August 23, 2019

Mr. J.R. Giska
Cleaner Air Oregon Program Engineer
Oregon Department of Environmental Quality
700 NE Multnomah Street, Suite 600
Portland, Oregon 97232

Re: Source Test Protocol
Columbia Steel Casting Co., Inc., Portland Oregon, ACDP No. 26-1869

Dear Mr. Giska,

On behalf of Columbia Steel Casting Co., Inc. (Columbia Steel) located at 10425 N. Bloss Avenue in Portland, Oregon, SLR International Corporation (SLR) is submitting a Source Test Protocol prepared by Bison Engineering, Inc. (Bison) for testing planned to begin on September 23, 2019. As described in the protocol, testing will be completed on the following emission sources:

- Baghouse 1, controlling electric arc furnaces (EAFs) 1 and 2
- Baghouse 2, controlling EAF 3
- Baghouse 15, controlling burning and arcing
- Baghouse 26, controlling a shot blast cleaning process
- Building 8 roof vents
- Building 11 roof vents

The purpose of the testing is to develop site-specific emission factors for total particulate matter (PM) and select total metals such as arsenic, chromium, lead, manganese, nickel, and hexavalent chromium. Additionally, the Air Contaminant Discharge Permit (ACDP) No. 26-1869 is currently in the process of being renewed by the Oregon Department of Environmental Quality (DEQ). Per electronic mail from Mr. David Graiver on May 14, 2019, the DEQ will require testing of the EAFs for $PM_{2.5}$, nitrogen oxides (NOx) and carbon monoxide (CO) when the new ACDP is issued. As such, Columbia Steel is including those parameters in this source testing effort and requests that this satisfies the anticipated source testing requirements in the pending ACDP.

If you have any questions, I can be reached at (503) 709-7039 or skronholm@slrconsulting.com, or you can contact Bruce Schacht from Columbia Steel at (503) 286-0685, x 286 or bruce_s@columbiasteel.com.

Sincerely,
SLR International Corporation

Sarah Kronholm, P.E.
Principal Engineer

cc David Graiver, Oregon Department of Environmental Quality
Bruce Schacht, Columbia Steel Casting Co., Inc.
Martha Cox, Columbia Steel Casting Co., Inc.
Dave Faust, Columbia Steel Casting Co., Inc.
Brien Flanagan, Schwabe Williamson and Wyatt

Enc Source Test Protocol from Bison Engineering, Inc.

TEST PROTOCOL

COLUMBIA STEEL CASTING CO., INC.

2019 PARTICULATE MATTER, METALS AND GASEOUS POLLUTANTS EMISSIONS TESTING

Oregon Department of Environmental Quality
Air Contaminant Discharge Permit: 26-1869

Prepared for:

Columbia Steel Casting Co., Inc.
10425 N Bloss Ave.
Portland, Oregon 97203

Prepared by:

Bison Engineering, Inc.
1400 11th Ave, Ste. 200
Helena, MT 59601
www.bison-eng.com

Protocol Submitted: August 23, 2019

STACK TESTING ACCREDITATION COUNCIL
ACCREDITED TO ASTM D7036 ONLY CERT #4675.01

BISON ENGINEERING, INC.

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PROTOCOL ENDORSEMENT

Bison Engineering, Inc. certifies that emissions testing will be conducted as described in this protocol. Every effort will be made to obtain reliable, repeatable, and representative data using approved test methods and following procedures listed in Bison Engineering Inc.'s quality manual and ASTM D7036-04.

Project Manager: _____

Title: _____

Signature: _____

Date: _____

1.0 INTRODUCTION

Bison Engineering, Inc. (Bison) has been retained by Columbia Steel Casting Co., Inc. (Columbia Steel) to perform emissions testing on Baghouses #1, #2, #15, #26 and select roof vents on Buildings #8 and #11 at their facility in Portland, Oregon. The purpose of the testing is to develop site-specific emission factors for use in air emission inventories related to Cleaner Air Oregon, as well as Oregon Department of Environmental Quality (ODEQ) Air Contaminant Discharge Permit (ACDP) #26-1869.

Testing will be conducted to determine emission rates for gaseous pollutants, particulate matter, hexavalent chromium and other metals from baghouse exhaust stacks and building vents.

2.0 KEY PERSONNEL AND CONTACT INFORMATION

The Columbia Steel emissions testing will be led by Adam Bender, Qualified Individual (QI). David Blankenship, QI, Zach Harding, QSTI, Robert Rogge, QSTI, Jacob Rankin, QI, and Riley Madsen, Environmental Technician, will perform on-site source testing. Lynn Dunnington, Environmental Analyst, will process the test data and prepare the final report.

Facility:	**Columbia Steel Casting Co., Inc.**
Address:	10425 N Bloss Ave Portland, Oregon 97203
Contact:	Bruce Schacht
Phone:	(503) 286-0685
Email:	bruce_s@columbiasteel.com
Primary Consultant:	**SLR International Corporation**
Address:	1800 Blankenship Rd, Suite 440 West Linn, Oregon 97068
Contact:	Sarah Kronholm
Phone:	(503) 905-3199
Email:	skronholm@slrconsulting.com
Testing Consultant:	**Bison Engineering, Inc.**
Address:	1400 11th Avenue Suite 200 Helena, MT 59601
Contact:	Adam Bender
Phone:	(406) 442-5768
Email:	abender@bison-eng.com
State Authority:	**Oregon Department of Environmental Quality (ODEQ)**
Address:	700 NE Multnomah Street, Suite 600 Portland, Oregon 97232
Contact:	Thomas Rhodes
Phone:	(503) 229-5534
Email:	thomas.rhodes@state.or.us
Outside Laboratory:	**Chester LabNet**
Address:	12242 SW Garden Place Tigard, Oregon 97223-8246
Contact:	Sheri Heldstab
Phone:	(503) 624-2183
Website:	www.chesterlab.net

3.0 SUMMARY OF TEST PROGRAM

All testing will be performed in accordance with Environmental Protection Agency (EPA) testing methodology and in accordance with the Oregon Source Sampling Manual. Emissions testing on each baghouse outlet stack will be conducted in accordance with the methods listed in Table 1. All stack test locations will be confirmed to be Method 1 compliant before testing commences.

Table 1: Baghouse Test Matrix

Columbia Steel Baghouses #1, 2, 15, 26 Test Matrix			
Source	**Method**	**Parameter**	**Test Plan and Comments**
BH#1 BH#2 BH#15 BH#26	Method 1	Measurement Location	One measurement per source
	Method 2	Volumetric Flow/Cyclonic flow check	Concurrent with each test run. One cyclonic flow check will be completed on each source.
	Method 3	O_2, CO_2 and Molecular Weight	Bison will utilize an assumed molecular weight of ambient air
	Method 4	Moisture Determination	Concurrent with M5, M29 and M0061
	Oregon Method 5	Total PM	Three 120-minute runs/source/scenario (2 process scenarios on BH 1, 1 scenario on all others)
	Method 7E	Oxides of Nitrogen (NOx)	Concurrent with Metals and PM testing under 1 scenario on BH1 and BH2 only
	Method 10	Carbon Monoxide (CO)	Concurrent with Metals and PM testing under 1 scenario on BH1 and BH2 only
	Method 29	Total Select Metals (Arsenic, Manganese, Nickel, Chromium, Lead)	Three 180-minute runs/source/scenario (2 process scenarios on BH1, 1 scenario on all others)
	Method 0061	Hexavalent Chromium	Three 180-minute runs/source/scenario (2 process scenarios on BH1, 1 scenario on all others)
	Method 201A	$PM_{2.5}$	Three 120-minute runs/source/scenario (2 process scenarios on BH1, 1 scenario on all others)

Emissions testing on the Buildings 8 and 11 roof vents listed will be conducted in accordance with the methods listed in Table 2 using MiniVol air samplers. The MiniVols will be placed below the roof vents via man-lift in locations selected to best represent building emissions (see Figure 1). Bison will verify negative draft of each tested roof vent with an anemometer and/or smoke emitter before testing commences. Chester LabNet will supply pre-weighed and conditioned filters. Once the filters are exposed, they will be delivered back to Chester LabNet for gravimetric, total metals and hexavalent chromium processing.

Table 2: Roof Vents Test Matrix

Columbia Steel Building 8 and 11 Roof Vent Ambient Sampling Test Matrix			
Source	**Method[b]**	**Parameter**	**Test Duration**
Building #11 (3-5 vents)[a]	Air Metrics MiniVol samplers TSP- gravimetry & cassette Metals- XRF spectroscopy CR(VI)-ASTM D7614-12	Head 1: Total PM and Total Metals Head 2: Cr(VI) Head 3: $PM_{2.5}$	Approximately 10-12 hr runs
Building #8 (1-3 vents)[a]	Air Metrics MiniVol samplers TSP- gravimetry & cassette Metals- XRF spectroscopy CR(VI)-ASTM D7614-12	Head 1: Total PM and Total Metals Head 2: Cr(VI) Head 3: $PM_{2.5}$	Approximately 10-12 hr runs

[a] The number of vents sampled are dependent upon MiniVol availability from the supplier, Air Metrics.
[b] The flow rates for each vent will be determined based on the rated fan and motor information.

3.1 Anticipated Test Schedule

Emissions testing is scheduled to commence on September 23, 2019. Testing of the Buildings 8 and 11 roof vents is expected to follow the proposed schedule outlined in Table 3 but may vary with facility production and other factors. Baghouses 15 and 26 may be tested during day shift while Baghouses 1 and 2 will be tested during night shift to accommodate normal Columbia Steel production schedules.

Table 3: Test Schedule

Columbia Steel Proposed Roof Vent Sampling and Baghouse Testing Schedule						
Day	**Date**	**Source**	**Sampling Method**	**Parameter**	**Number of Runs**	**Run Duration**
0	Sunday 9/22/19	Travel to Columbia Steel. On-site set up and equipment prep.				
1	Monday 9/23/19	BH15, BH26 (normal production)	M-29	Total Metals	3 runs	3 hours
			M-0061	Cr(VI)	3 runs	3 hours
2	Tuesday 9/24/19	Building 11 vents (normal production)	Mini Vol	PM/Total Metals/ Cr(VI)	2 samplers each on 3-5 chosen roof vents (see Figure 1)	10-12 hours
		BH15, BH26 (normal production)	Oregon M-5	Total PM	3 runs	2 hours
			M-201A	PM 2.5	3 runs	2 hours
3	Wednesday 9/25/19	Contingency day/Metals Prep/Setup on Baghouses 1 and 2				
4	Thursday 9/26/19	Building 11 vents	Mini Vol	N/A	N/A	Recovery
		BH1, BH2 (normal production)	M-7E	NOx (BH-1)	3 runs	3 runs
			M-10	CO (BH-1)	3 runs	3 runs
			M-29	Total Metals	3 runs	3 hours
			M-0061	Cr(VI)	3 runs	3 hours
5	Friday 9/27/19	BH1, BH2 (normal production)	M-7E	NOx (BH-2)	3 runs	3 runs
			M-10	CO (BH-2)	3 runs	3 runs
			Oregon M-5	Total PM	3 runs	2 hours
			M-201A	PM 2.5	3 runs	2 hours
6	Saturday 9/28/19	As needed	Contingency day/Metals Prep			
		Building 8 vents (normal production)	Mini Vol	PM/Total Metals/ Cr(VI)	2 samplers on 1-3 chosen roof vents (see Figure 1)	10-12 hours

7	Sunday 9/29/19	Building 8 vents	Mini Vol	N/A	N/A	Recovery
		Building 11 vents (High Chromium Steel)[a]	Mini Vol	PM/Total Metals/ Cr(VI)	2 samplers each on 3-5 chosen roof vents (see Figure 1)	10-12 hours
		BH1 (High Chromium Steel)[a]	M-29	Total Metals	3 runs	3 hours
			M-0061	Cr(VI)	3 runs	3 hours
8	Monday 9/30/19	BH1 (High Chromium Steel)[a]	Oregon M-5	Total PM	3 runs	2 hours
			M-201A	PM 2.5	3 runs	2 hours
9	Tuesday 10/1/19	Contingency Day				
10	Wednesday 10/2/19	Tear Down and Return Travel				

[a] Source testing for high chromium steel production is dependent upon the customer demand and operations schedule for the facility and may not be able to be obtained in this testing effort.

The schedule above assumes that testing proceeds as planned with minimal interruptions or process downtime. Bison will inform ODEQ of any changes to the schedule ahead of testing. A finalized test report will be submitted to ODEQ on or before 60 days after the conclusion of testing.

4.0 EMISSION SOURCE INFORMATION

4.1 Facility Description

Columbia Steel operates an alloy steel casting facility which produces medium to large size castings. They manufacture a wide variety of steel and iron parts for basic industry. The processes include metal melting, olivine green sand mold making and core making, metal pouring, casting shakeout and casting finishing. The main binders used are clay, water and sodium silicate.

4.3 Emission Source Description

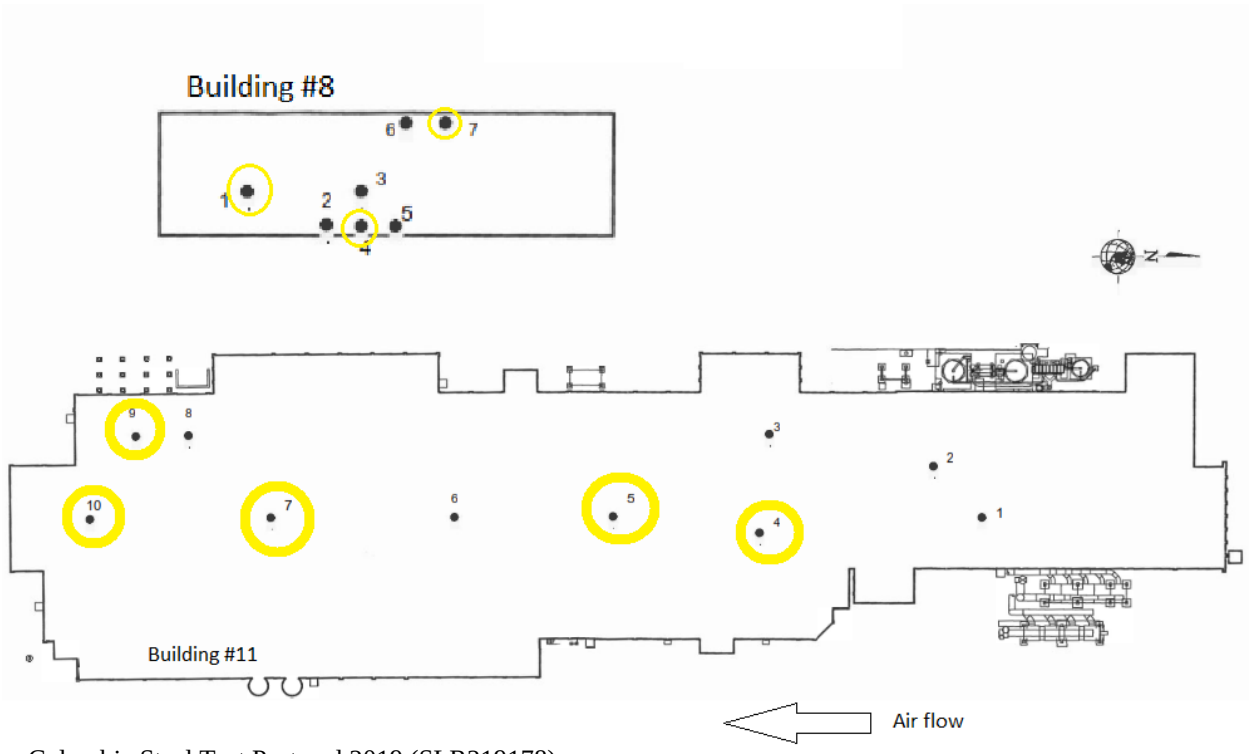
Baghouses 1 and 2 control emissions from three electric arc furnaces (EAFs) that are the heart of the melting process. Emissions from EAFs 1 and 2, melting steel alloys, are controlled by Baghouse 1 which is a Pangborn 264 CT-2 shaker baghouse. Emissions from EAF 3, melting manganese steel alloys, are controlled by Baghouse 2 which is a National 240-203-10 shaker baghouse. The melting capacity of the furnaces is as follows:

- EAF 1 – 10 tons per hour
- EAF 2 – 6 tons per hour
- EAF 3 – 10 tons per hour

Baghouse 15, a Wheelabrator shaker baghouse, controls emissions from the South Foundry burning and arcing process. Emissions from the shot blast cleaning process are controlled by Baghouse 26, a Torit 144FTP pulse jet baghouse.

The below figure shows the select vents on both Building 8 and Building 11 that may be tested; however, note that exact vents to be tested are dependent upon equipment availability. The vents were selected to be representative of overall operations.

Figure 1: Building Vents



4.4 Responsibilities of Plant

Columbia Steel will be responsible for the following:

- Relevant production data during testing
- Safe access to all sampling locations
- Communication during testing of any process changes

4.5 Plant Entry and Safety Requirements

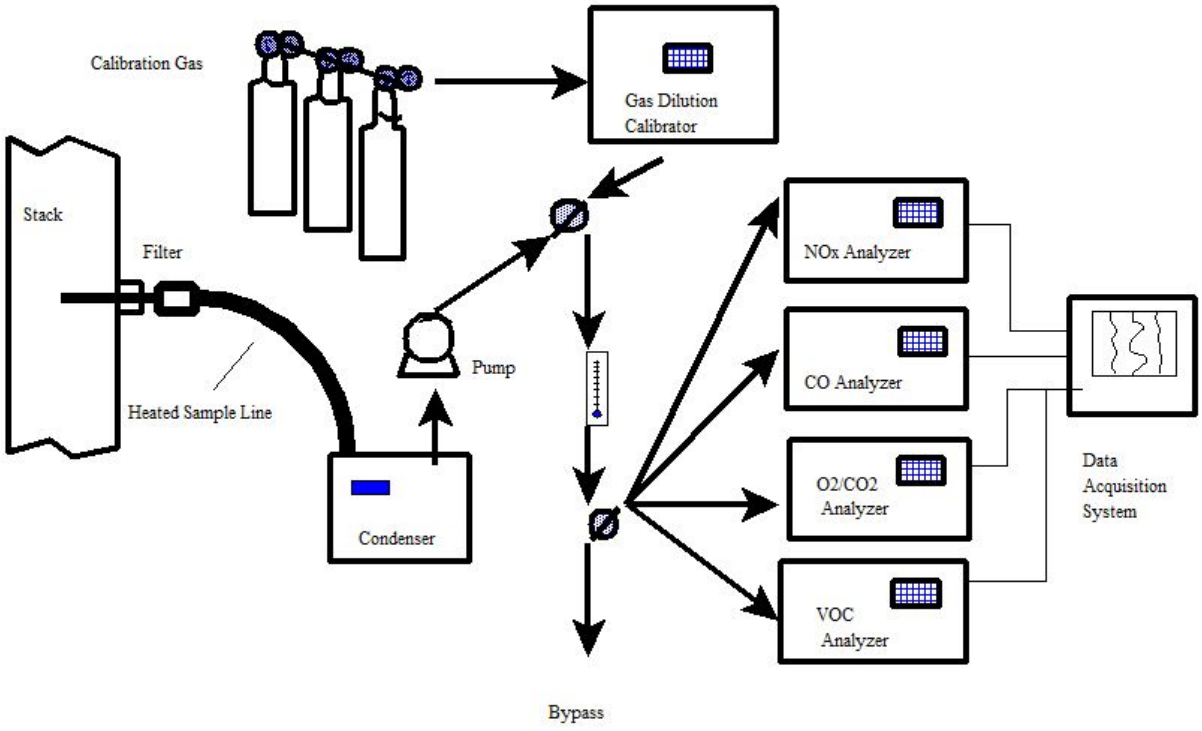
Bison personnel will adhere to facility safety requirements. Bison personnel may be required to hoist the sampling equipment to the source being tested. Bison will place the MiniVol samplers via manlift from the production floor. Yellow caution tape may be placed to alert people to overhead work. When required, radio or hand signals will be used for safe lifting. Hazards associated with this facility include elevated working heights, ladders, electrical usage, overhead power lines, heated equipment and hot surfaces. These sources may require the use of powered man-lift equipment or scaffolding. Test equipment may need to be rope-hoisted, lifted or carried up staircases. Testers will have the following safety equipment at hand: hard hat; full-length pants, shirt and/or coveralls; goggles (as required); full-height (over the ankle) work boots; hearing protection; work gloves; appropriate half- or full-face respirators.

5.0 SOURCE TESTING PROCEDURES

5.1 Instrumentation and Equipment Description

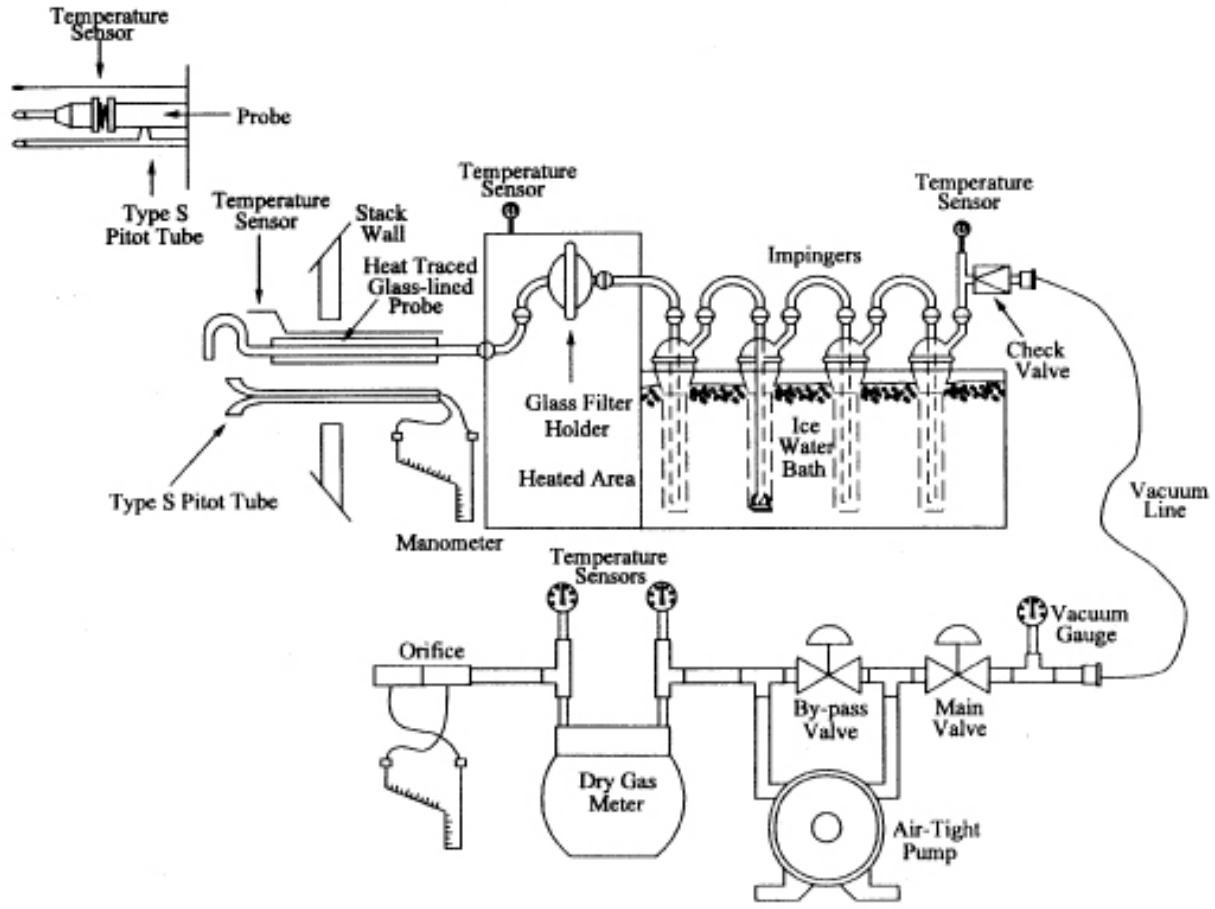
Bison will use an Environics gas dilution system for analyzer calibrations. Dilutions are performed according to EPA Reference Method 205. All analyzers are checked for leaks, system bias and drift, before and after testing. Figure 2 gives a schematic diagram showing Bison's typical setup for gaseous sampling.

Figure 2: Bison Gaseous Analyzer Schematic



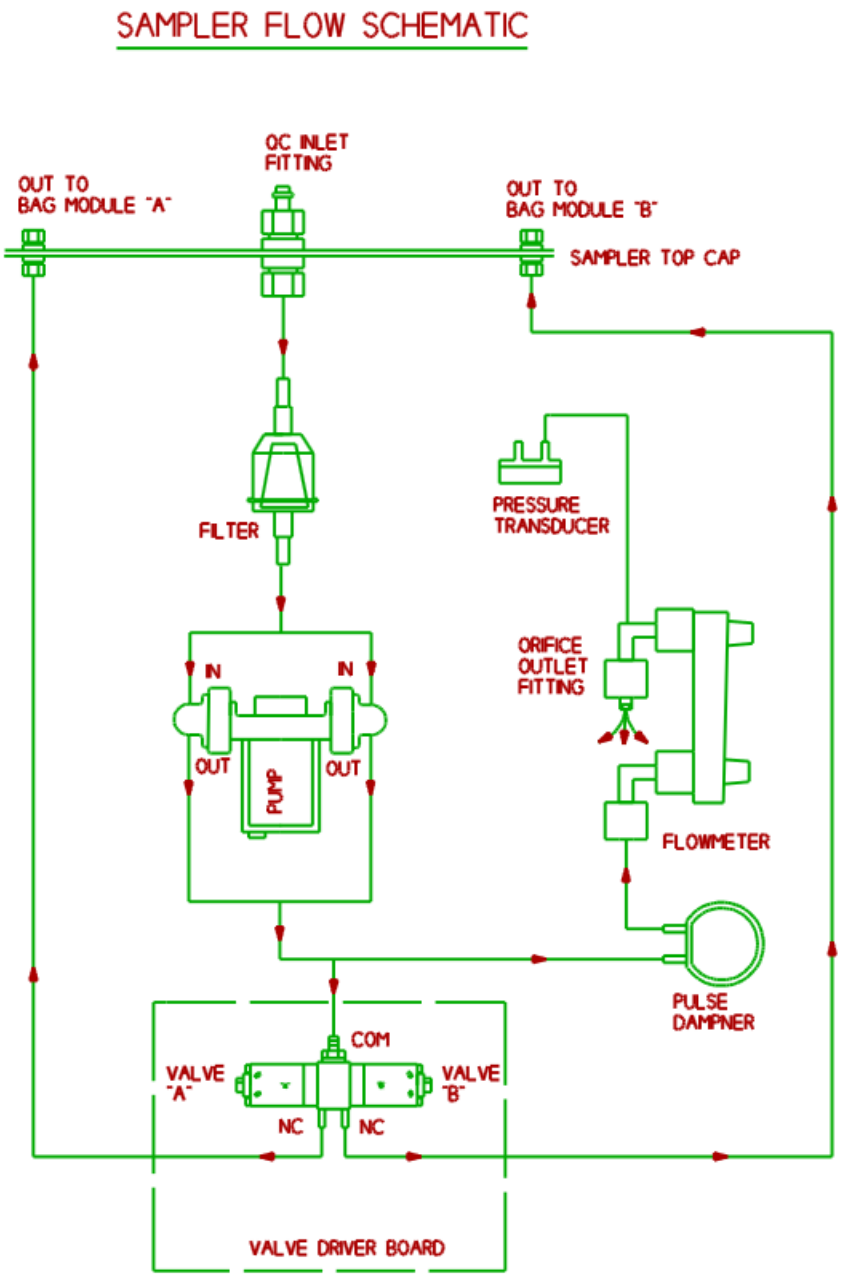
Bison will use an Environmental Supply or CleanAir dry gas meter for isokinetic sampling. Figure 3 shows the basic setup of the Method 5 sampling train.

Figure 3: Particulate Sampling Train



Bison will use Air Metrics MiniVol samplers to collect samples from the roof vents located on Buildings 8 and 11. Figure 4 shows the basic setup of the MiniVol sampling system.

Figure 4: MiniVol Samplers



5.2 Test Methods and Descriptions

Testing will be performed in strict accordance with the EPA methods described in Title 40, CFR, Part 60, Appendix A, as follows:

- Method 1, *Sample and velocity traverses for stationary sources*
- Method 2, *Determination of stack gas velocity and volumetric flow rate*
- Method 3A, *Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)*
- Method 4, *Determination of moisture content in stack gases*
- Method 5, *Determination of particulate emissions from stationary sources* [to be used in conjunction with Method 202]
- Method 7E, *Determination of nitrogen oxide emissions from stationary sources (Instrumental Analyzer Procedure)*
- Method 10, *Determination of carbon monoxide emissions from stationary sources*
- Method 29, "*Determination of Metals Emissions from Stationary Sources.*"
- Method 201, *"Determination of PM_{10} and $PM_{2.5}$ emissions from stationary sources"*
- Method 205, *"Verification of Gas Dilution Systems for Field Instrument Calibrations."*
- SW-846 Test Method 0061: *"Determination of Hexavalent Chromium Emissions from Stationary Sources."*
- ASTM D7614-12, *"Determination of Total Suspended Particulate Hexavalent Chromium in Ambient Air Analyzed by Ion Chromatography and Spectrophotometric Measurements"*

5.3 Analytical Methods

Sampling procedures are cited in the appropriate methods, and there will be no deviation from those methods. All analytical procedures will comply with EPA methodology. Bison will perform all baghouses PM sample analyses at their Helena, MT laboratory. Chester Lab will analyze all MiniVol PM samples.

5.4 Sampling Location

Testing on Baghouses #1, #2, #15 and #26 will be conducted on purpose-built platforms and ports. EPA Methods 1 and 2 will be used to verify the exhaust duct and flow is appropriate for sampling prior to testing.

Testing of the roof vents located on Buildings #8 and #11 will be conducted at a location near the inlet of the roof vents within the buildings at a location chosen to have the most representative concentration of flow from the buildings. Access to these locations will be from a manlift and the sampling equipment will be secured with sections of chain and clamps.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

6.1 Sampling Protocol and Collection Procedures

All testing will be performed in accordance with the specified test methods and their prescribed quality control procedures.

The run number, date, location and source uniquely identify samples obtained in the field. Subdivisions of a sample are labeled and recorded as such (i.e., Sample 1 of 2). Samples are maintained in a manner to prevent deterioration, loss or damage. Samples remain in the control of the emissions testing team until/unless they are released to an outside laboratory for analysis. A chain of custody will be employed for tracking all samples. Sample preservation follows the applicable method recommendations.

Bison's test, laboratory, reporting, and quality assurance procedures will conform to the requirements specified in Bison's quality manual and ASTM D7036. The individual test methods specify handling procedures for physical samples (liquids, traps, etc.). Bison will follow the procedures outlined in the appropriate methods as described in EPA 40 CFR Part 60, Appendix A and Appendix B.

Test data is recorded either on handwritten field datasheets or through direct entry into computer spreadsheets.

6.2 Equipment and Instrument Calibration, Audits and Maintenance

Ongoing calibrations and audits of the testing equipment comprise a preventive maintenance program. Bison personnel calibrate equipment and instruments according to a set schedule and with standards traceable to the National Institute of Standards and Technology (NIST) and ASTM D7036. All equipment requiring calibrations for the methods described in this protocol also meet the appropriate criteria as specified in EPA 40 CFR Part 60 Appendix A. Equipment and instrument calibration results will be included in an appendix to the final test report.

6.3 Data Collection, Reduction and Validation

Emissions test data is subject to multiple levels of validation. Bison has self-auditing spreadsheets that alert the field technician when data may be entered incorrectly by flagging calculation results that are outside of expected or reasonable values. Data is next audited during data processing and report generation. Quality assurance and quality control checks associated with testing (such as on-site analyzer calibrations, spikes and pre- or post-test equipment certifications) are rechecked during the review process.

A final draft of the test report is reviewed for technical content by a member of Bison's quality management team and the project manager. All field data and spreadsheets will be supplied in an appendix to the test report.

6.4 Internal Audits and Corrective Action

When departures from policies or procedures in Bison's quality system or technical operations

have been identified, Bison's quality management team meets with the personnel involved to evaluate the significance of the non-conforming work and discuss appropriate corrective action. Corrective actions are given the highest priority and determined immediately after identifying non-conforming work. The format for implementing corrective action follows ASTM D7036.

6.5 Documentation, Tracking and Certifications

Bison has assigned this project a unique number for document control and record keeping. The tracking number for this project is **SLR219178.**

Electronic project records are maintained on Bison's server indefinitely. The project manager and a member of the quality management team will sign a certification page to document and authenticate that testing was performed according to the appropriate methods, applicable regulatory requirements and Bison's quality manual. This certification page will accompany the final report.

Should a situation arise that warrants a deviation from the approved protocol, it will be discussed with the client and/or regulatory agency. If necessary, approval to modify the test plan will be obtained from the regulatory agency. Any modification to the test plan or deviation from approved test methods will be documented in the final test report.

6.6 Audit Samples

Bison obtains and uses audit samples for any testing that requires them. Method 29 audit samples, metals on filter paper and metals in impinger solution, will be obtained from ERA. Audit samples will be shipped to Columbia Steel, transported with the collected samples to Chester LabNet for analysis.

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