State of Oregon
Department of Environmental Quality Memorandum

Date: 4/20/2021

To: File/Kenzie Billings
From: Thomas Rhodes

Subject: Source Test Review Report
Columbia Steel Casting Co., Inc
Permit Number: 26-1869

Test Dates: December 6-18, 2020
Report Received: February 16, 2021
Revised Results Received: April 9, 2021
Source Tester: Bison Engineering
DEQ Observed: No

I) Facility Description: Columbia Steel operates an alloy steel casting facility which produces medium to large size castings. The processes include metal melting, metal pouring, casting shakeout and casting finishing.

II) Process(es)/Emissions Unit(s) Tested: Arcing and burning operations inside foundry Building #11 controlled by baghouse BH#15. Electric arc furnaces EAF 1 and EAF 2 controlled by baghouse BH#1. Electric arc furnace EAF 3 controlled by baghouse BH#2. Two roof vents from Building #8 and six roof vents from Building #11.

III) Test Purpose: Source testing to develop emission factors for air toxics to use in the Cleaner Air Oregon Emissions Inventory. Additional testing for particulate, carbon monoxide and nitrogen oxides on the electric arc furnaces was completed for ACDP purposes. Only the metals testing was reviewed for Cleaner Air Oregon.

IV) Testing Locations:

Baghouse BH#1:

Diameter:	46”
Distance A (Method 1):	200” (4.4 Diameters)
Distance B (Method 1):	184” (4.0 Diameters)
Number traverse points utilized:	24

Baghouse BH#2:

Diameter:	46.5”
Distance A (Method 1):	84” (1.8 Diameters)
Distance B (Method 1):	324” (7.0 Diameters)
Number traverse points utilized:	16

Baghouse BH#15:

Diameter:	66”
Distance A (Method 1):	42” (0.6 Diameters)
Distance B (Method 1):	132” (2.0 Diameters)
Number traverse points utilized:	24

V) Testing Methodology: The following testing methods were utilized during the testing program:

Flow Rate, O_2 & CO_2, & Moisture Content: EPA Methods 1, 2, 3A & 4
Total Particulate: ODEQ Method 5
PM_{10}, $PM_{2.5}$: EPA Method 201A
Nitrogen Oxides: EPA Method 7E
Carbon Monoxide: EPA Method 10
Multi Metals: EPA Method 29
Hexavalent Chromium: EPA SW846 Method 0061

MiniVol ambient samplers were utilized to collect samples at the inlet of the roof fans. Samples were analyzed for multi metals via the procedures in EPA Method 29 and for hexavalent chromium via the procedures in EPA SW846 Method 0061.

VI) Summary of Results: The testing parameters, test results and operating parameters are summarized in the Tables below:

Table 1: BH#1 Multi metals and hexavalent chromium
Table 2: BH#1 Multi metals and hexavalent chromium – Stainless Steel
Table 3: BH#2 Multi metals and hexavalent chromium
Table 4: BH#15 Multi metals and hexavalent chromium
Table 5: Building #8 Multi metals and hexavalent chromium
Table 6: Building #11 Multi metals and hexavalent chromium

TABLE 1: BH#1 Multi Metals and Hexavalent Chromium

	Run 1	Run 2	Run 3	Average
Date	12/10/2020	12/14/2020	12/15/2020	
Exhaust Gas Temperature (°F)	73.5	71	84	76
Exhaust Gas Moisture (%)	0.88	1.02	1.05	1.0
M29 Exhaust Gas Flow Rate (dscf/m)	39,729	41,870	42,708	41,436
0061 Exhaust Gas Flow Rate (dscf/m)	43,544	41,303	41,824	42,223
M29 Sample Volume (dscf)	437.269	298.062	299.223	344.852
0061 Sample Volume (dscf)	425.678	261.911	263.041	316.877
Production Rate (ton/hr)	1.77	2.03	2.12	1.97
Aluminum Emissions:				
lb/hr	4.43E-04	3.49E-04	7.29E-04	5.07E-04
lb/ton	2.50E-04	1.72E-04	3.44E-04	2.55E-04
Antimony Emissions:				
lb/hr	< 2.10E-05[a]	< 3.26E-05	< 3.30E-05[a]	< 2.88E-05
lb/ton	< 1.19E-05[a]	< 1.60E-05	< 1.56E-05[a]	< 1.45E-05
Arsenic Emissions:				
lb/hr	< 1.66E-05	< 4.45E-05	< 2.37E-05	< 2.83E-05
lb/ton	< 9.35E-06	< 2.19E-05	< 1.12E-05	< 1.42E-05
Barium Emissions:				
lb/hr	6.24E-05	1.08E-05	2.41E-05	3.24E-05
lb/ton	3.52E-05	5.31E-06	1.13E-05	1.73E-05
Beryllium Emissions:				
lb/hr	< 8.40E-07[a]	< 1.30E-06[a]	< 1.43E-06	< 1.19E-06
lb/ton	< 4.74E-07[a]	< 6.39E-07[a]	< 6.75E-07	< 5.96E-07
Cadmium Emissions:				
lb/hr	< 4.80E-07	< 7.42E-07	< 7.54E-07	< 6.58E-07
lb/ton	< 2.71E-07	< 3.65E-07	< 3.55E-07	< 3.31E-07
Chromium Emissions:				
lb/hr	2.77E-04	1.15E-04	7.44E-04	3.79E-04
lb/ton	1.56E-04	5.68E-05	3.51E-04	1.88E-04
Hexavalent Chromium Emissions:	--	--	--	--
lb/hr	1.33E-05	8.45E-06	1.72E-05	1.30E-05
lb/ton	7.51E-06	4.16E-06	8.11E-06	6.591E-06
% of total chromium	4.8%	7.3%	2.3%	4.8%
Cobalt Emissions:				
lb/hr	< 2.10E-06[a]	< 3.24E-06[a]	< 4.30E-06	< 3.21E-06
lb/ton	< 1.19E-06[a]	< 1.60E-06[a]	< 2.03E-06	< 1.60E-06
Copper Emissions:				
lb/hr	9.20E-05	1.18E-04	1.46E-04	1.19E-04
lb/ton	5.20E-05	5.84E-05	6.87E-05	5.97E-05
Lead Emissions:				
lb/hr	3.84E-06	1.30E-06	1.77E-05	7.62E-06
lb/ton	2.17E-06	6.39E-07	8.35E-06	3.72E-06

TABLE 1 Continued: BH#1 Multi Metals and Hexavalent Chromium

	Run 1	Run 2	Run 3	Average
Manganese Emissions:				
lb/hr	**2.24E-03**	**9.95E-04**	**6.45E-03**	**3.23E-03**
lb/ton	**1.26E-03**	**4.90E-04**	**3.04E-03**	**1.60E-03**
Nickel Emissions:				
lb/hr	**6.32E-05**	**3.92E-05**	**1.44E-04**	**8.21E-05**
lb/ton	**3.57E-05**	**1.93E-05**	**6.78E-05**	**4.09E-05**
Phosphorus Emissions:				
lb/hr	**8.28E-05**	**< 3.71E-05**	**< 2.09E-04**	**< 1.09E-04**
lb/ton	**4.68E-05**	**< 1.83E-05**	**< 9.84E-05**	**< 5.45E-05**
Selenium Emissions:				
lb/hr	**< 6.30E-05[a]**	**< 9.73E-05[a]**	**< 9.89E-05[a]**	**< 8.64E-05**
lb/ton	**< 3.56E-05[a]**	**< 4.80E-05[a]**	**< 4.67E-05[a]**	**< 4.34E-05**
Silver Emissions:				
lb/hr	**< 8.40E-06[a]**	**< 1.30E-05[a]**	**< 1.32E-05[a]**	**< 1.15E-05**
lb/ton	**< 4.74E-06[a]**	**< 6.39E-06[a]**	**< 6.22E-06[a]**	**< 5.79E-06**
Thallium Emissions:				
lb/hr	**< 4.20E-05[a]**	**< 6.49E-05[a]**	**< 6.59E-05[a]**	**< 5.76E-05**
lb/ton	**< 2.37E-05[a]**	**< 3.20E-05[a]**	**< 3.11E-05[a]**	**< 2.89E-05**
Vanadium Emissions:				
lb/hr	**< 8.28E-06**	**< 6.49E-06**	**< 1.54E-05**	**< 1.00E-05**
lb/ton	**< 4.68E-06**	**< 3.20E-06**	**< 7.24E-06**	**< 5.04E-06**
Zinc Emissions:				
lb/hr	**1.95E-04**	**3.19E-04**	**5.71E-04**	**3.62E-04**
lb/ton	**1.10E-04**	**1.57E-04**	**2.69E-04**	**1.79E-04**

'<' denotes results calculated using the MDL for front half and/or back half results that were non-detect.

[a] Both sample fractions were below the MDL.

TABLE 2: BH#1 Multi Metals and Hexavalent Chromium – Stainless Steel

	Run 1
Date	**12/17/2020**
Exhaust Gas Temperature (°F)	**69**
Exhaust Gas Moisture (%)	**0.98**
M29 Exhaust Gas Flow Rate (dscf/m)	**43,110**
0061 Exhaust Gas Flow Rate (dscf/m)	**43,727**
M29 Sample Volume (dscf)	**271.591**
0061 Sample Volume (dscf)	**244.084**
Production Rate (ton/hr)	**2.19**
Aluminum Emissions:	
lb/hr	**7.01E-04**
lb/ton	**3.20E-04**
Antimony Emissions:	
lb/hr	**< 3.67E-05[a]**
lb/ton	**< 1.68E-05[a]**
Arsenic Emissions:	
lb/hr	**< 6.63E-05**
lb/ton	**< 3.03E-05**
Barium Emissions:	
lb/hr	**3.07E-05**
lb/ton	**1.40E-05**
Beryllium Emissions:	
lb/hr	**< 1.47E-06[a]**
lb/ton	**< 6.71E-07[a]**
Cadmium Emissions:	
lb/hr	**< 8.40E-07**
lb/ton	**< 3.84E-07**
Chromium Emissions:	
lb/hr	**3.83E-04**
lb/ton	**1.75E-04**
Hexavalent Chromium Emissions:	
lb/hr	**2.10E-05**
lb/ton	**9.60E-06**
% of total chromium	**5.5%**
Cobalt Emissions:	
lb/hr	**< 8.19E-06**
lb/ton	**< 3.74E-06**
Copper Emissions:	
lb/hr	**1.07E-04**
lb/ton	**4.90E-05**
Lead Emissions:	
lb/hr	**4.54E-05**
lb/ton	**2.07E-05**

TABLE 2 Continued: BH#1 Multi Metals and Hexavalent Chromium – Stainless Steel

Manganese Emissions:	
lb/hr	**1.57E-03**
lb/ton	**7.15E-04**
Nickel Emissions:	
lb/hr	**1.60E-04**
lb/ton	**7.30E-05**
Phosphorus Emissions:	
lb/hr	**< 1.43E-04**
lb/ton	**< 6.51E-05**
Selenium Emissions:	
lb/hr	**< 1.10E-04[a]**
lb/ton	**< 5.03E-05[a]**
Silver Emissions:	
lb/hr	**< 1.47E-05[a]**
lb/ton	**< 6.71E-06[a]**
Thallium Emissions:	
lb/hr	**< 7.35E-05[a]**
lb/ton	**< 3.36E-05[a]**
Vanadium Emissions:	
lb/hr	**< 7.54E-06**
lb/ton	**< 3.44E-06**
Zinc Emissions:	
lb/hr	**2.83E-04**
lb/ton	**1.29E-04**

'<' denotes results calculated using the MDL for front half and/or back half results that were non-detect.

[a] Both sample fractions were below the MDL.

TABLE 3: BH#2 Multi Metals and Hexavalent Chromium

	Run 1	Run 2	Run 3	Average
Date	12/10/2020	12/14/2020	12/15/2020	
Exhaust Gas Temperature (°F)	70	67	77	71
Exhaust Gas Moisture (%)	1.10	1.12	1.17	1.13
M29 Exhaust Gas Flow Rate (dscf/m)	30,943	29,157	32,994	31,031
0061 Exhaust Gas Flow Rate (dscf/m)	31,014	33,513	34,559	33,029
M29 Sample Volume (dscf)	200.768	224.264	347.947	257.660
0061 Sample Volume (dscf)	235.920	257.681	368.369	287.324
Production Rate (ton/hr)	4.96	4.30	6.21	5.16
Aluminum Emissions:				
lb/hr	1.23E-03	1.88E-03	7.28E-04	1.27E-03
lb/ton	2.48E-04	4.38E-04	1.17E-04	2.66E-04
Antimony Emissions:				
lb/hr	< 4.66E-05	< 3.00E-05[a]	< 2.49E-05	< 3.39E-05
lb/ton	< 9.39E-06	< 6.98E-06[a]	< 4.01E-06	< 6.81E-06
Arsenic Emissions:				
lb/hr	< 1.42E-05	< 4.05E-05	< 8.76E-06	< 2.12E-05
lb/ton	< 2.87E-06	< 9.42E-06	< 1.41E-06	< 4.58E-06
Barium Emissions:				
lb/hr	3.40E-05	5.97E-05	6.33E-06	3.34E-05
lb/ton	6.85E-06	1.39E-05	1.02E-06	7.27E-06
Beryllium Emissions:				
lb/hr	< 1.42E-06[a]	< 1.20E-06[a]	< 8.76E-07[a]	< 1.17E-06
lb/ton	< 2.87E-07[a]	< 2.79E-07[a]	< 1.41E-07[a]	< 2.36E-07
Cadmium Emissions:				
lb/hr	< 3.42E-06	< 1.99E-06	< 5.01E-07	< 1.97E-06
lb/ton	< 6.89E-07	< 4.63E-07	< 8.06E-08	< 4.12E-07
Chromium Emissions:				
lb/hr	4.82E-05	4.11E-05	2.10E-05	3.68E-05
lb/ton	9.71E-06	9.55E-06	3.37E-06	7.56E-06
Hexavalent Chromium Emissions:				
lb/hr	2.19E-06	6.98E-07	2.30E-08	9.71E-07
lb/ton	4.42E-07	1.62E-07	3.70E-09	2.03E-07
% of total chromium	4.6%	1.7%	0.1%	2.1%
Cobalt Emissions:				
lb/hr	< 1.84E-05	< 1.29E-05	< 2.19E-06[a]	< 1.12E-05
lb/ton	< 3.70E-06	< 3.01E-06	< 3.53E-07[a]	< 2.36E-06
Copper Emissions:				
lb/hr	1.61E-04	9.23E-05	6.65E-05	1.07E-04
lb/ton	3.24E-05	2.15E-05	1.07E-05	2.16E-05
Lead Emissions:				
lb/hr	9.77E-06	1.53E-05	0.00	8.36E-06
lb/ton	1.97E-06	3.55E-06	0.00	1.84E-06

TABLE 3 Continued: BH#2 Multi Metals and Hexavalent Chromium

	Run 1	Run 2	Run 3	Average
Manganese Emissions:				
lb/hr	**3.09E-03**	**2.38E-03**	**1.31E-03**	**2.27E-03**
lb/ton	**6.23E-04**	**5.54E-04**	**2.11E-04**	**4.64E-04**
Nickel Emissions:				
lb/hr	**2.75E-05**	**2.84E-05**	**1.41E-05**	**2.34E-05**
lb/ton	**5.54E-06**	**6.61E-06**	**2.27E-06**	**4.82E-06**
Phosphorus Emissions:				
lb/hr	**< 6.04E-05**	**< 1.02E-04**	**< 5.22E-05**	**< 7.18E-05**
lb/ton	**< 1.22E-05**	**< 2.38E-05**	**< 8.40E-06**	**< 1.48E-05**
Selenium Emissions:				
lb/hr	**< 1.07E-04[a]**	**< 1.29E-04**	**< 6.57E-05[a]**	**< 1.01E-04**
lb/ton	**< 2.15E-05[a]**	**< 3.01E-05**	**< 1.06E-05[a]**	**< 2.08E-05**
Silver Emissions:				
lb/hr	**< 1.42E-05[a]**	**< 1.20E-05[a]**	**< 8.76E-06[a]**	**< 1.17E-05**
lb/ton	**< 2.87E-06[a]**	**< 2.79E-06[a]**	**< 1.41E-06[a]**	**< 2.36E-06**
Thallium Emissions:				
lb/hr	**< 7.12E-05[a]**	**< 6.01E-05[a]**	**< 4.38E-05[a]**	**< 5.85E-05**
lb/ton	**< 1.44E-05[a]**	**< 1.40E-05[a]**	**< 7.05E-06[a]**	**< 1.18E-05**
Vanadium Emissions:				
lb/hr	**< 7.12E-06[a]**	**< 6.01E-06[a]**	**< 4.38E-06[a]**	**< 5.85E-06**
lb/ton	**< 1.44E-06[a]**	**< 1.40E-06[a]**	**< 7.05E-07[a]**	**< 1.18E-06**
Zinc Emissions:				
lb/hr	**2.42E-04**	**3.51E-04**	**2.32E-04**	**2.75E-04**
lb/ton	**4.88E-05**	**8.17E-05**	**3.73E-05**	**5.60E-05**

'<' denotes results calculated using the MDL for front half and/or back half results that were non-detect.

[a] Both sample fractions were below the MDL.

TABLE 4: BH#15 Multi Metals and Hexavalent Chromium

	Run 1	Run 2	Run 3	Average
Date	**12/7/2020**	**12/8/2020**	**12/9/2020**	
Exhaust Gas Temperature (°F)	**50**	**52**	**52**	**51**
Exhaust Gas Moisture (%)	**0.46**	**0.71**	**1.00**	**0.72**
M29 Exhaust Gas Flow Rate (dscf/m)	**42,937**	**36,754**	**37,551**	**39,081**
0061 Exhaust Gas Flow Rate (dscf/m)	**36,999**	**34,139**	**35,255**	**35,464**
M29 Sample Volume (dscf)	**674.237**	**586.356**	**600.537**	**620.377**
0061 Sample Volume (dscf)	**585.530**	**545.744**	**560.859**	**564.044**
Production Rate (ton/hr)	**4.70**	**0.86**	**2.08**	**2.55**
Arsenic Emissions:				
lb/hr	**< 5.88E-06**	**< 5.79E-06**	**< 5.78E-06**	**< 5.83E-06**
lb/ton	**< 1.25E-06**	**< 6.73E-06**	**< 2.78E-06**	**< 3.60E-06**
Chromium Emissions:				
lb/hr	**9.06E-05**	**2.11E-05**	**2.26E-05**	**4.48E-05**
lb/ton	**1.93E-05**	**2.45E-05**	**1.09E-05**	**1.82E-05**
Hexavalent Chromium Emissions:				
lb/hr	**1.44E-06**	**7.57E-08**	**1.22E-06**	**9.13E-07**
lb/ton	**3.06E-07**	**8.80E-08**	**5.88E-07**	**3.28E-07**
% of total chromium	**1.6%**	**0.4%**	**5.4%**	**2.5%**
Lead Emissions:				
lb/hr	**< 1.47E-05[a]**	**< 1.57E-05**	**< 1.60E-05**	**< 1.55E-05**
lb/ton	**< 3.13E-06[a]**	**< 1.83E-05**	**< 7.69E-06**	**< 9.73E-06**
Manganese Emissions:				
lb/hr	**2.65E-03**	**7.32E-04**	**9.78E-04**	**1.46E-03**
lb/ton	**5.63E-04**	**8.51E-04**	**4.70E-04**	**6.30E-04**
Nickel Emissions:				
lb/hr	**< 5.58E-05**	**< 1.44E-05**	**< 1.64E-05**	**< 2.89E-05**
lb/ton	**< 1.19E-05**	**< 1.67E-05**	**< 7.90E-06**	**< 1.22E-05**

'<' denotes results calculated using the MDL for front half and/or back half results that were non-detect.

[a] Both sample fractions were below the MDL.

TABLE 5: Building #8 Multi Metals and Hexavalent Chromium

Vent	1	1	7	7
Date	12/6/2020	12/13/2020	12/6/2020	12/13/2020
Production Rate (ton/hr)	0.189	0.243	0.189	0.243
Arsenic Emissions:				
· lb/hr	< 8.02E-06	< 8.25E-06	< 7.53E-06	< 7.74E-06
· lb/ton	< 4.24E-05	< 3.39E-05	< 3.98E-05	< 3.19E-05
· average lb/ton	< 3.82E-05		< 3.58E-05	
Chromium Emissions:				
· lb/hr	6.60E-05	1.50E-04	2.66E-05	3.49E-05
· lb/ton	3.49E-04	6.17E-04	1.41E-04	1.44E-04
· average lb/ton	4.83E-04		1.42E-04	
Hexavalent Chromium Emissions:				
· lb/hr	--	3.32E-07	--	3.67E-08
· lb/ton	--	1.36E-06	--	1.51E-07
· % of total chromium	--	0.22%	--	0.11%
Lead Emissions:				
· lb/hr	9.67E-05	6.51E-05	3.08E-05	1.34E-05
· lb/ton	5.11E-04	2.68E-04	1.63E-04	5.52E-05
· average lb/ton	3.90E-04		1.09E-04	
Manganese Emissions:				
· lb/hr	3.89E-03	8.63E-03	2.04E-03	1.73E-03
· lb/ton	2.06E-02	3.55E-02	1.08E-02	7.10E-03
· average lb/ton	2.81E-02		8.95E-03	
Nickel Emissions:				
· lb/hr	2.76E-05	2.63E-05	1.47E-05	4.20E-05
· lb/ton	1.46E-04	1.08E-04	7.76E-05	1.73E-04
· average lb/ton	1.27E-04		1.25E-04	

'<' denotes results calculated using the MDL for results that were non-detect.

TABLE 6: Building #11 Multi Metals and Hexavalent Chromium

Vent	1	4	4	5	5	5	7	7*
Date	12/14/2020	12/10/2020	12/14/2020	12/9/2020	12/10/2020	12/15/2020	12/9/2020	12/15/2020
Production Rate (ton/hr)	1.409	2.143	1.409	1.443	2.143	2.059	1.443	2.059
Arsenic Emissions:								
· lb/hr	< 3.70E-05	< 3.72E-05	< 3.48E-05	< 3.55E-05	< 3.49E-05	< 3.58E-05	< 3.77E-05	*< 3.12E-04*
· lb/ton	< 2.63E-05	< 1.73E-05	< 2.47E-05	< 2.46E-05	< 1.63E-05	< 1.74E-05	< 2.61E-05	*< 1.52E-04*
· average lb/ton		< 2.10E-05			< 1.94E-05			
Chromium Emissions:								
· lb/hr	6.96E-04	4.78E-04	2.82E-04	1.13E-03	1.11E-03	9.75E-04	4.94E-04	*2.34E-04*
· lb/ton	4.94E-04	2.23E-04	2.00E-04	7.85E-04	5.19E-04	4.73E-04	3.42E-04	*1.13E-04*
· average lb/ton		2.12E-04			5.92E-04			
Hexavalent Chromium Emissions:								
· lb/hr	2.29E-06	3.22E-05	2.27E-05	4.29E-05	5.57E-05	1.64E-04	4.21E-06	1.47E-05
· lb/ton	1.63E-06	1.50E-05	1.61E-05	2.97E-05	2.60E-05	7.96E-05	2.92E-06	7.14E-06
· average lb/ton		1.56E-05			4.51E-05		5.03E-06	
· % of total chromium	0.33%	6.75%	8.04%	3.79%	5.01%	16.82%	0.85%	--
Lead Emissions:								
· lb/hr	7.71E-04	2.48E-04	1.32E-04	5.27E-04	9.35E-04	7.28E-04	2.39E-04	*2.23E-04*
· lb/ton	5.46E-04	1.16E-04	9.38E-05	3.65E-04	4.36E-04	3.53E-04	1.66E-04	*1.08E-04*
· average lb/ton		1.05E-04			3.85E-04			
Manganese Emissions:								
· lb/hr	1.05E-01	3.72E-02	1.78E-02	5.89E-02	4.92E-02	2.97E-02	2.42E-02	*8.75E-03*
· lb/ton	7.42E-02	1.73E-02	1.26E-02	4.08E-02	2.30E-02	1.44E-02	1.67E-02	*4.24E-03*
· average lb/ton		1.50E-02			2.61E-02			
Nickel Emissions:								
· lb/hr	1.81E-04	3.25E-04	3.79E-04	1.15E-03	9.41E-04	4.70E-04	9.64E-04	*5.19E-04*
· lb/ton	1.29E-04	1.52E-04	2.69E-04	7.97E-04	4.39E-04	2.28E-04	6.68E-04	*2.52E-04*
· average lb/ton		2.10E-04			4.88E-04			

'<' denotes results calculated using the MDL for results that were non-detect.

* Sampler stopped after only 2.6 hours. Multi-metals results presented as informational and not included in average.

TABLE 6 Continued: Building #11 Multi Metals and Hexavalent Chromium

							Stainless Steel	
Vent	**8**	**8**	**8***	**9**	**9**	**9**	**5**	**8**
Date	**12/7/2020**	**12/8/2020**	**12/16/2020**	**12/7/2020**	**12/8/2020**	**12/16/2020**	**12/17/2020**	**12/17/2020**
Production Rate (ton/hr)	**2.271**	**2.182**	**1.264**	**2.271**	**2.182**	**1.264**	**1.17**	**1.17**
Arsenic Emissions:								
· lb/hr	**< 4.54E-05**	**< 3.70E-05**	**< 3.62E-05**	**< 4.25E-05**	**--**	**--**	**< 3.48E-05**	**< 3.71E-05**
· lb/ton	**< 2.00E-05**	**< 1.69E-05**	**< 2.87E-05**	**< 1.87E-05**	**--**	**--**	**< 2.97E-05**	**< 3.17E-05**
· average lb/ton	**< 2.19E-05**							
Chromium Emissions:								
· lb/hr	**6.71E-04**	**6.10E-04**	**3.97E-03**	**2.75E-04**	**--**	**--**	**1.13E-03**	**8.99E-04**
· lb/ton	**2.95E-04**	**2.80E-04**	**3.14E-03**	**1.21E-04**	**--**	**--**	**9.65E-04**	**7.68E-04**
· average lb/ton	**1.24E-03**							
Hexavalent Chromium Emissions:								
· lb/hr	**8.99E-06**	**8.51E-06**	***2.40E-04***	**4.95E-06**	**1.26E-06**	**1.19E-05**	**1.19E-04**	**7.39E-06**
· lb/ton	**3.96E-06**	**3.90E-06**	***1.89E-04***	**2.18E-06**	**5.79E-07**	**9.38E-06**	**1.02E-04**	**6.32E-06**
· average lb/ton	**3.93E-06**			**4.05E-06**				
· % of total chromium	**1.34%**	**1.39%**	**--**	**1.80%**			**10.54%**	**0.82%**
Lead Emissions:								
· lb/hr	**1.78E-04**	**2.37E-04**	**8.36E-05**	**3.38E-04**	**--**	**--**	**4.75E-04**	**9.15E-05**
· lb/ton	**7.83E-05**	**1.08E-04**	**6.61E-05**	**1.49E-04**	**--**	**--**	**4.06E-04**	**7.82E-05**
· average lb/ton	**8.43E-05**							
Manganese Emissions:								
· lb/hr	**1.59E-02**	**1.76E-02**	**2.98E-02**	**1.93E-02**	**--**	**--**	**3.46E-02**	**5.32E-02**
· lb/ton	**7.00E-03**	**8.08E-03**	**2.35E-02**	**8.48E-03**	**--**	**--**	**2.96E-02**	**4.54E-02**
· average lb/ton	**1.29E-02**							
Nickel Emissions:								
· lb/hr	**8.96E-04**	**7.88E-04**	**4.07E-03**	**5.01E-04**	**--**	**--**	**1.19E-03**	**7.33E-04**
· lb/ton	**3.95E-04**	**3.61E-04**	**3.22E-03**	**2.21E-04**	**--**	**--**	**1.01E-03**	**6.26E-04**
· average lb/ton	**1.33E-03**							

'<' denotes results calculated using the MDL for results that were non-detect.

* Sampler stopped after only 14.5 hours. Hexavalent chromium results presented as informational and not included in average.

VII) Comments & Concerns:

1) Several of the Method 0061 sample runs did not achieve the sample volumes in the approved source test plan. The analytical results for those sample runs were above the method detection limit (MDL).

2) Method 29 sample runs 1 and 2 on BH2 did not achieve the sample volume in the approved source test plan. In-stack detection limits (ISDL) for those test runs were lower than the estimated ISDLs in the source test plan.

3) BH1, run 1, Method 29 – the incorrect Beryllium MDL mass of 0.050 ug for the backhalf (BH) sample on pages 58, 61, 63 and 71. The lab results on page 382 give a MDL mass of 0.020 ug for that sample fraction.

4) BH15, run 3, Method 0061 – Due to the breakage of the silica gel impinger, the moisture from the simultaneous Method 29 train was used. The field data entry on page 225 and page 231 incorrectly used the weight gain from the Method 29 train. The two sample trains did not pull the same sample volume so they would not be expected to have the same weight gain. The moisture percent (%) from the Method 29 run is what should have been used in the calculations.

5) Table 2, page 3 and Table 13, page 21. The Cr(VI) three run average lb/ton steel melted result was calculated incorrectly by dividing the average lb/hr by the average tons/hr. The correct average for the three test runs is 2.03E-07 lb/ton steel melted.

6) Table 13, page 21. The lbs/hr of Cr(VI) for run 1 is incorrect. The correct value is 2.19E-06 lb/hr as listed in the summary table on page 170.

VIII) Overall Evaluation: The test methods conducted and the data provided are sufficient to evaluate the emissions from the units at the operating conditions tested.