



EMISSIONS COMPLIANCE TEST

Performed At

**Flat Rock Metals, Inc.
EUROUGHLINE 1, 2 and 3
Flat Rock, Michigan**

Test Dates

November 7 through 10, 2023

Report No.

TRC Environmental Corporation Report 559670

Report Submittal Date

January 8, 2024

TRC Environmental Corporation
207C Eisenhower Lane South
Lombard, Illinois 60148
USA

T 312-533-2042



Report Certification

I certify that to the best of my knowledge:

- Testing data and all corresponding information have been checked for accuracy and completeness.
- Sampling and analysis have been conducted in accordance with the approved protocol and applicable reference methods (as applicable).
- All deviations, method modifications, or sampling and analytical anomalies are summarized in the appropriate report narrative(s).

A handwritten signature in black ink that reads "Anthony Sakellariou".

Anthony Sakellariou
Senior Project Manager

January 8, 2024

Date

TRC was operating in conformance with the requirements of ASTM D7036-04 during this test program.

A handwritten signature in black ink that reads "Bruce Randall".

Bruce Randall
TRC Emission Testing Technical Director



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EMISSIONS COMPLIANCE TEST

1.0 INTRODUCTION

TRC Environmental Corporation (TRC) performed an emissions compliance test program on the EUROUGHLINE 1, 2 and 3 of Flat Rock Metals, Inc. in Flat Rock, Michigan on November 7 through 10, 2023. The tests were authorized by and performed for Flat Rock Metals, Inc.

The purpose of this test program was to determine total particulate matter (PM, Method 201A and condensable) and nickel (Ni) emission rates of the pollutants during specific operating conditions. The results of the test program will be used in order to determine compliance with permitted limits. The test program was conducted according to the TRC Test Protocol dated October 9, 2023.

1.1 Project Contact Information

Participants		
Test Facility	Flat Rock Metals, Inc. 26601 West Huron Drive Flat Rock, Michigan 48614	Mr. Greg Zang Operations Manager 734-782-4454 ext. 2348 (phone) gregz@frm.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 207C Eisenhower Lane South Lombard, Illinois 60148	Mr. David Wells Senior Project Manager 312-533-2037 (phone) dwells@trccompanies.com

Beck Heil, Ryan Novosel and David Wells of TRC conducted the testing. Documentation of the on-site ASTM D7036-04 Qualified Individual(s) (QI) can be located in the appendix to this report.

Mr. Andrew Riley from the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) observed the testing.



1.2 Facility and Process Description

Flat Rock Metals, Inc. operates three belt grinding lines, termed Rough Lines, at their facility in Flat Rock, Michigan. The lines utilize a series of abrasive belts with decreasing grit to smooth steel sheets for further processing into truck bumpers. The three Rough Lines use three separate wet type dust collectors to control particulate and metal emissions. The facility is permitted under Permit to Install (PTI) 71-98A issued by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) – Air Quality Division (AQD) on May 30, 2023. The three Rough Lines are identified as EUROUGHLINE1, EUROUGHLINE2, and EUROUGHLINE3 in PTI 71-98A, and requirements for the three lines are grouped into FGROUGHLINES.

2.0 SUMMARY OF RESULTS

The results of this test program are summarized in the table below. Detailed individual run results are presented in Section 6.0.

Unit ID	Pollutant Tested		Measured Emissions	Permitted Emission Limit
EUROUGHLINE 1	Total PM	lb/hr	0.753	2.57
		lbs/1000 lbs of exhaust gas	0.0062	0.014*
	PM ₁₀ , lb/hr		0.544	0.95
	PM _{2.5} , lb/hr		0.403	0.50
EUROUGHLINE 2	Total PM	lb/hr	0.437	2.57
		lbs/1000 lbs of exhaust gas	0.0046	0.014*
	PM ₁₀ , lb/hr		0.351	0.95
	PM _{2.5} , lb/hr		0.261	0.50
EUROUGHLINE 3	Total PM	lb/hr	0.492	2.57
		lbs/1000 lbs of exhaust gas	0.0043	0.014*
	PM ₁₀ , lb/hr		0.385	0.95
	PM _{2.5} , lb/hr		0.368	0.50
	Nickel	lb/hr	5.64E-04	0.003
		ton/year	2.47E-03	0.012



* Permit limits for the Total PM in lbs/1000 lbs of exhaust gas have been updated in the table above to correct an error identified in PTI 71-98A. The permit limit of 0.00008 lb/1000 lbs of exhaust gas listed in PTI 71-98A FGROUGHLINES.I.1 has been identified as an error as confirmed by EGLE-AQD via email from Sam Liveson on December 18, 2023. Flat Rock Metals, Inc. has requested a supplemental revision to PTI 71-98A to correct the limit to 0.014 lb/1000 lbs exhaust gas as listed in the table above.

The table below summarizes the test methods used, as well as the number and duration at each test location:

Unit ID/ Sample Location	Parameter Measured	Test Method(s)	No. of Runs	Run Duration
EUROUGHLINE 1, 2 and 3	Volumetric Flowrate Filterable PM Condensable PM	USEPA 1, 2, 201A, 202	3	86 – 120 mins
EUROUGHLINE 3	Volumetric Flowrate Nickel	USEPA 1, 2, 29	3	120 mins

3.0 DISCUSSION OF RESULTS

No problems were encountered with the testing equipment during the test program. Source operation appeared normal during the entire test program. No changes or problems were encountered that required modification of any procedures presented in the test plan. No adverse test or environmental conditions were encountered during the conduct of this test program. Unit operating was recorded by plant personnel and appended to the report.

4.0 SAMPLING AND ANALYSIS PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed in accordance with the methods presented in the following sections. Where applicable, the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, USEPA 600/R-94/038c, September 1994 was used to supplement procedures.



4.1 Determination of Sample Point Locations by USEPA Method 1

This method is applicable to gas streams flowing in ducts, stacks, and flues and is designed to provide guidance for the selection of sampling ports and traverse points at which sampling for air pollutants will be performed. Sample ports must be located at least two duct diameters downstream and a half a duct diameter upstream from any flow disturbance.

The cross-section of the measurement site was divided into a number of equal areas, and the traverse points were located in the center of each area. The minimum number of points were determined from Figure 1-1 (particulate) of the Method.

4.2 Volumetric Flow Rate Determination by USEPA Method 2

This method is applicable for the determination of the average velocity and the volumetric flow rate of a gas stream.

The gas velocity head (ΔP) and temperature were measured at traverse points defined by USEPA Method 1. The velocity head was measured with a Type S (Stausscheibe or reverse type) pitot tube and oil-filled manometer; and the gas temperature was measured with a Type K thermocouple. The average gas velocity in the flue was calculated based on: the gas density; the flue gas pressure; the average of the square roots of the velocity heads at each traverse point, and the average flue gas temperature.

Since the test source was essentially comprised of air, an analysis of oxygen (O_2) and carbon dioxide (CO_2) was not conducted and a dry molecular weight of 29.0 was used per USEPA Method 2 Section 8.6.

4.3 Filterable PM_{10} and $PM_{2.5}$ Determination by USEPA Method 201A

This method applies to the in-stack measurement of filterable Particulate Matter (PM) emissions equal to or less than an aerodynamic diameter of nominally 10 μm (PM_{10}) and/or 2.5 μm ($PM_{2.5}$) from stationary sources. The EPA defines primary PM as particulate that enters the atmosphere directly from a source and is composed of two components: filterable PM and condensable PM. If the filtration temperature exceeds 30°C (85°F), and total primary PM must be measured, then this method must be combined with Method 202, 40CFR51 Appendix M. If the filtration temperature never exceeds 30°C (85°F), then Method 202 is not required to measure total primary PM.

Flue gas was withdrawn from the source at a predetermined constant flow rate through an in-stack sizing device and filter. The sizing device consisted of a PM_{10} cyclone and a $PM_{2.5}$ cyclone in series. The mass of each size fraction was determined gravimetrically after the removal of uncombined water. USEPA Methods 2-4 were performed concurrently as an integral part of these determinations.



4.4 Condensable PM Determination by USEPA Method 202

This method is applicable for the determination of condensable particulate matter (CPM) from stationary sources. CPM is measured in the emissions after removal from the stack and after passing through a filter.

The CPM was collected in dry impingers after filterable particulate material had been collected on filters maintained above 30°C (85°F) using the previously identified Method. The CPM sample train included a Method 23 type condenser capable of cooling the stack gas to less than 85°F, followed by a water dropout impinger. One modified Greenburg Smith impinger and a CPM filter followed the water dropout impinger. Prior to recovery, the impinger contents were immediately purged after the run with nitrogen (N₂) to remove dissolved sulfur dioxide. The impinger solution was then extracted with hexane, and the CPM filter was extracted with water and hexane. The organic and aqueous fractions were then taken to dryness and the residues weighed. A correction, if necessary, was made for any ammonia present due to laboratory analysis procedures. The total of all fractions represented the CPM.

4.5 Trace Metals Determination by USEPA Method 29

This method is applicable for the determination of metals emissions from stationary sources. This method may be used to determine particulate emissions in addition to the metals emissions if the prescribed procedures and precautions are followed. USEPA Methods 2-4 were performed concurrently with, and as an integral part of these determinations.

Flue gas was withdrawn isokinetically from the source at traverse points determined per USEPA Method 1 through a nozzle, probe liner, glass fiber filter and a series of impingers. The probe liner and filter were maintained at a temperature of 120±14°C (248 + 25°F). Particle-bound metals were collected in the nozzle, probe on the filter. Gaseous metals were collected in a solution of nitric acid and hydrogen peroxide.

The recovered samples were analyzed using the techniques identified in the appended analytical report.



5.0 QUALITY ASSURANCE PROCEDURES

TRC integrates our Quality Management System (QMS) into every aspect of our testing service. We follow the procedures specified in current published versions of the test Method(s) referenced in this report. Any modifications or deviations are specifically identified in the body of the report. We routinely participate in independent, third party audits of our activities, and maintain:

- Accreditation from the Louisiana Environmental Laboratory Accreditation Program (LELAP);
- Accreditation from the Stack Testing Accreditation Council (STAC) and the American Association for Laboratory Accreditation (A2LA) that our operations conform with the requirements of ASTM D 7036 as an Air Emission Testing Body (AETB).

These accreditations demonstrate that our systems for training, equipment maintenance and calibration, document control and project management will fully ensure that project objectives are achieved in a timely and efficient manner with a strict commitment to quality.

All calibrations are performed in accordance with the test Method(s) identified in this report. If a Method allows for more than one calibration approach, or if approved alternatives are available, the calibration documentation in the appendices specifies which approach was used. All measurement devices are calibrated or verified at set intervals against standards traceable to the National Institute of Standards and Technology (NIST). NIST traceability information is available upon request.

ASTM D7036-04 specifies that: *“AETBs shall have and shall apply procedures for estimating the uncertainty of measurement. Conformance with this section may be demonstrated by the use of approved test protocols for all tests. When such protocols are used, reference shall be made to published literature, when available, where estimates of uncertainty for test methods may be found.”* TRC conforms with this section by using approved test protocols for all tests.



6.0 TEST RESULTS SUMMARIES



METHOD 201A/202 PARTICULATE TEST RESULTS SUMMARY

Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit: Line 1 Stack

Test Run Number	1	2	3	Average
Source Condition	Normal	Normal	Normal	
Date	11/7/2023	11/7/2023	11/7/2023	
Start Time	7:55	10:58	13:34	
End Time	10:01	12:34	15:08	
Average Gas Velocity, ft/sec	99.41	95.51	95.28	96.74
Average Gas Temperature, °F	74.1	73.0	73.8	73.6
Flue Gas Moisture, percent by volume	2.0	1.8	1.9	1.9
Average Flue Pressure, in. Hg	29.23	29.23	29.23	
Barometric Pressure, in. Hg	29.10	29.10	29.10	
Dry Molecular Wt. of Gas, lb/lb-mole	29.00	29.00	29.00	29.00
*Gas Sample Volume, dscf	54.605	39.702	40.733	
Particle Cut Diameter for Cyclone I, D50 (PM ₁₀)	9.70	9.65	9.68	9.67
Particle Cut Diameter for Cyclone IV, D50 (PM _{2.5})	2.01	2.00	2.00	2.00
Isokinetic Variance (%)	100.5	105.3	105.2	
Measured Volumetric Flow Rate:				
Gas Volumetric Flow Rate, acfm	29,280	28,130	28,063	28,491
*Gas Volumetric Flow Rate, scfm	28,274	27,219	27,112	27,535
*Gas Volumetric Flow Rate, dscfm	27,716	26,730	26,607	27,018
Total Primary PM, Filterable and Condensable				
net mass, milligrams	8.90	7.90	11.10	9.30
*grains/dscf	0.0025	0.0031	0.0042	0.0033
lb/hr	0.598	0.704	0.959	0.753
lbs/1000 lbs Exhaust Gas	0.0048	0.0058	0.0080	0.0062
Total Primary PM₁₀, Filterable and Condensable				
net mass, milligrams	6.90	7.00	6.30	6.73
*grains/dscf	0.0020	0.0027	0.0024	0.0024
lb/hr	0.463	0.623	0.544	0.544
Total Primary PM_{2.5}, Filterable and Condensable				
net mass, milligrams	5.30	5.90	3.80	5.00
*grains/dscf	0.0015	0.0023	0.0014	0.0017
lb/hr	0.356	0.525	0.328	0.403



METHOD 201A/202 PARTICULATE TEST RESULTS SUMMARY

Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit: Line 1 Stack

Test Run Number	1	2	3	Average
Source Condition	Normal	Normal	Normal	
Date	11/7/2023	11/7/2023	11/7/2023	
Start Time	7:55	10:58	13:34	
End Time	10:01	12:34	15:08	
Average Gas Velocity, ft/sec	99.41	95.51	95.28	96.74
Average Gas Temperature, °F	74.1	73.0	73.8	73.6
Flue Gas Moisture, percent by volume	2.0	1.8	1.9	1.9
Average Flue Pressure, in. Hg	29.23	29.23	29.23	
Barometric Pressure, in. Hg	29.10	29.10	29.10	
Dry Molecular Wt. of Gas, lb/lb-mole	29.00	29.00	29.00	29.00
*Gas Sample Volume, dscf	54.605	39.702	40.733	
Particle Cut Diameter for Cyclone I, D50 (PM ₁₀)	9.70	9.65	9.68	9.67
Particle Cut Diameter for Cyclone IV, D50 (PM _{2.5})	2.01	2.00	2.00	2.00
Isokinetic Variance (%I)	100.5	105.3	105.2	
Measured Volumetric Flow Rate:				
Gas Volumetric Flow Rate, acfm	29,280	28,130	28,063	28,491
*Gas Volumetric Flow Rate, scfm	28,274	27,219	27,112	27,535
*Gas Volumetric Flow Rate, dscfm	27,716	26,730	26,607	27,018
Total Filterable PM:				
net mass, milligrams	4.40	4.40	9.00	5.93
*grains/dscf	0.0012	0.0017	0.0034	0.0021
lb/hr	0.295	0.392	0.778	0.488
Total Filterable PM₁₀:				
net mass, milligrams	2.40	3.50	4.20	3.37
*grains/dscf	0.0007	0.0014	0.0016	0.0012
lb/hr	0.161	0.312	0.363	0.279
Total Filterable PM_{2.5}:				
net mass, milligrams	0.80	2.40	1.70	1.63
*grains/dscf	0.0002	0.0009	0.0006	0.0006
lb/hr	0.054	0.214	0.147	0.138
Condensable PM				
Total Condensable				
net mass, milligrams	4.50	3.50	2.10	3.37
*grains/dscf	0.0013	0.0014	0.0008	0.0011
lb/hr	0.302	0.312	0.181	0.265

*Standard conditions of 29.92 in/Hg and 68° F



METHOD 201A/202 PARTICULATE TEST RESULTS SUMMARY

Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit: Line 2 Stack

Test Run Number	1	2	3	Average
Source Condition	Normal	Normal	Normal	
Date	11/8/2023	11/8/2023	11/8/2023	
Start Time	8:51	10:45	12:53	
End Time	10:22	12:14	14:27	
Average Gas Velocity, ft/sec	58.84	57.43	58.50	58.26
Average Gas Temperature, °F	72.9	75.3	74.6	74.3
Flue Gas Moisture, percent by volume	1.8	1.4	1.2	1.5
Average Flue Pressure, in. Hg	29.40	29.40	29.40	
Barometric Pressure, in. Hg	29.35	29.35	29.35	
Dry Molecular Wt. of Gas, lb/lb-mole	29.00	29.00	29.00	29.00
*Gas Sample Volume, dscf	39.394	37.742	39.973	
Particle Cut Diameter for Cyclone I, D50 (PM ₁₀)	9.81	10.11	10.12	10.01
Particle Cut Diameter for Cyclone IV, D50 (PM _{2.5})	2.03	2.11	2.11	2.08
Isokinetic Variance (%)	108.4	107.0	104.9	
Measured Volumetric Flow Rate:				
Gas Volumetric Flow Rate, acfm	22,261	21,727	22,131	22,040
*Gas Volumetric Flow Rate, scfm	21,670	21,056	21,477	21,401
*Gas Volumetric Flow Rate, dscfm	21,276	20,763	21,227	21,088
Total Primary PM, Filterable and Condensable				
net mass, milligrams	5.20	7.20	5.90	6.10
*grains/dscf	0.0020	0.0029	0.0023	0.0024
lb/hr	0.371	0.524	0.414	0.437
lbs/1000 lbs Exhaust Gas	0.0039	0.0056	0.0043	0.0046
Total Primary PM₁₀, Filterable and Condensable				
net mass, milligrams	4.20	5.90	4.60	4.90
*grains/dscf	0.0016	0.0024	0.0018	0.0019
lb/hr	0.300	0.429	0.323	0.351
Total Primary PM_{2.5}, Filterable and Condensable				
net mass, milligrams	3.30	4.90	2.70	3.63
*grains/dscf	0.0013	0.0020	0.0010	0.0014
lb/hr	0.236	0.357	0.190	0.261



METHOD 201A/202 PARTICULATE TEST RESULTS SUMMARY

Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit: Line 2 Stack

Test Run Number	1	2	3	Average
Source Condition	Normal	Normal	Normal	
Date	11/8/2023	11/8/2023	11/8/2023	
Start Time	8:51	10:45	12:53	
End Time	10:22	12:14	14:27	
Average Gas Velocity, ft/sec	58.84	57.43	58.50	58.26
Average Gas Temperature, °F	72.9	75.3	74.6	74.3
Flue Gas Moisture, percent by volume	1.8	1.4	1.2	1.5
Average Flue Pressure, in. Hg	29.40	29.40	29.40	
Barometric Pressure, in. Hg	29.35	29.35	29.35	
Dry Molecular Wt. of Gas, lb/lb-mole	29.00	29.00	29.00	29.00
*Gas Sample Volume, dscf	39.394	37.742	39.973	
Particle Cut Diameter for Cyclone I, D50 (PM ₁₀)	9.81	10.11	10.12	10.01
Particle Cut Diameter for Cyclone IV, D50 (PM _{2.5})	2.03	2.11	2.11	2.08
Isokinetic Variance (%I)	108.4	107.0	104.9	
Measured Volumetric Flow Rate:				
Gas Volumetric Flow Rate, acfm	22,261	21,727	22,131	22,040
*Gas Volumetric Flow Rate, scfm	21,670	21,056	21,477	21,401
*Gas Volumetric Flow Rate, dscfm	21,276	20,763	21,227	21,088
Total Filterable PM:				
net mass, milligrams	3.00	4.20	3.90	3.70
*grains/dscf	0.0012	0.0017	0.0015	0.0015
lb/hr	0.214	0.306	0.274	0.265
Total Filterable PM₁₀:				
net mass, milligrams	2.00	2.90	2.60	2.50
*grains/dscf	0.0008	0.0012	0.0010	0.0010
lb/hr	0.143	0.211	0.183	0.179
Total Filterable PM_{2.5}:				
net mass, milligrams	1.10	1.90	0.70	1.23
*grains/dscf	0.0004	0.0008	0.0003	0.0005
lb/hr	0.079	0.138	0.049	0.089
Condensable PM				
Total Condensable				
net mass, milligrams	2.20	3.00	2.00	2.40
*grains/dscf	0.0009	0.0012	0.0008	0.0010
lb/hr	0.157	0.218	0.140	0.172

*Standard conditions of 29.92 in/Hg and 68° F



METHOD 201A/202 PARTICULATE TEST RESULTS SUMMARY

Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit: Line 3 Stack

Test Run Number	1	2	3	Average
Source Condition	Normal	Normal	Normal	
Date	11/9/2023	11/9/2023	11/9/2023	
Start Time	7:54	10:20	12:38	
End Time	9:33	11:57	14:15	
Average Gas Velocity, ft/sec	47.66	46.71	47.07	47.15
Average Gas Temperature, °F	73.0	72.9	70.1	72.0
Flue Gas Moisture, percent by volume	1.4	2.3	1.9	1.9
Average Flue Pressure, in. Hg	29.21	29.14	29.14	
Barometric Pressure, in. Hg	29.25	29.18	29.18	
Dry Molecular Wt. of Gas, lb/lb-mole	29.00	29.00	29.00	29.00
*Gas Sample Volume, dscf	36.416	39.842	39.461	
Particle Cut Diameter for Cyclone I, D50 (PM ₁₀)	10.83	10.04	10.00	10.29
Particle Cut Diameter for Cyclone IV, D50 (PM _{2.5})	2.33	2.09	2.08	2.17
Isokinetic Variance (%I)	96.5	109.2	108.6	
Measured Volumetric Flow Rate:				
Gas Volumetric Flow Rate, acfm	26,720	26,184	26,390	26,431
*Gas Volumetric Flow Rate, scfm	25,844	25,269	25,604	25,572
*Gas Volumetric Flow Rate, dscfm	25,470	24,688	25,130	25,096
Total Primary PM, Filterable and Condensable				
net mass, milligrams	6.80	5.50	4.70	5.67
*grains/dscf	0.0029	0.0021	0.0018	0.0023
lb/hr	0.629	0.451	0.396	0.492
lbs/1000 lbs Exhaust Gas	0.0055	0.0040	0.0035	0.0043
Total Primary PM₁₀, Filterable and Condensable				
net mass, milligrams	6.20	3.50	3.50	4.40
*grains/dscf	0.0026	0.0014	0.0014	0.0018
lb/hr	0.574	0.287	0.295	0.385
Total Primary PM_{2.5}, Filterable and Condensable				
net mass, milligrams	6.20	3.50	2.90	4.20
*grains/dscf	0.0026	0.0014	0.0011	0.0017
lb/hr	0.574	0.287	0.244	0.368



METHOD 201A/202 PARTICULATE TEST RESULTS SUMMARY

Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit: Line 3 Stack

Test Run Number	1	2	3	Average
Source Condition	Normal	Normal	Normal	
Date	11/9/2023	11/9/2023	11/9/2023	
Start Time	7:54	10:20	12:38	
End Time	9:33	11:57	14:15	
Average Gas Velocity, ft/sec	47.66	46.71	47.07	47.15
Average Gas Temperature, °F	73.0	72.9	70.1	72.0
Flue Gas Moisture, percent by volume	1.4	2.3	1.9	1.9
Average Flue Pressure, in. Hg	29.21	29.14	29.14	
Barometric Pressure, in. Hg	29.25	29.18	29.18	
Dry Molecular Wt. of Gas, lb/lb-mole	29.00	29.00	29.00	29.00
*Gas Sample Volume, dscf	36.416	39.842	39.461	
Particle Cut Diameter for Cyclone I, D50 (PM ₁₀)	10.83	10.04	10.00	10.29
Particle Cut Diameter for Cyclone IV, D50 (PM _{2.5})	2.33	2.09	2.08	2.17
Isokinetic Variance (%I)	96.5	109.2	108.6	
Measured Volumetric Flow Rate:				
Gas Volumetric Flow Rate, acfm	26,720	26,184	26,390	26,431
*Gas Volumetric Flow Rate, scfm	25,844	25,269	25,604	25,572
*Gas Volumetric Flow Rate, dscfm	25,470	24,688	25,130	25,096
Total Filterable PM:				
net mass, milligrams	3.80	4.00	3.10	3.63
*grains/dscf	0.0016	0.0015	0.0012	0.0015
lb/hr	0.352	0.328	0.261	0.314
Total Filterable PM₁₀:				
net mass, milligrams	3.20	2.00	1.90	2.37
*grains/dscf	0.0014	0.0008	0.0007	0.0010
lb/hr	0.296	0.164	0.160	0.207
Total Filterable PM_{2.5}:				
net mass, milligrams	3.20	2.00	1.30	2.17
*grains/dscf	0.0014	0.0008	0.0005	0.0009
lb/hr	0.296	0.164	0.110	0.190
Condensable PM				
Total Condensable				
net mass, milligrams	3.00	1.50	1.60	2.03
*grains/dscf	0.0013	0.0006	0.0006	0.0008
lb/hr	0.278	0.123	0.135	0.178

*Standard conditions of 29.92 in/Hg and 68° F



Method 29 Metals Test Results Summary

Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit: Line 3
 Location: Stack

Run No:	1	2	3	Average
Date:	11/10/2023	11/10/2023	11/10/2023	
Start Time:	12:51	15:13	17:28	
End Time:	14:54	17:16	19:31	
Run Duration (min):	120.0	120.0	120.0	
Fixed Gas Content:				
Fractional Moisture Content:	0.014	0.015	0.016	0.015
Sample Volume, V _{m(std)}				
(dry std ft ³):	80.242	77.575	77.114	78.310
(dry std m ³):	2.272	2.197	2.184	2.218
Measured Volumetric Flow Rate				
Q _{std} (std ft ³ /min):	25,961	25,863	25,945	25,923
Q _{std(dry)} (dry std ft ³ /min):	25,599	25,467	25,535	25,533
Net Mass Collected (µg)				
Nickel:	24.76	7.47	7.40	¹ 13.21 ^{DLL}
Metals Concentration (µg/dscm)				
Nickel:	1.09E+01	3.40E+00	3.39E+00	¹ 5.90E+00 ^{DLL}
Metals Emission Rate (lb/hr)				
Nickel:	1.04E-03	3.24E-04	3.24E-04	¹ 5.64E-04 ^{DLL}
Metals Emission Rate (tons/year)				
Nickel:	4.58E-03	1.42E-03	1.42E-03	¹ 2.47E-03 ^{DLL}
Isokinetic Variation (%):	108.6	105.5	104.6	106.2

Nickel tons/year = lb/hr × 730 hr/month × 12 months/year

1 - The mass at least one of the sample fractions was below the analytical detection limit

DLL - at least one, but not all values used to calculate and report an in-stack emissions value are greater than the laboratory's reported detection level(s)

English Units: Standard conditions of 29.92 inHg and 68° F

Metric Units: Standard conditions of 760 mmHg and 20° C

APPENDIX

AETB and QI Information Summary



Facility Name:	Flat Rock Metals, Inc.
Location:	EUROUGHLINE 1, 2 and 3
Test Date:	November 7 through 10, 2023

Test Parameters:	1, 2, 201A, 202, 29
QI Last Name:	Wells
QI First Name:	David
QI Middle Initial:	----
AETB Name:	TRC Environmental Corporation
AETB Phone No:	312-533-2037
AETB Email:	dwells@trccompanies.com
Group 1 Exam Date:	10/11/2022
Provider Name:	Source Evaluation Society
Provider Email:	gstiprogram@gmail.com

This is to Certify that:

David Wells

Is a Qualified Individual as defined in Section 8.3 of ASTM D7036-04 for the following test methods:

EPA Methods 1, 1A, 2, 2A, 2C, 2D, 2F, 2G, 2H, 3, 3B, 4, 5, 5A, 5B, 5D, 5E, 5F, 5i, 17, 19, 201A, and 202.

The individual has met the minimum experience requirements defined in Section 8.3.4.2 of ASTM D7036-04 and has successfully passed a comprehensive examination for the test methods designated above.

This certification is effective until: 10-11-2027



Edward J MacKinnon
Air Measurements Practice Quality Manager

Date of Issue: 11-14-2022

Certificate Number: 01897



This certificate is the exclusive property of TRC and is non-transferable.

FRM TRC Stack Testing from week of 11/6/23

Date	Line	Test	Start	Stop	Run minutes	Gage	Width	Length	Sheet weight		# os sheets ran	weight processed		Tons Processed
									lbs	Pressure drop		lbs		
11/7/2023	Combo 1	1	7:55	10:01	126	0.063	40.59	72.95	52.8	8.3	720	38050.8	19.0	
		2	10:58	12:34	96	0.063	40.59	72.95	52.8	8.3	549	29020.1	14.5	
		3	13:34	15:08	94	0.063	40.59	72.95	52.8	8.3	766	40507.2	20.3	
11/8/2023	Combo 2	1	7:54	9:33	99	0.061	25.075	94.0	40.7	12.7	615	25042.2	12.5	
		2	10:20	11:56	96	0.061	32.5	99.5	55.9	12.7	596	33315.5	16.7	
		3	12:38	14:15	97	0.061	32.5	99.5	55.9	12.7	602	33662.5	16.8	
11/9/2023	Combo 3	1	7:54	9:53	119	0.069	25.5	100.5	50.1	9.2	476	23845.6	11.9	
		2	10:20	11:56	96	0.069	25.5	100.5	50.1	9.2	384	19236.8	9.6	
		3	12:38	14:15	97	0.069	25.5	100.5	50.1	9.2	388	19437.2	9.7	
11/10/2023	Combo 3	1	12:51	14:54	123	0.069	25.5	100.5	50.1	9.5	492	24647.2	12.3	
		2	15:13	17:16	123	0.069	25.5	100.5	50.1	9.5	492	24647.2	12.3	
		3	17:28	19:31	123	0.069	25.5	100.5	50.1	9.5	492	24647.2	12.3	

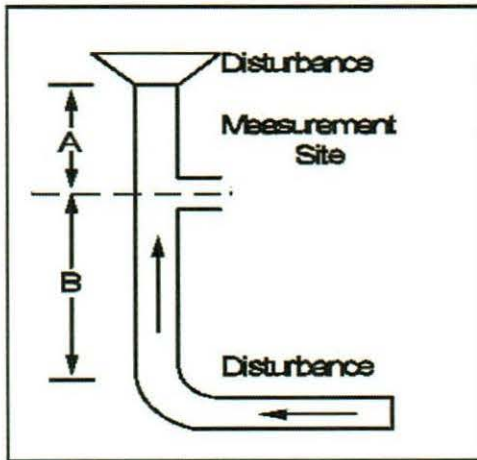
Sample Location Information for Particulate and Velocity Traverses - Round Ducts

Project #: 559670
 Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit ID: Line 1
 Sample Location: Stack

Duct Diameter: 30 inches 2.50 feet
 # of Ports Used: 2
 # of Points/Diameter: 6
 Sample Plane: Horizontal
 Port Type: Nipple
 Port Length: 4.0 inches
 Port Inside Diameter: 6.0 inches

Distance A: 2.10 Feet, 0.84 Duct diameters
 Distance B: 5.00 Feet, 2.00 Duct diameters
 Meets Method 1 criteria

Traverse Point Locations



Point	% of diameter	Inches from wall	Inches from port edge
1	4.4	1.3	5.3
2	14.6	4.4	8.4
3	29.6	8.9	12.9
4	70.4	21.1	25.1
5	85.4	25.6	29.6
6	95.6	28.7	32.7

Pre-cyclonic flow check conducted? Yes

Pre-Test Cyclonic Flow Check Data

Point #	Port:			Port:			Port:			Port:		
	ΔP ("H ₂ O)	Ts (°F)	a (°)	ΔP ("H ₂ O)	Ts (°F)	a (°)	ΔP ("H ₂ O)	Ts (°F)	a (°)	ΔP ("H ₂ O)	Ts (°F)	a (°)
1	-	-	15	-	-	10	-	-	-	-	-	-
2	-	-	10	-	-	15	-	-	-	-	-	-
3	-	-	5	-	-	15	-	-	-	-	-	-
4	-	-	20	-	-	15	-	-	-	-	-	-
5	-	-	15	-	-	10	-	-	-	-	-	-
6	-	-	15	-	-	10	-	-	-	-	-	-

Average a: 12.9 (°) Average Ts: _____ (°F) Average ΔP : _____ ("H₂O)
 Status: Pass Avg of sqrt ΔP : _____

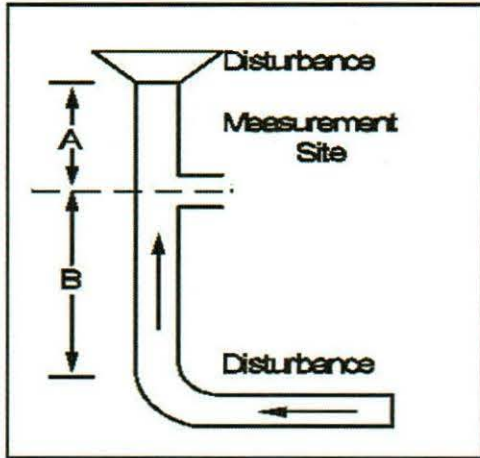
Sample Location Information for Particulate and Velocity Traverses - Round Ducts

Project #: 559670
 Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit ID: Line 2
 Sample Location: Stack

Duct Diameter: 34 inches 2.83 feet
 # of Ports Used: 2
 # of Points/Diameter: 6
 Sample Plane: Horizontal
 Port Type: Flange
 Port Length: 4.0 inches
 Port Inside Diameter: 6.0 inches

Distance A: 2.10 Feet, 0.74 Duct diameters
 Distance B: 6.00 Feet, 2.12 Duct diameters
 Meets Method 1 criteria

Traverse Point Locations



Point	% of diameter	Inches from wall	Inches from port edge
1	4.4	1.5	5.5
2	14.6	5.0	9.0
3	29.6	10.1	14.1
4	70.4	23.9	27.9
5	85.4	29.0	33.0
6	95.6	32.5	36.5

Pre-cyclonic flow check conducted? Yes

Pre-Test Cyclonic Flow Check Data

Point #	Port:			Port:			Port:			Port:		
	ΔP ("H ₂ O)	Ts (°F)	a (°)	ΔP ("H ₂ O)	Ts (°F)	a (°)	ΔP ("H ₂ O)	Ts (°F)	a (°)	ΔP ("H ₂ O)	Ts (°F)	a (°)
1	-	76	10	-	76	15	-	-	-	-	-	-
2	-	76	10	-	77	20	-	-	-	-	-	-
3	-	76	5	-	76	15	-	-	-	-	-	-
4	-	76	5	-	77	15	-	-	-	-	-	-
5	-	76	5	-	77	5	-	-	-	-	-	-
6	-	76	0	-	76	5	-	-	-	-	-	-

Average a: 9.2 (°)
 Status: Pass

Average Ts: 76.25 (°F)

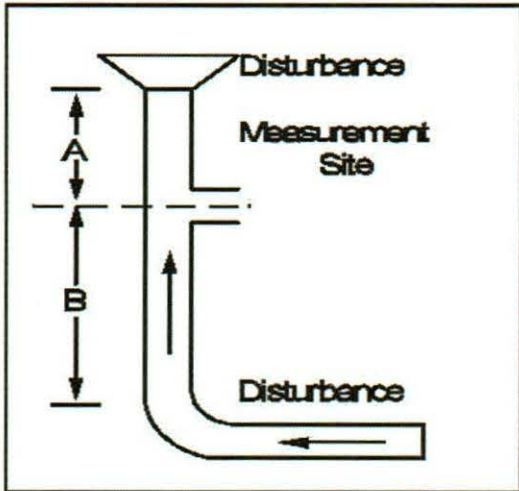
Average ΔP : _____ ("H₂O)
 Avg of sqrt ΔP : _____

Sample Location Information for Isokinetic Sampling - Rectangular Ducts

Project #: 559670
 Company: Flat Rock Metals
 Plant: Flat Rock, Michigan
 Unit ID: Line 3
 Sample Location: Stack

Duct Depth: 34.5 inches 2.88 feet
 Duct Width: 39 inches 3.25 feet
 Equivalent Diameter: 3.05 feet
 # of Ports Used: 4
 # of Points/Port: 4
 Total # of points: 16
 Sample Plane: Horizontal
 Port Type: Flange
 Port Length: 4.5 inches
 Port Inside Diameter: 6.0 inches

Distance A: 5.00 Feet, 1.64 Duct diameters
 Distance B: 7.00 Feet, 2.29 Duct diameters
 Meets Method 1 criteria



Traverse Point Locations

Point	Inches from wall	Inches from port edge
1	4.3	8.8
2	12.9	17.4
3	21.6	26.1
4	30.2	34.7

Pre-cyclonic flow check conducted? Yes

Pre-Test Cyclonic Flow Check Data

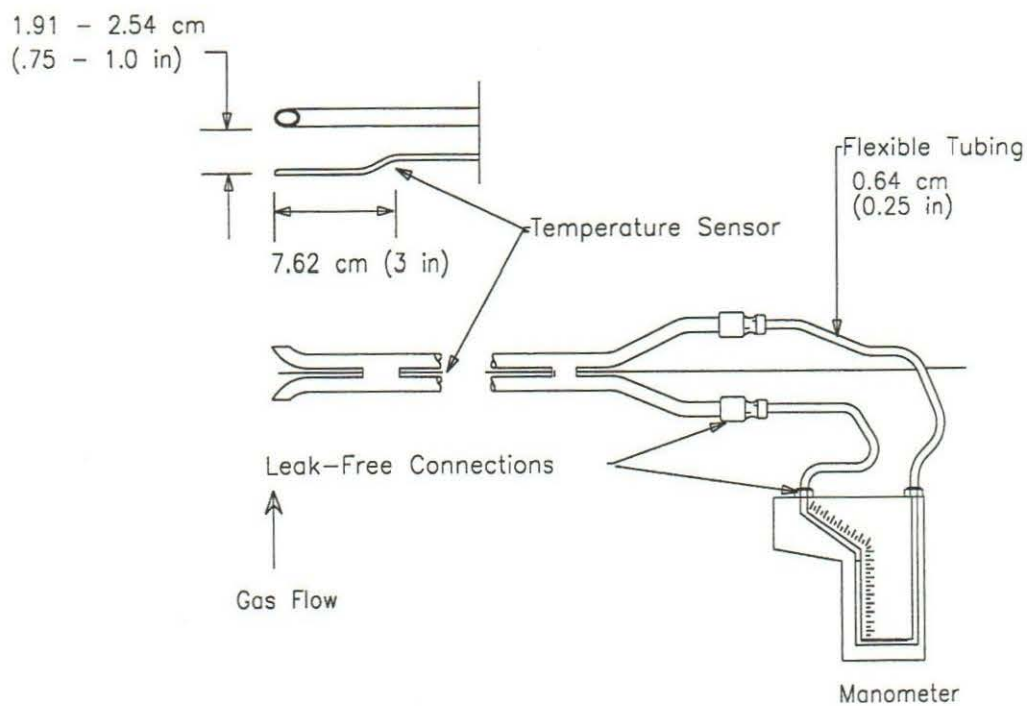
Point #	Port:			Port:			Port:			Port:		
	ΔP ("H2O)	T_s (°F)	a (°)	ΔP ("H2O)	T_s (°F)	a (°)	ΔP ("H2O)	T_s (°F)	a (°)	ΔP ("H2O)	T_s (°F)	a (°)
1	0.88	71	10	0.67	69	5	0.5	72	5	0.37	69	5
2	0.88	71	10	0.7	69	5	0.54	72	5	0.4	69	5
3	0.88	71	5	0.74	70	10	0.58	71	5	0.45	70	10
4	0.9	71	5	0.82	71	15	0.68	70	10	0.48	70	10

Average a: 7.5 (°) Average T_s : 70 (°F) Average DP: 0.65 ("H2O)
 Status: Pass Avg of sqrt DP: 0.80



Determination of Stack Gas Velocity and Volumetric Flow Rate

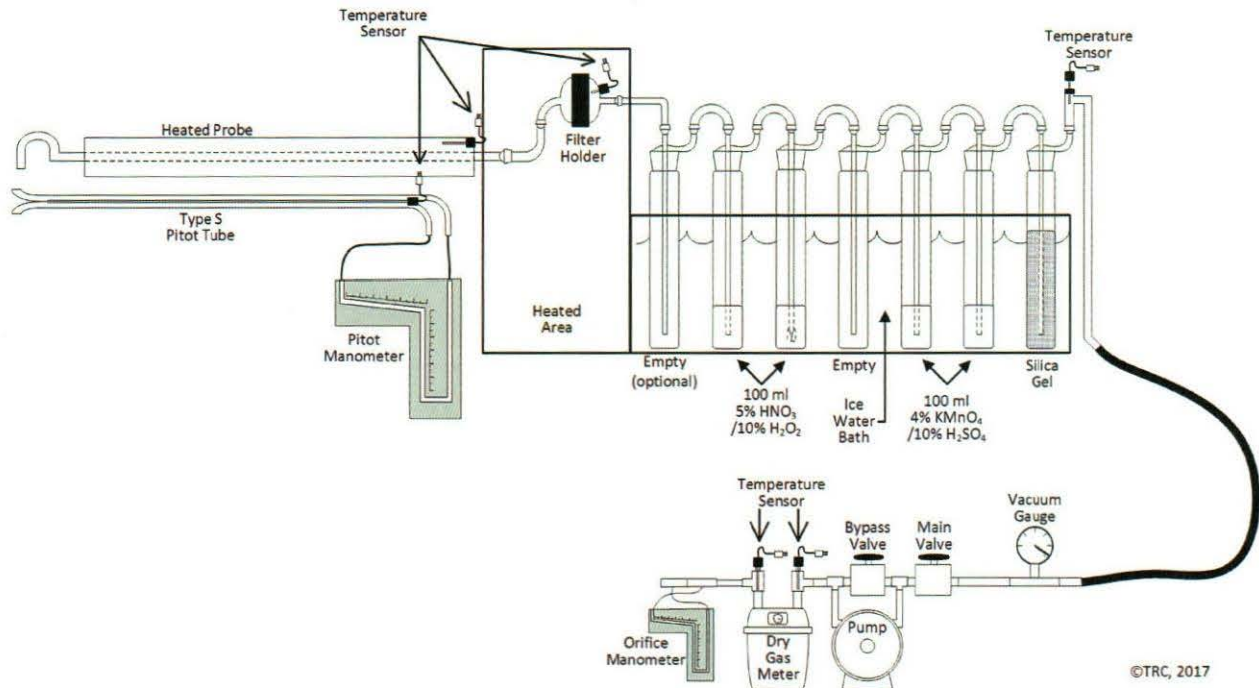
USEPA Promulgated Test Method 2





Determination of Metals Emissions From Stationary Sources

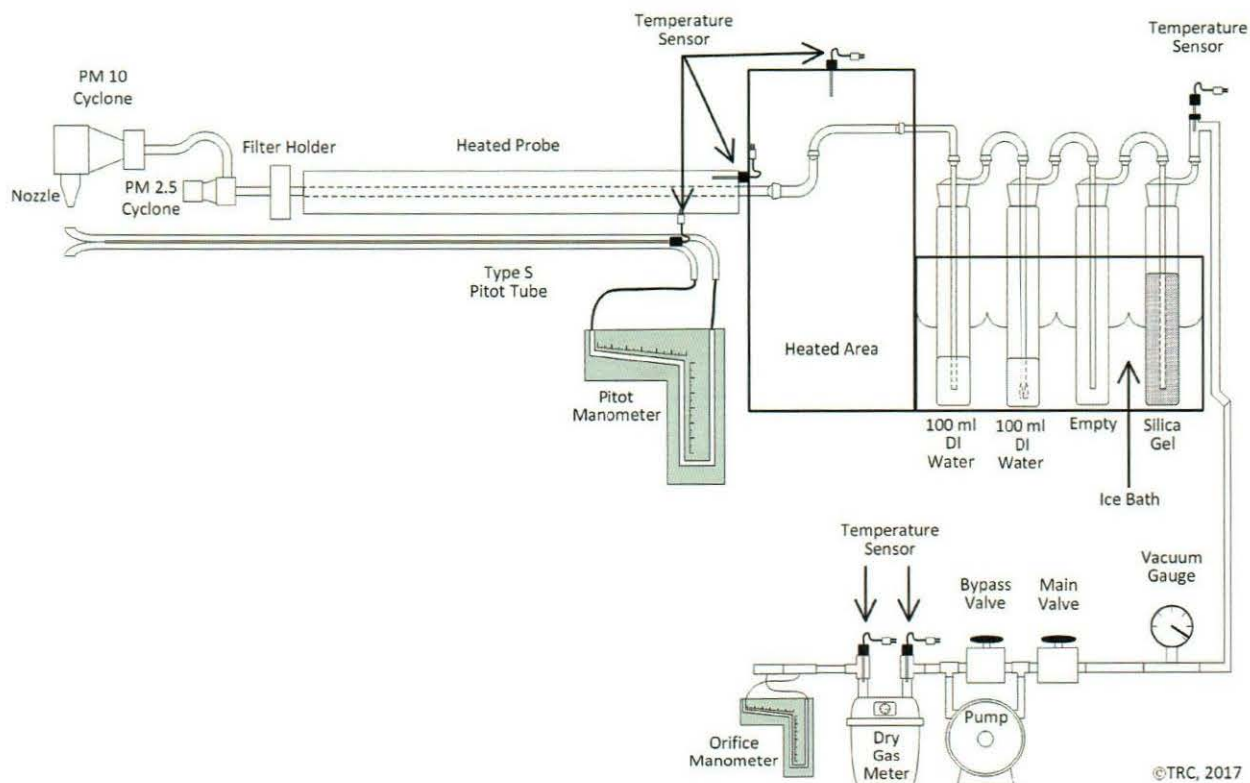
USEPA Promulgated Method 29





Determination of PM₁₀ and PM_{2.5} Emissions From Stationary Sources (Constant Sampling Rate Procedure)

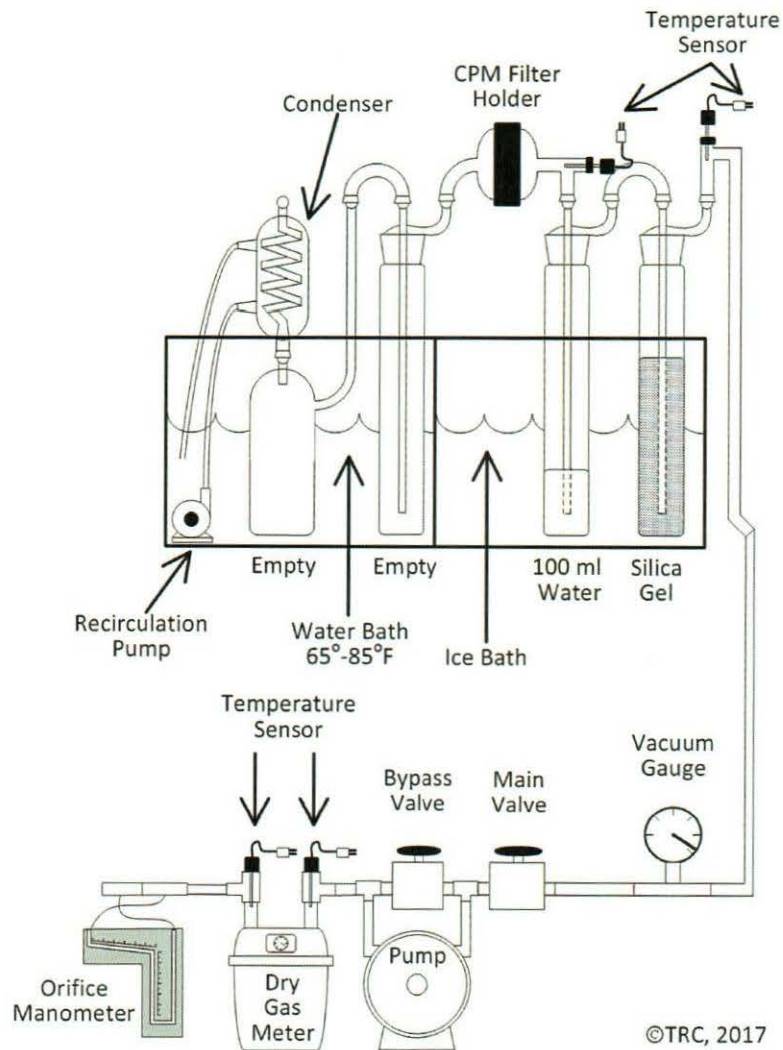
USEPA Promulgated Method 201A (effective after 1/1/2011)



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Dry Impinger Method for Determining of Condensable Particulate Emissions From Stationary Sources

USEPA Promulgated Method 202





Project #: 559670
 Company: Flat Rock Metals
 Plant: Flat Rock, Michigan

Unit ID: Line 1
 Location: Stack
 Test Date(s): 11/7/2023

Method 201A Sample Analysis Summary

Front-Half PM: PM10 and PM2.5

Fraction ID	Fraction Description	Run 1	Run 2	Run 3	Run 4
M1 -	PM collected on filter \leq PM2.5 (mg)	0.00	0.00	0.80	-
M2 -	PM collected in acetone wash $>$ PM10 (mg)	2.00	0.90	4.80	-
	Acetone volume (ml)	36.0	32.0	54.0	-
	Blank correction (mg)	0.00	0.00	0.00	-
	Net mass (mg)	2.00	0.90	4.80	-
M3 -	PM collected in acetone wash $>$ PM2.5 \leq PM10 (mg)	1.60	1.10	2.50	-
	Acetone volume (ml)	31.0	52.0	60.0	-
	Blank correction (mg)	0.00	0.00	0.00	-
	Net mass (mg)	1.60	1.10	2.50	-
M4 -	PM collected in acetone wash \leq PM2.5 (mg)	0.80	2.40	0.90	-
	Acetone volume (ml)	110.0	130.0	81.0	-
	Blank correction (mg)	0.00	0.00	0.00	-
	Net mass (mg)	0.80	2.40	0.90	-
Blank	Acetone Blank Volume (ml)	100.0			
	Acetone Blank Residue (mg)	0.00			
	Calculated Blank Correction Factor (mg/ml)	0.00000			
	Applied Blank Correction Factor (mg/ml)	0.00000			

Filterable PM Totals

M1 + M2 + M3 + M4	Total Filterable PM (mg)	4.40	4.40	9.00	-	eq 43
M1 + M3 + M4	Total Filterable \leq PM10 (mg)	2.40	3.50	4.20	-	eq 44
M1 + M4	Total Filterable \leq PM2.5 (mg)	0.80	2.40	1.70	-	eq 45

Comment:

Method 202 Sample Analysis Summary

Condensable PM

	Run 1	Run 2	Run 3	Run 4	Field Train Blank
Aqueous impinger catch mass (mg):	6.50	4.40	4.10	-	3.20
NH ₄ OH Correction factor (mg):	-	-	-	-	
Net Aqueous (Inorganic) CPM (mg):	6.50	4.40	4.10	-	
Mass of Organic CPM (mg):	0.00	1.10	0.00	-	0.00
Field Train Recovery Blank Correction (mg)*	2.00	2.00	2.00	-	
Total Mass of CPM (mg)	4.50	3.50	2.10	-	

*Maximum of 2.00 mg combined aqueous and organic field train blank mass

Comment: