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**SOURCE TEST REPORT  
COMPLIANCE TESTING  
C-BLAST FURNACE BAGHOUSE  
AK STEEL DEARBORN WORKS  
DEARBORN, MICHIGAN**

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Prepared for:



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**RENEWABLE OPERATING PERMIT  
REPORT CERTIFICATION**

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name AK Steel Dearborn Works County Wayne

Source Address 4001 Miller Road City Dearborn

AQD Source ID (SRN) A8640 ROP No. MI-ROP-A8640-2016a ROP Section No. 1

Please check the appropriate box(es):

**Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

Reporting period (provide inclusive dates): From \_\_\_\_\_ To \_\_\_\_\_

1. During the entire reporting period, this source was in compliance with ALL terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.

2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, EXCEPT for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

**Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

Reporting period (provide inclusive dates): From \_\_\_\_\_ To \_\_\_\_\_

1. During the entire reporting period, ALL monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.

2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, EXCEPT for the deviations identified on the enclosed deviation report(s).

**Other Report Certification**

Reporting period (provide inclusive dates): From 3/28/2017 To 3/29/2017

Additional monitoring reports or other applicable documents required by the ROP are attached as described:  
C-Blast Furnace Baghouse Emissions Testing Report  
 \_\_\_\_\_  
 \_\_\_\_\_

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

Nicholas Kohlhas General Manager (313) 317-8955  
Name of Responsible Official (print or type) Title Phone Number

N. Kohlhas Signature of Responsible Official 5/23/17 Date

\* Photocopy this form as needed.

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## **1. INTRODUCTION**

Environmental Quality Management, Inc. (EQM) was retained by AK Steel Dearborn Works to plan and conduct a compliance air sampling program at the C-Blast Furnace Baghouse exhaust. The compliance program was conducted to evaluate emissions of filterable and condensable particulate (PM, PM<sub>10</sub>, and PM<sub>2.5</sub>); metals [lead (Pb) and manganese (Mn)]; carbon monoxide (CO); nitrogen oxide (NO<sub>x</sub>); volatile organic compounds (VOC); and visible emissions (VEs). Three sampling runs (each run at least 1 cast in duration) were conducted for each method except for visible emissions. One 1-hour run was conducted for visible emissions concurrently with each PM/CPM sampling run. EPA-approved sampling methods and laboratory analysis procedures were used to meet the objectives of the sampling program.

An outline of the test program is presented in Table 1-1. Project participants and responsibilities are presented in Table 1-2.

**Table 1-1. Sampling Requirements for AK Steel  
Dearborn, Michigan**

<b>Test Point No.</b>	<b>Test Point Name</b>	<b>Parameter Tested</b>	<b>Test Method</b>
1	C-Blast Furnace Baghouse	Flow Moisture PM/Condensables O <sub>2</sub> , CO <sub>2</sub> , CO, NO <sub>x</sub> Metals: Pb and Mn VOC Opacity	EPA Method 2 EPA Method 4 EPA Method 5/202 EPA Method 3A, 7E & 10 EPA Method 5/29 EPA Method 25A EPA Method 9

**Table 1-2. Project Participants**

<b>Name/Company</b>	<b>Responsibility</b>
David Pate/AK Steel	Coordinate process operation and sampling activities Site/Process preparation Process information
David Patterson/DEQ Katherine Koster/DEQ	Agency Review of Process and Sampling Procedures
Dan Scheffel/EQM Chris Janzen/EQM Ben Fern/EQM Gary Drexler/EQM Nick Pharo/EQM Eric Zang/EQM Robert Bingham/Smoke Reader LLC	Project Manager Field sampling crew Field sampling crew Field sampling crew Field sampling crew Field sampling crew VE observations

## 2. SUMMARY OF TEST RESULTS

The emission measurement program was performed on March 28 and 29, 2017. Table 2-1 presents the average results and limit comparison. Table 2-2 presents a summary of stack gas conditions. Table 2-3 presents total particulate concentrations and mass emission rates. Table 2-4 presents manganese concentrations and mass emission rates. Table 2-5 presents lead concentrations and mass emission rates. Table 2-6 presents nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), and volatile organic compound (VOC) concentrations and mass emission rates.

Appendix A summarizes emission and example calculations, Appendix B presents field data, Appendix C presents laboratory results, Appendix D presents calibration data, Appendix E presents process data, Appendix F presents visible emissions data, and Appendix G presents the test protocol and regulatory letter regarding the test effort.

**Table 2-1. Average Results and Limit Comparison**

Pollutant	C-Blast Furnace Baghouse	Limits <sup>a</sup>
PM (lb/hr)	0.74	13.87
PM <sub>10</sub> (lb/hr)	1.26	18.24
PM <sub>2.5</sub> (lb/hr)	1.26	18.24
Mn (lb/hr)	0.010	0.042
Lead (lb/hr)	0.0003	0.0077
VOC (lb/hr)	1.14	9.92
NO <sub>x</sub> (lb/hr)	2.13	5.46
CO (lb/hr)	34.56	56.25
VE	0% <sup>b</sup>	10% <sup>c</sup>

<sup>a</sup>Limits as provided in Permit MI-ROP-A8640-2016a.

<sup>b</sup>Calculated as highest observed 6-minute average.

<sup>c</sup>6-minute average.

**Table 2-2. Stack Gas Conditions  
C-Blast Furnace Baghouse**

March 28-29, 2017

AK Steel, Dearborn Works

Run No.	Date/Time		Stack Gas Velocity, fps <sup>a</sup>	Volumetric Flow Rate		Stack Temperature, °F	Moisture Content, % H <sub>2</sub> O	CO <sub>2</sub> , %	O <sub>2</sub> , %
				acfm <sup>b</sup>	dscfm <sup>c</sup>				
<b>Method 5/202 Test Runs (Total Particulate)</b>									
1	3/28/2017	1140-1649	62.9	475,889	442,531	103	0.7	0.2	21.1
2	3/29/2017	0801-1044	60.3	455,986	426,859	106	0.6	0.1	20.7
3	3/29/2017	1313-1718	59.2	447,926	411,550	116	0.8	0.1	20.6
<b>Average</b>			<b>60.8</b>	<b>459,933</b>	<b>426,980</b>	<b>108</b>	<b>0.7</b>	<b>0.1</b>	<b>20.8</b>
<b>Method 5/29 Test Runs (Metals)</b>									
1	3/28/2017	1140-1648	60.6	457,910	423,766	105	0.8	0.2	21.1
2	3/29/2017	0801-1044	58.6	442,823	413,100	107	0.7	0.1	20.7
3	3/29/2017	1313-1716	59.2	447,898	411,078	117	0.6	0.1	20.6
<b>Average</b>			<b>59.5</b>	<b>449,544</b>	<b>415,981</b>	<b>110</b>	<b>0.7</b>	<b>0.1</b>	<b>20.8</b>

<sup>a</sup>Feet per second.

<sup>b</sup>Actual cubic feet per minute.

<sup>c</sup>Dry standard cubic feet per minute.

**Table 2-3. Total Particulate Emissions  
C-Blast Furnace Baghouse**

March 28-29, 2017

AK Steel, Dearborn Works

Run No.	Date/Time	Total Particulate Matter		Filterable Particulate Matter		Condensable Particulate Matter	
		Concentration, gr/dscf <sup>a</sup>	Mass Rate, lb/hr <sup>b</sup>	Concentration, gr/dscf <sup>a</sup>	Mass Rate, lb/hr <sup>b</sup>	Concentration, gr/dscf <sup>a</sup>	Mass Rate, lb/hr <sup>b</sup>
1	3/28/2017 1140-1649	3.59E-04	1.36	2.00E-04	0.76	1.59E-04	0.60
2	3/29/2017 0801-1044	3.48E-04	1.27	1.99E-04	0.73	1.49E-04	0.55
3	3/29/2017 1313-1718	3.27E-04	1.15	1.63E-04	0.74	1.18E-04	0.42
<b>Average</b>		<b>3.45E-04</b>	<b>1.26</b>	<b>1.87E-04</b>	<b>0.74</b>	<b>1.42E-04</b>	<b>0.52</b>

<sup>a</sup>Grains per dry standard cubic foot.

<sup>b</sup>Pounds per hour.

Note – Condensable particulate results are corrected with Field Blank results.

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**Table 2-4. Front-Half and Back-Half Manganese and Total Manganese Emissions  
C-Blast Furnace Baghouse**

March 28-29, 2017

AK Steel, Dearborn Works

Run No.	Date/Time	Front Half Manganese		Back Half Manganese		Total Manganese	
		Concentration, µg/dscm <sup>a</sup>	Mass Rate, lb/hr <sup>b</sup>	Concentration, µg/dscm <sup>a</sup>	Mass Rate, lb/hr <sup>b</sup>	Concentration, µg/dscm <sup>a</sup>	Mass Rate, lb/hr <sup>b</sup>
1	3/28/2017 1140-1648	6.8	1.07E-02	1.7	2.76E-03	8.5	1.35E-02
2	3/29/2017 0801-1044	2.2	3.35E-03	3.3	5.06E-03	5.4	8.40E-03
3	3/29/2017 1313-1716	2.8	4.29E-03	2.6	3.97E-03	5.4	8.26E-03
<b>Average</b>		<b>3.9</b>	<b>6.12E-03</b>	<b>2.5</b>	<b>3.93E-03</b>	<b>6.4</b>	<b>1.01E-02</b>

<sup>a</sup>Micrograms per dry standard cubic meter.

<sup>b</sup>Pounds per hour.

Note: Metals data was blank corrected.

**Table 2-5. Front-Half and Back Half-Lead and Total Lead Emissions  
C-Blast Furnace Baghouse**

March 28-29, 2017

AK Steel, Dearborn Works

Run No.	Date/Time	Front-Half Lead		Back-Half Lead		Total Lead	
		Concentration, $\mu\text{g}/\text{dscm}^{\text{a}}$	Mass Rate, $\text{lb}/\text{hr}^{\text{b}}$	Concentration, $\mu\text{g}/\text{dscm}^{\text{a}}$	Mass Rate, $\text{lb}/\text{hr}^{\text{b}}$	Concentration, $\mu\text{g}/\text{dscm}^{\text{a}}$	Mass Rate, $\text{lb}/\text{hr}^{\text{b}}$
1	3/28/2017 1140-1648	0.1	2.18E-04	0.1	9.54E-05	0.2	3.13E-04
2	3/29/2017 0801-1044	0.1	2.28E-04	0.1	1.41E-04	0.2	3.69E-04
3	3/29/2017 1313-1716	0.1	1.78E-04	0.1	1.22E-04	0.2	3.00E-04
<b>Average</b>		<b>0.1</b>	<b>2.08E-04</b>	<b>0.1</b>	<b>1.19E-04</b>	<b>0.2</b>	<b>3.27E-04</b>

<sup>a</sup>Micrograms per dry standard cubic meter.

<sup>b</sup>Pounds per hour.

Note: Metals data was blank corrected.

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**Table 2-6. NO<sub>x</sub>, CO, and VOC Emissions  
C-Blast Furnace Baghouse**

March 28-29, 2017

AK Steel, Dearborn Works

Run Date/Time	Nitrogen Oxides			Carbon Monoxide			Volatile Organic Compounds		
	Concentration, $\text{ppm}^{\text{a}}$	Mass Rate		Concentration, $\text{ppm}^{\text{a}}$	Mass Rate		Concentration, $\text{ppm}^{\text{a}}$	Mass Rate	
		$\text{lb}/\text{hr}^{\text{b}}$	$\text{lb}/\text{ton}^{\text{c}}$		$\text{lb}/\text{hr}^{\text{b}}$	$\text{lb}/\text{ton}^{\text{c}}$		$\text{lb}/\text{hr}^{\text{b}}$	$\text{lb}/\text{ton}^{\text{c}}$
3/28/2017 1140-1648	0.5	1.62	5.83E-03	23.7	45.79	0.17	1.3	1.47	5.28E-03
3/29/2017 0801-1044	0.8	2.36	8.81E-03	7.9	14.79	0.06	0.6	0.66	2.48E-03
3/29/2017 1313-1716	0.8	2.40	6.63E-03	24.0	43.08	0.12	1.3	1.30	3.59E-03
<b>Average</b>	<b>0.7</b>	<b>2.13</b>	<b>7.09E-03</b>	<b>18.6</b>	<b>34.56</b>	<b>0.11</b>	<b>1.1</b>	<b>1.14</b>	<b>3.78E-03</b>

<sup>a</sup>Parts per million, dry basis. VOC ppm is methane corrected, wet basis.

<sup>b</sup>Pounds per hour.

<sup>c</sup>Pounds per ton.



### **3. SAMPLING AND ANALYTICAL PROCEDURES**

The sampling and analytical procedures used in this test program conform to EPA Reference Methods 1 through 4, 5, 7E, 9, 10, 25A, 29, and 202, as published in the Federal Register.

#### **3.1 Location of Measurement Sites**

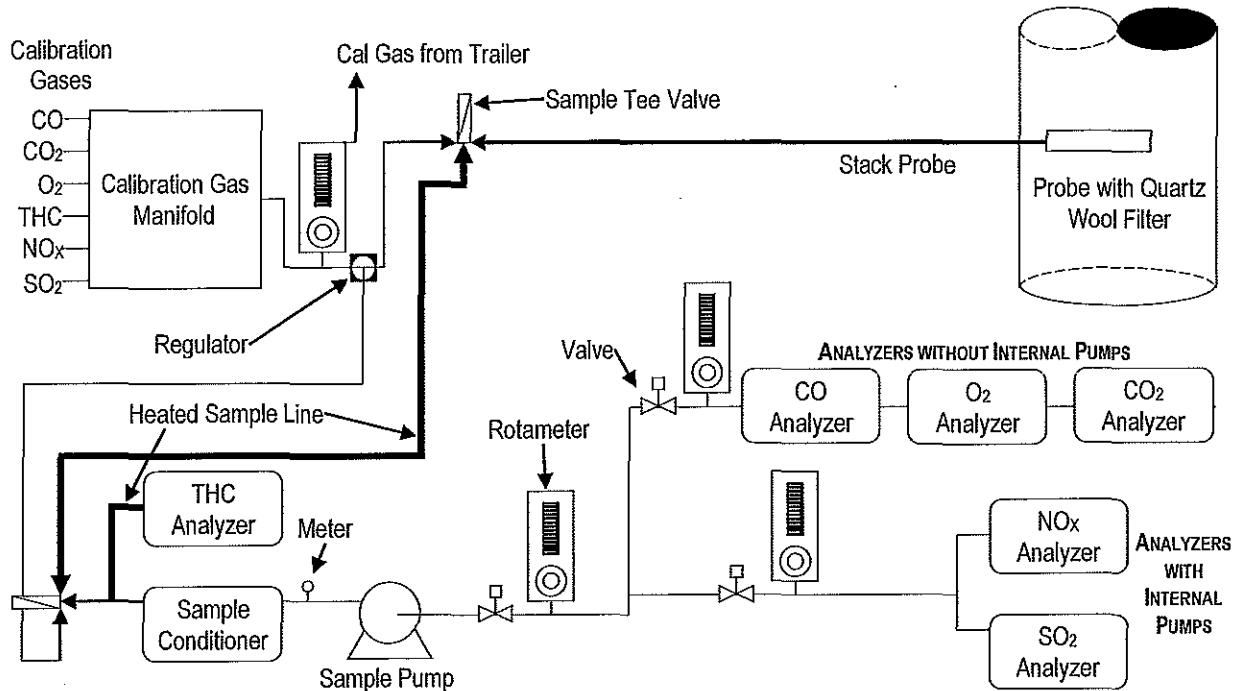
EPA Method 1, "Sample Velocity Traverses for Stationary Sources," was used to select representative measurement sites. The sampling location was at the exhaust of the C-Blast Furnace baghouse. A schematic of the test location is shown in Figure 4-1 in Section 4.

#### **3.2 Stack Gas Volumetric Flow Rate**

EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rates," was used to determine stack gas volumetric flow rates. Type "S" pitot tubes meeting EPA specifications and an inclined manometer were used to measure velocity pressures. A calibrated Type "K" thermocouple attached directly to the pitot tube was used to measure stack gas temperature. The stack gas velocity was calculated from the average square root of the stack gas velocity pressure, average stack gas temperature, stack gas molecular weight, and absolute static pressure. The volumetric flow rate is the product of velocity and stack cross-sectional area.

#### **3.3 Stack Gas Dry Molecular Weight**

The baghouse sampling location was sampled continuously for CO<sub>2</sub> and O<sub>2</sub> by using non-dispersive infrared analyzers (CO<sub>2</sub>) or paramagnetic analyzers (O<sub>2</sub>); gaseous pollutants were measured according to EPA Reference Method 3A, "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Instrumental Analyzer Procedure)." Figure 3-1 is a schematic of the sampling system.



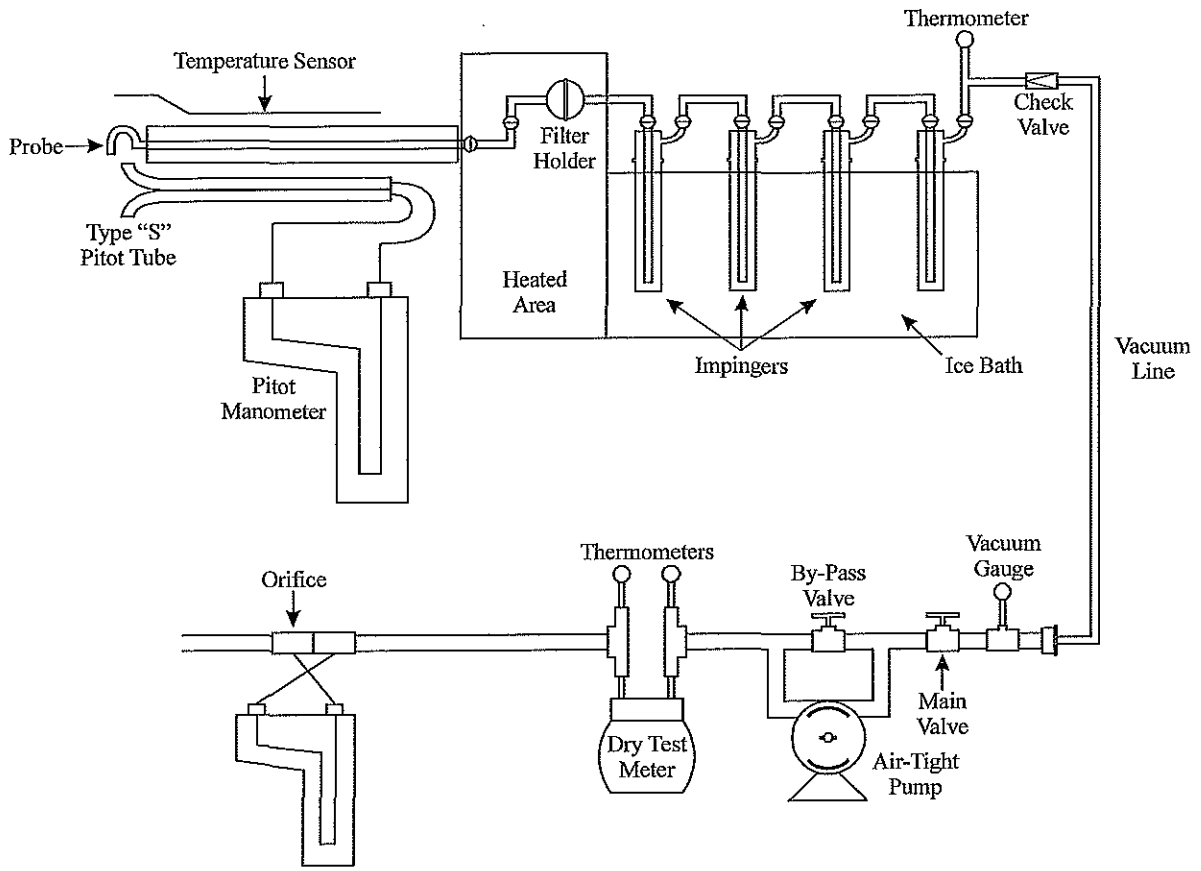
**Figure 3-1. CEM Sample Flow and Calibration System**  
 Note: This study used the CO, NO<sub>x</sub>, THC, CO<sub>2</sub>, and O<sub>2</sub> analyzers.

### 3.4 Stack Gas Moisture Content

EPA Reference Method 4, “Determination of Moisture Content in Stack Gases,” was used to determine stack gas moisture content. This method was conducted as part of each particulate and metals measurement run. The initial and final contents of all impingers were determined gravimetrically.

### 3.5 Filterable Particulate and Condensable

EPA Methods 5/202 were used to measure the concentration and mass emission rate of total filterable particulate matter. Particulate matter of less than 10 microns (PM<sub>10</sub>) and particulate matter of less than 2.5 microns (PM<sub>2.5</sub>) were determined as the sum of the filterable and condensable fractions. Three sampling runs and a blank were collected at the baghouse stack outlet location. Figures 3-2 and 3-3 present schematics of the sampling trains for Method 5 and Method 202, respectively.



**Figure 3-2. Method 5 Front-half of Sampling Train**

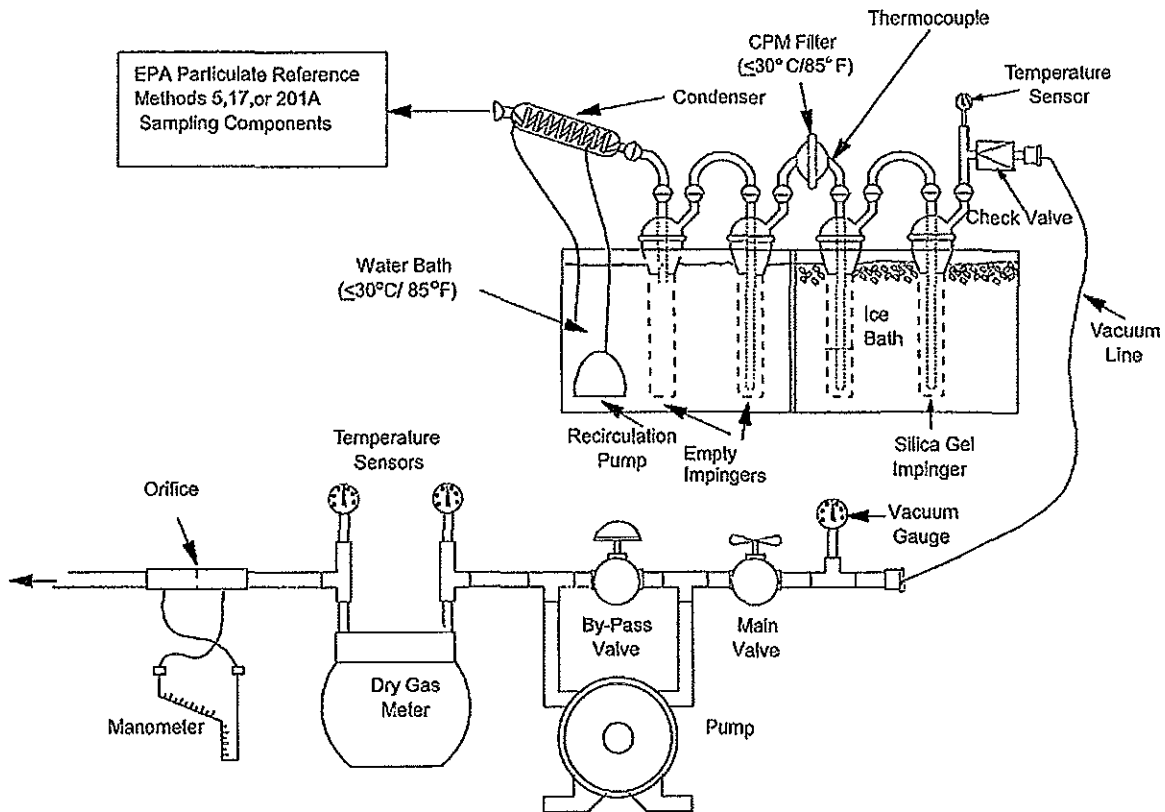


Figure 3-3. Method 202 Sampling Train

### 3.6 Nitrogen Oxides (NO<sub>x</sub>)

Nitrogen oxide concentrations were analyzed following the procedures of EPA Reference Method 7E, "Determination of Nitrogen Oxide Emissions from Stationary Sources by Instrumental Analyzer Technique." The sampling system consists of a stainless steel probe, a glass fiber filter for particulate matter removal, a heated Teflon sampling line, and a sample gas conditioner to remove moisture prior to the gas entering the chemiluminescent analyzer. A zero gas and two Protocol One calibration gases were used to calibrate the instrument. Data was recorded on a data-logging system recording 1-minute averages of pollutant data. Figure 3-1 is a schematic of the continuous emission analyzer system. An NO<sub>2</sub>-NO<sub>x</sub> converter efficiency test was conducted according to EPA Method 7E. An NO<sub>2</sub> calibration gas with a value of 52.2 ppm was introduced to the analyzer. The lowest response observed was 49.06 ppm, which is an efficiency of 94.0%. This result is above the 90% converter efficiency that is required. Results are provided in Appendix B.

### **3.7 Carbon Monoxide (CO)**

Carbon monoxide concentrations were sampled and analyzed continuously following the procedures of EPA Method 10, "Determination of Carbon Monoxide Emissions from Stationary Sources by Instrumental Analyzer Technique." The same sampling system that was used for the other continuous analyzers was used for the CO analyzer. The instrument used is a non-dispersive infrared analyzer manufactured by Thermo Environmental.

A zero gas and two calibration gases were used to calibrate the instrument. Figure 3-1 is a schematic of the sampling system.

### **3.8 Volatile Organic Compounds (VOC)**

EPA Reference Method 25A, "Determination of Total Gaseous Organic Concentration," was used. The sampling system consisted of an Inconel stainless steel probe, a heated Teflon® line, and a heated flame ionization analyzer (FIA). The FIA was calibrated with three Protocol One methane standards in air and a zero gas. Calibrations and drift checks were conducted after each sampling run. Data was reduced on a dry basis using moisture values from the EPA Reference Method 5 sampling system. A schematic of the sampling system is shown in Figure 3-1. The instrument used was a J.U.M. Model 109A analyzer, which contains two FIDs. The analyzer, via an internal pumping system, withdraws gas from the stack. Once inside the analyzer, the gas stream is split and a portion is directed to a FID that measures the total TGO and a portion is directed to a proprietary-design non-methane hydrocarbon cutter. The cutter oxidizes all hydrocarbons except methane. The methane-containing gas stream is then sent to a FID that determines methane concentration. VOCs reported in this report are non-methane hydrocarbons.

### **3.9 Metals**

EPA Method 29 was used to determine metals (Pb and Mn) emissions. The test apparatus consisted of a glass nozzle, a heated glass-lined probe, a heated 83-mm quartz fiber filter, four chilled impingers, and a metering console. The samples were withdrawn isokinetically from the source. Particulate emissions were collected in the probe and on the heated filter, and the

gaseous emissions were then collected in an aqueous acidic solution of hydrogen peroxide in order to measure lead and manganese emissions. The recovered samples were digested and analyzed at the laboratory. Three test runs were performed at the baghouse stack outlet. Figure 3-4 is a schematic of the Method 29 sampling train.

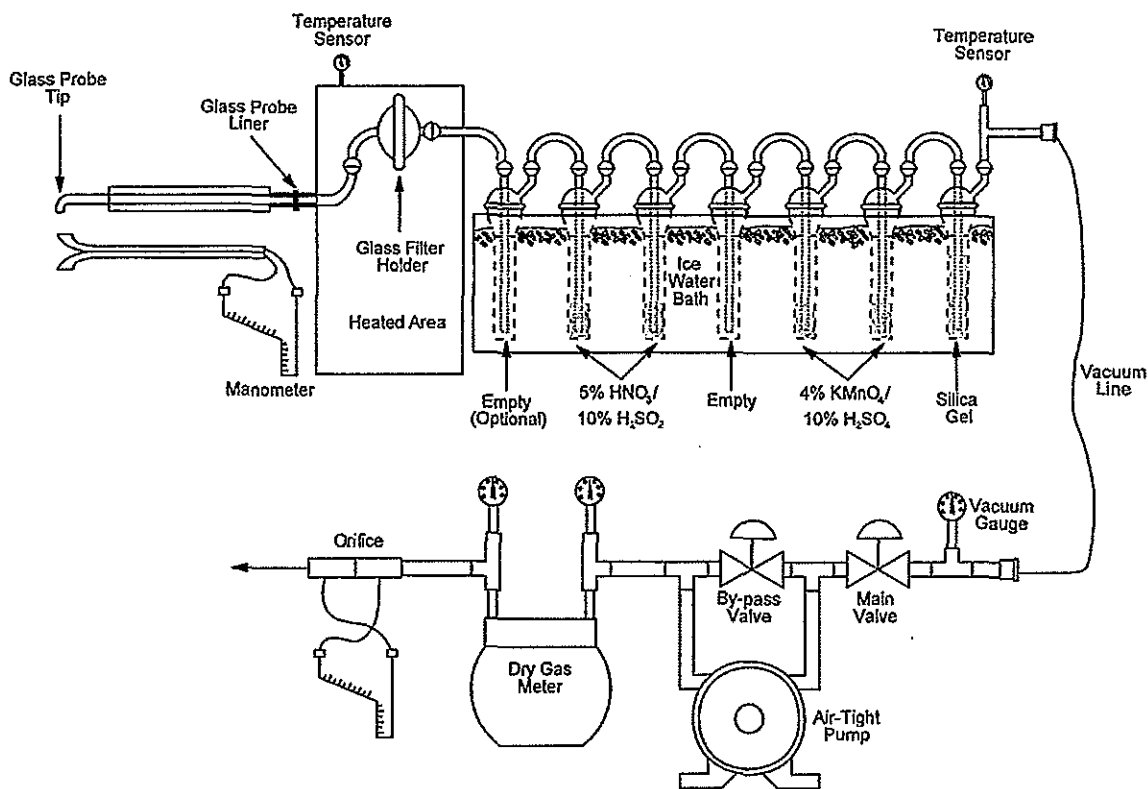


Figure 3-4. Method 5/29 Sampling Train

### 3.10 Opacity

EPA Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources," was used to measure visible emissions from the C-Blast Furnace baghouse exhaust for the test program. During each particulate measurement run, plume opacity was recorded every 15 seconds (four readings per minute) for 60 minutes.

### 3.11 Test Comments

1. The methane correction via the 109A analyzer was verbally allowed by MDEQ on site. Methane correction was used on the VOC emissions.

2. If EQM had completed a full traverse with the sampling prior to the cast being completed, the traverse was restarted at Point 1. Sampling was continued until the cast was completed. All traverse points sampled were used in the velocity calculations.
3. During the first analysis of the metals samples, the Laboratory Control Sample (LCS) and the Laboratory Control Sample Duplicate (LCSD) recoveries were below the laboratory control limits. Therefore, the laboratory reanalyzed the samples. The second analysis set met all of the laboratory QA/QC requirements and was used in the emission calculations. Both sets of analysis are presented in Appendix C. The first analysis of the samples included the audit samples for lead and manganese. The audit results were within the acceptable range and are presented in Appendix C.

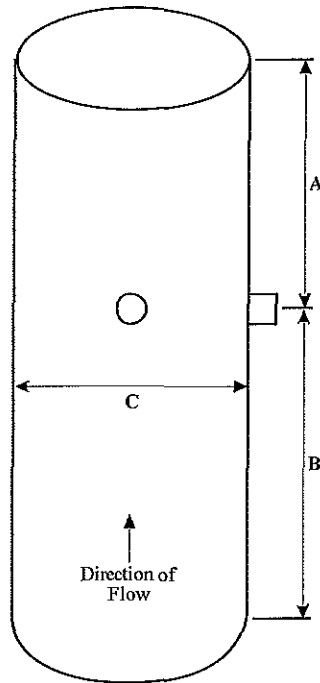
#### **4. PROCESS DESCRIPTION/SAMPLING LOCATIONS**

Molten iron (hot metal) is produced in the blast furnaces 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 and pulverized coal 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 C Blast Furnace are captured by collection hoods and routed to a baghouse that is used to control particulate emissions from the process. Figure 4-1 presents the sampling location.





<b>Location</b>	<b>Upstream A</b>	<b>Downstream B</b>	<b>Inside Diameter C</b>
C Blast Furnace Baghouse	>37 ft	>148 ft	152 in.
4 Sampling Ports	Three Traverse Points per Port		12 Total Sampling Points
Traverse Pt 1: 20.69 in.	Travers Pt 2: 36.19 in.		Traverse Pt 3: 58.99 in.

**Figure 4-1. Sampling Location**

## 5. QUALITY ASSURANCE AND QUALITY CONTROL

The field sampling quality assurance for this project included the use of calibrated source sampling equipment, reference test methods, and traceability protocols for recording and calculating data. The analytical quality assurance includes use of validated analytical procedures, calibration of equipment, and analysis of control samples and blanks. The calibration and quality control procedures used for this test program are described in the following subsection.

### 5.1 Calibration Procedures and Frequency

All manual stack gas sampling equipment is calibrated before the start of the test program in accordance with the procedures outlined in the *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III*, EPA-600/4-72-027B. Table 5-1 is a summary of the stack gas sampling equipment calibrations that are performed in preparation for this project. The meter boxes are re-calibrated after the test.

Table 5-2 lists additional calibration checks performed on the sampling equipment on site, just prior to the testing, to ensure that equipment was not damaged during transport. Table 5-3 details the field checks conducted on the continuous emission monitoring systems before and during the test program.

**Table 5-1. Field Equipment Calibration Summary<sup>a</sup>**

Equipment	Calibrated Against	Allowable Error
Method 5 meter box	Reference test meter	Y ±0.02 Y ΔH@ ±0.20 ΔH@ post-test Y ±0.05 Y
Pitot tube	Geometric specifications	See EPA Method 2
Thermocouple	ASTM-3F thermometer	±1.5%
Impinger (or condenser thermometer)	ASTM-3F	±2°F
Dry gas meter thermometer	ASTM-3F	±5°F
Probe nozzles	Caliper	±0.004 in.
Barometer	NBS traceable barometer	±0.1 in. Hg

<sup>a</sup>As recommended in the *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III. Stationary Source-Specific Methods*. EPA-600/4-77-027b, August 1977.

**Table 5-2. Field Checks of Sampling Equipment**

Equipment	Checked Against	Allowable Difference
Pitot tube	Inspection	No visible damage
Thermocouples	ASTM 2F or 3F	±1.5%
Probe nozzles	Caliper	±0.004 in.

**Table 5-3. Field Checks of O<sub>2</sub>, CO<sub>2</sub>, CO, NO<sub>x</sub>, and VOC Analyzers**

Calibration	Instrument Check	Acceptable Limit
Initial Calibration	O <sub>2</sub> , CO <sub>2</sub> , CO, & NO <sub>x</sub> Calibration Error, % Span	±2%
	VOC Calibration Error, % Calibration Gas Value	±5%
	Sampling System Bias	±5% of Span
Daily Calibration	O <sub>2</sub> , CO <sub>2</sub> , CO, & NO <sub>x</sub> Calibration Error, % Span	±2%
	VOC Calibration Error, % Calibration Gas Value	±3%
	O <sub>2</sub> , CO <sub>2</sub> , CO, & NO <sub>x</sub> Drift, % Span	±3% of Span