

CLEVELAND – CLIFFS DEARBORN WORKS

C Blast Furnace Casthouse Baghouse & Capture System

Operation & Maintenance Plan

Iron & Steel MACT Rule

40 CFR 63 Part FFFFF

October 15, 2007

Revised July 30, 2024

PLAN(E)-W-10-01

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Cleveland - Cliffs Dearborn Works C Blast Furnace Baghouse and Capture System Operation and Maintenance Plan: Roadmap

Purpose: This plan provides a roadmap to the operation and maintenance (O & M) procedures for the C Blast Furnace Baghouse and capture system. This plan is intended to satisfy the requirements of the Integrated Iron and Steel Manufacturing Facilities Maximum Achievable Control Technology (MACT) rules to have a written O & M Plan pursuant to 40 CFR 63.7800(b). The roadmap directs interested parties to the appropriate written operational control document contained in the Dearborn Works document management system. Revisions to the operating control documents are not considered revisions to the O & M Plan. These procedures describe O & M of the capture system and the pollution control equipment (baghouse) to comply with the relevant MACT rules. The referenced procedures are intended to provide direction to operate and maintain affected sources, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions, at least to the levels required by the relevant standard. This plan, if implemented correctly, will also reduce reporting burdens.

- 1. Detailed Procedures:** Dearborn Works will operate and maintain the source and associated air pollution control equipment in accordance with the procedures specified in the O & M plan as contained herein:

Procedure	Reference
1. C Blast Furnace Baghouse system and/or capture system inspection procedures. The following equipment shall be inspected daily. The procedures provide how to evaluate each component and to repair, replace, or isolate each component. If established procedures are not followed, excess emission, repeated failure, or further damage could result. A record of each inspection will be maintained for 5 years. a. Pressure drop across each baghouse compartment. These requirements are pursuant to 40 CFR 63.7830(b)(1). b. Confirm that the compressed air supply to the pulse-jet baghouse is operating properly. These requirements are pursuant to 40 CFR 63.7830(b)(3). c. Baghouse cleaning cycles to ensure proper operation. These requirements are pursuant to 40 CFR 63.7830(b)(4).	a. CCDP-F3-15-12 – Level II Reports – Daily Environmental Requirements b. CCDP-F3-15-12 - Level II Reports – Daily Environmental Requirements c. CCDP-F3-15-12 - Level II Reports – Daily Environmental Requirements

Procedure	Reference
The following equipment shall be inspected at intervals of no less than weekly. The procedures provide how to evaluate each component and to repair, replace or isolate each component. a. Dust removal from the hopper through visual inspections or other means. These requirements are pursuant to 40 CFR 63.7830(b)(2). The following equipment shall be inspected at intervals of no less than monthly. The procedures provide how to evaluate each component and to repair, replace or isolate each component. a. Capture system hoods, ductwork, dampers, and expansion joints. These requirements are pursuant to 40 CFR 63.7800(b)(1). b. Baghouse components (inlet and outlet dampers and actuators, pressure sensors). These requirements are pursuant to 40 CFR 63.7800(b)(1). c. Bag cleaning mechanisms for proper functioning. These requirements are pursuant to 40 CFR 63.7830(b)(5). The following equipment shall be inspected at intervals of no less than quarterly. The procedures provide how to evaluate each component and to repair, replace or isolate each component. a. Physical inspection of the baghouse interior for air leaks. These requirements are pursuant to 40 CFR 63.7830(b)(7). b. I.D. fan for wear, material buildup, and corrosion. These requirements are pursuant to 40 CFR 63.7830(b)(8).	Requirements a. QSOPE-A2-65-0133 Baghouse Dust Removal a. QSMPE-A2-65-3700 Weekly Inspection of C-Furnace Baghouse b. QSMPE-A2-65-3700 Weekly Inspection of C-Furnace Baghouse c. QSMPE-A2-65-3704 Inspection of C Furnace Pulse-Jets (Monthly) a. QSMPE-A2-65-3707 Quarterly Baghouse Tubesheet and Compartment Inspection d. QSMPE-A2-65-3700 Weekly Inspection of C-Furnace Baghouse b. CCDP-F3-15-12 Level II Reports – Daily Environmental Requirements
2. Bag leak detection system alarm corrective action procedure. In the event of an alarm, corrective action must be initiated within one hour to determine the cause of the alarm. Corrective action must be initiated within 24 hours	QSOPE-A2-65-0132 Investigation of Potential Environmental

Procedure	Reference
to correct the cause of the problem, and the corrective action must be completed as soon as practicable. These requirements are pursuant to 40 CFR 63.7800(b)(4).	Equipment Deviations CCDP-F3-15-12 Level II Reports – Daily Environmental Monitoring

Source Operation: Operation of C Blast Furnace includes the period of time when burden feed is occurring, and “wind” is on the furnace and when hot metal and slag are cast from the tap hole. The hot metal is collected in torpedo cars, and the slag is captured in slag pots. This latter period of time (when fugitive emissions are generated) begins when the tap hole is drilled prior to the cast and ends after the tap hole is plugged at the end of the cast. The C Blast Furnace Casthouse Baghouse must be in operation during tap hole opening, casting, slagging, and plugging.

2. **Responsible Official (RO):** The person who is designated to have the overall responsibility for managing compliance to the Integrated Iron and Steel MACT rules and implementing the O & M procedures. This person is the signature authority for the records and reports as required in these plans. The RO for the Blast Furnace is the General Manager – Dearborn Works.
3. **Roles and Responsibilities:** The RO has delegated the responsibilities associated with the RO to the following position within the Dearborn Works Blast Furnace: Department Manager, Ironmaking.
4. **Training:** Personnel responsible for the air pollution control equipment must have adequate knowledge to operate, troubleshoot, and maintain the air pollution control equipment as established in these O & M Plan procedures. Each person must be trained on the tasks and responsibilities they are required to perform, and a record of the training maintained in accordance with departmental procedures.
5. **Monitoring:** Baghouse inlet pressure and hood damper positions are the designated operational monitoring components of the capture system and are listed in Table 1 which contain values established pursuant to §63.7790(b)(1) during the **July 2024** performance test. The baghouse inlet draft pressure transmitter and hood damper actuators are calibrated during their operational use, per the “C Blast Furnace Casthouse Baghouse Site Specific Monitoring Plan.”
6. **Recordkeeping:** Specific recordkeeping requirements will be contained in each procedure, as appropriate. In general, files of all information required by the Integrated Iron and Steel MACT rules shall be maintained in a form suitable and readily available for expeditious inspection and review. The files shall be retained for at least 5 years following the date of each O & M occurrence, measurement, maintenance, corrective action, report, or record.

7. **Reporting:** Baghouse inlet pressure and damper position deviations as well as deviations to the operation and maintenance requirements of this O&M plan are required to be reported to the agency on a periodic basis according to the Facility Title V permit and/or Integrated Iron and Steel MACT rules schedule.

A. REFERENCES:

40 CFR Subpart FFFFF

**LIST OF CONTROLLED OPERATING
AND MAINTENANCE PROCEDURES**

The following procedures listed in this plan serve as the required inspections to comply with the Iron and Steel MACT rules for the Blast Furnace C Casthouse Baghouse.

Procedure	Reference
Level II Reports – Daily Environmental Requirements	CCDP-F3-15-12
Baghouse Dust Removal	QSOPE-A2-65-0133
Weekly Inspection of C-Furnace Baghouse	QSMPE-A2-65-3700
Inspection of C Furnace Pulse-Jets (Monthly)	QSMPE-A2-65-3704
Quarterly Baghouse Tubesheet and Compartment Inspection	QSMPE-A2-65-3707
Investigation of Potential Environmental Equipment Deviations	QSOPE-A2-65-0132

The following procedures listed in this plan serve as the required bag leak detector corrective action plan for the C Blast Furnace Casthouse Baghouse.

Procedure	Reference
Investigation of Potential Environmental Equipment Deviations	QSOPE-A2-65-0132
Level II Reports – Daily Environmental Requirements	CCDP-F3-15-12

REVISION TABLE

Date	Revision	Revision Comments
October 15, 2007	0	Original Issue
April 15, 2011	1	Revised plan with new facility name
September 12, 2013	2	O & M Plan revised by SNC Lavalin
May 9, 2014	3	O & M Plan updated by SNC Lavalin
November 17, 2014	4	O & M Plan revised by AK Steel
December 29, 2014	5	O & M Plan revised with new CPMS table
January 28, 2015	6	Removed Weekly Baghouse Lubrication and replaced with Inspection of C-Furnace Baghouse (Weekly)
August 17, 2015	7	Revised Procedure Numbers
September 16, 2016	9	Revised Procedure Names and Numbers, Fixed clerical errors
August 14, 2017	10	Revised reporting step 7, removed redundant steps 8 and 9
August 14, 2018	11	Revised Procedure Numbers
July 24, 2019	12	O & M plan revised to reflect new limits established during June 2019 performance testing
July 15, 2021	13	Changed AK Steel references to Cleveland - Cliffs
August 02, 2022	14	Changed AKDP references changed to CCDP throughout plan.
July 30, 2024	15	O & M plan revised to reflect new limits established during July 2024 performance testing

TABLE 1 – CLEVELAND - CLIFFS DEARBORN WORKS “C” BLAST FURNACE BAGHOUSE OPERATING PARAMETERS
(ESTABLISHED **JULY 2024**)

Scenario Number	East Casthouse Activity	North Casthouse Activity	Baghouse Inlet Pressure, Minimum (inches Water Column)	East Slag Damper North (8051) Setpoint (%)	East Slag Damper South (8052) Setpoint (%)	East Iron Tilter West (8053A) Setpoint (%)	East Iron Tilter East (8053B) Setpoint (%)	East Taphole Damper (8054) Setpoint (%)	North Slag Damper South (8041) Setpoint (%)	North Slag Damper North (8042) Setpoint (%)	North Iron Tilter Damper (8043) Setpoint (%)	North Taphole Damper (8044) Setpoint (%)
0	Idle	Idle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1	Drill	Idle	-3.2	0	0	0	0	100	0	0	0	0
2-5	Cast	Idle	-2.4	0	0	50	50	100	0	0	0	0
6-7	Slag, North Slag Leg	Idle	-2.7	30	0	50	50	100	0	0	0	0
8-9	Slag, South Slag Leg	Idle	-2.7	0	30	50	50	100	0	0	0	0
10	Idle	Drill	-2.8	0	0	0	0	0	0	0	0	100
11-12	Idle	Cast	-5.9	0	0	0	0	0	0	0	65	65
13	Idle	Slag, North Slag Leg	-2.4	0	0	0	0	0	0	30	95	100
14	Idle	Slag, South Slag Leg	-2.4	0	0	0	0	0	30	0	95	100
15-16	Drill	Cast	-4.5	0	0	0	0	100	0	0	65	75
17-18, 21-22	Slag, North Slag Leg	Cast	-3.4	30	0	50	50	97	0	0	65	74
19-20, 23-24	Slag, South Slag Leg	Cast	-3.5	0	30	50	50	97	0	0	65	74
25	Cast	Drill	-4.4	0	0	50	50	100	0	0	0	75
29	Cast	Cast	-3.5	0	0	50	50	100	0	0	65	75
37	Cast	Slag, North Slag Leg	-3.2	0	0	50	50	100	0	30	95	83
41	Cast	Slag, South Slag Leg	-3.4	0	0	50	50	100	30	0	95	83
45	Drill	Slag, North Slag Leg	-3.4	0	0	0	0	100	0	30	95	81
46	Drill	Slag, South Slag Leg	-3.4	0	0	0	0	100	30	0	95	81
47	Slag, North Slag Leg	Drill	-3.2	30	0	50	50	100	0	0	0	83
49	Slag, South Slag Leg	Drill	-3.2	0	30	50	50	100	0	0	0	83
51	Slag, North Slag Leg	Slag, North Slag Leg	-3.2	30	0	50	50	97	0	30	95	83
53	Slag, South Slag Leg	Slag, North Slag Leg	-3.3	0	30	50	50	97	0	30	95	83
55	Slag, North Slag Leg	Slag, South Slag Leg	-3.2	30	0	50	50	97	30	0	95	83
57	Slag, South Slag Leg	Slag, South Slag Leg	-3.3	0	30	50	50	97	30	0	95	83
1A	Drill	Idle	-5.9	0	0	0	0	100	0	0	0	30
2-5A	Cast	Idle	-2.9	0	0	50	50	100	0	0	0	30
6-7A	Slag, North Slag Leg	Idle	-3.8	30	0	50	50	100	0	0	0	30
8-9A	Slag, South Slag Leg	Idle	-3.9	0	30	50	50	100	0	0	0	30
10A	Idle	Drill	-4.0	0	0	0	0	30	0	0	0	100
11-12A	Idle	Cast	-6.2	0	0	0	0	30	0	0	65	65
13A	Idle	Slag, North Slag Leg	-3.1	0	0	0	0	30	0	30	95	100
14A	Idle	Slag, South Slag Leg	-3.1	0	0	0	0	30	30	0	95	100

*Note: Minimum inlet pressure readings that are less than the values specified in Table 1 and damper position readings that deviate from the values specified in Table 1 by over 5% will not be considered deviations if the readings occurred within two minutes of a scenario transition.

CLEVELAND – CLIFFS DEARBORN WORKS

C Blast Furnace Casthouse Baghouse

Continuous Parametric Monitoring System (CPMS) Site Specific Monitoring Plan

Iron & Steel MACT Rule

40 CFR 63 Part FFFFF

September 30, 2011

Revised July 31, 2024

PLAN(E)-W-10-02

Continuous Parametric Monitoring System (CPMS) Site Specific Monitoring Plan for the C Blast Furnace Casthouse Baghouse

System Description and Introduction

The purpose of this CPMS Site Specific Monitoring Plan is to address the following procedures associated with the CPMS used at the casthouse emission control system to satisfy the Integrated Iron and Steel MACT requirements as well as Dearborn Works ROP No. MI-ROP-A8640-2016a: installation; system description; performance evaluation; operation and maintenance; sampling frequency; out of control periods; data quality assurance; and recordkeeping and reporting procedures. This plan will follow the six provisions in the Iron and Steel MACT rule under 40 CFR 63.7831(a)(1) - (6) regarding the contents of such site-specific monitoring plans.

The parameters that will be monitored for C Blast Furnace Casthouse Baghouse ("Casthouse Baghouse") are inlet static pressure (indicating the level of ventilation draft) and hood damper positions. As a result of the varying operation, the level of inlet static pressure and the hood damper positions will vary. A list of scenarios, or modes, has been created and the corresponding acceptable inlet static pressure and hood damper positions are listed. The CPMS modes are included in the attached Table 1: C Blast Furnace Casthouse Emission Control System: CPMS Scenario Table.

Comments on §63.7830(a)(1) and (2)

Dearborn Works does not have any dampers in the exhaust system that remain in the same position and are not manually set, so the following requirement (§63.7830(a)(1)) is not applicable: "Dampers that are not manually set and remain in the same position are required to be visually checked at least once every 24 hours to verify that each damper is in the same position as during the initial performance test."

Dearborn Works is not using flow monitoring devices, so the requirement in §63.7830(a)(2) to monitor "the hourly average actual volumetric flow rate through each separately ducted hood, the average hourly total volumetric flow rate at the inlet to the control device" is not applicable.

Installation Requirements

Per 40 CFR 63.7831(a)(1), the CPMS Site Specific Monitoring Plan must address the "Installation of the CPMS sampling probe or other interface at a measurement location relative to each affected process unit such that the measurement is representative of control of the exhaust emissions (e.g., on or downstream of the last control device)."

For the Casthouse Baghouse, the measurement of inlet static pressure satisfies this requirement since the measurement device is located on the baghouse.

System Description and Equipment Specifications

Per 40 CFR 63.7831(a)(2), the CPMS Site Specific Monitoring Plan must address the "Performance and equipment specifications for the sample interface, the parametric signal analyzer, and the data collection and reduction system."

The nine hood dampers are controlled by Group 11 Beck Drives, or equivalent, which provide a 4-20 mA analog position feedback signal. The signal indicates the damper position from full open to full close through 90° (100%) of movement. The Group 11 actuator is a powerful control package designed to provide precise position control of dampers.

The inlet static pressure is measured by a Foxboro IGP20 Pressure Transmitter. Two redundant transmitters are used. Under normal circumstances, the average of the two inlet pressure transmitters is used to control baghouse draft. Should either one of the two transmitters fail, the other will continue to control baghouse draft.

The required CPMS equipment is included in Table 2: CPMS Equipment for Casthouse Baghouse.

Table 2: CPMS Equipment for Casthouse Baghouse

Application	Model/Serial Number ⁽¹⁾	Quantity
Damper for North and East Casthouse Tapholes	Beck Drive 11-409-114784-01-0X	2
Damper for North and East Casthouse Iron Runners	Beck Drive 11-309-114784-02-0X	3
Damper for North and East Casthouse Slag Runners	Beck Drive 11-209-114784-03-0X	4
Inlet Static Pressure Measurement Device	Foxboro IGP20 Pressure Transmitter	2 ⁽²⁾
Data Management System	ActiveFactory or DVIS Wonderware Historian	1

⁽¹⁾ or equivalent

⁽²⁾ the system includes a primary and a backup transmitter.

Performance Evaluation Procedures (Calibrations)

Per 40 CFR 63.7830(a)(3), the site-specific monitoring plan must include "Performance evaluation procedures and acceptance criteria (e.g., calibrations)." The calibration frequency and methodology are included in Table 3: CPMS Calibration Frequency for Casthouse Baghouse.

Table 3: CPMS Calibration Frequency for Casthouse Baghouse

Measurement	Instrument Type ⁽¹⁾	Calibration Frequency	Procedure #
Inlet Static Pressure	Transmation QuikCal 190 Pressure Calibrator	Once per Quarter	QSMPE-A2-65-2117
Damper Position	Protractor	Once per Quarter	QSMPE-A2-65-3703

⁽¹⁾ or equivalent

Operation and Maintenance

Per 40 CFR 63.7831(a)(4), the site specific monitoring plan must address the following: "Ongoing operation and maintenance procedures in accordance with the general requirements of **§§63.8(c)(1), (c)(3), (c)(4)(ii), (c)(7), and (c)(8).**"

§§63.8 (c) Operation and maintenance of continuous monitoring systems.

(1) The owner or operator of an affected source shall maintain and operate each CMS as specified in this section, or in a relevant standard, and in a manner consistent with good air pollution control practices. (i) The owner or operator of an affected source must maintain and operate each CMS as specified in **§63.6(e)(1)**.

(ii) The owner or operator must keep the necessary parts for routine repairs of the affected CMS equipment readily available.

(iii) The owner or operator of an affected source must develop a written startup, shutdown, and malfunction plan for CMS as specified in **§63.6(e)(3)**.

(3) All CMS shall be installed, operational, and the data verified as specified in the relevant standard either prior to or in conjunction with conducting performance tests under §63.7. Verification of operational status shall, at a minimum, include completion of the manufacturer's written specifications or recommendations for installation, operation, and calibration of the system.

(4) Except for system breakdowns, out-of-control periods, repairs, maintenance periods, calibration checks, and zero (low-level) and high-level calibration drift adjustments, all CMS, including COMS and CEMS, shall be in continuous operation and shall meet minimum frequency of operation requirements as follows:

(ii) All CEMS for measuring emissions other than opacity shall complete a minimum of one cycle of operation (sampling, analyzing, and data recording) for each successive 15-minute period.

(7)(i) A CMS is out of control if—

(A) The zero (low-level), mid-level (if applicable), or high-level calibration drift (CD) exceeds two times the applicable CD specification in the applicable performance specification or in the relevant standard; or

(B) The CMS fails a performance test audit (e.g., cylinder gas audit), relative accuracy audit, relative accuracy test audit, or linearity test audit; or

(C) The COMS CD exceeds two times the limit in the applicable performance specification in the relevant standard.

(ii) When the CMS is out of control, the owner or operator of the affected source shall take the necessary corrective action and shall repeat all necessary tests which indicate that the system is out of control. The owner or operator shall take corrective action and conduct retesting until the performance requirements are below the applicable limits. The beginning of the out-of-control period is the hour the owner or operator conducts a performance check (e.g., calibration drift) that indicates an exceedance of the performance requirements established under this part. The end of the out-of-control period is the hour following the completion of corrective action and successful demonstration that the system is within the allowable limits. During the period the CMS is out of control, recorded data shall not be used in data averages and calculations, or to meet any data availability requirement established under this part.

(8) The owner or operator of a CMS that is out of control as defined in paragraph (c)(7) of this section shall submit all information concerning out-of-control periods, including start and end dates and hours and descriptions of corrective actions taken, in the excess emissions and continuous monitoring system performance report required in §63.10(e)(3).

In order to comply with the requirements listed above, Dearborn Works has implemented the following Casthouse Baghouse procedures:

➤ **Operation and Maintenance Procedures**

- The hood damper actuators are constructed with no burnout motors, sealed electronics, and powerful gear trains. The manufacturer indicates that they require no periodic maintenance. Dearborn Works has included the hood damper actuator linkage on its periodic monitoring schedule.
- Preventive maintenance performed on the Casthouse Baghouse CPMS system is described in Table 4: CPMS Preventative Maintenance Tasks for the Casthouse Baghouse.

Table 4: CPMS Preventative Maintenance Tasks for the Casthouse Baghouse

Equipment Name	Preventative Maintenance Task	Frequency	Procedure #
Damper Linkage	Check linkage attachment	Weekly	QSMPE-A2-65-3700
Damper Position	Calibrate / verify	Quarterly	QSMPE-A2-65-3703
Inlet Static Pressure Transmitters	Calibrate	Quarterly	QSMPE-A2-65-2117

➤ **Casthouse Baghouse CPMS Spare Parts (to satisfy §63.8(c)(1)(ii) requirements):**

- The spare parts for the CPMS will be incorporated into the procedure located in Table 5: CPMS Spare Parts for Casthouse Baghouse.

Table 5: CPMS Spare Parts for Casthouse Baghouse

Procedure Name	Procedure #
Quarterly Environmental Critical Spare Parts Inventory	QSMPE-A2-02-2008

Sampling Frequency

The CPMS will be operated continuously and performance of the CPMS will be evaluated at least twice a year. A performance evaluation will consist of sampling historical baghouse data (a minimum of three of the required four data points constitutes a valid hour of data for inlet pressure). Historical data will be evaluated against the set points specified in the attached Table 1, C Blast Furnace Casthouse Emission Control System: CPMS Scenario Table. Deviations from the CPMS modes will be reported in Dearborn Works semiannual ROP deviation report.

Hood dampers will be deemed to conform to the site-specific CPMS plan should they match their specified set points within the range of their respective calibration accuracies specified in Table 3: CPMS Calibration Frequency for Casthouse Baghouse. Inlet static pressure will be deemed to conform to the site specific CPMS plan if the absolute value of the inlet pressure is greater than the absolute value of the minimum inlet pressure values specified in Table 1: C Blast Furnace Casthouse Emission Control System: CPMS Scenario Table. Data collected at regular 15-minute intervals will occasionally record inlet static pressure when dampers are transitioning between scenarios. Inlet static pressure and damper positions are not expected to correspond to specific set points in the CPMS scenario table when transitioning. Transition periods will not be considered deviations.

The evaluation will be considered valid should data be available for 95% of the reporting period. Data will be retained for a period of (5) years.

Out-of Control Periods

Dearborn Works will take the necessary corrective actions to repair/recalibrate the CPMS. During the period the monitoring equipment is out of control, the facility will not use the recorded data in data averages and calculations or to meet any data availability requirement. Out-of-control conditions, as defined in 40 CFR 63.8(c)(7)(i) addresses continuous opacity monitoring systems (COMS) and is not applicable to CPMS. Requirements for being "out of control" conform to 40 CFR 63.8(c)(7)(ii), based on exceedance to device calibration. Out of control requirements for CPMS components are presented in Table 6: CPMS Out of Control Requirements Casthouse Baghouse.

- The beginning of the out-of-control period, per 40 CFR 63.8(c)(7)(ii), is defined by the facility as the hour that the CPMS is noted to be operating outside of the performance (calibration) limits. This occurs when a calibration check of the baghouse inlet static pressure or hood damper actuators are deemed to be outside of the acceptable calibration specified in this site specific CPMS Monitoring Plan.
- The end of the out-of-control period is defined by the facility as the hour following the completion of corrective action and successful demonstration that the system is within the allowable limits (calibration).

Table 6: CPMS Out of Control Requirements Casthouse Baghouse

Measurement Type	Instrument Type ⁽¹⁾	"Out of Control" conditions
Damper Position	Damper Actuator	A damper alarm will be activated when the damper position deviates from the setpoint by 5%
Inlet Static Pressure	Pressure Transmitter	An inlet pressure alarm will be activated if the absolute value of the inlet pressure is less than the absolute value of the minimum inlet pressure specified in Table 1.

(1) or equivalent

Data Quality Assurance

The requirements presented in this section of the Site-Specific Monitoring Plan apply to the CPMS for the inlet static pressure and hood damper positions as previously described. Per 40 CFR 63.7831(b)(5), the CPMS Site-Specific Monitoring Plan must address the following:

Ongoing data quality assurance procedures in accordance with the general requirements of 63.8(d).

§63.8(d) Quality control program. (1) *The results of the quality control program required in this paragraph will be considered by the Administrator when he/she determines the validity of monitoring data.*

(2) *The owner or operator of an affected source that is required to use a CMS and is subject to the monitoring requirements of this section and a relevant standard shall develop and implement a CMS quality control program. As part of the quality control program, the owner or operator shall develop and submit to the Administrator for approval upon request a site-specific performance evaluation test plan for the CMS performance evaluation required in paragraph (e)(3)(i) of this section, according to the procedures specified in paragraph (e). In addition, each quality control program shall include, at a minimum, a written protocol that describes procedures for each of the following operations:*

(i) *Initial and any subsequent calibration of the CMS;*

- (ii) Determination and adjustment of the calibration drift of the CMS;
 - (iii) Preventive maintenance of the CMS, including spare parts inventory;
 - (iv) Data recording, calculations, and reporting;
 - (v) Accuracy audit procedures, including sampling and analysis methods; and
 - (vi) Program of corrective action for a malfunctioning CMS.
- (3) The owner or operator shall keep these written procedures on record for the life of the affected source or until the affected source is no longer subject to the provisions of this part, to be made available for inspection, upon request, by the Administrator. If the performance evaluation plan is revised, the owner or operator shall keep previous (i.e., superseded) versions of the performance evaluation plan on record to be made available for inspection, upon request, by the Administrator, for a period of 5 years after each revision to the plan. Where relevant, e.g., program of corrective action for a malfunctioning CMS, these written procedures may be incorporated as part of the affected source's startup, shutdown, and malfunction plan to avoid duplication of planning and recordkeeping efforts.

In order to comply with the Data Quality Assurance requirement, Dearborn Works has implemented the following procedures:

- Initial and any subsequent calibration of the CMS
 - Calibration and adjustment procedures were presented in the section, "Performance Evaluation Procedures (Calibrations)".
- Determination and adjustment of the calibration drift of the CMS
 - Calibration drift is associated with CEMS. The type of monitoring equipment that Dearborn Works is using to comply with the Iron and Steel MACT does not involve periodic drift tests (as CEMS use) because the equipment is not designed for that purpose.
- Preventative maintenance of the CMS, including spare parts inventory;
 - Preventative maintenance procedures are conducted based on standard industry practices and facility maintenance experience.
 - The spare parts inventory is maintained onsite or readily available offsite and is included in the section, "Cathouse Baghouse CPMS Spare Parts."
- Data recording, calculations, and reporting;
 - Data recording is conducted as follows:
 - Data is collected through the PLC and is sent to a data historian system. The data historian system software is used to reduce, manage and archive the collected data from the PLC.
 - Calculations are not required in this type of system, as there are no emissions or flowrates to calculate. The data recorded are fan amps and hood damper positions.
 - Reporting is addressed in the next section, "Recordkeeping and Reporting Procedures for CPMS".
- Accuracy audit procedures including sampling and analysis methods.
 - Accuracy audit procedures were addressed in the section, "Performance Evaluation Procedures (Calibrations)"
 - Sampling and analysis methods pertain only to CEMS, not to the CPMS system in use at Dearborn Works.

- Program of corrective action for a malfunctioning CPMS
 - Corrective action procedures are addressed in the "C Blast Furnace Casthouse Baghouse Startup, Shutdown, and Malfunction Plan" (separate document).

Recordkeeping and Reporting Procedures for CPMS

The requirements presented in this section of the Site-Specific Monitoring Plan apply to the CPMS for the inlet static pressure and damper positions as previously described. Per 40 CFR 63.7831(b)(6), the Site-Specific Monitoring Plan must address the following:

(6) Ongoing recordkeeping and reporting procedures in accordance with the general requirements of §§63.10(c), (e)(1), and (e)(2)(i);

§§63.10(c) *Additional recordkeeping requirements for sources with continuous monitoring systems. In addition to complying with the requirements specified in paragraphs (b)(1) and (b)(2) of this section, the owner or operator of an affected source required to install a CMS by a relevant standard shall maintain records for such source of—*

- (1) All required CMS measurements (including monitoring data recorded during unavoidable CMS breakdowns and out-of-control periods);*
- (2)-(4) [Reserved]*
- (5) The date and time identifying each period during which the CMS was inoperative except for zero (low-level) and high-level checks;*
- (6) The date and time identifying each period during which the CMS was out of control, as defined in §63.8(c)(7);*
- (7) The specific identification (i.e., the date and time of commencement and completion) of each period of excess emissions and parameter monitoring exceedances, as defined in the relevant standard(s), that occurs during startups, shutdowns, and malfunctions of the affected source;*
- (8) The specific identification (i.e., the date and time of commencement and completion) of each time period of excess emissions and parameter monitoring exceedances, as defined in the relevant standard(s), that occurs during periods other than startups, shutdowns, and malfunctions of the affected source;*
- (9) [Reserved]*
- (10) The nature and cause of any malfunction (if known);*
- (11) The corrective action taken or preventive measures adopted;*
- (12) The nature of the repairs or adjustments to the CMS that was inoperative or out of control;*
- (13) The total process operating time during the reporting period; and*
- (14) All procedures that are part of a quality control program developed and implemented for CMS under §63.8(d).*
- (15) In order to satisfy the requirements of paragraphs (c)(10) through (c)(12) of this section and to avoid duplicative recordkeeping efforts, the owner or operator may use the affected source's startup, shutdown, and malfunction plan or records kept to satisfy the recordkeeping requirements of the startup, shutdown, and malfunction plan*

specified in §63.6(e), provided that such plan and records adequately address the requirements of paragraphs (c)(10) through (c)(12).

§63.10 (e) Additional reporting requirements for sources with continuous monitoring systems—

(2) Reporting results of continuous monitoring system performance evaluations. **(i)** The owner or operator of an affected source required to install a CMS by a relevant standard shall furnish the Administrator a copy of a written report of the results of the CMS performance evaluation, as required under §63.8(e), simultaneously with the results of the performance test required under §63.7, unless otherwise specified in the relevant standard.

In order to comply with the above requirements, the facility maintains the following records for a minimum of 5 years:

- All required parametric monitoring data. This includes monitoring data from the beginning of startup until the end of shutdown, as defined in the "C Blast Furnace Casthouse Baghouse Startup, Shutdown and Malfunction (SSM) Plan" (separate document). This includes monitoring data recorded during unavoidable CPMS breakdowns and out-of-control periods.
 - Records are maintained electronically on the Cleveland – Cliffs Environmental Server.
- The date and time identifying each period during which the monitoring system was inoperative.
 - Records are maintained electronically on the Cleveland – Cliffs Environmental Server.
- The date and time identifying each period during which the CPMS was out of control, as previously defined above.
 - Records are maintained by the BF Computer Aided Maintenance System (CAMS) department personnel and on the Cleveland – Cliffs Environmental Server.
- The specific identification (i.e., the date and time of commencement and duration) of each period of parametric monitoring exceedance, as defined in this site-specific monitoring plan.
 - Records are maintained electronically on the Cleveland – Cliffs Environmental Server.
- The nature and cause of each malfunction (if known).
 - Records are maintained electronically on the Cleveland – Cliffs Environmental Server.
 - Records will include corrective action taken or preventive measures adopted.
- The nature of the repairs or adjustments to the CPMS that was inoperative or out of control.
 - Records are maintained electronically by the BF CAMS department personnel and on the Cleveland – Cliffs Environmental Server.
- A record of the total process operating time during the reporting period is maintained as required.

- All procedures that are part of a quality control program developed and implemented for the monitoring equipment are recorded in this site-specific monitoring plan or in the C-Blast Furnace Casthouse and Bleeders Startup, Shutdown, and Malfunction Plan.

LIST OF CONTROLLED PROCEDURES

The following procedures listed in this plan serve as the required inspections to comply with the CPMS Requirements of the Iron and Steel MACT rules for the Blast Furnace C Casthouse Baghouse.

Procedure	Reference
1. Baghouse Inlet Pressure Transmitter Calibration	QSMPE-A2-65-2117
2. Inspection of C Furnace Baghouse Damper Positions (Quarterly)	QSMPE-A2-65-3703
3. Inspection of C Furnace Baghouse	QSMPE-A2-65-3700
4. Quarterly Environmental Critical Spare Parts Inventory	QSMPE-A2-02-2008

REVISION TABLE

Date	Revision	Revision Comments
9/30/2011	1	Original Issue – CPMS operating parameters incorporated into O&M Plan
11/21/13	2	Updated CPMS details and operating parameters – incorporated in revision of O&M Plan
8/22/14	3	Revised CPMS parameters to address seasonal variations – incorporated in revision of O&M Plan
5/07/2015	4	Disassembled C Blast Furnace MACT Plan that included CPMS, SSM, O&M portions and made separate plans that conform to AK standards, updated plan to reference inlet static pressure instead of fan amps
8/17/15	5	Updated procedure numbers, added list of controlled procedures
9/16/16	6	Updated procedure numbers
8/14/17	7	Removed references to PTI 182-05C, replaced with reference to new ROP.
8/14/18	8	Updated procedure numbers, updated location of where CPMS records are kept
7/24/19	9	Plan revised to reflect new limits established during June 2019 performance testing
7/16/2021	10	Changed AK Steel references to Cleveland – Cliffs, Added “F” to cover page, added “or DVIS” to Table 2
7/31/2024	11	Updated Table at end to be same as in revised O & M Plan.

FINAL REPORT



CLEVELAND CLIFFS

DEARBORN, MICHIGAN

SOURCE TESTING REPORT: CF-BF BAGHOUSE MACT 2024

RWDI #2402100

August 16, 2024

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) has been retained by Cleveland-Cliffs Dearborn Works (CCDW) to complete the 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 as well as to conduct performance testing in accordance with the NESHAP for Integrated Iron and Steel Manufacturing Facilities, 40 CFR Part 63, Subpart FFFFF. The test program consisted of testing for Particulate Matter (PM) from the EUCFURNACE (C-Blast Furnace (C-BF)) Baghouse while conducting overlapping visual emission observations (VE) on the North C-BF Casthouse and East C-BF Casthouse for a portion of the testing. RWDI conducted testing during all operating scenarios of the C-BF Baghouse Capture System. Testing consisted of four (4) PM tests of varying lengths (based on production cycle) in duration with concurrent VE observations during the PM testing.

The particulate matter, north casthouse VE testing, and east casthouse VE testing was conducted on July 8th-11th, 2024.

Executive Table i: Test Results – C-BF Baghouse Particulate Matter and Visual Emissions Summary

Location	Parameter	Emission Rate					
		Test 1	Test 2	Test 3	Test 4	Average Results	Permit Limit
C-BF Baghouse	Particulate Matter	0.69 lb/hr	0.39 lb/hr	0.92 lb/hr	1.27 lb/hr	0.82 lb/hr	13.87 lb/hr
		0.00016 gr/dscf	0.00010 gr/dscf	0.00037 gr/dscf	0.00048 gr/dscf	0.00018 gr/dscf	0.003 gr/dscf 0.01 gr/dscf ¹
North C-BF Casthouse	Visible Emissions	0%	0%	0%	0%	0% ₍₂₎	20% opacity, 6-minute rolling average
		0%	0%	0%	0%	0% ₍₂₎	20% opacity, 6-minute block average ¹
East C-BF Casthouse	Visible Emissions	5%	6%	5%	N/A	6% ₍₂₎	20% opacity, 6-minute rolling average
		5%	5%	4%	N/A	5% ₍₂₎	20% opacity, 6-minute block average ¹

¹ NESHAP 40 CFR 63.7790(a) PM Limit and Opacity Limit

² Opacity reported as highest 6-minute averages observed



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- Figure 1:** C-BF Baghouse Emissions Stack Schematic
- Figure 2:** USEPA Method 3 Schematic (Fyrite)
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- Appendix A:** Process Data
- Appendix B:** C-BF Baghouse Particulate Matter Results
- Appendix C:** Visible Emission Observations
- Appendix D:** Field Sheets
- Appendix E:** Laboratory Data
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- Appendix G:** Example Calculations
- Appendix H:** EGLE Correspondence and Source Testing Plan



1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by Cleveland-Cliffs Dearborn Works (CCDW) to complete the 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 as well as to conduct performance testing in accordance with the NESHAP for Integrated Iron and Steel Manufacturing Facilities, 40 CFR Part 63, Subpart FFFFF. The test program consisted of testing for Particulate Matter (PM) from the EUCFURNACE (C-Blast Furnace (C-BF)) Baghouse while conducting overlapping visual emission observations (VE) on the North C-BF Casthouse, and East C-BF Casthouse for a portion of the testing. RWDI conducted testing during all operating scenarios of the C-BF Baghouse. Testing consisted of four (4) PM tests of varying lengths (based on production cycle) in duration with VE observations overlapping with a portion of the PM testing.

The particulate matter, north casthouse VE testing, and east casthouse VE testing was conducted on July 8th-11th, 2024.

1.1 Location and Dates of Testing

The C-Blast Furnace baghouse particulate matter testing, north casthouse VE testing, and east casthouse VE testing was conducted on July 8th-11th, 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 as well as to conduct performance testing in accordance with the NESHAP for Integrated Iron and Steel Manufacturing Facilities, 40 CFR Part 63, Subpart FFFFF.



1.3 Description of Source

Molten iron (hot metal) is produced in the blast furnace by heating iron ore pellets and other iron-bearing materials, coke, limestone, slag, or other fluxing material. Burden materials consisting of iron ore pellets, flux material (slag, limestone, or dolomite), and a carbon source (usually coke) are delivered to and charged into the top of the furnace. Additional carbon is supplied to the furnace by injecting natural gas into the hot blast section of the furnace. Preheated combustion (hot blast) air is pushed vertically through the burden material in the furnace from tuyeres located at the bottom of the furnace.

The components of the burden chemically react with the hot blast air to reduce the iron oxides into elemental iron and melt. The blast furnace produces molten iron, blast furnace gas, and slag. Periodically, the molten iron and slag are cast from the furnace into a trough and iron runners in the floor of the casthouse. The slag is separated from the molten iron in the trough prior to entering refractory-lined bottle cars. The slag is then diverted to slag pots. The molten iron is transported in bottle cars to the BOF for use in the steelmaking process. Emissions generated within the casthouse from the molten iron and slag that are cast from the furnace are captured by collection hoods and are routed to a baghouse that is used to control particulate emissions from the process.

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
Brad Bergeron Technical Director	RWDI USA LLC 2239 Star Court Rochester Hills, MI 48309	(248) 234-3885 Brad.Bergeron@rwdi.com
Steve Smith Project Manager		(734) 751-9701 Steve.Smith@rwdi.com
Mike Nummer Senior Field Technician		Michael.Nummer@rwdi.com
Roy Zimmer Field Technician		Roy.Zimmer@rwdi.com
Cade Smith Field Technician		Cade.Smith@rwdi.com



2 SUMMARY OF RESULTS

2.1 Operating Data

CCDW personnel monitored the process during the testing. All process data can be found in **Appendix A**. During the testing, production averaged 286.2 TPH of liquid steel.

2.2 Applicable Permit Number

MI-ROP-A8640-2016a and NESHAP for Integrated Iron and Steel Manufacturing Facilities, 40 CFR Part 63, Subpart FFFFF

3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

See section 1.3 for a description of the process. Emissions from the C-BF Casthouse are controlled by a baghouse. The baghouse is a pulse jet baghouse containing 10 separate compartments. Two ID Fans provide an estimated maximum capacity of 570,000 ACFM. Collection hoods are located directly over the tapholes, iron runners, and slag runners.

3.2 Process Flow Sheet or Diagram (if applicable)

Process flow diagram can be provided upon request.

3.3 Type and Quantity of Raw and Finished Materials

Approximately 300 tons of molten iron and 75 tons of slag is produced at the Blast Furnace per hour. Primarily iron ore pellets, coke, and a flux (typically limestone) and charged into the top of the furnace. Hot blast and natural gas are injected into the bottom of the furnace through tuyeres. Blast Furnace gas exits through the top of the furnace where it is either flared, used as fuel to heat the stoves, or routed to an offsite electrical generating plant for use in their operations.



3.4 Process Instrumentation Monitored During the Test

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

- Iron Production Rate in tons per cast and tons per hour
- Start and stop time of each cast
- Baghouse pressure drop and bag leak detector readings
- Number of baghouse fans in operation
- Damper position and inlet pressure for each capture system operating scenario

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. The volumetric flow rate was determined following the equal area method as outlined in US EPA Method 1. Temperature measurements were made simultaneously with the velocity measurement and was 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 and USEPA Method 3 (Fyrite). RWDI collected integrated sample bags over the duration of each test period for the SEC Baghouse using the orsat pump from the sampling consoles. The bag samples were analyzed on-site using a Fyrite for CO₂ and O₂ measurements. The analysis confirmed that oxygen and carbon dioxide levels on the C-BF Baghouse were at ambient conditions.

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



4.1.2 Particulate Matter USEPA Method 5

For USEPA Method 5, the particulate matter was withdrawn isokinetically from the source and collected on a quartz filter maintained at a temperature of 120 ± 14 °C (248 ± 25 °F). The PM mass, which includes any material that condenses at or above the filtration temperature, was determined gravimetrically after the removal of uncombined water. The sampling train consisted of the following: nozzle (stainless-steel), probe liner (borosilicate glass) with heating system, quartz filter, modified GS impinger with 100 ml of water, standard GS impinger with 100 ml of water, empty modified GS impinger, silica gel impinger, and the metering system. At the end of each test a leak check was performed. The filter and probe/nozzle acetone rinses were analyzed at the RWDI in-house laboratory.

A schematic of the sampling train is included in **Figure Section (Figure 3)**.

4.1.3 Visible Emissions

Visible Emissions were determined in accordance with U.S. EPA 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. 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. VE readings at the North Casthouse and East Casthouse covered varying time periods based on production cycles and coincided with PM sampling.

4.1.4 Method Deviations

The following modifications were provided and accepted in the Source Testing Plan. All modifications were applied during the testing.

1. In order to establish new operating limits, the test cycle was required to cover each operating scenario. Therefore, when applicable, it was necessary to either extend a run or to run extra runs to ensure that all operating scenarios were tested.
2. Testing was performed for an integral number of production cycles. When all sample points had been sampled but the heat was still in progress, sampling on the final test port was repeated (and if necessary, moved to the previous test port) until the production cycle was completed.



4.1.5 NESHAP Testing Considerations

1. All testing was conducted for an integral number of furnace tapping operations (casts). Each run was a minimum of 1 hour in duration.
2. All opacity observations for the casthouses overlapped with the performance testing for particulate.
3. Visible emission observations on each casthouse consisted of a minimum of 30 6-minute block averages during tapping of the furnace. 433 minutes were observed on the north casthouse and 470 minutes were observed on the east casthouse.
4. A minimum of 60 dscf of gas was collected during each particulate matter test run.

4.2 Description of Recovery and Analytical Procedures

The recovery followed USEPA Method 5. Results were analyzed gravimetrically at the RWDI in-house laboratory.

4.3 Sampling Port Description

The C-BF Baghouse emissions stack is a circular stack with an inner diameter of 152". 4 ports were used for testing. A schematic of the sampling points is shown in **Figure Section (Figure 1)**.



5 TEST RESULTS AND DISCUSSION

5.1 Detailed Results

Table 5.1: Test Results – C-BF Baghouse Particulate Matter and Visual Emissions

Location	Parameter	Emission Rate					
		Test 1	Test 2	Test 3	Test 4	Average Results	Permit Limit
C-BF Baghouse	Particulate Matter	0.69 lb/hr	0.39 lb/hr	0.92 lb/hr	1.27 lb/hr	0.82 lb/hr	13.87 lb/hr
		0.00016 gr/dscf	0.00010 gr/dscf	0.00037 gr/dscf	0.00048 gr/dscf	0.00018 gr/dscf	0.003 gr/dscf 0.01 gr/dscf ¹
North C-BF Casthouse	Visible Emissions	0%	0%	0%	0%	0% ₍₂₎	20% opacity, 6-minute rolling average
		0%	0%	0%	0%	0% ₍₂₎	20% opacity, 6-minute block average ¹
East C-BF Casthouse	Visible Emissions	5%	6%	5%	N/A	6% ₍₂₎	20% opacity, 6-minute rolling average
		5%	5%	4%	N/A	5% ₍₂₎	20% opacity, 6-minute block average ¹

¹ NESHAP 40 CFR 63.7790(a) PM Limit and Opacity Limit

² Opacity reported as highest 6-minute averages observed

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

- C-BF Baghouse Particulate Matter Results – **Appendix B**
- Visual Emissions Results – **Appendix C**

5.2 Process Upset Conditions During Testing

No process upsets occurred during the testing.

5.3 Maintenance Performed in Last Three Months

Only routine maintenance has been performed within the last three months. Two compartments have been rebagged within the previous 12-months. Typically, the baghouse will be completely rebagged over a 5-year cycle.



5.4 Audit Samples

This test did not require any audit samples.

5.5 Visible Emission Observations

Visible emission observations data can be found in **Appendix C**.

5.6 Field Data Sheets

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

5.7 Laboratory Data

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

5.8 Calibration Data

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

5.9 Sample Calculations

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

TABLES



Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests per Stack	Sampling Parameter	Sampling Method
C-BF Baghouse	4	Velocity & Temperature	U.S. EPA ^[1] Methods 1 & 2
		Oxygen & Carbon Dioxide	U.S. EPA ^[1] Method 3
		Moisture	U.S. EPA ^[1] Method 4
		Particulate Matter	U.S. EPA ^[1] Method 5
		Visual Emissions	U.S. EPA ^[1] Method 9

Notes:

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

Table 2: Sampling Summary and Sample Log

Source and Test #	Sampling Date	Start Time	End Time	Filter ID / Trap ID
C-BF Baghouse - Particulate Matter				
Blank	11-Jul-24	-	-	QZ215
Test #1	8-Jul-24	10:49 AM	3:12 PM	QZ216
Test #2	9-Jul-24	10:19 AM	4:26 PM	QZ133
Test #3	10-Jul-24	9:18 AM	1:42 PM	QZ214
Test #4	11-Jul-24	8:06 AM	9:58 AM	QZ215

Table 3: Sampling Summary - Flow Characteristics - C-BF Baghouse

Stack Gas Parameter		Test No. 1	Test No. 2	Test No. 3	Test No. 4	Average
		Filterable PM	Filterable PM	Filterable PM	Filterable PM	
Testing Date		8-Jul-24	9-Jul-24	10-Jul-24	11-Jul-24	
Stack Temperature	°F	114	136	65	125	110
Moisture	%	1.8%	2.1%	2.4%	2.1%	2.1%
Velocity	ft/s	72.0	68.1	39.4	45.6	56.3
Referenced Flow Rate	CFM	494,203	439,807	289,560	306,278	382,462
Oxygen	%	21.0	21.0	21.0	21.0	21.0
Carbon Dioxide	%	0.0	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	101.0	102.8	102.3	104.1	102.6

Notes:

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

Table 4 - Particulate Matter Results

Company	Cleveland Cliffs				
Source	C-BF Bag House				
Date	8-Jul-24	9-Jul-24	10-Jul-24	11-Jul-24	
Test Number	Test 1	Test 2	Test 3	Test 4	Average
Start Time	10:49	10:19	9:18	8:06	-
End Time	15:12	16:26	13:42	9:58	-
Stack Information					
Flow Rate (ft ³ /min) (Actual)	544,125	514,652	297,739	345,108	425,406
Flow (ft ³ /min) (Standard Wet)	503,221	449,424	296,584	312,891	390,530
Flow (ft ³ /min) (Standard Dry)	494,203	439,807	289,560	306,278	382,462
Flow (m ³ /min) (Standard Dry)	13,994	12,454	8,199	8,673	10,830
Percent Moisture (%)	1.8	2.1	2.4	2.1	2.1
Pressure Ps ("Hg)	30.06	29.47	29.65	30.05	29.80
Average Stack Temperature (T _s) (°F)	113.5	135.5	65.2	124.8	109.8
Molecular Weight of Stack Gas dry (M _d) (g/mole)	28.84	28.84	28.84	28.84	28.84
Molecular Weight of Stack Gas wet (M _w) (g/mole)	28.65	28.61	28.58	28.58	28.61
Stack Gas Specific Gravity (G _s) (kg/L)	1.0	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction (%)	0.0	0.0	0.0	0.0	0.0
Average Stack Velocity (V _s) (ft/sec)	72.0	68.1	39.4	45.6	56.3
Cross Section Area of Stack (ft ²)	126.0	126.0	126.0	126.0	126.0
Percent Carbon Dioxide (%)	0.0	0.0	0.0	0.0	0.0
Percent Oxygen (%)	21.0	21.0	21.0	21.0	21.0
Percent Carbon Monoxide (%)	0.0	0.0	0.0	0.0	0.0
Meter Info					
Isokinetic Variation I (%)	101.0	102.8	102.3	104.1	102.6
Meter Pressure Pm ("Hg)	30.3	29.6	29.7	30.2	29.9
Meter Temperature Tm (°F)	90.7	84.8	70.8	72.8	79.8
Measured Sample Volume Vm (ft ³)	208.37	260.25	112.67	85.50	166.70
Sample Volume (Vm St ft ³)	219.62	271.48	120.89	93.03	176.25
Sample Volume (Vm St m ³)	6.22	7.69	3.42	2.63	4.99
Total Weight of Sampled Gas (lbs) wet	16.56	20.51	9.15	7.03	13.31
Total Weight of Sampled Gas (lbs) dry	16.37	20.24	9.01	6.93	13.14
Gas Density Ps wet ("Hg)	0.07	0.07	0.07	0.07	0.07
Gas Density Ps dry ("Hg)	0.07	0.07	0.07	0.07	0.07
Condensate Volume (ft ³)	4.01	5.94	2.93	2.01	3.72
Nozzle Size (in ²)	0.00025	0.00025	0.00025	0.00038	0.00
Impinger Gain (g)	45.4	81.3	37.0	23.9	46.9
Silica Gel Gain (g)	39.6	44.6	25.2	18.7	32.0
Total Gas Sampled (vm st ft ³ + condensate volume)	223.62	277.41	123.83	95.04	179.98
Particulate Results					
Nozzle/Probe/Filter Weight (mg)	2.3	1.8	2.9	2.9	2.5
Total Particulate (mg)	2.3	1.8	2.9	2.9	2.5
Total Particulate Emission Rate (lb/hr)	0.69	0.39	0.92	1.27	0.82
Total Particulate Concentration lb/1000 lb (wet)	3.06E-04	1.93E-04	6.99E-04	9.10E-04	5.27E-04
Total Particulate Concentration lb/1000 lb (dry)	3.10E-04	1.96E-04	7.09E-04	9.22E-04	5.34E-04
Total Particulate Concentration mg/dscm (dry)	0.37	0.23	0.85	1.10	0.64
Total Particulate Concentration (gr/dscf)	0.00016	0.00010	0.00037	0.00048	0.00028
Total Particulate Concentration (mg/acm)	0.34	0.20	0.83	0.98	0.59

Table 5 - Cleveland Cliffs North Casthouse Visual Emissions Results

SOURCE(S): North Casthouse

Test ID	Source	Date	Time			Average Daily Opacity	Maximum 6 min. average
Cleveland Cliffs North Casthouse							
Test 1	North Casthouse	July 8, 2024	13:32	to	15:10	0	0
Test 2		July 9, 2024	11:56	to	13:48	0	0
Test 3		July 10, 2024	11:23 - 11:49	to	12:12 - 13:42	0	0
Test 4		July 11, 2024	8:06		9:58	0	0
Total						0	0

Table 6 - Cleveland Cliffs East Casthouse Visual Emissions Results

SOURCE(S): East Casthouse

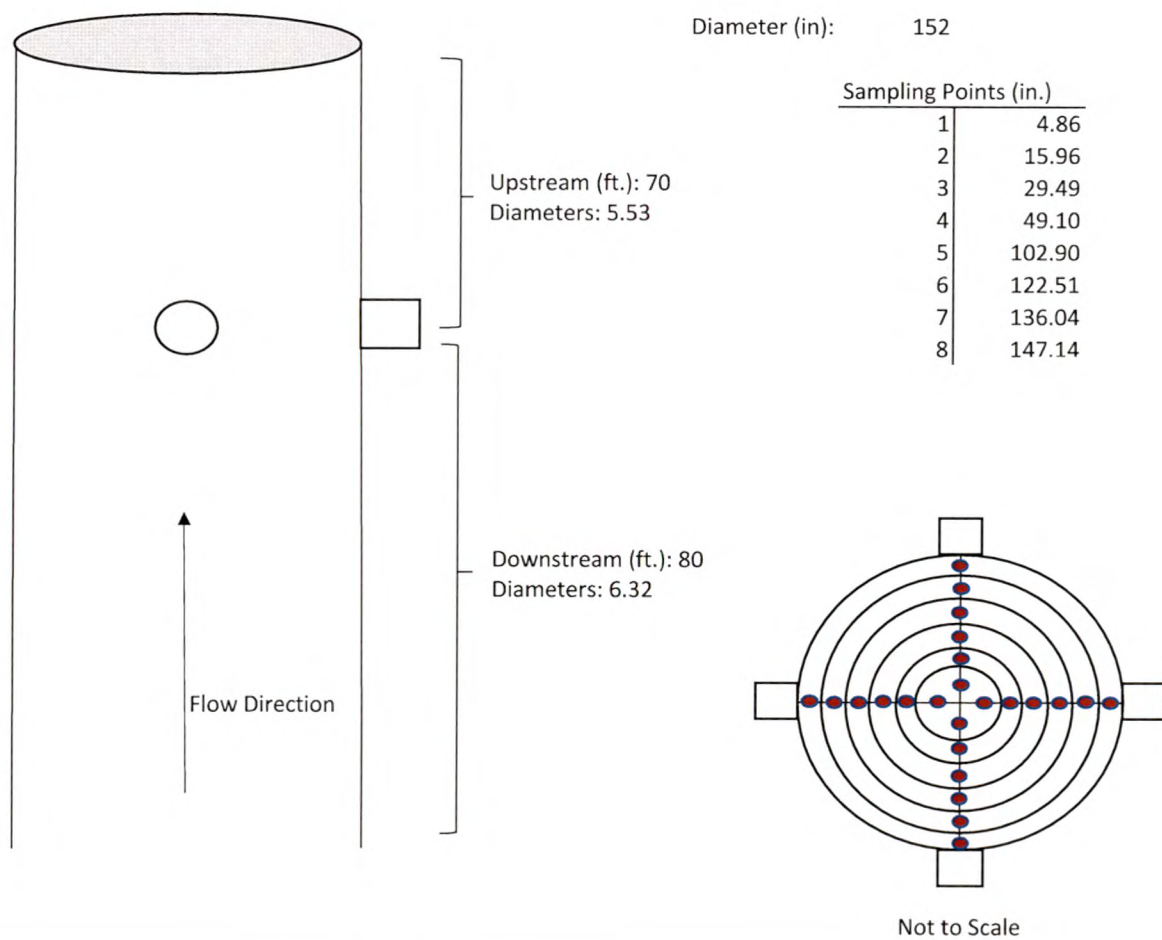
Test ID	Source	Date	Time			Average Daily Opacity	Maximum 6 min. average
Cleveland Cliffs East Casthouse							
Test 1	East Casthouse	July 8, 2024	10:49	to	13:08	0	5
Test 2-1		July 9, 2024	10:19	to	11:40	0	4
Test 2-2		July 10, 2024	14:04	to	16:26	1	6
Test 3		July 11, 2024	9:18	to	11:06	0	5
Total						0	5

FIGURES





Figure No. 1: C-BF Baghouse Emissions Stack Schematic



C-BF Baghouse
Cleveland Cliffs
Dearborn Works
Dearborn, Michigan

Date:
July 8-11, 2024

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. 2: USEPA Method 3 Schematic (Fyrite)



USEPA Method 3

Cleveland Cliffs
Dearborn Works
Dearborn, MI

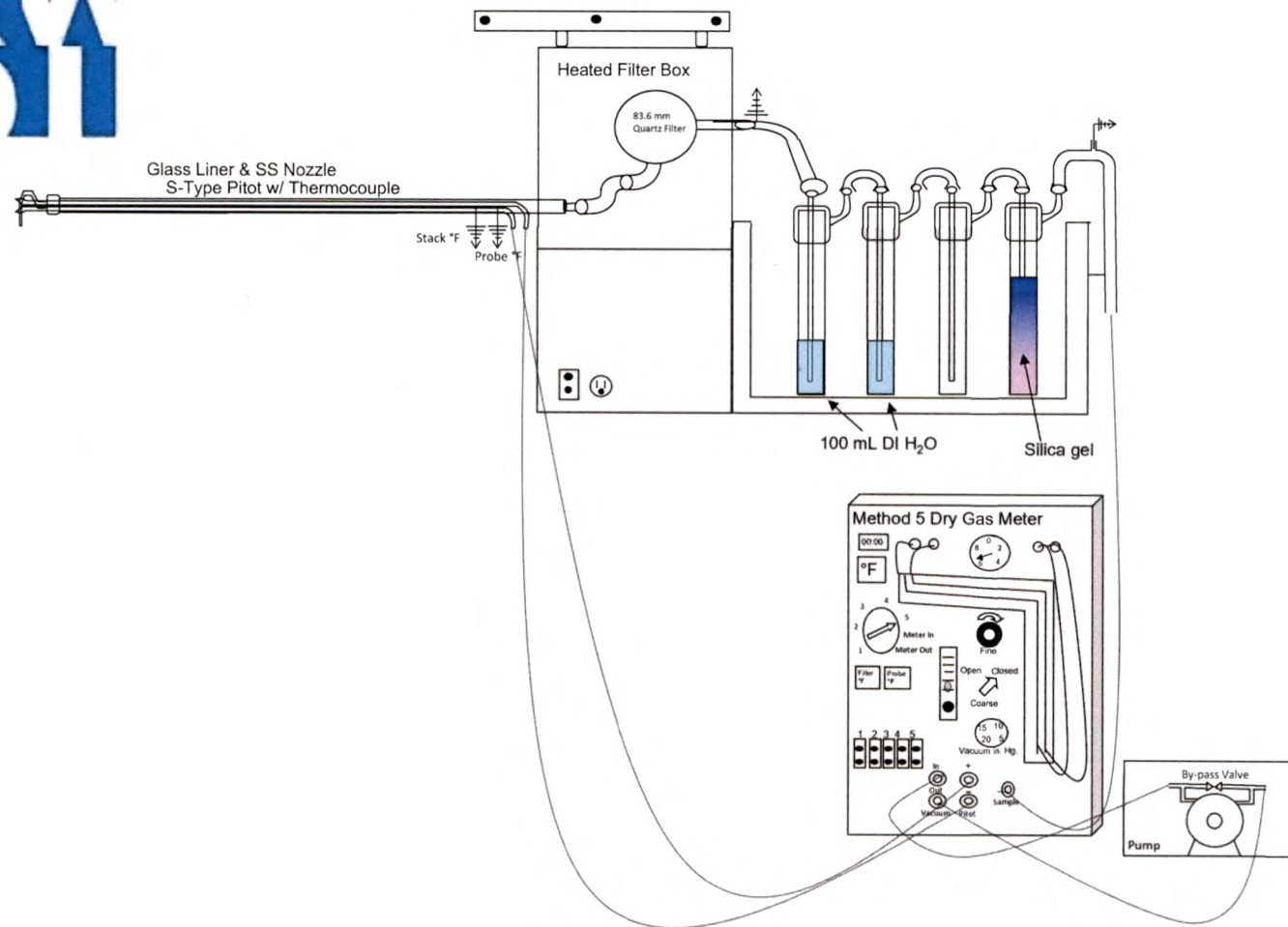
Project# 2402100

Date: July 8-11, 2024





Figure 3: USEPA Method 5 Schematic



USEPA Method 5

Cleveland Cliffs
Dearborn Works
Dearborn, Michigan

Job No. 2402100

Date: July 8-11, 2024

