684

Average	4.5
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Average**Run 2**

Tag	ADBI1709
Start	6/9/2015 11:55
End	6/9/2015 14:20

09-Jun-15 11:55:00	4.301581602
09-Jun-15 12:10:00	4.263442259
09-Jun-15 12:25:00	4.370353571
09-Jun-15 12:40:00	4.288417844
09-Jun-15 12:55:00	4.337008098
09-Jun-15 13:10:00	4.395131518
09-Jun-15 13:25:00	4.369321999
09-Jun-15 13:40:00	4.40816788
09-Jun-15 13:55:00	4.382797776

Average	4.3
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Minimum**Run 3**

Tag	ADBI1709
Start	6/9/2015 15:25
End	6/9/2015 17:44

09-Jun-15 15:25:00	4.225337505
09-Jun-15 15:40:00	4.166113853
09-Jun-15 15:55:00	4.073700905
09-Jun-15 16:10:00	4.132412722
09-Jun-15 16:25:00	4.12090826
09-Jun-15 16:40:00	4.151763747
09-Jun-15 16:55:00	4.139219761
09-Jun-15 17:10:00	4.367562503
09-Jun-15 17:25:00	4.154383183

Average	4.2	Total Average	4.2
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Maximum**Run 3**

Tag	ADBI1709
Start	6/9/2015 15:25
End	6/9/2015 17:44

09-Jun-15 15:25:00	4.407708097
09-Jun-15 15:40:00	4.514556943
09-Jun-15 15:55:00	4.528324604
09-Jun-15 16:10:00	4.521744251
09-Jun-15 16:25:00	4.410448551
09-Jun-15 16:40:00	4.380693436
09-Jun-15 16:55:00	4.398596129
09-Jun-15 17:10:00	4.451933861
09-Jun-15 17:25:00	4.367562503

Average	4.4	Total Average	4.5
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Average**Run 3**

Tag	ADBI1709
Start	6/9/2015 15:25
End	6/9/2015 17:44

09-Jun-15 15:25:00	4.280892392
09-Jun-15 15:40:00	4.377924137
09-Jun-15 15:55:00	4.259700719
09-Jun-15 16:10:00	4.31332688
09-Jun-15 16:25:00	4.289621772
09-Jun-15 16:40:00	4.266248081
09-Jun-15 16:55:00	4.237575075
09-Jun-15 17:10:00	4.420352762
09-Jun-15 17:25:00	4.248215616

Average	4.3	Total Average	4.4
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Pressure Drop - Inches of Water Column

Furnace Stacks Line #1

SV023

Minimum**Run 1**

Tag ADBI1715
Start 6/9/2015 8:25
End 6/9/2015 10:33

09-Jun-15 08:25:00 4.593556881
 09-Jun-15 08:40:00 4.58726263
 09-Jun-15 08:55:00 4.456798077
 09-Jun-15 09:10:00 4.535763264
 09-Jun-15 09:25:00 4.400434971
 09-Jun-15 09:40:00 4.573815346
 09-Jun-15 09:55:00 4.261672974
 09-Jun-15 10:10:00 4.314562755

Average 4.5

Maximum**Run 1**

Tag ADBI1715
Start 6/9/2015 8:25
End 6/9/2015 10:33

09-Jun-15 08:25:00 4.907416344
 09-Jun-15 08:40:00 4.911135674
 09-Jun-15 08:55:00 4.714866161
 09-Jun-15 09:10:00 4.893396854
 09-Jun-15 09:25:00 4.854485989
 09-Jun-15 09:40:00 4.703543904
 09-Jun-15 09:55:00 4.708858013
 09-Jun-15 10:10:00 4.797817018

Average 4.8

Average**Run 1**

Tag ADBI1715
Start 6/9/2015 8:25
End 6/9/2015 10:33

09-Jun-15 08:25:00 4.743170684
 09-Jun-15 08:40:00 4.714821996
 09-Jun-15 08:55:00 4.610387959
 09-Jun-15 09:10:00 4.694851479
 09-Jun-15 09:25:00 4.616618184
 09-Jun-15 09:40:00 4.602828515
 09-Jun-15 09:55:00 4.53219721
 09-Jun-15 10:10:00 4.602261369

Average 4.6

Minimum**Run 2**

Tag ADBI1715
Start 6/9/2015 11:55
End 6/9/2015 14:20

09-Jun-15 11:55:00 4.26996994
 09-Jun-15 12:10:00 4.315780522
 09-Jun-15 12:25:00 4.428513926
 09-Jun-15 12:40:00 4.364671707
 09-Jun-15 12:55:00 4.323758125
 09-Jun-15 13:10:00 4.378976822
 09-Jun-15 13:25:00 4.386531456
 09-Jun-15 13:40:00 4.381837845
 09-Jun-15 13:55:00 4.299438953

Average 4.3

Maximum**Run 2**

Tag ADBI1715
Start 6/9/2015 11:55
End 6/9/2015 14:20

09-Jun-15 11:55:00 4.924010277
 09-Jun-15 12:10:00 4.752918243
 09-Jun-15 12:25:00 4.730888367
 09-Jun-15 12:40:00 4.772348414
 09-Jun-15 12:55:00 4.949759483
 09-Jun-15 13:10:00 4.691691399
 09-Jun-15 13:25:00 4.406443119
 09-Jun-15 13:40:00 4.731645219
 09-Jun-15 13:55:00 4.888819218

Average 4.8

Average**Run 2**

Tag ADBI1715
Start 6/9/2015 11:55
End 6/9/2015 14:20

09-Jun-15 11:55:00 4.613294591
 09-Jun-15 12:10:00 4.613949693
 09-Jun-15 12:25:00 4.63612252
 09-Jun-15 12:40:00 4.52156263
 09-Jun-15 12:55:00 4.569822776
 09-Jun-15 13:10:00 4.568896281
 09-Jun-15 13:25:00 4.3986114
 09-Jun-15 13:40:00 4.448833081
 09-Jun-15 13:55:00 4.618388871

Average 4.6

Minimum**Run 3**

Tag ADBI1715
Start 6/9/2015 15:25
End 6/9/2015 17:44

09-Jun-15 15:25:00 4.158043792
 09-Jun-15 15:40:00 4.078278542
 09-Jun-15 15:55:00 4.277409077
 09-Jun-15 16:10:00 4.360952377
 09-Jun-15 16:25:00 4.246795654
 09-Jun-15 16:40:00 4.266249295
 09-Jun-15 16:55:00 4.474536419
 09-Jun-15 17:10:00 4.190146446
 09-Jun-15 17:25:00 4.449931145

Average 4.3 **Total Average** 4.4

Maximum**Run 3**

Tag ADBI1715
Start 6/9/2015 15:25
End 6/9/2015 17:44

09-Jun-15 15:25:00 4.707427502
 09-Jun-15 15:40:00 5.075932503
 09-Jun-15 15:55:00 4.65993309
 09-Jun-15 16:10:00 4.562657356
 09-Jun-15 16:25:00 4.542467354
 09-Jun-15 16:40:00 4.701419353
 09-Jun-15 16:55:00 4.701297967
 09-Jun-15 17:10:00 4.602712154
 09-Jun-15 17:25:00 4.782673359

Average 4.7 **Total Average** 4.8

Average**Run 3**

Tag ADBI1715
Start 6/9/2015 15:25
End 6/9/2015 17:44

09-Jun-15 15:25:00 4.531216638
 09-Jun-15 15:40:00 4.62457268
 09-Jun-15 15:55:00 4.460474151
 09-Jun-15 16:10:00 4.451911458
 09-Jun-15 16:25:00 4.407480485
 09-Jun-15 16:40:00 4.408874039
 09-Jun-15 16:55:00 4.60843062
 09-Jun-15 17:10:00 4.375294222
 09-Jun-15 17:25:00 4.592928432

Average 4.5 **Total Average** 4.6

Furnace Stacks Line #1

SV021

Minimum**Run 1**

Tag ADBI1711
Start 6/9/2015 8:25
End 6/9/2015 10:33

09-Jun-15 08:25:00 431.5561523
 09-Jun-15 08:40:00 435.2814636
 09-Jun-15 08:55:00 438.6491699
 09-Jun-15 09:10:00 436.3544006
 09-Jun-15 09:25:00 432.3309937
 09-Jun-15 09:40:00 422.6451111
 09-Jun-15 09:55:00 430.3044434
 09-Jun-15 10:10:00 433.6928116

Average 433

Maximum**Run 1**

Tag ADBI1711
Start 6/9/2015 8:25
End 6/9/2015 10:33

09-Jun-15 08:25:00 443.1661601
 09-Jun-15 08:40:00 444.5203247
 09-Jun-15 08:55:00 449.4675903
 09-Jun-15 09:10:00 443.3095024
 09-Jun-15 09:25:00 451.0029741
 09-Jun-15 09:40:00 452.8651428
 09-Jun-15 09:55:00 453.1333618
 09-Jun-15 10:10:00 441.6592407

Average 447

Average**Run 1**

Tag ADBI1711
Start 6/9/2015 8:25
End 6/9/2015 10:33

09-Jun-15 08:25:00 438.2185076
 09-Jun-15 08:40:00 440.9238413
 09-Jun-15 08:55:00 443.1314772
 09-Jun-15 09:10:00 438.6288876
 09-Jun-15 09:25:00 443.0437433
 09-Jun-15 09:40:00 440.5976071
 09-Jun-15 09:55:00 443.8219211
 09-Jun-15 10:10:00 438.3726302

Average 441

Minimum**Run 2**

Tag ADBI1711
Start 6/9/2015 11:55
End 6/9/2015 14:20

09-Jun-15 11:55:00 442.6976948
 09-Jun-15 12:10:00 440.6161499
 09-Jun-15 12:25:00 449.3639143
 09-Jun-15 12:40:00 449.318573
 09-Jun-15 12:55:00 449.9146423
 09-Jun-15 13:10:00 437.2782593
 09-Jun-15 13:25:00 431.4369202
 09-Jun-15 13:40:00 436.3245879
 09-Jun-15 13:55:00 435.6092834

Average 441

Maximum**Run 2**

Tag ADBI1711
Start 6/9/2015 11:55
End 6/9/2015 14:20

09-Jun-15 11:55:00 461.5675354
 09-Jun-15 12:10:00 452.7459412
 09-Jun-15 12:25:00 452.101031
 09-Jun-15 12:40:00 462.0443726
 09-Jun-15 12:55:00 458.2533738
 09-Jun-15 13:10:00 451.9691546
 09-Jun-15 13:25:00 454.5638733
 09-Jun-15 13:40:00 469.8824768
 09-Jun-15 13:55:00 461.8011773

Average 458

Average**Run 2**

Tag ADBI1711
Start 6/9/2015 11:55
End 6/9/2015 14:20

09-Jun-15 11:55:00 453.3744994
 09-Jun-15 12:10:00 447.3711286
 09-Jun-15 12:25:00 450.8460304
 09-Jun-15 12:40:00 454.5924657
 09-Jun-15 12:55:00 452.8924006
 09-Jun-15 13:10:00 443.1691957
 09-Jun-15 13:25:00 443.1761672
 09-Jun-15 13:40:00 450.1936891
 09-Jun-15 13:55:00 450.0624454

Average 450

Minimum**Run 3**

Tag ADBI1711
Start 6/9/2015 15:25
End 6/9/2015 17:44

09-Jun-15 15:25:00 436.0265808
 09-Jun-15 15:40:00 441.4481351
 09-Jun-15 15:55:00 443.8418287
 09-Jun-15 16:10:00 436.3544006
 09-Jun-15 16:25:00 436.7120056
 09-Jun-15 16:40:00 438.2319336
 09-Jun-15 16:55:00 445.294335
 09-Jun-15 17:10:00 442.2255554
 09-Jun-15 17:25:00 437.1888428

Average 440 **Total Average** 438

Maximum**Run 3**

Tag ADBI1711
Start 6/9/2015 15:25
End 6/9/2015 17:44

09-Jun-15 15:25:00 451.6432495
 09-Jun-15 15:40:00 450.4212646
 09-Jun-15 15:55:00 467.6473083
 09-Jun-15 16:10:00 464.3549574
 09-Jun-15 16:25:00 466.2167664
 09-Jun-15 16:40:00 453.0439453
 09-Jun-15 16:55:00 470.1506958
 09-Jun-15 17:10:00 455.2791748
 09-Jun-15 17:25:00 460.523312

Average 460 **Total Average** 455

Average**Run 3**

Tag ADBI1711
Start 6/9/2015 15:25
End 6/9/2015 17:44

09-Jun-15 15:25:00 445.6359409
 09-Jun-15 15:40:00 445.9523244
 09-Jun-15 15:55:00 454.562855
 09-Jun-15 16:10:00 450.0504261
 09-Jun-15 16:25:00 450.59272
 09-Jun-15 16:40:00 446.8401786
 09-Jun-15 16:55:00 455.8079824
 09-Jun-15 17:10:00 448.1191512
 09-Jun-15 17:25:00 445.0435631

Average 449 **Total Average** 447

Furnace Stacks Line #1

SV023

Minimum**Run 1**

Tag	ADBI1717
Start	6/9/2015 8:25
End	6/9/2015 10:33

09-Jun-15 08:25:00	438.6193542
09-Jun-15 08:40:00	439.9306946
09-Jun-15 08:55:00	441.0036011
09-Jun-15 09:10:00	441.0800942
09-Jun-15 09:25:00	442.9123863
09-Jun-15 09:40:00	441.7188416
09-Jun-15 09:55:00	441.7095713
09-Jun-15 10:10:00	437.9935303

Average	441
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Maximum**Run 1**

Tag	ADBI1717
Start	6/9/2015 8:25
End	6/9/2015 10:33

09-Jun-15 08:25:00	440.8511694
09-Jun-15 08:40:00	443.7823833
09-Jun-15 08:55:00	445.5336609
09-Jun-15 09:10:00	447.0987215
09-Jun-15 09:25:00	447.8582458
09-Jun-15 09:40:00	445.7124634
09-Jun-15 09:55:00	444.401123
09-Jun-15 10:10:00	441.7095713

Average	445
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Average**Run 1**

Tag	ADBI1717
Start	6/9/2015 8:25
End	6/9/2015 10:33

09-Jun-15 08:25:00	439.3807629
09-Jun-15 08:40:00	441.4356978
09-Jun-15 08:55:00	443.6701454
09-Jun-15 09:10:00	444.7957732
09-Jun-15 09:25:00	446.5759796
09-Jun-15 09:40:00	443.7723855
09-Jun-15 09:55:00	443.1955019
09-Jun-15 10:10:00	439.6654254

Average	443
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Minimum**Run 2**

Tag	ADBI1717
Start	6/9/2015 11:55
End	6/9/2015 14:20

09-Jun-15 11:55:00	451.0347192
09-Jun-15 12:10:00	439.6624756
09-Jun-15 12:25:00	447.9929879
09-Jun-15 12:40:00	450.1619401
09-Jun-15 12:55:00	439.4836731
09-Jun-15 13:10:00	448.5172033
09-Jun-15 13:25:00	442.6129761
09-Jun-15 13:40:00	437.1129662
09-Jun-15 13:55:00	432.0329895

Average	443
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Maximum**Run 2**

Tag	ADBI1717
Start	6/9/2015 11:55
End	6/9/2015 14:20

09-Jun-15 11:55:00	458.4382324
09-Jun-15 12:10:00	451.4840734
09-Jun-15 12:25:00	451.8816528
09-Jun-15 12:40:00	454.5936584
09-Jun-15 12:55:00	450.1619401
09-Jun-15 13:10:00	451.9114685
09-Jun-15 13:25:00	449.1276877
09-Jun-15 13:40:00	442.8514099
09-Jun-15 13:55:00	454.6619178

Average	452
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Average**Run 2**

Tag	ADBI1717
Start	6/9/2015 11:55
End	6/9/2015 14:20

09-Jun-15 11:55:00	454.8235721
09-Jun-15 12:10:00	444.7563996
09-Jun-15 12:25:00	450.9295744
09-Jun-15 12:40:00	452.1697926
09-Jun-15 12:55:00	444.4380642
09-Jun-15 13:10:00	450.3831589
09-Jun-15 13:25:00	446.7019982
09-Jun-15 13:40:00	441.7588471
09-Jun-15 13:55:00	442.0818032

Average	448
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Minimum**Run 3**

Tag	ADBI1717
Start	6/9/2015 15:25
End	6/9/2015 17:44

09-Jun-15 15:25:00	447.5702801
09-Jun-15 15:40:00	451.5835571
09-Jun-15 15:55:00	449.0269744
09-Jun-15 16:10:00	448.3052673
09-Jun-15 16:25:00	445.20578
09-Jun-15 16:40:00	446.2833998
09-Jun-15 16:55:00	446.2489014
09-Jun-15 17:10:00	451.553772
09-Jun-15 17:25:00	451.2259216

Average	449	Total Average	444
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Maximum**Run 3**

Tag	ADBI1717
Start	6/9/2015 15:25
End	6/9/2015 17:44

09-Jun-15 15:25:00	454.1168213
09-Jun-15 15:40:00	456.3724801
09-Jun-15 15:55:00	458.3190308
09-Jun-15 16:10:00	452.000885
09-Jun-15 16:25:00	449.0801697
09-Jun-15 16:40:00	454.5042725
09-Jun-15 16:55:00	453.5505981
09-Jun-15 17:10:00	454.1590837
09-Jun-15 17:25:00	455.1897583

Average	454	Total Average	450
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Average**Run 3**

Tag	ADBI1717
Start	6/9/2015 15:25
End	6/9/2015 17:44

09-Jun-15 15:25:00	451.7530137
09-Jun-15 15:40:00	453.4019597
09-Jun-15 15:55:00	454.4395101
09-Jun-15 16:10:00	450.0829037
09-Jun-15 16:25:00	447.8151892
09-Jun-15 16:40:00	451.2947678
09-Jun-15 16:55:00	449.2711456
09-Jun-15 17:10:00	452.6283247
09-Jun-15 17:25:00	452.8545637

Average	452	Total Average	447
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**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: SV022

Test date(s): 6/10/15

Equipment and Operating Data

- Process equipment description: Line No 1 Pellet Indurating Furnace 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
1/30/15 Changeout demist panels; 1/24/15 replace spray nozzles; 3/2/15 Repair holes in scrubber house; 1/14/15 transmitter calibration; 1/17/15 clean demist panels; 1/24/15 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	388	390	391	390
Feed Rate, DSTPH	435	437	438	436
Fuel Input (list units): MCF/hr	109	109	108	108
Heat Input (10⁶ British thermal units/hour)	118	117	116	117

- 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	5.5	5.6	5.6	5.6
Wet Scrubber Pressure Drop Maximum, in. w.c	5.7	5.7	5.8	5.7
Wet Scrubber Pressure Drop Average, in. w.c	5.7	5.7	5.7	5.7
Wet Scrubber Water Flow Rate Minimum, gpm	480	481	479	480
Wet Scrubber Water Flow Rate Maximum, gpm	484	484	482	483
Wet Scrubber Water Flow Rate Average, gpm	482	482	480	481
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.

aq-f6-05
5/1/07



**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: SV024

Test date(s): 6/10/15

Equipment and Operating Data

- Process equipment description: Line No 1 Pellet Indurating Furnace 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
1/24/15 replace spray nozzles; 3/9/15 Repair holes in scrubber house walls and floor; 1/14/15 transmitter calibration; 1/17/15 clean demist panels; 1/24/15 maintenance PM; 1/30/15 replace demist panels; 1/30/15 reline scrubber house
- 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	388	390	391	390
Feed Rate, DSTPH	435	437	438	436
Fuel Input (list units): MCF/hr	109	109	108	108
Heat Input (10⁶ British thermal units/hour)	118	117	116	117

- 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	4.2	4.2	4.2
Wet Scrubber Pressure Drop Maximum, in. w.c	4.5	4.4	4.4	4.4
Wet Scrubber Pressure Drop Average, in. w.c	4.4	4.3	4.3	4.3
Wet Scrubber Water Flow Rate Minimum, gpm	460	459	453	457
Wet Scrubber Water Flow Rate Maximum, gpm	474	474	468	472
Wet Scrubber Water Flow Rate Average, gpm	466	466	461	464
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.

Furnace Stacks Line #1

Minimum Run 1		Minimum Run 2		Minimum Run 3	
Tag	ADBI1160	Tag	ADBI1160	Tag	ADBI1160
Start	6/10/2015 8:25	Start	6/10/2015 15:10	Start	6/10/2015 17:55
End	6/10/2015 9:46	End	6/10/2015 17:19	End	6/10/2015 20:03
10-Jun-15 08:25:00	471.4172668	10-Jun-15 15:10:00	465.7774658	10-Jun-15 17:55:00	490.4855366
10-Jun-15 08:40:00	492.8962097	10-Jun-15 15:25:00	483.4293518	10-Jun-15 18:10:00	469.3664246
10-Jun-15 08:55:00	497.9134521	10-Jun-15 15:40:00	484.1801147	10-Jun-15 18:25:00	480.591156
10-Jun-15 09:10:00	487.6043091	10-Jun-15 15:55:00	482.8617249	10-Jun-15 18:40:00	474.2738037
10-Jun-15 09:25:00	479.6572876	10-Jun-15 16:10:00	467.5170288	10-Jun-15 18:55:00	492.5299988
		10-Jun-15 16:25:00	482.9898987	10-Jun-15 19:10:00	487.9155884
10-Jun-15 13:28:00	458.4346924	10-Jun-15 16:40:00	480.9573669	10-Jun-15 19:25:00	477.2585144
10-Jun-15 13:43:00	468.1029663	10-Jun-15 16:55:00	474.768219	10-Jun-15 19:40:00	500.3671265
10-Jun-15 13:58:00	488.6480408				
Average	480.5842781	Average	477.8101463	Average	484.0985186
Maximum Run 1		Maximum Run 2		Maximum Run 3	
Tag	ADBI1160	Tag	ADBI1160	Tag	ADBI1160
Start	6/10/2015 8:25	Start	6/10/2015 15:10	Start	6/10/2015 17:55
End	6/10/2015 9:46	End	6/10/2015 17:19	End	6/10/2015 20:03
10-Jun-15 08:25:00	553.1580811	10-Jun-15 15:10:00	547.9577026	10-Jun-15 17:55:00	548.0675659
10-Jun-15 08:40:00	535.4695435	10-Jun-15 15:25:00	527.7911561	10-Jun-15 18:10:00	554.9158936
10-Jun-15 08:55:00	541.3657227	10-Jun-15 15:40:00	547.701355	10-Jun-15 18:25:00	549.6240234
10-Jun-15 09:10:00	540.8163452	10-Jun-15 15:55:00	549.8254395	10-Jun-15 18:40:00	542.7939453
10-Jun-15 09:25:00	545.2293701	10-Jun-15 16:10:00	539.3331909	10-Jun-15 18:55:00	538.5138248
		10-Jun-15 16:25:00	538.7105713	10-Jun-15 19:10:00	547.7929077
10-Jun-15 13:28:00	515.7484741	10-Jun-15 16:40:00	530.3607178	10-Jun-15 19:25:00	551.7297974
10-Jun-15 13:43:00	542.6291504	10-Jun-15 16:55:00	534.9018555	10-Jun-15 19:40:00	537.227417
10-Jun-15 13:58:00	541.9699707				
Average	539.5483322	Average	539.5727486	Average	546.3331719
Average Run 1		Average Run 2		Average Run 3	
Tag	ADBI1160	Tag	ADBI1160	Tag	ADBI1160
Start	6/10/2015 8:25	Start	6/10/2015 15:10	Start	6/10/2015 17:55
End	6/10/2015 9:46	End	6/10/2015 17:19	End	6/10/2015 20:03
10-Jun-15 08:25:00	515.5512394	10-Jun-15 15:10:00	507.8217637	10-Jun-15 17:55:00	526.4325704
10-Jun-15 08:40:00	511.2180477	10-Jun-15 15:25:00	512.7520243	10-Jun-15 18:10:00	508.6415432
10-Jun-15 08:55:00	518.2742397	10-Jun-15 15:40:00	515.3306789	10-Jun-15 18:25:00	520.1861384
10-Jun-15 09:10:00	507.1612565	10-Jun-15 15:55:00	522.6298731	10-Jun-15 18:40:00	504.2194163
10-Jun-15 09:25:00	515.7010527	10-Jun-15 16:10:00	511.7631208	10-Jun-15 18:55:00	512.2103947
		10-Jun-15 16:25:00	513.0932885	10-Jun-15 19:10:00	518.5857229
10-Jun-15 13:28:00	490.3436907	10-Jun-15 16:40:00	510.6471786	10-Jun-15 19:25:00	507.3853242
10-Jun-15 13:43:00	505.5284825	10-Jun-15 16:55:00	511.0546791	10-Jun-15 19:40:00	519.2881918
10-Jun-15 13:58:00	520.2935256				
Average	388 dltph 435 dshtp	Average	390 dltph 437 dshtp	Average	391 dltph 438 dshtp
				Average	390 dltph 436 dshtp

Line 1 Furnace
Natural Gas Usage

Furnace Stacks Line #1

Natural Gas Usage

North Chamber

Run 1

Tag ADBI1109
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 59.26773755
10-Jun-15 08:40:00 59.25023813
10-Jun-15 08:55:00 59.23273871
10-Jun-15 09:10:00 59.21523929
10-Jun-15 09:25:00 59.19773986

10-Jun-15 13:28:00 62.1088224
10-Jun-15 13:43:00 61.86052965
10-Jun-15 13:58:00 62.17073369

Average 60

North Chamber

Run 2

Tag ADBI1109
Start 6/10/2015 13:28
End 6/10/2015 14:21

10-Jun-15 15:10:00 60.96903276
10-Jun-15 15:25:00 60.8879675
10-Jun-15 15:40:00 60.80664232
10-Jun-15 15:55:00 60.6988409
10-Jun-15 16:10:00 60.57339041
10-Jun-15 16:25:00 60.44793992
10-Jun-15 16:40:00 60.32248943
10-Jun-15 16:55:00 60.19703894

Average 61

North Chamber

Run 3

Tag ADBI1109
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 60.25676239
10-Jun-15 18:10:00 60.29198496
10-Jun-15 18:25:00 60.23402189
10-Jun-15 18:40:00 60.16131519
10-Jun-15 18:55:00 60.17509294
10-Jun-15 19:10:00 60.24121514
10-Jun-15 19:25:00 60.30733734
10-Jun-15 19:40:00 60.37345955

Average 60 **Total Average** 60

South Chamber

Run 1

Tag ADBI1108
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 46.23238683
10-Jun-15 08:40:00 46.78101233
10-Jun-15 08:55:00 47.11829182
10-Jun-15 09:10:00 46.95331266
10-Jun-15 09:25:00 46.45531115

10-Jun-15 13:28:00 52.72056362
10-Jun-15 13:43:00 51.64967592
10-Jun-15 13:58:00 50.45117436

Average 49

South Chamber

Run 2

Tag ADBI1108
Start 6/10/2015 13:28
End 6/10/2015 14:21

10-Jun-15 15:10:00 48.78706802
10-Jun-15 15:25:00 48.71434731
10-Jun-15 15:40:00 49.14667492
10-Jun-15 15:55:00 47.78274766
10-Jun-15 16:10:00 47.76175326
10-Jun-15 16:25:00 47.987091
10-Jun-15 16:40:00 46.84593877
10-Jun-15 16:55:00 47.11105458

Average 48

South Chamber

Run 3

Tag ADBI1108
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 48.36469539
10-Jun-15 18:10:00 47.98213178
10-Jun-15 18:25:00 47.44671858
10-Jun-15 18:40:00 47.24108656
10-Jun-15 18:55:00 47.34840021
10-Jun-15 19:10:00 47.05917763
10-Jun-15 19:25:00 46.7236246
10-Jun-15 19:40:00 46.79731008

Average 47 **Total Average** 48

Total (MCF/hr) 109

Heat Content
(MMBtu/MCF) 1.08

Heat Input
(MMBtu/hr) 118

Total (MCF/hr) 109

Heat Content
(MMBtu/MCF) 1.08

Heat Input
(MMBtu/hr) 117

Total (MCF/hr) 108 **Total (MCF/hr)** 108

Heat Content
(MMBtu/MCF) 1.08 Heat Content
(MMBtu/MCF) 1.08

Heat Input
(MMBtu/hr) 116 Heat Input
(MMBtu/hr) 117

Pressure Drop - Inches of Water Column

Furnace Stacks Line #1

SV022

**Minimum
Run 1**

Tag ADBI1712
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 5.60465765
10-Jun-15 08:40:00 5.603227139
10-Jun-15 08:55:00 5.566033363
10-Jun-15 09:10:00 5.640421391
10-Jun-15 09:25:00 5.610927747

10-Jun-15 13:28:00 5.173780918
10-Jun-15 13:43:00 5.526298468
10-Jun-15 13:58:00 5.618480334

Average 5.5

**Minimum
Run 2**

Tag ADBI1712
Start 6/10/2015 13:28
End 6/10/2015 14:21

10-Jun-15 15:10:00 5.671725364
10-Jun-15 15:25:00 5.559166908
10-Jun-15 15:40:00 5.650721073
10-Jun-15 15:55:00 5.640135288
10-Jun-15 16:10:00 5.61874644
10-Jun-15 16:25:00 5.509384632
10-Jun-15 16:40:00 5.522545338
10-Jun-15 16:55:00 5.596883167

Average 5.6

**Minimum
Run 3**

Tag ADBI1712
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 5.540963158
10-Jun-15 18:10:00 5.508526325
10-Jun-15 18:25:00 5.48506546
10-Jun-15 18:40:00 5.549153328
10-Jun-15 18:55:00 5.585881471
10-Jun-15 19:10:00 5.630121708
10-Jun-15 19:25:00 5.632124424
10-Jun-15 19:40:00 5.667887688

Average 5.6 **Total Average** 5.6

**Maximum
Run 1**

Tag ADBI1712
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 5.755149841
10-Jun-15 08:40:00 5.82438755
10-Jun-15 08:55:00 5.819634167
10-Jun-15 09:10:00 5.789768696
10-Jun-15 09:25:00 5.76115799

10-Jun-15 13:28:00 5.526298468
10-Jun-15 13:43:00 5.692206383
10-Jun-15 13:58:00 5.820668221

Average 5.7

**Maximum
Run 2**

Tag ADBI1712
Start 6/10/2015 15:10
End 6/10/2015 17:19

10-Jun-15 15:10:00 5.802643299
10-Jun-15 15:25:00 5.705367088
10-Jun-15 15:40:00 5.698500633
10-Jun-15 15:55:00 5.742343584
10-Jun-15 16:10:00 5.758010864
10-Jun-15 16:25:00 5.773460388
10-Jun-15 16:40:00 5.717049025
10-Jun-15 16:55:00 5.638906609

Average 5.7

**Maximum
Run 3**

Tag ADBI1712
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 5.726539135
10-Jun-15 18:10:00 5.746852398
10-Jun-15 18:25:00 5.760871887
10-Jun-15 18:40:00 5.828679085
10-Jun-15 18:55:00 5.727683544
10-Jun-15 19:10:00 5.729114056
10-Jun-15 19:25:00 5.720530987
10-Jun-15 19:40:00 5.776013755

Average 5.8 **Total Average** 5.7

Average

Run 1

Tag ADBI1712
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 5.66678618
10-Jun-15 08:40:00 5.688426631
10-Jun-15 08:55:00 5.716798107
10-Jun-15 09:10:00 5.754176033
10-Jun-15 09:25:00 5.703075461

10-Jun-15 13:28:00 5.343766427
10-Jun-15 13:43:00 5.612996618
10-Jun-15 13:58:00 5.74894699

Average 5.7

Average

Run 2

Tag ADBI1712
Start 6/10/2015 15:10
End 6/10/2015 17:19

10-Jun-15 15:10:00 5.769303387
10-Jun-15 15:25:00 5.645113164
10-Jun-15 15:40:00 5.67471323
10-Jun-15 15:55:00 5.678032683
10-Jun-15 16:10:00 5.701092038
10-Jun-15 16:25:00 5.675084793
10-Jun-15 16:40:00 5.623399884
10-Jun-15 16:55:00 5.610945455

Average 5.7

Average

Run 3

Tag ADBI1712
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 5.654890866
10-Jun-15 18:10:00 5.633421883
10-Jun-15 18:25:00 5.667745662
10-Jun-15 18:40:00 5.699034188
10-Jun-15 18:55:00 5.665425503
10-Jun-15 19:10:00 5.677720696
10-Jun-15 19:25:00 5.67276335
10-Jun-15 19:40:00 5.722477494

Average 5.7 **Total Average** 5.7

Pressure Drop - Inches of Water Column

Furnace Stacks Line #1

SV024

**Minimum
Run 1**

Tag ADBI1718
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 4.358663559
10-Jun-15 08:40:00 4.421892643
10-Jun-15 08:55:00 4.341127257
10-Jun-15 09:10:00 4.231917858
10-Jun-15 09:25:00 4.252803802

10-Jun-15 13:28:00 4.152952671
10-Jun-15 13:43:00 4.288563009
10-Jun-15 13:58:00 4.314602852

Average 4.3

**Minimum
Run 2**

Tag ADBI1718
Start 6/10/2015 13:28
End 6/10/2015 14:21

10-Jun-15 15:10:00 4.183566093
10-Jun-15 15:25:00 4.251519068
10-Jun-15 15:40:00 4.254520416
10-Jun-15 15:55:00 4.080853462
10-Jun-15 16:10:00 4.189860344
10-Jun-15 16:25:00 4.229915142
10-Jun-15 16:40:00 4.273403168
10-Jun-15 16:55:00 4.206454277

Average 4.2

**Minimum
Run 3**

Tag ADBI1718
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 4.164111137
10-Jun-15 18:10:00 4.32017319
10-Jun-15 18:25:00 4.118522478
10-Jun-15 18:40:00 4.028496265
10-Jun-15 18:55:00 4.189288139
10-Jun-15 19:10:00 4.190718651
10-Jun-15 19:25:00 4.262817383
10-Jun-15 19:40:00 4.248512268

Average 4.2 **Total Average** 4.2

**Maximum
Run 1**

Tag ADBI1718
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 4.524319172
10-Jun-15 08:40:00 4.569523811
10-Jun-15 08:55:00 4.485819208
10-Jun-15 09:10:00 4.608148575
10-Jun-15 09:25:00 4.642194748

10-Jun-15 13:28:00 4.342069626
10-Jun-15 13:43:00 4.41159296
10-Jun-15 13:58:00 4.474536419

Average 4.5

**Maximum
Run 2**

Tag ADBI1718
Start 6/10/2015 15:10
End 6/10/2015 17:19

10-Jun-15 15:10:00 4.277108374
10-Jun-15 15:25:00 4.344072342
10-Jun-15 15:40:00 4.365243912
10-Jun-15 15:55:00 4.540913105
10-Jun-15 16:10:00 4.396429539
10-Jun-15 16:25:00 4.402151585
10-Jun-15 16:40:00 4.453936577
10-Jun-15 16:55:00 4.414453983

Average 4.4

**Maximum
Run 3**

Tag ADBI1718
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 4.386701584
10-Jun-15 18:10:00 4.539482594
10-Jun-15 18:25:00 4.353670589
10-Jun-15 18:40:00 4.479114056
10-Jun-15 18:55:00 4.429869763
10-Jun-15 19:10:00 4.349478712
10-Jun-15 19:25:00 4.380121231
10-Jun-15 19:40:00 4.490558624

Average 4.4 **Total Average** 4.4

Average

Run 1
Tag ADBI1718
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 4.443572888
10-Jun-15 08:40:00 4.486386195
10-Jun-15 08:55:00 4.407172871
10-Jun-15 09:10:00 4.361900178
10-Jun-15 09:25:00 4.452164498

10-Jun-15 13:28:00 4.258579509
10-Jun-15 13:43:00 4.373101347
10-Jun-15 13:58:00 4.381564574

Average 4.4

Average

Run 2
Tag ADBI1718
Start 6/10/2015 15:10
End 6/10/2015 17:19

10-Jun-15 15:10:00 4.229367744
10-Jun-15 15:25:00 4.316857599
10-Jun-15 15:40:00 4.33020643
10-Jun-15 15:55:00 4.32846578
10-Jun-15 16:10:00 4.298044915
10-Jun-15 16:25:00 4.29112382
10-Jun-15 16:40:00 4.34317877
10-Jun-15 16:55:00 4.330005755

Average 4.3

Average

Run 3
Tag ADBI1718
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 4.279048386
10-Jun-15 18:10:00 4.442868863
10-Jun-15 18:25:00 4.260997776
10-Jun-15 18:40:00 4.262899903
10-Jun-15 18:55:00 4.301577407
10-Jun-15 19:10:00 4.263556024
10-Jun-15 19:25:00 4.32852929
10-Jun-15 19:40:00 4.344301237

Average 4.3 **Total Average** 4.3

Furnace Stacks Line #1

SV022

Minimum**Run 1**

Tag ADBI1714
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 480.5947833
 10-Jun-15 08:40:00 478.1378784
 10-Jun-15 08:55:00 481.8449443
 10-Jun-15 09:10:00 479.9558716
 10-Jun-15 09:25:00 480.3494816

 10-Jun-15 13:28:00 473.2501831
 10-Jun-15 13:43:00 483.3808691
 10-Jun-15 13:58:00 479.6279907

Average 480

Minimum**Run 2**

Tag ADBI1714
Start 6/10/2015 13:28
End 6/10/2015 14:21

10-Jun-15 15:10:00 485.3282507
 10-Jun-15 15:25:00 475.8132629
 10-Jun-15 15:40:00 482.7942263
 10-Jun-15 15:55:00 481.6292056
 10-Jun-15 16:10:00 478.7935181
 10-Jun-15 16:25:00 481.4934962
 10-Jun-15 16:40:00 480.1351558
 10-Jun-15 16:55:00 478.4794794

Average 481

Minimum**Run 3**

Tag ADBI1714
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 479.8238825
 10-Jun-15 18:10:00 477.7143357
 10-Jun-15 18:25:00 477.6610413
 10-Jun-15 18:40:00 477.8398438
 10-Jun-15 18:55:00 480.0452576
 10-Jun-15 19:10:00 479.0934722
 10-Jun-15 19:25:00 478.1378784
 10-Jun-15 19:40:00 481.099293

Average 479 **Total Average** 480

Maximum**Run 1**

Tag ADBI1714
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 483.7825656
 10-Jun-15 08:40:00 484.2575336
 10-Jun-15 08:55:00 484.5752563
 10-Jun-15 09:10:00 481.8449443
 10-Jun-15 09:25:00 483.1149292

 10-Jun-15 13:28:00 485.0520935
 10-Jun-15 13:43:00 484.998667
 10-Jun-15 13:58:00 483.3808691

Average 484

Maximum**Run 2**

Tag ADBI1714
Start 6/10/2015 15:10
End 6/10/2015 17:19

10-Jun-15 15:10:00 487.7045898
 10-Jun-15 15:25:00 485.8776656
 10-Jun-15 15:40:00 485.1712952
 10-Jun-15 15:55:00 482.7942263
 10-Jun-15 16:10:00 481.6292056
 10-Jun-15 16:25:00 484.7242737
 10-Jun-15 16:40:00 482.9094
 10-Jun-15 16:55:00 480.1351558

Average 484

Maximum**Run 3**

Tag ADBI1714
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 483.7407837
 10-Jun-15 18:10:00 481.3088332
 10-Jun-15 18:25:00 480.1942749
 10-Jun-15 18:40:00 481.4161682
 10-Jun-15 18:55:00 481.391429
 10-Jun-15 19:10:00 482.0420227
 10-Jun-15 19:25:00 481.099293
 10-Jun-15 19:40:00 482.3698425

Average 482 **Total Average** 483

Average**Run 1**

Tag ADBI1714
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 482.6090532
 10-Jun-15 08:40:00 480.3756017
 10-Jun-15 08:55:00 483.8047628
 10-Jun-15 09:10:00 480.2957009
 10-Jun-15 09:25:00 481.7383102

 10-Jun-15 13:28:00 477.7467828
 10-Jun-15 13:43:00 483.936465
 10-Jun-15 13:58:00 481.6033155

Average 482

Average**Run 2**

Tag ADBI1714
Start 6/10/2015 15:10
End 6/10/2015 17:19

10-Jun-15 15:10:00 486.7561648
 10-Jun-15 15:25:00 480.6098857
 10-Jun-15 15:40:00 483.8078969
 10-Jun-15 15:55:00 482.2938487
 10-Jun-15 16:10:00 480.2038717
 10-Jun-15 16:25:00 483.4484517
 10-Jun-15 16:40:00 481.3340034
 10-Jun-15 16:55:00 479.5551893

Average 482

Average**Run 3**

Tag ADBI1714
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 481.9537741
 10-Jun-15 18:10:00 478.9593464
 10-Jun-15 18:25:00 479.1013976
 10-Jun-15 18:40:00 479.2740822
 10-Jun-15 18:55:00 480.6630231
 10-Jun-15 19:10:00 480.8898782
 10-Jun-15 19:25:00 479.4753691
 10-Jun-15 19:40:00 481.9415289

Average 480 **Total Average** 481

Furnace Stacks Line #1

SV024

Minimum**Run 1**

Tag ADBI1720
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 462.6702271
 10-Jun-15 08:40:00 462.9086304
 10-Jun-15 08:55:00 461.0012817
 10-Jun-15 09:10:00 457.2759094
 10-Jun-15 09:25:00 451.285553

 10-Jun-15 13:28:00 463.6914503
 10-Jun-15 13:43:00 461.0012817
 10-Jun-15 13:58:00 460.4193141

Average 460

Minimum**Run 2**

Tag ADBI1720
Start 6/10/2015 13:28
End 6/10/2015 14:21

10-Jun-15 15:10:00 464.0411072
 10-Jun-15 15:25:00 460.9714355
 10-Jun-15 15:40:00 457.3653259
 10-Jun-15 15:55:00 459.1828166
 10-Jun-15 16:10:00 465.1470158
 10-Jun-15 16:25:00 451.4345398
 10-Jun-15 16:40:00 455.7858579
 10-Jun-15 16:55:00 457.6037598

Average 459

Minimum**Run 3**

Tag ADBI1720
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 450.4510803
 10-Jun-15 18:10:00 451.1365356
 10-Jun-15 18:25:00 456.4116516
 10-Jun-15 18:40:00 447.351593
 10-Jun-15 18:55:00 458.5831868
 10-Jun-15 19:10:00 455.9646301
 10-Jun-15 19:25:00 453.2525635
 10-Jun-15 19:40:00 454.0322887

Average 453 **Total Average** 457

Maximum**Run 1**

Tag ADBI1720
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 476.7073669
 10-Jun-15 08:40:00 473.1905823
 10-Jun-15 08:55:00 471.3050116
 10-Jun-15 09:10:00 470.3891602
 10-Jun-15 09:25:00 471.3726501

 10-Jun-15 13:28:00 477.9292603
 10-Jun-15 13:43:00 477.1544189
 10-Jun-15 13:58:00 476.5083566

Average 474

Maximum**Run 2**

Tag ADBI1720
Start 6/10/2015 15:10
End 6/10/2015 17:19

10-Jun-15 15:10:00 471.0448303
 10-Jun-15 15:25:00 467.2896729
 10-Jun-15 15:40:00 471.0746155
 10-Jun-15 15:55:00 478.374196
 10-Jun-15 16:10:00 480.5220947
 10-Jun-15 16:25:00 466.8426208
 10-Jun-15 16:40:00 480.5220947
 10-Jun-15 16:55:00 473.2801992

Average 474

Maximum**Run 3**

Tag ADBI1720
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 471.253418
 10-Jun-15 18:10:00 464.1604004
 10-Jun-15 18:25:00 471.4620361
 10-Jun-15 18:40:00 462.1113819
 10-Jun-15 18:55:00 476.5583191
 10-Jun-15 19:10:00 471.6241015
 10-Jun-15 19:25:00 461.6910815
 10-Jun-15 19:40:00 468.75

Average 468 **Total Average** 472

Average**Run 1**

Tag ADBI1720
Start 6/10/2015 8:25
End 6/10/2015 9:46

10-Jun-15 08:25:00 468.7270616
 10-Jun-15 08:40:00 465.5987589
 10-Jun-15 08:55:00 463.7569748
 10-Jun-15 09:10:00 464.0781632
 10-Jun-15 09:25:00 461.1835718

 10-Jun-15 13:28:00 470.0284282
 10-Jun-15 13:43:00 468.2580746
 10-Jun-15 13:58:00 469.5967602

Average 466

Average**Run 2**

Tag ADBI1720
Start 6/10/2015 15:10
End 6/10/2015 17:19

10-Jun-15 15:10:00 467.3601997
 10-Jun-15 15:25:00 464.7079323
 10-Jun-15 15:40:00 463.5364964
 10-Jun-15 15:55:00 464.7681795
 10-Jun-15 16:10:00 472.5240904
 10-Jun-15 16:25:00 460.2317169
 10-Jun-15 16:40:00 469.4288587
 10-Jun-15 16:55:00 462.2044849

Average 466

Average**Run 3**

Tag ADBI1720
Start 6/10/2015 17:55
End 6/10/2015 20:03

10-Jun-15 17:55:00 458.9400152
 10-Jun-15 18:10:00 459.139568
 10-Jun-15 18:25:00 462.9128956
 10-Jun-15 18:40:00 452.6353959
 10-Jun-15 18:55:00 467.9804729
 10-Jun-15 19:10:00 461.5719653
 10-Jun-15 19:25:00 457.2918543
 10-Jun-15 19:40:00 463.6295245

Average 461 **Total Average** 464

Appendix F

Stack Test Plan

Ryan Pantzke

From: Severin, Marc (MPCA) <marc.severin@state.mn.us>
Sent: Thursday, June 04, 2015 9:44 AM
To: Lucas, Julie (Julie.Lucas@CliffsNR.com); Thomas Leier
Cc: Severin, Marc (MPCA)
Subject: Test Plan Approval Letter for the June 9-10, 2015 MACT and Mercury testing
Attachments: CERTIFICATIONS REQUIRED FOR PERFORMANCE TEST REPORT.doc; Electronic Submittals Guidance Document.Approval.pdf; MICROFICHE AND CD REPORT SUBMITTALS.doc; OPERATING DATA SUMMARY FOR PROCESS SOURCES.doc; Performance Test Report Completeness Criteria (PTRCC).doc; HibbingTac_EU020_5RFHPM_Hg_Jun2015_TPAL.doc

Hi Julie and Tom

Attached is the Test Plan Approval Letter (TPAL) for the Performance Testing to be conducted on EU020 on June 9-10, 2015 at your facility in Hibbing, Minnesota. Note that mercury test results are to be reported in lbs/hr and lbs/mmBTU. Please include a copy of the Test Plan, TPAL, and this email in the final report.

The Performance Test Report Completeness Criteria (PTRCC) form is referenced in the TPAL. Please use this to review the report prior to submitting to the agency. The form is designed to ensure completeness of test reports and aid in efficient MPCA report review and compliance determination.

Note: You can forego sending any paper copies of the performance test report by following any of the three performance test submittal procedures outlined in the attached document titled "Electronic Submittals Guidance Document.Approval".

Please feel free to call with any questions

Marc Severin
Pollution Control Specialist
Land & Air Compliance Section
Industrial Division
Minnesota Pollution Control Agency
Ph. # (651)757-2716



**Minnesota Pollution
Control Agency**

520 Lafayette Road
St. Paul, MN 55155-4194

Air Performance Test Form

Performance Test Plan Approval

Facility Information (please print)

Facility name: Hibbing Taconite Co AQ#: 541
Facility contact: Julie Lucas
Address: 4950 County Highway 5 North, Hibbing, MN 55746
Phone: 218-262-6856
Unit(s) to be tested: EU020
Scheduled for: June 9-10, 2015 at your facility located in: Hibbing Minnesota

Test Plan

Submitted on (date): May 12, 2015 Discussed on (date): June 1, 2015

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

- ☐ Shortened test notification approved
- ☒ Test plan approved without modification
- ☐ Test plan approved with the following provisions:
 1. Performance testing to be conducted on EU020 to determine Front-half Particulate Matter (FHPM) to demonstrate compliance with 40 CFR Part 63 Subpart RRRRR and for mercury as per Minnesota Mercury Rule. Mercury results are to be reported in pounds per hour and pounds per million BTU's.
 2. Include in the final test report all process and pollution control equipment operating data collected at 15 minute intervals and averaged for each test period. This information should be easily understood by individuals not familiar with the process.
 3. Include in the final test report the full reference method data record (strip chart and/or datalogger output) used to calculate emissions. The data record should include calibration values for any instrumental analyzer used for emissions compliance testing.
 4. Include in the final test report and CD-ROM copy; a signed certifications form, the test plan, this test plan approval letter (TPAL) and the email to which the TPAL was attached.
 5. The CD-ROM test report copy must be labeled with the AQ File Number, Company Name, Emission Unit Tested and Test Dates as stated on the submittal form. Only one paper copy and one CD-ROM copy of the test report are to be submitted.
 6. Include in the final test report a simplified drawing of the test locations including pollution control equipment, stack orientation and test port locations.
 7. Use of the PTRCC form will help assure that a complete test report is submitted to the MPCA.
 8. Please be reminded 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.
 9. Obtain the required submittal and operating data forms from the Web site noted below. **Forms have been revised as of May 1, 2007. Please utilize the current forms for this test.**

Required Forms

- | | |
|--|---|
| <input type="checkbox"/> Operating Data Summary – Combustion Sources | <input type="checkbox"/> Operating Data Summary – Asphalt Plants |
| <input checked="" type="checkbox"/> Operating Data Summary – Process Sources | <input checked="" type="checkbox"/> Microfiche/CD-ROM Submittal Form |
| <input checked="" type="checkbox"/> Certifications Form | <input checked="" type="checkbox"/> Performance Test Report Completeness Criteria (PTRCC) |

Note: Forms are available at www.pca.state.mn.us/air/performance/test.html

Approved by:



Pollution Control Specialist
Compliance and Enforcement Unit
Minnesota Pollution Control Agency

Date: June 4, 2015

Please contact me at 651-757-2716 if you have any questions regarding this approval.

Please be aware that enforcement action will be taken for performance test failures indicating emissions above applicable limits (excess actual emissions to the environment). Failures commonly result in assessment of a monetary penalty. Upon the first test failure, the Company should take immediate measures to minimize emissions. The measures taken should be documented, as they will become part of the record of corrective actions.

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

Air Quality Compliance Tracking Coordinator
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

cc: Thomas Leier (tleier@barr.com)
Julie Lucas (Julie.lucas@cliffsnr.com)
Steven Palzkill, MPCA, Duluth (steven.palzkill@state.mn.us)
AQ Correspondence File No. 541

Thomas Leier

From: Thomas Leier
Sent: Monday, May 11, 2015 10:09 AM
To: 'Severin, Marc (MPCA)'
Cc: 'Lucas, Julie C'; Tom Kuchinski; tasha.niemi@cliffsnr.com
Subject: Hibbing Taconite Company - Line 1 MACT/Hg Test Plan
Attachments: Hibbing Taconite Company - Line 1 MACT-Hg 5-11-2015.pdf

Marc,

Barr is submitting the attached test plan on behalf of Hibbing Taconite Company as required in Minn. R. 7017.2020 subps. 2 and 3 and performance test notification as required by Minn. R. 7017.2030 subp.

Testing is scheduled for the week of June 8, 2015.

Please don't hesitate to ask if you have any questions or need additional information.

Regards,

Thomas Leier

Air Quality Technician
Hibbing office: 218.262.8679
cell: 218.929.7070
tleier@barr.com
www.barr.com





HIBBING TACONITE COMPANY
Managed by Cliffs Mining Company
4950 County Highway 5 North, PO Box 589, Hibbing, MN 55746-0589
P 218.262.5950 cliffsnaturalresources.com

TEST PLAN FOR TACONITE PROCESSING FACILITY

HIBBING TACONITE COMPANY
HIBBING, MINNESOTA

Date test plan created/revised: May 11, 2015

Scheduled test date(s): Week of June 8, 2015

PART I: General Information

Facility contact person and address:	Julie C. Lucas Environmental Manager Hibbing Taconite Company 4950 County Highway 5 North Hibbing, Minnesota 55746 (218) 262-6856 (218) 262-6877 (fax) julie.lucas@cliffsnr.com
Name and address of emission facility:	Hibbing Taconite Company 4950 County Highway 5 North Hibbing, Minnesota 55746
MPCA AQD File Number:	541
Air Emission Permit Number:	13700061-006
Testing Company and Contact:	Tom Leier Barr Engineering Company 3128 14 th Avenue East Hibbing, Minnesota 55746 (218) 262-8679 (218) 262-3460 (fax) tleier@barr.com

Reason the emission unit is to be tested:

Conduct air pollution control equipment performance tests at Hibbing Taconite Company (HTC) to demonstrate compliance with 40 Code of Federal Regulations (CFR) Part 63, Subpart RRRRR [National Emissions Standards for Hazardous Air Pollutants: Taconite Ore Processing (Taconite MACT)] and the Minnesota (MN) Rule 7007.0502 [Mercury Emissions Reduction Plan]. It is not intended that these tests will reset control device parametric for the sources tested for MACT.

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)	Filterable Particulate Matter ≤ 0.01 g/dscf Mercury	40 CFR Part 63, Subpart RRRRR, Table 1 MN Rule 7007.0502 subp. 6.A	40 CFR Part 60, Appendix A EPA Methods 1-4 EPA Method 5 (MACT) EPA Method 29 (Train will be combined with M5) 3 120-minute runs

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 5	Determination of particulate matter. 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.
Method 29	Determination of Metals Emissions from Stationary Sources. One sample for mercury (Hg) concentration will be made concurrent with each Method 5 test run.

Part V: Continuous Emissions Monitors

No CEMS are currently installed.

Part VI: Other

The emissions will be reported in units of the applicable emissions standards. A copy of the MACT report will be submitted on or before 45 days after completion of the last test of the mobilization and a copy of the Hg report will be submitted on or before 60 days after completion of the last test date of the mobilization. Hibbing Taconite will provide an updated MACT compliance document with the report submittal.

Testing schedule: Week of June 8, 2015

Mobilization	Description
Monday June 8, 2015	Travel/Setup Test Equipment
Tuesday June 9, 2015	Test SV021 and SV023

Mobilization	Description
Wednesday June 10, 2015	Test SV022 and SV024
Thursday June 11, 2015	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.



Julie C. Lucas
Environmental Manager
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

Marc Severin – Performance Test Coordinator

Hibbing Taconite Company

Julie Lucas – Environmental Manager

Tasha Niemi – Environmental Representative

Corie Ekholm – CEMS Engineer

Barr Engineering Company

Tim Russell – Vice President/Chemical Engineer

Tom Kuchinski – Supervisor/Senior Air Quality Technician

Tom Leier – Project Manager/Air Quality Technician

Matt Kistner – Air Quality Technician

Richard Skibsted – Air Emissions Stack Sampling Technician

John Rooney – Air Quality Technician

CONTACT INFORMATION

MPCA Marc Severin Performance Test Coordinator Compliance and Enforcement Section—Industrial Division Minnesota Pollution Control Agency 520 Lafayette Rd. N. Saint Paul, Minnesota 55155 (651) 757-2716 Marc.Severin@state.mn.us	Hibbing Taconite Company Julie Lucas Environmental Manager 4950 County Highway 5 North Hibbing, MN 55746 (218) 262-6856 Julie.Lucas@CliffsNR.com	Barr Engineering Co. Tom Leier Air Quality Technician Barr Engineering Company 3128 14 th Ave East Hibbing, MN 55746 (218) 262-8679 TLeier@barr.com
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