FINAL REPORT

CLEVELAND CLIFFS

DEARBORN, MICHIGAN

EMISSIONS TESTING PROGRAM REPORT - ADDITIONAL CONFIGURATION - 50 FIELDS: BASIC OXYGEN FURNACE (EUBOF) AND BASIC OXYGEN FURNACE SHOP OPERATIONS (FGBOFSHOP)

RWDI #2303982.05

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SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by Cleveland-Cliffs Dearborn Works (CCDW) to complete the additional configuration (50-Fields configuration on ESP) emission sampling program at their facility located at 4001 Miller Road, Dearborn, Michigan. The purpose of the emissions test program was to verify emissions required by Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit MI-ROP-A8640-2016a, and to comply with the testing requirements specified within the First Material Modification to the consent decree, Civil Action No. 15-cv-11804, DJ # 90-5-2-1-10702. The test program consisted of testing for particulate matter, particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), lead (Pb), manganese (Mn), and visible emissions (VE) from the Electrostatic Precipitator (ESP) (SVBOFESP) and Pb and Mn from the Secondary Emission Control (SEC) Baghouse (SVBOFBH). In addition, visible emission observations were conducted on the BOF Roof Monitor at the request of EGLE. Pb and Mn testing was performed simultaneously on the ESP and the SEC Baghouse. Condensable Particulate Emissions (CPM) were measured from the ESP along with the FPM testing and $PM_{2.5}$ and PM_{10} emissions are reported as the sum of FPM and CPM.

In addition to the consent decree testing, testing was also conducted to satisfy testing requirements within the NESHAP for Integrated Iron and Steel Manufacturing Facilities, 40 CFR 63, Subpart FFFFF. The PM testing on the ESP and the concurrent opacity observations on the BOF Roof Monitor met the requirements of performance testing under the NESHAP. A summary of these requirements is included in **Section 6** of this report.

Executive Table i: Test Results

Source	Parameter	Concentration / Emission Rate	
		Average Testing Data	Emission Limit
BOF ESP	PM (Filterable only)	0.0015 gr/dscf	0.0152 gr/dscf(1)
			0.02 gr/dscf(2)
		6.8 lb/hr	62.6 lb/hr
	PM_{10} (Filterable + Condensable)	9.6 lb/hr	47.5 lb/hr
	$PM_{2.5}$ (Filterable + Condensable)	9.55 lb/hr	46.85 lb/hr
	Lead	0.0055 lb/hr	--
	Manganese	0.013 lb/hr	--
	Visible Emissions	1%, 6-minute average (3)(4)	20%, 6-minute average (4)
BOF SEC Baghouse	Lead	0.0049 lb/hr	--
	Manganese	0.0105 lb/hr	0.07 lb/hr
BOF ESP & SEC Baghouse Combined	Lead	0.010 lb/hr	0.067 lb/hr
	Manganese	0.024 lb/hr	0.10 lb/hr
BOF Roof Monitor	Visible Emissions	3%, 3-minute Average(4) 2%, 3-minute Average – Block (5)	15% 3-minute Average (FGBOFSHOP) 20% 3-minute Average (EUBOF, NESHAP)

Notes: (1) MI-ROP-A8640-2016a emission limit
(2) 40 CFR 63, Subpart FFFFF emission limit
(3) One 6-minute average opacity of up to 27% is exempt per hour
(4) Reported as maximum 3-minute average observed for BOF Roof Monitor and 6-minute average for ESP during all observations
(5) 3-minute block average calculated in accordance with NESHAP requirements

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1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by Cleveland-Cliffs Dearborn Works (CCDW) to complete the additional configuration (50-Fields configuration on ESP) emission sampling program at their facility located at 4001 Miller Road, Dearborn, Michigan. The test program consisted of testing for total particulate matter (TPM), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), lead (Pb), manganese (Mn), and visible emissions (VE) from the Electrostatic Precipitator (ESP) and Pb and Mn from the Secondary Emission Control (SEC) Baghouse. In addition, VE observations were conducted on the BOF Roof Monitor at the request of EGLE. Pb and Mn testing was performed simultaneously on the ESP and the SEC Baghouse. Condensable Particulate Emissions (CPM) were measured from the ESP along with the FPM testing, and $PM_{2.5}$ and PM_{10} emissions are reported as the sum of FPM and CPM. The testing on the ESP was conducted in such a manner as to satisfy the requirements of the NESHAP for Integrated Iron and Steel Manufacturing Facilities, 40 CFR 63, Subpart FFFFF.

1.1 Location and Dates of Testing

The test program was completed on February 23rd, 2024.

1.2 Purpose of Testing

The purpose of the emissions test program was to verify emissions required by Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit MI-ROP-A8640-2016a, to comply with the testing requirements specified within the First Material Modification to the consent decree, Civil Action No. 15-cv-11804, DJ # 90-5-2-1-10702, and to satisfy the requirements of the NESHAP for Integrated Iron and Steel Manufacturing Facilities, 40 CFR 63, Subpart FFFFF.

1.3 Description of Source

CCDW is a steel-producing facility. Scrap metal is charged into the basic oxygen furnace (BOF) vessel and then molten iron is charged into the vessel on top of the scrap. Fluxing agents are also added during the steelmaking process. Oxygen is blown into the molten iron/scrap mixture causing the scrap to melt and refining the iron into steel by reducing the carbon content. The heat from the steelmaking process comes from the reaction of oxygen with the dissolved carbon in the molten iron.

The emissions are controlled by an ESP (SVBOFESP). The emissions enter the ESP where the particulate is electrically charged. The charged particles then flow over positively charged collector plates where the particles are collected. Vibration to both the discharge electrodes and the collection plates dislodge the particulate matter. The exhaust gas is then discharged from the ESP outlet.

The BOF also utilizes a secondary emission control (SEC) baghouse (SVBOFBH). The SEC Baghouse controls particulate emissions from the hot metal charging and tapping operations during the steel making process. The SEC Baghouse also controls emissions generated by the iron reladling operation.

1.4 Personnel Involved in Testing

Table 1.4: Testing Personnel

David Pate Senior Environmental Engineer	**Cleveland-Cliffs Dearborn Works**	(313) 323-1261 David.Pate@Clevelandcliffs.com
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Jeffrey Peitzsch	**Montrose Air Quality Services**	Jbpeitzsch@montrose-env.com
Katherine Koster	**Michigan Department of Environment, Great Lakes, and Energy (EGLE)**	Kosterk1@michigan.gov

2 SUMMARY OF RESULTS

2.1 Operating Data

CCDW personnel monitored the process during the course of the testing. All process data can be found in **Appendix A**. During the testing, production averaged 318 TPH of liquid steel. The ESP operated at 50 equivalent fields during the testing. This represents the entire collection capacity of the ESP with all fields online.

2.2 Applicable Permit Number

MI-ROP-A8640-2016a

3.5 Process Instrumentation Monitored During the Test

The process data recorded during the testing can be found in **Appendix A**. The following parameters were recorded:

- Steel Production Rate, TPH
- Start and stop time of each steel production cycle and oxygen blow
- Average oxygen blow rate per heat
- Start and stop time of charging, tapping, and reladling per heat
- Number and identification of the ESP casings, compartments, and fields in operation per heat
- Average ESP inlet draft during oxygen blowing measured per heat
- Average primary louver position of the blowing vessel per heat
- ESP COMS 1-hour and 6-minute block average data per run
- Baghouse pressure drop and bag leak detection readings per heat
- Identification of baghouse compartments in operation per heat
- Manganese and lead concentration in hot metal per heat
- Analysis of a dust sample for Pb and Mn from the ESP hopper per test run

4 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Description of Sampling Train and Field Procedures

4.1.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination USEPA Method 1-4

The exhaust velocities and flow rates were determined following the US EPA Method 2, "Determination of Stack Gas Velocity and Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube. Volumetric flow rates were determined following the equal area method as outlined in US EPA Method 1. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "k" thermocouple in conjunction with a digital temperature indicator.

The dry molecular weight of the stack gas was determined following calculations outlined in U.S. EPA Method 3, "Gas Analysis for the Determination of Dry Molecular Weight" for the ESP and SEC. RWDI collected integrated sample bags for each of the ESP and SEC using the orsat pump from the sampling consoles. The integrated bag samples were collected over the duration of each test period. Bag sample analysis was then conducted by a calibrated Fyrite analyzer.

Stack moisture content was determined through direct condensation from the PM or metals sampling trains according to U.S. EPA Method 4, "Determination of Moisture Content of Stack Gases".

4.1.2 Particulate Matter and Condensable Particulate Matter USEPA Method 5/202

Filterable particulate matter was collected isokinetically by USEPA Method 5, and the condensable particulate matter was sampled by USEPA Method 202. The sampling train consisted of a stainless-steel nozzle, glass-lined probe, filter, pot belly impinger, empty impinger, CPM filter, water knockout impinger, and silica gel impinger. Samples were sent to the laboratory for analysis. A schematic of the sampling train is included in **Figure Section** (**Figure 3**).

For the Total Particulate, only the filterable results were used for comparison to the Permit Limits. For PM_{10} and $PM_{2.5}$, filterable + condensable results were used for comparison to applicable Permit Limits.

4.1.3 Metals (Lead and Manganese) USEPA Method 29

A sample of stack gas was drawn from the stack isokinetically to measure metals. The sampling train consisted of a Teflon coated nozzle, a glass-lined probe, quartz filter, and five impingers in series. Particulate metals were collected in the nozzle, probe, and filter. The gaseous emissions were collected in the impinger train with the first impinger being empty, the next two impingers containing acidified hydrogen peroxide, an empty fourth impinger, and a final impinger containing silica gel. The recovery process followed USEPA Method 29, and all samples were sent to the laboratory for analysis. A schematic of the sampling train is included in **Figure Section** (**Figure 4**).

4.1.4 Visible Emissions USEPA Method 9

Visible emissions were determined in accordance with USEPA Reference Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources". For the visible emission observations, readings were observed every 15 seconds over a continuous period of time. A certified observer stood at a distance that provided a clear view of the emissions with the sun oriented in the 140 degree sector at their back. Observations were taken every 15 seconds. A minimum of one 60-minute, 1 heat observation was conducted during each particulate matter test run on the ESP.

Visible emissions readings for the ESP were taken by RWDI staff. Additional VE measurements were taken by a 3rd party vendor for the BOF Roof Monitor. These readings covered 5 steel production cycles and were conducted while sampling was taking place on the ESP. These observations met the applicable NESHAP requirements for observations to consist of a minimum of 3 steel production cycles during PM sampling. All results are provided in this report (See **Appendix H**).

4.1.5 Method Deviations and Comments

The following modifications were provided and accepted in the Source Testing Plan. Modification 4 did not come into play during this testing event.

1. CCDW operates two BOF Vessels that exhaust to the common ESP. While oxygen blowing can only take place on one vessel at a time, oxygen blowing could be occurring on a vessel while performing charging, tapping, and deslagging on the other vessel. Some overlapping into a heat on the other vessel at the end of a production cycle could occur. All tests ended at the end of the production cycle regardless of what is taking place on the other vessel. Production will be prorated to account for these occurrences where there is overlap.
2. No port changes took place during oxygen blowing on the ESP. When it was time for a port change, the probe was left at the same port and the points were re-traversed until the oxygen blow was completed. The probe was then moved to the next port and testing was resumed at the first point.
3. In cases where the end of the sampling run did not correspond with the end of a heat, the points were traversed in reverse order until the heat was completed.
4. Each batch consists of 5 steps: 1) scrap charge; 2) hot metal charge; 3) oxygen blowing; 4) tapping; and 5) deslagging. It is a common occurrence for the scrap charge to take place at a time that is far in advance of charging hot metal. For this reason, there could be occasions where starting the test on a hot metal charge is desirable as it is a better indicator of when the batch is actually starting. In these cases, Cleveland-Cliffs proposed that the integral heat requirement be satisfied by testing during the scrap charge of the following heat.

4.2 Description of Recovery and Analytical Procedures

The recovery followed USEPA Method 5, 202, and 29.

4.3 Sampling Port Description

EUBOF ESP (SVBOFESP) is a circular stack with an inner diameter of 204". 4 ports are used for testing.

FGBOFSHOP (SVBOFBH) is a circular stack with an inner diameter of 222". 4 ports are used for testing.

5 TEST RESULTS AND DISCUSSION

5.1 Detailed Results

Table 5.1: Test Results

Source	Parameter	Concentration / Emission Rate	
		Average Testing Data	Emission Limit
BOF ESP	PM (Filterable only)	0.0015 gr/dscf	0.0152 gr/dscf(1)
			0.02 gr/dscf(2)
		6.8 lb/hr	62.6 lb/hr
	PM_{10} (Filterable + Condensable)	9.6 lb/hr	47.5 lb/hr
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	Visible Emissions	1%, 6-minute average (3)(4)	20%, 6-minute average (4)
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BOF ESP & SEC Baghouse Combined	Lead	0.010 lb/hr	0.067 lb/hr
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BOF Roof Monitor	Visible Emissions	3%, 3-minute Average(4) 2%, 3-minute Average – Block (5)	15% 3-minute Average (FGBOFSHOP) 20% 3-minute Average (EUBOF, NESHAP)

Notes: (1) MI-ROP-A8640-2016a emission limit
(2) 40 CFR 63, Subpart FFFFF emission limit
(3) One 6-minute average opacity of up to 27% is exempt per hour
(4) Reported as maximum 3-minute average observed for BOF Roof Monitor and 6-minute average for ESP during all observations
(5) 3-minute block average calculated in accordance with NESHAP requirements

Detailed results for the program are provided in the following Appendices:

- SVBOFESP (ESP) – **Appendix B**
- SVBOFBH (Secondary Baghouse) – **Appendix C**
- Visible Emissions – **Appendix H**

5.2 Process Upset Conditions During Testing

There were no process upsets during testing.

5.3 Maintenance Performed in Last Three Months

Only routine maintenance has been performed within the last three months.

5.4 Audit Samples

This test did not require any audit samples.

5.5 Calibration Sheets

Calibration sheets can be found in **Appendix D**.

5.6 Field Data Sheets

Field data sheets can be found in **Appendix E**.

5.7 Laboratory Data

Laboratory data can be found in **Appendix F**.

5.8 Sample Calculations

Sample calculations can be found in **Appendix G**.

6 NESHAP CONSIDERATIONS

Table 6.1 provides a summary of the NESHAP Requirements and verification that all NESHAP requirements were satisfied during this test.

Table 6.1: Specific ROP and NESHAP Testing Requirements

NESHAP Reference	ROP Reference	NESHAP / ROP Language	Comments
40 CFR 63.7822(g)(1) and 40 CFR 63.7822(g)(2)	EUBOF V.1	Sample only during the steel production cycle and perform sampling over an integral number of steel production cycles.	Testing was performed only during the steel production cycle and consisted of an integral number of steel production cycles.
40 CFR 63.7823(b)	EUBOF V.2	Performance tests for visible emissions shall be conducted such that the opacity observations overlap with the performance tests for particulate.	All opacity observations on the BOF Shop Building overlapped with the particulate testing on the ESP.
40 CFR 63.7823(d)(1)(ii)	EUBOF V.4.a	Record observations to the nearest 5% at 15 second intervals for at least 3 steel production cycles rather than using the procedure specified in section 2.4 of Method 9.	Testing was conducted in accordance with the NESHAP requirements and covered 5 steel production cycles.
40 CFR 63.7823(d)(1)(iii)	EUBOF V.4.b	Determine the 3-minute block average opacity from the average of 12 consecutive observations recorded at 15-second intervals.	Opacity was calculated using the 3-minute block averages in accordance with this requirement.
40 CFR 63.7823(d)(4)	EUBOF V.5	Opacity observations from the roof monitors must cover at least three steel production cycles. A production cycle begins when scrap is charged and ends three minutes after slag is emptied from the vessel into a slag pot.	Opacity observations covered 5 steel production cycles using the definition of "steel production cycle" in the NESHAP
40 CFR 63.7822(b)(1)	N/A	Determine the concentration of particulate matter according to the listed test methods in 40 CFR 63.7822(b)(1)(i-v).	The particulate matter concentration was determined in accordance with the required test methods, namely EPA Methods 1-5.
40 CFR 63.7822(b)(2)	N/A	Collect a minimum of 60 dscf of gas during the particulate matter test run. Three valid test runs are needed to comprise a performance test.	A minimum of 60 dscf was collected during each particulate matter test run.

TABLES

Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests per Stack	Sampling Parameter	Sampling Method
ESP (SVBOFESP)	3	Velocity, Temperature and Flow Rate	U.S. EPA [1] Methods 1, 2, and 4
	3	PM / PM_{10} / $PM_{2.5}$	U.S. EPA [1] Method 5/202
	3	Lead / Manganese	U.S. EPA [1] Method 29
	3	Oxygen / Carbon Dioxide	U.S. EPA [1] Method 3
	3	Visible Emission	U.S. EPA [1] Method 9
Secondary Baghouse (SVBOFBH)	3	Velocity, Temperature and Flow Rate	U.S. EPA [1] Methods 1, 2 and 4
	3	Lead / Manganese	U.S. EPA [1] Method 29
	3	Oxygen / Carbon Dioxide	U.S. EPA [1] Method 3

Notes:

[1] U.S. EPA - United States Environmental Protection Agency

Table 2A: Sampling Summary and Sample Log (SVBOFESP)

Source and Test #	Sampling Date	Start Time	End Time	Filter ID / Trap ID
SVBOFESP - Velocity / Total Particulate				
Blank	23-Feb-24	-	-	A-411
Test #1	23-Feb-24	7:05 AM	9:30 AM	A-395
Test #2	23-Feb-24	10:47 AM	1:07 PM	A-394
Test #3	23-Feb-24	2:15 PM	4:31 PM	A-393
SVBOFESP - Velocity / Lead / Manganese				
Blank	23-Feb-24	-	-	M29-Blank
Test #1	23-Feb-24	7:05 AM	9:30 AM	M29-1
Test #2	23-Feb-24	10:47 AM	1:07 PM	M29-2
Test #3	23-Feb-24	2:15 PM	4:31 PM	M29-3
SVBOFESP - Visble Emissions				
Test #1	23-Feb-24	8:00 AM	9:30 AM	--
Test #2	23-Feb-24	10:47 AM	1:07 PM	--
Test #3	23-Feb-24	2:15 PM	3:15 PM	--

Table 2B: Sampling Summary and Sample Log (SVBOFBH)

Source and Test #	Sampling Date	Start Time	End Time	Filter ID / Trap ID
SVBOFBH - Velocity / Lead / Manganese				
Blank	23-Feb-24	-	-	M29-Blank
Test #1	23-Feb-24	7:05 AM	9:30 AM	M29-1
Test #2	23-Feb-24	10:47 AM	1:07 PM	M29-2
Test #3	23-Feb-24	2:15 PM	4:32 PM	M29-3

Table 3A: Sampling Summary - Flow Characteristics - SVBOFESP

Stack Gas Parameter		Test No. 1		Test No. 2		Test No. 3		Average
		Particulate	Lead/Manganese	Particulate	Lead/Manganese	Particulate	Lead/Manganese	
Testing Date		23-Feb-24		23-Feb-24		23-Feb-24		
Stack Temperature	°F	208	208	234	233	242	242	228
Moisture	%	14.7%	14.8%	15.0%	15.0%	13.2%	13.9%	14.4%
Velocity	ft/s	48.5	49.1	49.8	50.6	54.1	54.4	51.1
Referenced Flow Rate	CFM	429,377	434,083	422,906	431,200	463,828	462,108	440,584
Oxygen	%	18.0	18.0	18.0	18.0	18.5	18.5	18.2
Carbon Dioxide	%	3.5	3.5	3.0	3.0	3.0	3.0	3.2
Sampling Isokinetic Rate	%	102.7	101.4	101.8	101.4	99.8	99.6	101.1

Notes:

[1] Referenced flow rate expressed as dry at 101.3 kPa, 68 °F, and Actual Oxygen

Table 3B: Sampling Summary - Flow Characteristics - SVBOFBH

Stack Gas Parameter		Test No. 1 Lead/Manganese	Test No. 1 Lead/Manganese	Test No. 3 Lead/Manganese	Average
Testing Date		23-Feb-24	23-Feb-24	23-Feb-24	
Stack Temperature	°F	76	88	85	83
Moisture	%	1.1%	0.8%	0.9%	0.9%
Velocity	ft/s	43.7	40.1	36.1	40.0
Referenced Flow Rate	CFM	679,277	611,788	547,828	612,964
Oxygen	%	21.0	21.0	21.0	21.0
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	100.1	99.8	98.4	99.4

Notes:

[1] Referenced flow rate expressed as dry at 101.3 kPa, 68 °F, and Actual Oxygen

Table 4A: Total Particulate Matter and Metals – Averaged Results - SVBOFESP

SVBOFESP	Test 1		Test 2		Test 3		Average		Emission Limit			
	Concentration	Emission Rate	Concentration	Emission Rate	Concentration	Emission Rate						
Particulate	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lbs/hr)**	**(gr/dscf)**	**PM lb/hr**	**PM_{10} lb/hr**	**$PM_{2.5}$ lb/hr**
PM (Filterable only)	0.00216	8.0	0.0022	8.0	0.0011	4.5	0.0018	6.8	0.0152	62.6	--	--
PM (Filterable + Condensable)	0.0028	10.2	0.0034	12.4	0.0015	6.1	0.0026	9.6	--	--	47.5	46.85
Metals	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**lb/hr**			
Total Lead (Pb)	1.98E-06	0.0074	1.42E-06	0.0053	1.01E-06	0.004	1.47E-06	0.0055	--			
Total Manganese (Mn)	4.18E-06	0.016	3.17E-06	0.012	3.06E-06	0.012	3.47E-06	0.013	--			

Table 4B: Metals – Averaged Results (SVBOFBH)

SVBOFBH	Test 1		Test 2		Test 3		Average		Emission Limit
	Concentration	Emission Rate	Concentration	Emission Rate	Concentration	Emission Rate			
Metals	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**lb/hr**
Total Lead (Pb)	9.53E-07	0.0056	1.17E-06	0.0061	6.60E-07	0.0031	9.27E-07	0.0049	--
Total Manganese (Mn)	1.94E-06	0.0113	2.59E-06	0.0136	1.41E-06	0.0067	1.98E-06	0.0105	0.07

Table 4C: Metals – Averaged Results (SVBOFESP + SVBOFBH)

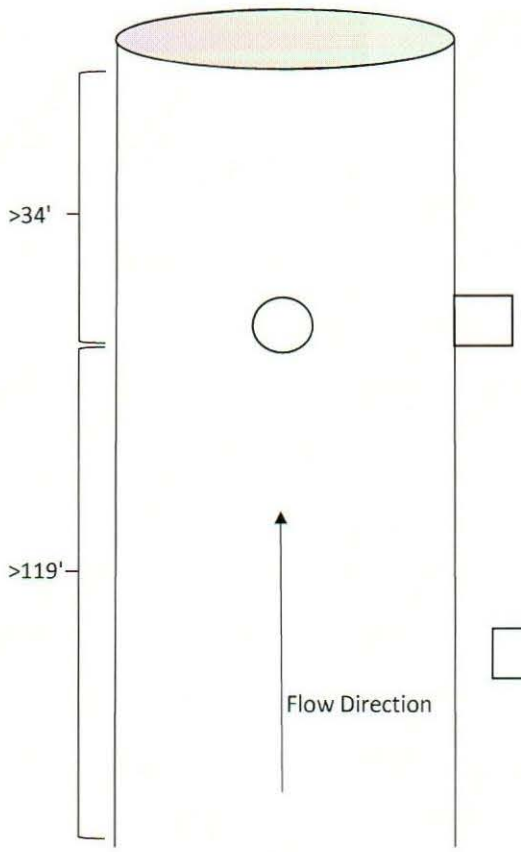
SVBOFESP + SVBOFBH	Test 1		Test 2		Test 3		Average		Emission Limit
	Concentration	Emission Rate	Concentration	Emission Rate	Concentration	Emission Rate			
Metals	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**(gr/dscf)**	**(lb/hr)**	**lb/hr**
Total Lead (Pb)	2.93E-06	0.0130	2.59E-06	0.0114	1.67E-06	0.007	2.40E-06	0.010	0.067
Total Manganese (Mn)	6.12E-06	0.027	5.76E-06	0.025	4.47E-06	0.019	5.45E-06	0.024	0.10

Table 5: Opacity- Averaged Results - SVBOFESP

SVBOFESP	Opacity						Average Opacity	Maximum 6-Min Opacity	Average 6-Min Opacity Limit
	Average	Max 6-Min Reading	Average	Max 6-Min Reading	Average	Max 6-Min Reading			
	Test 1		Test 2		Test 3				
Parameter	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**
Opacity	0	0	0	1	0	1	0	1	20

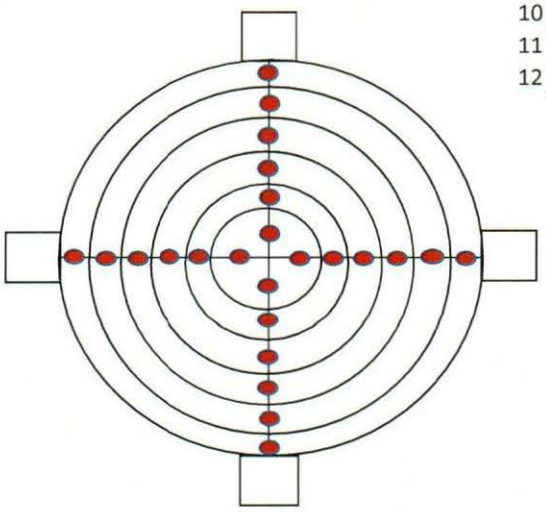
FIGURES

Figure 1: Sampling Points and Configuration - **SVBOFESP**



Diameter: 204

Sampling Points (in.)	
1	4.28
2	13.67
3	24.07
4	36.11
5	51.00
6	72.62
7	131.38
8	153.00
9	167.89
10	179.93
11	190.33
12	199.72



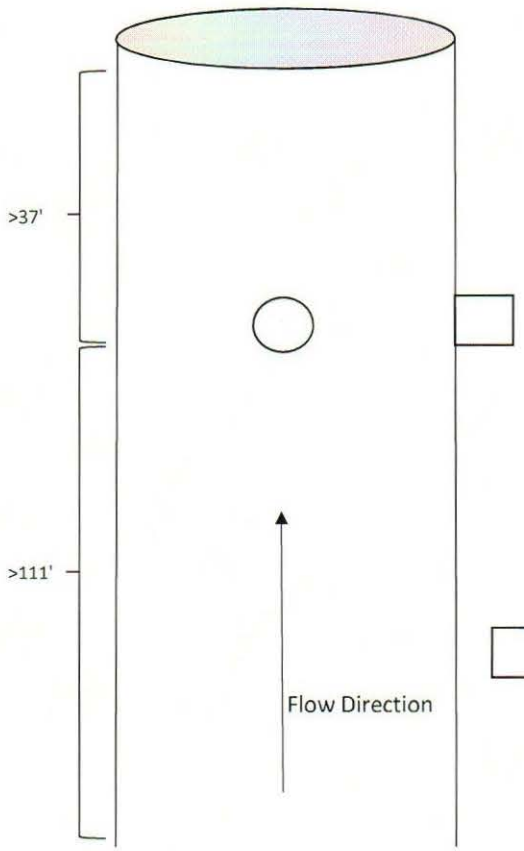
Not to scale

ESP (SVBOFESP)
Cleveland-Cliffs
Dearborn Works
Dearborn, Michigan

Date:
February 23rd, 2024

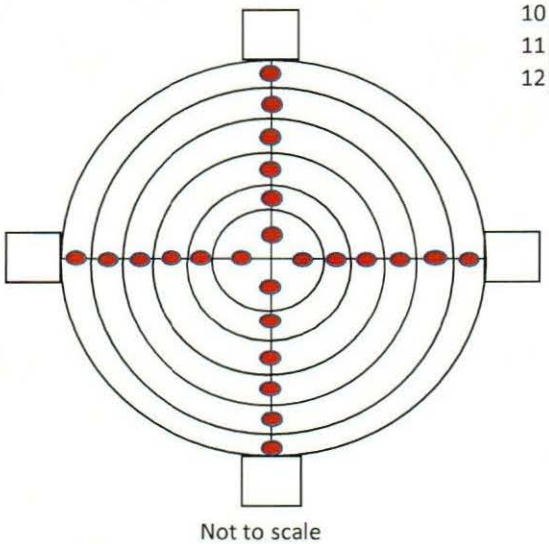
RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309

Figure 2: Sampling Points and Configuration - **SVBOFBH**



Diameter: 222

Sampling Points (in.)	
1	4.66
2	14.87
3	26.20
4	39.29
5	55.50
6	79.03
7	142.97
8	166.50
9	182.71
10	195.80
11	207.13
12	217.34

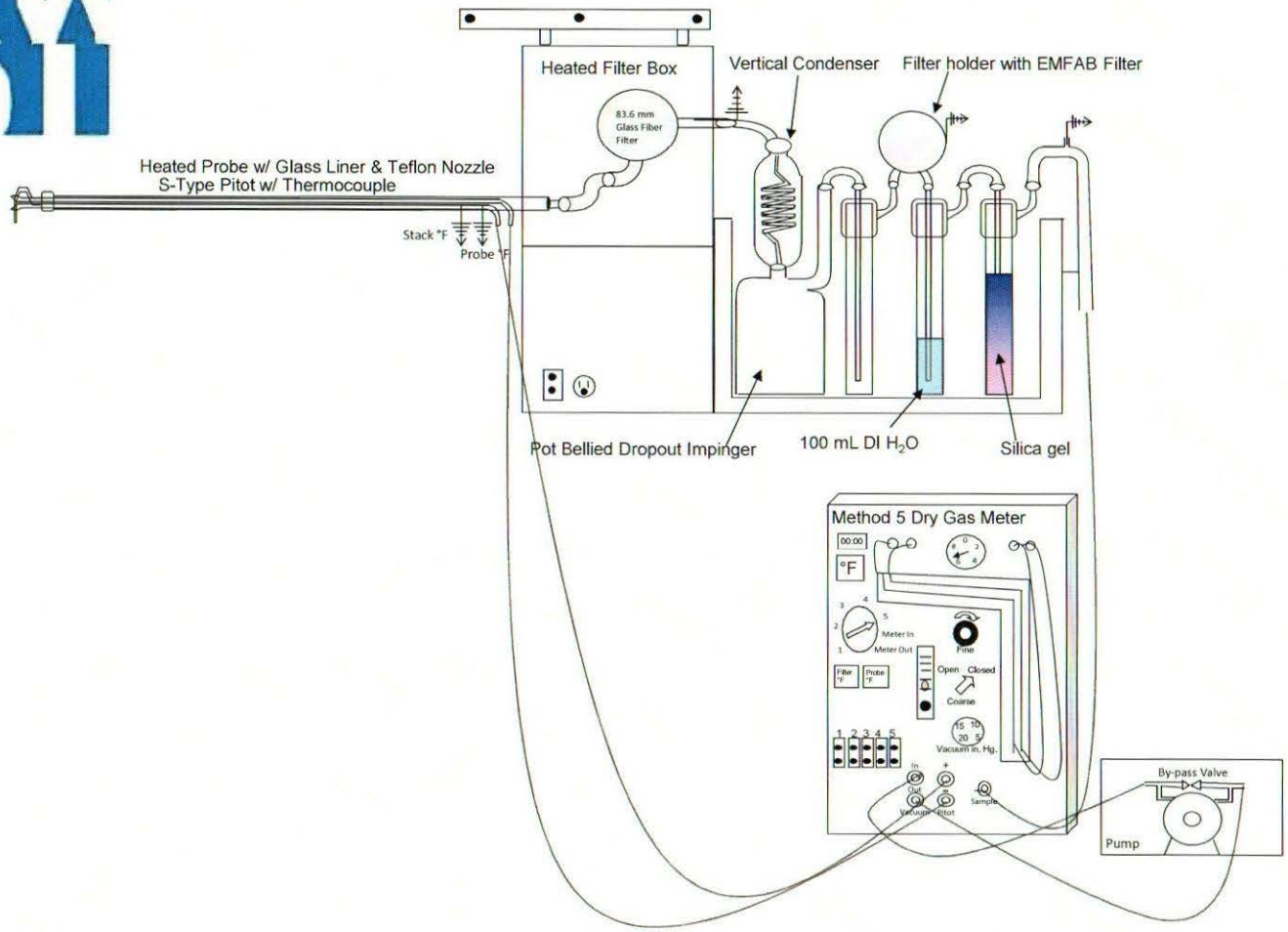


Not to scale

SEC Baghosue (SVBOFBH)
Cleveland-Cliffs
Dearborn Works
Dearborn, Michigan

Date:
February 23rd, 2024

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309

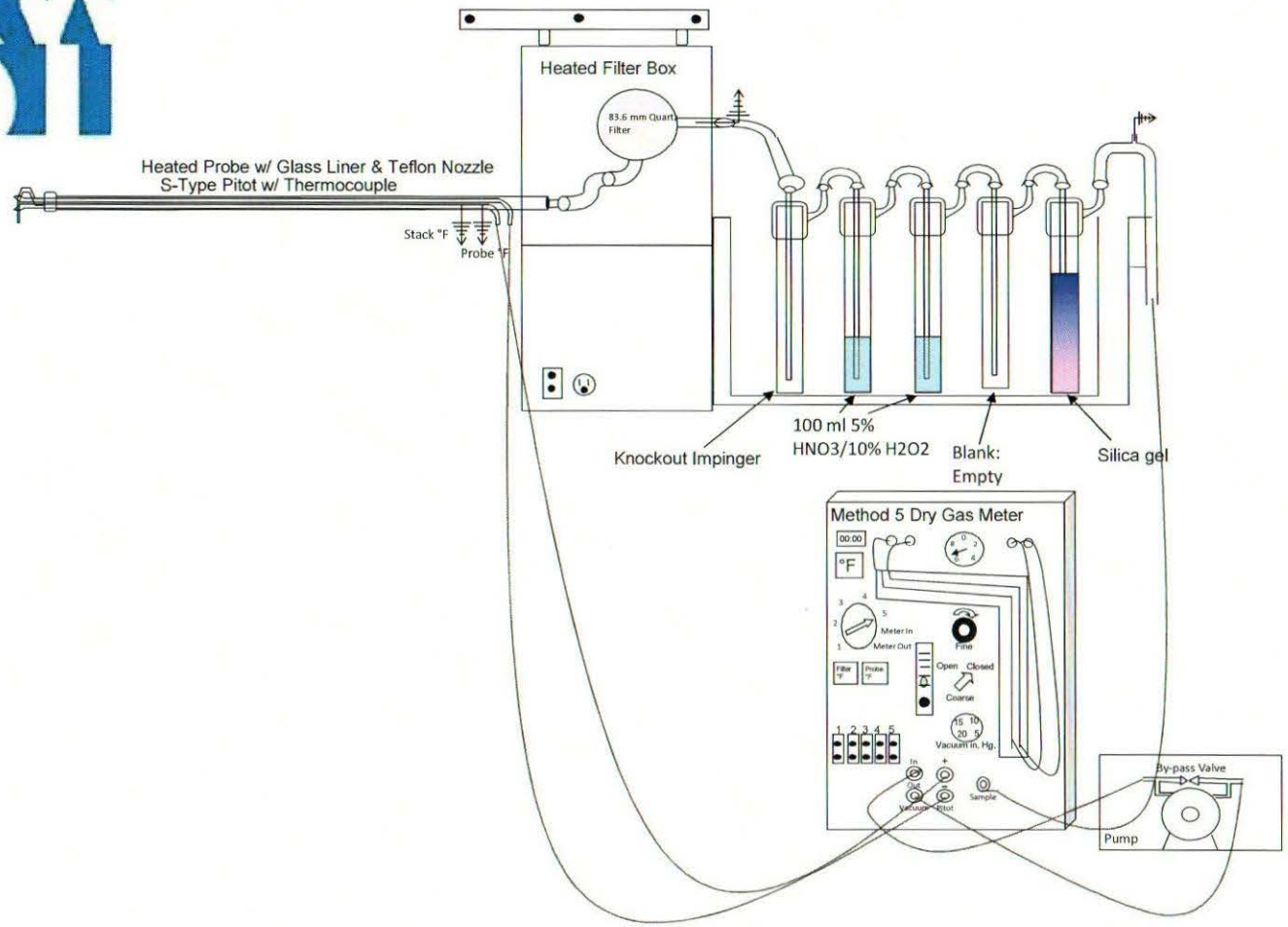


USEPA Method 5/202

Cleveland Cliffs Dearborn Works
Dearborn, Michigan

Figure 3:
Schematic of USEPA Method 5/202

February 23rd, 2024



USEPA Method 29

Cleveland-Cliffs
Dearborn Works
Dearborn, Michigan

Figure 4:
Schematic of USEPA Method 29

February 23rd, 2024

USEPA Method 3

Cleveland Cliffs Dearborn Works
Dearborn, Michigan

Figure 5:
Schematic of USEPA Method 3 Fyrite Sample Analyzer
February 23rd, 2024