I. INTRODUCTION

Network Environmental, Inc. was retained by Cadillac Casting, Inc. of Cadillac, Michigan to conduct emission sampling at their facility. The purpose of the sampling was to meet the testing requirements of the Michigan Department of Environment, Great Lakes and Energy (EGLE) – Air Quality Division Renewable Operating Permit (ROP) Number MI-ROP-B2178-2021.

The following is a list of the sources that were sampled and the emission limits for each source:

Source	Compound(s) To Be Sampled	Emission Limit(s)
EUALINE (RTO Exhaust)	Particulate, Lead (Pb), PM-10 (Total Filterable & Condensable), Total Hydrocarbons (VOC), Carbon Monoxide (CO) & Benzene	**ROP:** PM-10: 5.6 Tons/Year; Lead: 0.23 Tons/Year; VOC: 26.7 Tons/Year; CO: 29.1 Tons/Year; Benzene: 0.30 Lbs/Hr & 1.0 Ton/Year **MACT:** Total Metal HAP: 0.0008 Grains/DSCF **OR** Particulate: 0.010 Grains/DSCF
EUSPOGREENSAND (N. Multiwash Scrubber Exhaust Only)	Particulate	Particulate: 0.36 Lbs/Ton of Metal Charged & 32.0 Tons/Year
EGSPOPOURANDCOOL (3 – Inline Exhaust Stacks)	Particulate, Lead (Pb), Total Hydrocarbons (VOC) & Carbon Monoxide (CO)	Particulate: 0.07 Lbs/Ton of Metal Processed & 6.50 Tons/Year; Pb: 4.4e-5 Lb/Ton of Iron Poured & 7.92 Lbs/Year; CO: 2.78 Lbs/Ton of metal charged & 250 Tons/Year; VOC: 60.0 Lbs/Hr & 107.0 Tons/Year
EUSPOSHAKEOUT (S. Multiwash Scrubber Exhaust)	Particulate, Total Hydrocarbons (VOC) & Carbon Monoxide (CO)	Particulate: 0.27 Lbs/Ton of Metal Charged & 24.0 Tons/Year; CO: 2.78 Lbs/Ton of metal charged & 250 Tons/Year; VOC: 60.0 Lbs/Hr & 107.0 Tons/Year

EUMELTING (Cupola Scrubber Exhaust)	Particulate, Manganese (Mn), Lead (Pb), Total Metal HAPs, Total Hydrocarbons (VOC), Total VO HAPs, Carbon Monoxide (CO), Sulfur Dioxide (SO_2) & Fugitive VE's (MACT)	**ROP:** Particulate: 18.0 Lbs/Hr, 3.17 Tons/Month, 38.0 Tons/Year & 0.38 Lbs/Ton of Charge; CO: 375.0 Lbs/Hr, 66.7 Tons/Month, 800.0 Tons/Year & 8.0 Lbs/Ton of Charge; SO_2: 17.7 Lbs/Hr, 3.2 Tons/Month, 38.0 Tons/Year & 0.38 Lbs/Ton of Charge; VOC: 3.6 Lbs/Hr, 0.65 Tons/Month, 7.74 Tons/Year & 0.12 Lbs/Ton of Charge; Mn: 0.62 Lbs/Hr, & 1.35 Tons/Year; Pb: 0.3 Lbs/Hr, 0.054 Tons/Month, 0.65 Tons/Year & 0.0065 Lbs/Ton of Charge **MACT:** Metal HAP's: 0.0005 Grains/DSCF or 0.008 Lbs/Ton of Metal Charged **OR** Particulate: 0.006 Grains/DSCF or 0.10 Lbs/Ton of Metal Charged; VO HAP's: 20 PPM @ 10% O_2; Fugitive VE's: 20% 6 Minute Average

The emission sampling was conducted by employing the following reference methods:

- Particulate & Lead (Pb) (EUALINE & EUSPOPOURANDCOOL) – U.S. EPA Method 29
- Particulate, Lead (Pb), Manganese (Mn) & Total Metal HAPs (EUMELTING) – U.S. EPA Method 29
- Particulate (EUSPOSHAKEOUT & EUSPOGREENSAND) – U.S. EPA Method 17
- PM-10 (EUALINE) – U.S. EPA Methods 17 & 202
- Total Hydrocarbons (VOC's) – U.S. EPA Method 25A
- Carbon Monoxide (CO) – U.S. EPA Method 10
- Sulfur Dioxide (SO_2) – U.S. EPA Method 6C
- Benzene – U.S. EPA Method 18
- Exhaust Gas Parameters (air flow, temperature, moisture & density) - U.S. EPA Methods 1-4
- Visible Emissions (Fugitive MACT) – U.S. EPA Method 9

The sampling in the study was conducted over the period of July 19-28, 2021 by Stephan K. Byrd, R. Scott Cargill, Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc.. Assisting with the study were Mr. Erik Olson of Cadillac Casting, Inc. and the operating staff of the facility. Mr. Kurt Childs and Mr. Jeremy Howe of the Michigan Department of Environment, Great Lakes and Energy (EGLE) – Air Quality Division were present to observe the sampling and source operation.

II. PRESENTATION OF RESULTS

II.1 EUSPOSHAKEOUT

II.1.1 TABLE 1
PARTICULATE EMISSION RESULTS
EUSPOSHAKEOUT
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate SCFM (1)	Particulate Mass Rate	
					Lbs/Hr (2)	Lbs/Ton of Metal (3)
South Multiwash	1	7/19/21	12:10-13:14	57,224	0.82	0.037
	2	7/19/21	13:29-14:32	57,969	1.00	0.063
	3	7/19/21	16:01-17:04	57,016	0.53	0.031
	Average			**57,403**	**0.78**	**0.044**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Lbs/Hr = Pounds of Particulate Per Hour
(3) Lbs/Ton of Metal = Pounds of Particulate Per Ton of Metal Processed. Calculated Using Pouring Rates of 22.36 Tons/Hr For Sample 1, 15.93 Tons/Hr For Sample 2 & 17.14 Tons/Hr For Sample 3.

II.1.2 TABLE 2
CARBON MONOXIDE (CO) EMISSION RESULTS
EUSPOSHAKEOUT
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate DSCFM (1)	CO Concentration PPM (2)	CO Mass Rates	
						Lbs/Hr (3)	Lbs/Ton (4)
South Multiwash Exhaust	1	7/19/21	12:03-13:03	54,378	57.2	13.52	0.60
	2	7/19/21	13:27-14:27	54,717	41.8	9.95	0.62
	3	7/19/21	16:00-17:00	53,272	22.1	5.12	0.30
	Average			**54,122**	**40.4**	**9.53**	**0.51**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Dry Basis
(3) Lbs/Hr = Pounds of CO Per Hour
(4) Lbs/Ton = Pounds of CO Per Ton of Iron Poured. Calculated Using Pouring Rates of 22.36 Tons/Hr For Sample 1, 15.93 Tons/Hr For Sample 2 & 17.14 Tons/Hr For Sample 3.

II.1.3 TABLE 3
TOTAL HYDROCARBON (VOC) EMISSION RESULTS
EUSPOSHAKEOUT
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate SCFM (1)	VOC Concentration PPM (2)	VOC Mass Rates	
						Lbs/Hr (3)	Lbs/Ton (4)
South Multiwash Exhaust	1	7/19/21	12:03-13:03	57,224	25.4	9.93	0.44
	2	7/19/21	13:27-14:27	57,969	26.6	10.54	0.66
	3	7/19/21	16:00-17:00	57,016	22.7	8.84	0.52
	Average			**57,403**	**24.9**	**9.77**	**0.54**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Wet (Actual) Basis
(3) Lbs/Hr = Pounds of VOC Per Hour As Propane
(4) Lbs/Ton = Pounds of VOC Per Ton of Iron Poured. Calculated Using Pouring Rates of 22.36 Tons/Hr For Sample 1, 15.93 Tons/Hr For Sample 2 & 17.14 Tons/Hr For Sample 3.

II.2 EUSPOGREENSAND

II.2.1 TABLE 4
PARTICULATE EMISSION RESULTS
EUSPOGREENSAND
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate SCFM (1)	Particulate Mass Rate	
					Lbs/Hr (2)	Lbs/Ton of Metal (3)
North Multiwash	1	7/19/21	11:54-12:58	59,658	1.27	0.051
	2	7/19/21	16:19-17:23	59,754	1.15	0.066
	3	7/19/21	17:39-18:41	60,584	0.65	0.035
	Average			**59,999**	**1.02**	**0.051**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Lbs/Hr = Pounds of Particulate Per Hour
(3) Lbs/Ton of Metal = Pounds of Particulate Per Ton of Metal Processed. North Multiwash Calculated Using Pouring Rates of 24.77 Tons/Hr For Sample 1, 17.48 Tons/Hr For Sample 2 & 18.79 Tons/Hr For Sample 3.

II.3 EUALINE

II.3.1 TABLE 5
PARTICULATE EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 20-21, 2021

Sample	Time	Air Flow Rate DSCFM (1)	Particulate Concentration Grains/DSCF (2)	Particulate Mass Rates	
				Lbs/Hr (3)	Lbs/Ton Poured (4)
1	20:33-22:14	78,753	0.00065	0.44	0.035
2	22:57-00:38	76,703	0.00045	0.30	0.022
3	01:10-02:49	81,112	0.00042	0.30	0.022
Average		**78,856**	**0.00051**	**0.34**	**0.026**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Grains/DSCF = Grains of Particulate Per Dry Standard Cubic Foot of Exhaust Gas
(3) Lbs/Hr = Pounds of Particulate Per Hour
(4) Lbs/Ton Poured = Pounds of Particulate Per Ton of Iron Poured. Calculated Using Pouring Rates of 12.67 Tons/Hr For Sample 1, 13.51 Tons/Hr For Sample 2 & 13.86 Tons/Hr For Sample 3.

II.3.2 TABLE 6
PM-10 (TOTAL FILTERABLE & CONDENSABLE) EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 27, 2021

Sample	Time	Air Flow Rate DSCFM (1)	PM-10 Concentration Grains/DSCF (2)	PM-10 Mass Rates	
				Lbs/Hr (3)	Lbs/Ton Poured (4)
1	16:31-17:35	79,571	0.0072	4.90	0.418
2	18:11-20:03	77,393	0.0043	2.83	0.204
3	20:36-21:42	79,023	0.0048	3.28	0.230
Average		**78,662**	**0.0054**	**3.67**	**0.284**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Grains/DSCF = Grains of PM-10 Per Dry Standard Cubic Foot of Exhaust Gas
(3) Lbs/Hr = Pounds of PM-10 Per Hour
(4) Lbs/Ton Poured = Pounds of PM-10 Per Ton of Iron Poured. Calculated Using Pouring Rates of 11.71 Tons/Hr For Sample 1, 13.89 Tons/Hr For Sample 2 & 14.26 Tons/Hr For Sample 3.

II.3.3 TABLE 7
LEAD EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 20-21, 2021

Sample	Time	Air Flow Rate DSCFM (1)	Lead Concentration Mg/M3 (2)	Lead Mass Rates	
				Lbs/Hr (3)	Lbs/Ton (4)
1	20:33-22:14	78,753	0.0039	1.16E-03	9.15E-05
2	22:57-00:38	76,703	0.0039	1.12E-03	8.27E-05
3	01:10-02:49	81,112	0.0039	1.19E-03	8.62E-05
Average		**78,856**	**0.0039**	**1.16E-03**	**8.68E-05**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Mg/M3 = Milligrams Per Dry Standard Cubic Meter
(3) Lbs/Hr = Pounds of Lead Per Hour
(4) Lbs/Ton = Pounds of Lead Per Ton of Iron Poured. Calculated Using Pouring Rates of 12.67 Tons/Hr For Sample 1, 13.51 Tons/Hr For Sample 2 & 13.86 Tons/Hr For Sample 3.

II.3.4 TABLE 8
CARBON MONOXIDE (CO) EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 20-21, 2021

Sample	Time	Air Flow Rate DSCFM (1)	CO Concentration PPM (2)	CO Mass Rates	
				Lbs/Hr (3)	Lbs/Ton Poured (4)
1	20:30-21:38	78,753	17.9	6.13	0.480
2	21:58-22:58	78,753	15.3	5.24	1.061
3	23:23-00:31	76,703	19.9	6.64	0.441
Average		**78,070**	**17.7**	**6.00**	**0.661**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Dry Basis
(3) Lbs/Hr = Pounds of CO Per Hour
(4) Lbs/Ton Poured = Pounds of CO Per Ton of Iron Poured. Calculated Using Pouring Rates of 12.77 Tons/Hr For Sample 1, 4.94 Tons/Hr For Sample 2 & 15.05 Tons/Hr For Sample 3.

II.3.5 TABLE 9
TOTAL HYDROCARBON (VOC) EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 20-21, 2021

Sample	Time	Air Flow Rate SCFM (1)	VOC Concentration PPM (2)	VOC Mass Rates	
				Lbs/Hr (3)	Lbs/Ton Poured (4)
1	20:30-21:38	80,819	18.0	9.94	0.778
2	21:58-22:58	80,819	16.9	9.33	1.889
3	23:23-00:31	78,622	19.1	10.26	0.682
Average		**80,087**	**18.0**	**9.84**	**1.116**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On An Actual "Wet" Basis As Propane
(3) Lbs/Hr = Pounds of VOC Per Hour As Propane
(4) Lbs/Ton Poured = Pounds of VOC Per Ton of Iron Poured. Calculated Using Pouring Rates of 12.77 Tons/Hr For Sample 1, 4.94 Tons/Hr For Sample 2 & 15.05 Tons/Hr For Sample 3.

II.3.6 TABLE 10
BENZENE EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 20-21, 2021

Sample	Time	Air Flow Rate DSCFM (1)	Benzene Concentration Mg/M^3 (2)	Benzene Mass Rates	
				Lbs/Hr (3)	Lbs/Ton Poured (4)
1	21:46-22:46	78,753	0.764	0.225	0.0278
2	23:57-00:57	76,703	0.965	0.277	0.0130
3 (5)	02:10-03:10	81,112	0.055	0.017	0.0012
Average		**78,856**	**0.594**	**0.173**	**0.0140**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Mg/M^3 = Milligrams of Benzene Per Dry Standard Cubic Meter
(3) Lbs/Hr = Pounds of Benzene Per Hour
(4) Lbs/Ton Poured = Pounds of Benzene Per Ton of Iron Poured. Calculated Using Pouring Rates of 8.09 Tons/Hr For Sample 1, 21.31 Tons/Hr For Sample 2 & 13.75 Tons/Hr For Sample 3.
(5) Sample 3 was Non Detect. Shown are the detection limit values. The detection limit values were used in the calculation of the averages.

II.4 EGSPOPOURANDCOOL (3 - INLINE EXHAUST STACKS)

II.4.1 TABLE 11
PARTICULATE EMISSION RESULTS
EGSPOPOURANDCOOL
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate SCFM (1)	Particulate Mass Rate	
					Lbs/Hr (2)	Lbs/Ton of Metal (3)
SPO Pouring/Cooling #1	1	7/21/21	13:44-14:48	9,465	0.075	0.0040
	2	7/21/21	15:13-16:17	9,117	0.113	0.0046
	3	7/21/21	16:35-17:39	9,004	0.079	0.0039
	Average			**9,195**	**0.089**	**0.0042**
SPO Pouring/Cooling #2	1	7/22/21	08:50-09:54	10,345	0.171	0.0075
	2	7/22/21	10:35-11:39	10,097	0.114	0.0038
	3	7/22/21	12:03-13:30	9,994	0.154	0.0070
	Average			**10,145**	**0.146**	**0.0061**
SPO Pouring/Cooling #3	1	7/22/21	14:03-15:09	9,991	0.123	0.0052
	2	7/22/21	15:32-16:35	9,911	0.096	0.0039
	3	7/22/21	17:09-18:12	10,016	0.137	0.0058
	Average			**9,972**	**0.119**	**0.0050**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Lbs/Hr = Pounds of Particulate Per Hour
(3) Lbs/Ton of Metal = Pounds of Particulate Per Ton of Metal Processed. Calculated Using The Following Metal Process Rates: Stack #1; 18.98 Tons/Hr For Sample 1, 24.63 Tons/Hr For Sample 2 & 20.16 Tons/Hr For Sample 3. Stack#2; 22.66 Tons/Hr For Sample 1, 29.83 Tons/Hr For Sample 2 & 21.86 Tons/Hr For Sample 3. Stack #3; 23.86 Tons/Hr For Sample 1, 24.89 Tons/Hr For Sample 2 & 23.59 Tons/Hr For Sample 3. Metal Process Rates Were Calculated Using Tons Of Metals Poured Data Supplied By Cadillac Casting, Inc..

II.4.2 TABLE 12
LEAD (Pb) EMISSION RESULTS
EGSPOPOURANDCOOL
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate DSCFM (1)	Lead (Pb) Mass Rate	
					Lbs/Hr (2)	Lbs/Ton of Iron (3)
SPO Pouring/Cooling #1	1	7/21/21	13:44-14:48	9,350	1.22E-04	6.43E-06
	2	7/21/21	15:13-16:17	8,987	1.38E-04	5.62E-06
	3	7/21/21	16:35-17:39	8,874	1.42E-04	7.07E-06
	Average			**9,070**	**1.34E-04**	**6.37E-06**
SPO Pouring/Cooling #2	1	7/22/21	08:50-09:54	10,140	1.37E-04	6.06E-06
	2	7/22/21	10:35-11:39	9,921	9.58E-05	3.21E-06
	3	7/22/21	12:03-13:30	9,796	1.28E-04	5.86E-06
	Average			**9,952**	**1.20E-04**	**5.05E-06**
SPO Pouring/Cooling #3	1	7/22/21	14:03-15:09	9,786	8.12E-05	3.40E-06
	2	7/22/21	15:32-16:35	9,736	1.06E-04	4.24E-06
	3	7/22/21	17:09-18:12	9,818	6.43E-05	2.73E-06
	Average			**9,780**	**8.37E-05**	**3.46E-06**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Lbs/Hr = Pounds of Pb Per Hour
(3) Lbs/Ton of Iron = Pounds of Pb Per Ton of Iron Poured. Calculated Using The Following Metal Process Rates: Stack #1; 18.98 Tons/Hr For Sample 1, 24.63 Tons/Hr For Sample 2 & 20.16 Tons/Hr For Sample 3. Stack#2; 22.66 Tons/Hr For Sample 1, 29.83 Tons/Hr For Sample 2 & 21.86 Tons/Hr For Sample 3. Stack #3; 23.86 Tons/Hr For Sample 1, 24.89 Tons/Hr For Sample 2 & 23.59 Tons/Hr For Sample 3. Metal Process Rates Were Calculated Using Tons Of Metals Poured Data Supplied By Cadillac Casting, Inc..

II.4.3 TABLE 13
TOTAL HYDROCARBON (VOC) EMISSION RESULTS
EGSPOPOURANDCOOL
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate SCFM (1)	VOC Concentration PPM (2)	VOC Mass Rates	
						Lbs/Hr (3)	Lbs/Ton (4)
SPO Pouring /Cooling #1 Exhaust	1	7/21/21	13:40-14:48	9,465	39.6	2.56	0.119
	2	7/21/21	15:11-16:19	9,117	40.2	2.50	0.086
	3	7/21/21	16:37-17:42	9,004	34.1	2.10	0.107
	Average			**9,195**	**38.0**	**2.39**	**0.104**
SPO Pouring /Cooling #2 Exhaust	1	7/22/21	08:49-09:56	10,345	55.3	3.91	0.178
	2	7/22/21	10:18-11:31	10,097	48.9	3.37	0.155
	3	7/22/21	11:58-13:27	9,994	35.0	2.39	0.142
	Average			**10,145**	**46.4**	**3.22**	**0.158**
SPO Pouring /Cooling #3 Exhaust	1	7/22/21	14:01-15:09	9,991	28.8	1.97	0.082
	2	7/22/21	15:30-16:39	9,911	37.1	2.51	0.096
	3	7/22/21	17:04-18:11	10,016	28.2	1.93	0.088
	Average			**9,972**	**31.4**	**2.14**	**0.089**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Wet (Actual) Basis
(3) Lbs/Hr = Pounds of VOC Per Hour As Propane
(4) Lbs/Ton = Pounds of VOC Per Ton of Iron Poured. Calculated Using The Following Metal Process Rates: Stack #1; 21.58 Tons/Hr For Sample 1, 28.99 Tons/Hr For Sample 2 & 19.67 Tons/Hr For Sample 3. Stack#2; 21.94 Tons/Hr For Sample 1, 21.75 Tons/Hr For Sample 2 & 16.87 Tons/Hr For Sample 3. Stack #3; 24.00 Tons/Hr For Sample 1, 26.02 Tons/Hr For Sample 2 & 21.86 Tons/Hr For Sample 3. Metal Process Rates Were Calculated Using Tons Of Metals Poured Data Supplied By Cadillac Casting, Inc..

II.4.4 TABLE 14
CARBON MONOXIDE (CO) EMISSION RESULTS
EGSPOPOURANDCOOL
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate DSCFM (1)	CO Concentration PPM (2)	CO Mass Rates	
						Lbs/Hr (3)	Lbs/Ton (4)
SPO Pouring /Cooling #1 Exhaust	1	7/21/21	13:40-14:48	9,350	392.2	15.95	0.739
	2	7/21/21	15:11-16:19	8,987	405.0	15.83	0.546
	3	7/21/21	16:37-17:42	8,874	297.7	11.49	0.584
	Average			**9,070**	**365.0**	**14.42**	**0.623**
SPO Pouring /Cooling #2 Exhaust	1	7/22/21	08:49-09:56	10,140	359.9	15.87	0.723
	2	7/22/21	10:18-11:31	9,921	518.6	22.37	1.029
	3	7/22/21	11:58-13:27	9,796	340.5	14.50	0.860
	Average			**9,952**	**406.3**	**17.58**	**0.871**
SPO Pouring /Cooling #3 Exhaust	1	7/22/21	14:01-15:09	9,786	251.2	10.69	0.445
	2	7/22/21	15:30-16:39	9,736	397.5	16.83	0.647
	3	7/22/21	17:04-18:11	9,818	271.1	11.57	0.529
	Average			**9,780**	**306.6**	**13.03**	**0.540**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Dry Basis
(3) Lbs/Hr = Pounds of CO Per Hour
(4) Lbs/Ton = Pounds of CO Per Ton of Iron Poured. Calculated Using The Following Metal Process Rates: Stack #1; 21.58 Tons/Hr For Sample 1, 28.99 Tons/Hr For Sample 2 & 19.67 Tons/Hr For Sample 3. Stack#2; 21.94 Tons/Hr For Sample 1, 21.75 Tons/Hr For Sample 2 & 16.87 Tons/Hr For Sample 3. Stack #3; 24.00 Tons/Hr For Sample 1, 26.02 Tons/Hr For Sample 2 & 21.86 Tons/Hr For Sample 3. Metal Process Rates Were Calculated Using Tons Of Metals Poured Data Supplied By Cadillac Casting, Inc..

II.5 CUPOLA SCRUBBER EXHAUST (EUMELTING)

II.5.1 TABLE 15
PARTICULATE EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 28, 2021

Sample	Time	Air Flow Rate DSCFM (1)	Particulate Concentration Grains/DSCF (2)	Particulate Mass Rates	
				Lbs/Hr (3)	Lbs/Ton Charged (4)
1	13:11-14:44	29,840	0.0079	2.02	0.065
2	16:07-17:40	29,402	0.0061	1.54	0.055
3	18:13-19:46	29,708	0.0082	2.09	0.064
Average		**29,650**	**0.0074**	**1.88**	**0.061**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Grains/DSCF = Grains of Particulate Per Dry Standard Cubic Foot of Exhaust Gas
(3) Lbs/Hr = Pounds of Particulate Per Hour
(4) Lbs/Ton Charged = Pounds of Particulate Per Ton of Metal Charged. Calculated Using Charge Rates of 31.03 Tons/Hr For Sample 1, 28.00 Tons/Hr For Sample 2 & 32.58 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.5.2 TABLE 16
TOTAL METAL HAP'S EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 28, 2021

Sample	Time	Air Flow Rate DSCFM (1)	Total Metal HAP's Concentration Grains/DSCF (2)	Total Metal HAP's Mass Rates	
				Lbs/Hr (3)	Lbs/Ton Charged (4)
1	13:11-14:44	29,840	0.00014	0.037	0.00119
2	16:07-17:40	29,402	0.00014	0.034	0.00122
3	18:13-19:46	29,708	0.00011	0.029	0.00090
Average		**29,650**	**0.00013**	**0.033**	**0.00110**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Grains/DSCF = Grains Per Dry Standard Foot
(3) Lbs/Hr = Pounds Per Hour
(4) Lbs/Ton Charged = Pounds of Metal HAP's Per Ton of Metal Charged. Calculated Using Charge Rates of 31.03 Tons/Hr For Sample 1, 28.00 Tons/Hr For Sample 2 & 32.58 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.5.3 TABLE 17
METALS EMISSION RESULTS SUMMARY
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 28, 2021

Metal	Sample 1 (13:11-14:44)		Sample 2 (16:07-17:40)		Sample 3 (18:13-19:46)		**Average**	
	Lbs/Hr (1)	Lb/Ton (2)	Lbs/Hr (1)	Lb/Ton (2)	Lbs/Hr (1)	Lb/Ton (2)	**Lbs/Hr (1)**	**Lb/Ton (2)**
Arsenic (As)	3.94E-05	1.27E-06	3.74E-05	1.33E-06	2.98E-05	9.14E-07	**3.55E-05**	**1.17E-06**
Antimony (Sb)	2.26E-04	7.27E-06	3.12E-04	1.11E-05	2.04E-04	6.25E-06	**2.47E-04**	**8.21E-06**
Beryllium (Be)(3)	2.70E-06	8.70E-08	2.70E-06	9.64E-08	2.69E-06	8.26E-08	**2.70E-06**	**8.87E-08**
Cadmium (Cd)	6.86E-05	2.21E-06	5.99E-05	2.14E-06	4.56E-05	1.40E-06	**5.80E-05**	**1.92E-06**
Chromium (Cr)	4.65E-04	1.50E-05	6.75E-04	2.41E-05	6.19E-04	1.90E-05	**5.86E-04**	**1.94E-05**
Cobalt (Co)	2.62E-05	8.46E-07	3.83E-05	1.37E-06	2.35E-05	7.21E-07	**2.93E-05**	**9.78E-07**
Lead (Pb)	4.88E-03	1.57E-04	5.40E-03	1.93E-04	5.23E-03	1.60E-04	**5.17E-03**	**1.70E-04**
Manganese (Mn)	3.04E-02	9.81E-04	2.65E-02	9.47E-04	2.27E-02	6.96E-04	**2.65E-02**	**8.75E-04**
Nickel (Ni)	5.83E-04	1.88E-05	1.15E-03	4.11E-05	3.54E-04	1.09E-05	**6.96E-04**	**2.36E-05**
Selenium (Se)(3)	1.08E-05	3.48E-07	1.08E-05	3.86E-07	1.08E-05	3.31E-07	**1.08E-05**	**3.55E-07**
Mercury (Hg)	4.27E-05	1.38E-06	5.51E-05	1.97E-06	4.98E-05	1.53E-06	**4.92E-05**	**1.62E-06**

(1) Lbs/Hr = Pounds Per Hour (Calculated using 29,840 DSCFM for Sample 1, 29,402 DSCFM for Sample 2 & 29,708 DSCFM for Sample 3)
(2) Lb/Ton = Pound Per Ton of Metal Charged. Calculated Using Charge Rates of 31.03 Tons/Hr For Sample 1, 28.00 Tons/Hr For Sample 2 & 32.58 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..
(3) All the samples for Be & Se were Non-Dectect. Shown are the detection limit values.

II.5.4 TABLE 18
TOTAL HYDROCARBON (VOC) EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 28, 2021

Sample	Time	Air Flow Rate SCFM (1)	VOC Concentration PPM (2)	VOC Mass Rates	
				Lbs/Hr (3)	Lbs/Ton of Charge(4)
1	12:41-13:41	41,865	1.4	0.40	0.0093
2	14:26-15:26	41,865	1.6	0.46	0.0121
3	16:03-17:03	41,483	0.7	0.20	0.0052
Average		**41,738**	**1.2**	**0.35**	**0.0089**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On An Actual "Wet" Basis As Propane
(3) Lbs/Hr = Pounds of VOC Per Hour As Propane
(4) Lbs/Ton of Charge = Pounds of VOC Per Ton of Metal Charged. Calculated Using Charge Rates of 43.20 Tons/Hr For Sample 1, 38.10 Tons/Hr For Sample 2 & 38.60 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.5.5 TABLE 19
VO HAP'S EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 28, 2021

Sample	Time	Air Flow Rate SCFM (1)	VO HAP's PPM (2)	VO HAP's PPM @ 10% O_2 (3)
1	12:41-13:41	41,865	0.7	0.73
2	14:26-15:26	41,865	0.8	0.83
3	16:03-17:03	41,483	0.3	0.31
Average		**41,738**	**0.6**	**0.62**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On An Actual Basis As Hexane
(3) PPM @ 10% O_2 = Parts Per Million (v/v) On An Actual Basis As Hexane Corrected To 10 Percent Oxygen. O_2 = 10.4% for Sample 1, 10.4% for Sample 2 and 10.5% for Sample 3.

II.5.6 TABLE 20
CARBON MONOXIDE (CO) EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
JULY 28, 2021

Sample	Time	Air Flow Rate DSCFM (1)	CO Concentration PPM (2)	CO Mass Rates	
				Lbs/Hr (3)	Lbs/Ton of Charge (4)
1	12:41-13:41	29,840	32.4	4.20	0.097
2	14:26-15:26	29,840	26.4	3.43	0.090
3	16:03-17:03	29,402	26.5	3.39	0.088
Average		**29,694**	**28.4**	**3.67**	**0.092**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Dry Basis
(3) Lbs/Hr = Pounds of CO Per Hour
(4) Lbs/Ton of Charge = Pounds of CO Per Ton of Metal Charged. Calculated Using Charge Rates of 43.20 Tons/Hr For Sample 1, 38.10 Tons/Hr For Sample 2 & 38.60 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

II.5.7 TABLE 21
SULFUR DIOXIDE (SO_2) EMISSION RESULTS
CUPOLA SCRUBBER EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
OCTOBER 25, 2016

Sample	Time	Air Flow Rate DSCFM (1)	SO_2 Concentration PPM (2)	SO_2 Mass Rates	
				Lbs/Hr (3)	Lbs/Ton of Charge (4)
1	12:41-13:41	29,840	0.1	0.030	0.00069
2	14:26-15:26	29,840	0.2	0.059	0.00155
3	16:03-17:03	29,402	0.4	0.117	0.00303
Average		**29,694**	**0.2**	**0.069**	**0.00176**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) PPM = Parts Per Million (v/v) On A Dry Basis
(3) Lbs/Hr = Pounds of SO_2 Per Hour
(4) Lbs/Ton of Charge = Pounds of SO_2 Per Ton of Metal Charged. Calculated Using Charge Rates of 43.20 Tons/Hr For Sample 1, 38.10 Tons/Hr For Sample 2 & 38.60 Tons/Hr For Sample 3. Charge Rates Were Calculated Using Tons Of Metals Charged Data Supplied By Cadillac Casting, Inc..

III. DISCUSSION OF RESULTS

The results of the emission sampling are summarized in Tables 1 through 21 (Sections II.1 through II.5). The results are presented as follows:

III.1 EUSPOSHAKEOUT

III.1.1 EUSPOSHAKEOUT Particulate Emission Results (Table 1)

Table 1 summarizes the EUSPOSHAKEOUT (South Multiwash) particulate emission results as follows:

- Source
- Sample
- Date
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour
- Particulate Mass Emission Rate (Lbs/Ton of Metal) – Pounds of Particulate Per Ton of Metal Processed

A more detailed breakdown for each sample can be found in Appendix A.

III.1.2 EUSPOSHAKEOUT Carbon Monoxide (CO) Emission Results (Table 2)

Table 2 summarizes the EUSPOSHAKEOUT (South Multiwash) CO emission results as follows:

- Source
- Sample
- Date
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- CO Concentration (PPM) – Parts Per Million (v/v) On A Dry Basis
- CO Mass Emission Rate (Lbs/Hr) – Pounds of CO Per Hour
- CO Mass Emission Rate (Lbs/Ton) – Pounds of CO Per Ton of Iron Poured

III.1.3 EUSPOSHAKEOUT Total Hydrocarbon (VOC) Emission Results (Table 3)

Table 3 summarizes the EUSPOSHAKEOUT (South Multiwash) VOC emission results as follows:

- Source
- Sample
- Date

- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- VOC Concentration (PPM) – Parts Per Million (v/v) On A Wet (Actual) Basis
- VOC Mass Emission Rate (Lbs/Hr) – Pounds of VOC Per Hour As Propane
- VOC Mass Emission Rate (Lbs/Ton) – Pounds of VOC Per Ton of Iron Poured

III.2 EUSPOGREENSAND

III.2.1 EUSPOGREENSAND Particulate Emission Results (Table 4)

Table 4 summarizes the EUSPOGREENSAND (North Multiwash) particulate emission results as follows:

- Source
- Sample
- Date
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour
- Particulate Mass Emission Rate (Lbs/Ton of Metal) – Pounds of Particulate Per Ton of Metal Processed

A more detailed breakdown for each sample can be found in Appendix A.

III.3 EUALINE

III.3.1 RTO Particulate Emission Results (Table 5)

Table 5 summarizes the RTO particulate emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Concentration (Grains/DSCF) – Grains of Particulate Per Dry Standard Cubic Foot of Exhaust Gas
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour
- Particulate Mass Emission Rate (Lbs/Ton Poured) – Pounds of Particulate Per Ton of Iron Poured

A more detailed breakdown for each sample can be found in Appendix A.

III.3.2 RTO PM-10 Emission Results (Table 6)

Table 6 summarizes the RTO PM-10 emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- PM-10 Concentration (Grains/DSCF) – Grains of PM-10 Per Dry Standard Cubic Foot of Exhaust Gas
- PM-10 Mass Emission Rate (Lbs/Hr) – Pounds of PM-10 Per Hour
- PM-10 Emission Rate (Lbs/Ton Poured) – Pounds of PM-10 Per Ton of Iron Poured

The PM-10 results include the total filterable and condensable particulate matter. A more detailed breakdown for each sample can be found in Appendix A.

III.3.3 RTO Lead (Pb) Emission Results (Table 7)

Table 7 summarizes the RTO Lead emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Pb Concentration (Mg/M^3) – Milligrams Per Dry Standard Cubic Meter
- Pb Mass Emission Rate (Lbs/Hr) – Pounds of Pb Per Hour
- Pb Mass Emission Rate (Lbs/Ton) – Pounds of Pb Per Ton of Iron Poured

III.3.4 RTO Carbon Monoxide (CO) Emission Results (Table 8)

Table 8 summarizes the RTO CO emission results as follows:

- Sample
- Date
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- CO Concentration (PPM) – Parts Per Million (v/v) On A Dry Basis
- CO Mass Emission Rate (Lbs/Hr) – Pounds of CO Per Hour
- CO Mass Emission Rate (Lbs/Ton Poured) – Pounds of CO Per Ton of Iron Poured

III.3.5 RTO Total Hydrocarbon (VOC) Emission Results (Table 9)

Table 9 summarizes the RTO VOC emission results as follows:

- Sample
- Time

- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- VOC Concentration (PPM) – Parts Per Million (v/v) On An Actual (Wet) Basis As Propane
- VOC Mass Emission Rate (Lbs/Hr) – Pounds of VOC Per Hour As Propane
- VOC Mass Emission Rate (Lbs/Ton Poured) – Pounds of VOC Per Ton of Iron Poured

III.3.6 RTO Benzene Emission Results (Table 10)

Table 10 summarizes the RTO Benzene emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Benzene Concentration (Mg/M^3) – Milligrams of Benzene Per Dry Standard Cubic Meter
- Benzene Mass Emission Rate (Lbs/Hr) – Pounds of Benzene Per Hour
- Benzene Mass Emission Rate (Lbs/Ton Poured) – Pounds of Benzene Per Ton of Iron Poured

III.4 EUSPOPOURANDCOOL (3 - INLINE EXHAUST STACKS)

III.4.1 EGSPOPOURANDCOOL Particulate Emission Results (Table 11)

Table 11 summarizes the EGSPOPOURANDCOOL (SPO Pouring/Cooling #1, #2 & #3 Exhausts) particulate emission results as follows:

- Source
- Sample
- Date
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour
- Particulate Mass Emission Rate (Lbs/Ton of Metal) – Pounds of Particulate Per Ton of Metal Processed

A more detailed breakdown for each sample can be found in Appendix A.

III.4.2 EGSPOPOURANDCOOL Lead (Pb) Emission Results (Table 12)

Table 12 summarizes the EGSPOPOURANDCOOL (SPO Pouring/Cooling #1, #2 & #3 Exhausts) Pb emission results as follows:

- Source
- Sample

- Date
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Pb Mass Emission Rate (Lbs/Hr) – Pounds of Pb Per Hour
- Pb Mass Emission Rate (Lbs/Ton of Iron) – Pounds of Pb Per Ton of Iron Poured

A more detailed breakdown for each sample can be found in Appendix A.

III.4.3 EGSPOPOURANDCOOL Total Hydrocarbon (VOC) Emission Results (Table 13)

Table 13 summarizes the EGSPOPOURANDCOOL (SPO Pouring/Cooling #1, #2 & #3 Exhausts) VOC emission results as follows:

- Source
- Sample
- Date
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- VOC Concentration (PPM) – Parts Per Million (v/v) On A Wet (Actual) Basis
- VOC Mass Emission Rate (Lbs/Hr) – Pounds of VOC Per Hour As Propane
- VOC Mass Emission Rate (Lbs/Ton) – Pounds of VOC Per Ton of Iron Poured

III.4.4 EGSPOPOURANDCOOL Carbon Monoxide (CO) Emission Results (Table 14)

Table 14 summarizes the EGSPOPOURANDCOOL CO emission results as follows:

- Sample
- Date
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- CO Concentration (PPM) – Parts Per Million (v/v) On A Dry Basis
- CO Mass Emission Rate (Lbs/Hr) – Pounds of CO Per Hour
- CO Mass Emission Rate (Lbs/Ton Poured) – Pounds of CO Per Ton of Iron Poured

III.5 Cupola (EUMELTING) Scrubber Exhaust

III.5.1 Cupola Particulate Emission Results (Table 15)

Table 15 summarizes the Cupola particulate emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Concentration (Grains/DSCF) – Grains of Particulate Per Dry Standard Cubic Foot of Exhaust Gas
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour
- Particulate Mass Emission Rate (Lbs/Ton Charged) – Pounds of Particulate Per Ton of Metal Charged

A more detailed breakdown for each sample can be found in Appendix A.

III.5.2 Cupola Total Metal HAP's Emission Results (Table 16)

Table 16 summarizes the cupola total metal HAP's emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Total Metal HAP's Concentration (Grains/DSCF) – Grains Per Dry Standard Cubic Foot
- Total Metal HAP's Mass Emission Rate (Lbs/Hr) – Pounds Per Hour
- Total Metal HAP's Mass Emission Rate (Lbs/Ton Charged) – Pounds Per Ton of Metal Charged

A more detailed breakdown for each sample can be found in Appendix A.

III.5.3 Cupola Metals Emission Results (Table 17)

Table 17 summarizes the cupola metals emission results as follows:

- Sample
- Time
- Metals Mass Emission Rate (Lbs/Hr) – Pounds Per Hour
- Metals Mass Emission Rate (Lb/Ton) – Pound Per Ton of Metal Charged

III.5.4 Cupola Total Hydrocarbon (VOC) Emission Results (Table 18)

Table 18 summarizes the cupola VOC emission results as follows:

- Sample
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- VOC Concentration (PPM) – Parts Per Million (v/v) On An Actual (Wet) Basis As Propane
- VOC Mass Emission Rate (Lbs/Hr) – Pounds of VOC Per Hour As Propane

- VOC Mass Emission Rate (Lbs/Ton of Charge) – Pounds of VOC Per Ton of Metal Charged

III.5.5 Cupola VO HAP's Emission Results (Table 19)

Table 19 summarizes the cupola VO HAP's emission results as follows:

- Sample
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- VO HAP's Concentration (PPM) – Parts Per Million (v/v) On An Actual (Wet) Basis As Hexane
- VO HAP's Concentration (PPM @ 10% O_2) – Parts Per Million (v/v) On An Actual (Wet) Basis As Hexane Corrected to 10 Percent Oxygen

III.5.6 Cupola Carbon Monoxide (CO) Emission Results (Table 20)

Table 20 summarizes the CO emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- CO Concentration (PPM) – Parts Per Million (v/v) On A Dry Basis
- CO Mass Emission Rate (Lbs/Hr) – Pounds of CO Per Hour
- CO Mass Emission Rate (Lbs/Ton of Charge) – Pounds of CO Per Ton of Metal Charged

III.5.7 Cupola Sulfur Dioxide (SO_2) Emission Results (Table 21)

Table 21 summarizes the SO_2 emission results as follows:

- Sample
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- SO_2 Concentration (PPM) – Parts Per Million (v/v) On A Dry Basis
- SO_2 Mass Emission Rate (Lbs/Hr) – Pounds of SO_2 Per Hour
- SO_2 Mass Emission Rate (Lbs/Ton of Charge) – Pounds of SO_2 Per Ton of Metal Charged

III.5.8 Visible Emissions

The visible emissions (VE's) observations can be found in Appendix D. Fugitive VE's from the foundry buildings were recorded on 7/28/21. The highest six minute average opacity reading recorded was 0.0%.

IV. SAMPLING AND ANALYTICAL PROTOCOL

The sampling location for each source was as follows:

- EUSPOSHAKEOUT (South Multiwash Exhaust) – A 52 inch I.D. diameter exhaust stack with 2 sample ports in a location 13.8 duct diameters downstream and 4.6 duct diameters upstream from the nearest disturbances. Twelve (12) sampling points were used for the isokinetic sampling.

- EUSPOGREENSAND (North Multiwash Exhaust) – A 52 inch I.D. diameter exhaust stack with 2 sample ports in a location 13.8 duct diameters downstream and 4.6 duct diameters upstream from the nearest disturbances. Twelve (12) sampling points were used for the isokinetic sampling.

- RTO Exhaust – A 78 inch I.D. diameter exhaust stack with 2 sample ports in a location 2 duct diameters downstream and 2 duct diameters upstream from the nearest disturbances. Twenty-Four (24) sampling points were used for the isokinetic sampling on this source.

- EUSPOPOURANDCOOL (3 – Inline Exhaust Stacks) – Each exhaust is a 24 inch I.D. diameter stack and have 2 sample ports in a location 20 duct diameters downstream and 5 duct diameters upstream from the nearest disturbances. Twelve (12) sampling points were used for the isokinetic sampling.

- Cupola Scrubber Exhaust – A 48 inch I.D. diameter exhaust stack with 2 sample ports in a location 8 duct diameters downstream and 3 duct diameters upstream from the nearest disturbances. Twelve (12) sampling points were used for the isokinetic sampling on this source.

The emission sampling was conducted by employing the following reference methods:

- Particulate & Lead (Pb) (EUALINE & EUSPOPOURANDCOOL) – U.S. EPA Method 29
- Particulate, Lead (Pb), Manganese (Mn) & Total Metal HAPs (EUMELTING) – U.S. EPA Method 29
- Particulate (EUSPOSHAKEOUT & EUSPOGREENSAND) – U.S. EPA Method 17
- PM-10 (EUALINE) – U.S. EPA Methods 17 & 202
- Total Hydrocarbons (VOC's) – U.S. EPA Method 25A
- Carbon Monoxide (CO) – U.S. EPA Method 10
- Sulfur Dioxide (SO_2) – U.S. EPA Method 6C
- Benzene – U.S. EPA Method 18
- Exhaust Gas Parameters (air flow, temperature, moisture & density) - U.S. EPA Methods 1-4
- Visible Emissions (Fugitive MACT) – U.S. EPA Method 9

IV.1 Particulate (EUSPOSHAKEOUT & EUSPOGREENSAND)

The particulate emission sampling was conducted in accordance with U.S. EPA Method 17. Method 17 is an in-stack filtration method. Three (3) samples were collected from each exhaust sampled. Each sample was sixty (60) minutes in duration and had minimum sample volumes of thirty (30) dry standard cubic feet. The samples were collected isokinetically and analyzed for particulate by gravimetric analysis. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis. Figure 1 is a diagram of the particulate sampling train.

IV.2 Particulate & Lead (EUALINE - RTO & EUSPOPOURANDCOOL)

The total particulate & lead (Pb) emission sampling was determined by employing U.S. EPA Method 29 (multiple metals train). Three (3) samples were collected from each of the sources sampled. The RTO samples were ninety-six (96) minutes in duration and had a minimum sample volume of sixty (60) dry standard cubic feet to meet the MACT requirement. Each SPO Pouring/Cooling sample was sixty (60) minutes in duration and had minimum sample volumes of thirty (30) dry standard cubic feet. The samples were collected isokinetically on quartz filters and in a nitric acid/hydrogen peroxide solution.

The filters, nozzle/probe rinses (front half) were analyzed gravimetrically for particulates in accordance with U.S. EPA Reference Method 5. The front half and the nitric acid/hydrogen peroxide solutions were analyzed for lead (Pb) by inductively coupled argon plasma mass spec (ICAP/MS) analysis. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis. A diagram of the particulate and lead sampling train is shown in Figure 2.

IV.3 PM-10 (RTO)

The PM-10 emission sampling was conducted in accordance with U.S. EPA Methods 17 and 202. Method 17 is an in-stack filtration method. Three (3) samples were collected from the RTO exhaust. Each sample was sixty (60) minutes in duration and had a minimum sample volume of thirty (30) dry standard cubic feet. The samples were collected isokinetically and analyzed for Particulate by gravimetric analysis.

In addition to the standard front half analysis, the back half condensable particulate matter was determined in accordance with U.S. EPA Method 202 (Dry Impinger Technique). A sixty (60) minute nitrogen purge (as specified in Method 202) was conducted for the back half condensables immediately following each sample. The back half samples were extracted and analyzed for condensable particulate in accordance with Method 202. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis. Figure 3 is a diagram of the PM-10 sampling train.

IV.4 Particulate & Metals (Cupola)

The total particulate & metals emission sampling was determined by employing U.S. EPA Method 29 (multiple metals train). Three (3) samples were collected from the cupola exhaust. The samples were ninety (90) minutes in duration. Each sample had a minimum sample volume of sixty (60) dry standard cubic feet for all the MACT compliance samples . The samples were collected isokinetically on quartz filters, in a nitric acid/hydrogen peroxide solution and in a acidic potassium permanganate solution.

The filters, nozzle/probe rinses (front half) were analyzed gravimetrically for particulates in accordance with U.S. EPA Reference Method 5. The front half and the nitric acid/hydrogen peroxide solutions were analyzed for the specific metals by inductively coupled argon plasma mass spec (ICAP/MS) analysis. The front half, the nitric acid/hydrogen peroxide solutions and the acidic potassium permanganate solutions were analyzed for mercury by cold vapor atomic absorption spectrophotometry (CVAAS) . All the quality assurance and quality control procedures listed in the methods will be incorporated in the sampling and analysis.

The metals analyzed were as follows:

Cupola ROP & Metal HAP's –

- Arsenic (As)
- Antimony (Sb)
- Beryllium (Be)
- Cadmium (Cd)
- Chromium (Cr)
- Cobalt (Co)
- Mercury (Hg)
- Lead (Pb)
- Manganese (Mn)
- Nickel (Ni)
- Selenium (Se)

A diagram of the particulate and metals sampling train is shown in Figure 4.

IV.5 Carbon Monoxide (CO) - The Carbon Monoxide (CO) emission sampling was conducted in accordance with U.S. EPA Reference Method 10. The sample gas was extracted from the exhausts through a heated teflon sample line which led to a VIA MAK 2 sample gas conditioner and then to either a Thermo

Environmental Model 48 or Model 48C portable stack gas monitor. These analyzers are capable of giving instantaneous readouts of the CO concentrations (PPM). Three (3) samples were collected from each of the exhausts sampled. Each sample was sixty (60) minutes in duration.

The analyzer was calibrated with EPA protocol CO calibration gases. Span gases of 2,215 PPM (for the Cupola), 998.0 PPM (for the SPO Pouring/Cooling), 168.0 PPM (for the S. Multiwash) and 89.7 PPM (for the RTO) were used to establish the initial instrument calibration. Calibration gases of 998.0 PPM, 498.0 PPM, & 251.0 PPM (for the Cupola), 498.0 PPM & 251.0 PPM (for the SPO Pouring/Cooling), 89.7 PPM & 49.5 PPM (for the S. Multiwash) and 49.5 PPM (for the RTO) were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 251.0 PPM gas for the Cupola, the 498.0 PPM gas for the SPO Pouring/Cooling and the 49.5 PPM gas for the RTO & S. Multiwash to determine the system bias. After each sample, a system zero and system injection of 251.0 PPM for the Cupola, 498.0 PPM for the SPO Pouring/Cooling and 49.5 PPM for the RTO & S. Multiwash were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the exhausts. The analyzer averages were corrected for calibration error and drift using formula EQ.7E-5 from 40 CFR Part 60, Appendix A, Method 7E. A diagram of the sampling train is shown in Figure 5.

IV.6 Total Hydrocarbons (VOC) – The VOC sampling was conducted in accordance with U.S. EPA Reference Method 25A. A J.U.M. Model 3-500 flame ionization detector (FID) analyzer was used to monitor the sources sampled. Sample gas was extracted through a heated probe. A heated teflon sample line was used to transport the exhaust gases to the analyzer. The analyzer produces instantaneous readouts of the VOC concentrations (PPM).

The analyzer was calibrated by system injection (from the back of the stack probe to the analyzer) prior to the testing. A span gas of 94.9 PPM Propane was used to establish the initial instrument calibration. Calibration gases of 30.2 PPM and 50.6 PPM Propane were used to determine the calibration error of the analyzer. For the Cupola VO HAP's determinations, Hexane calibration gases of 86.00 PPM, 51.20 PPM and 27.00 PPM were also used in order to develop a response factor. After each sample, a system zero and system injection of 30.2 PPM Propane (for the Cupola, RTO & S. Multiwash), 50.6 PPM Propane (SPO Pouring/Cooling) and 27.00 PPM Hexane (Cupola Only) were performed to establish system drift and system bias during the test period. All calibration gases used were EPA Protocol Calibration Gases. Three (3) samples were collected from each of the sources. Each sample was sixty (60) minutes in duration.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the exhaust. The analyzer averages were corrected for calibration error and drift using formula EQ.7E-5 from 40 CFR Part 60, Appendix A, Method 7E. Figure 6 is a diagram of the VOC sampling train.

IV.7 Sulfur Dioxide - The Sulfur Dioxide (SO_2) emission sampling was conducted in accordance with U.S. EPA Reference Method 6C. The sample gas was extracted from the Cupola exhaust through a heated teflon sample line which led to a VIA MAK 2 sample gas conditioner and then to a Bovar Model 721M portable stack gas monitor. This analyzer is capable of giving instantaneous readouts of the SO_2 concentrations (PPM). Three (3) samples were collected from the Cupola exhaust. Each sample was sixty (60) minutes in duration.

The analyzer was calibrated with EPA protocol SO_2 calibration gases. A span gas of 95.2 PPM was used to establish the initial instrument calibration. Calibration gases of 50.2 PPM and 25.0 PPM were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 25.0 PPM gas to determine the system bias. After each sample, a system zero and system injection of 25.0 PPM were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the source. All reference method data was corrected using Equation 7E-5 from U.S. EPA Method 7E. A diagram of the sampling train is shown in Figure 5.

IV.8 Benzene – The sampling for benzene was conducted by employing U.S. EPA Method 18. The samples were collected on charcoal sorbent tubes using pumps equipped with calibrated critical orifices (calibrated at approximately 500 cc/min). The samples were analyzed for benzene by gas chromatography (GCFID). A duplicate spiked sample was run simultaneously with each sampling run. Six (6) samples (3 sample runs & 3 spiked/duplicates) were collected from the RTO. Each sample was sixty (60) minutes in duration. The final results were corrected in accordance with Method 18 by using the recovery efficiencies (Sample 1 = 98.63%, Sample 2 = 102.69% & Sample 3 = 102.40%) of the spiked samples. The calculations for each sample can be found in Appendix G. All the quality assurance and quality control procedures listed in the method were incorporated in the sampling and analysis. Figure 7 is a diagram of the benzene sampling train

IV.9 Oxygen & Carbon Dioxide (RTO & Cupola Only) – The O_2 & CO_2 sampling was conducted in accordance with U.S. EPA Reference Method 3A. Servomex Model 1400M portable stack gas analyzers were used to monitor the exhausts. A heated teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzers. The analyzers produce instantaneous readouts of the O_2 & CO_2 concentrations (%). Three (3) samples were collected from the RTO and Cupola exhaust. Each sample was sixty (60) minutes in duration.

The analyzers were calibrated by direct injection prior to the testing. Span gases of 21.0% O_2 and 21.1% CO_2 were used to establish the initial instrument calibrations. Calibration gases of 12.06% O_2/6.01% CO_2 and 5.97% O_2/12.1% CO_2 were used to determine the calibration error of the analyzers. The sampling system (from the back of the stack probe to the analyzers) was injected using either the 12.06% O_2/6.01% CO_2 or the 5.97% O_2/12.1% CO_2 gas to determine the system bias. After each sample, a system zero and system injection of 12.06% O_2/6.01% CO_2 or 5.97% O_2/12.1% CO_2 were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzers were calibrated to the output of the data acquisition system (DAS) used to collect the data from the exhaust. The analyzer averages were corrected for calibration error and drift using formula EQ.7E-5 from 40 CFR Part 60, Appendix A, Method 7E. A diagram of the sampling train is shown in Figure 5.

IV.10 Exhaust Gas Parameters – The exhaust gas parameters (air flow rate, temperature, moisture and density) were determined in conjunction with the other sampling by employing U.S. EPA Methods 1 through 4.

The N. Multiwash, S. Multiwash and SPO Pouring/Cooling exhausts have demonstrated ambient air (20.9% O_2 & 0.0 % CO_2) gas composition in the past. The ambient air default values were used to calculate gas density for the N. Multiwash, S. Multiwash and SPO Pouring/Cooling exhausts. Bag samples were collected from the PM-10 train (7/27/21) on the RTO and analyzed by Orsat.

Air flow rates, temperatures and moistures were determined using the isokinetic sampling trains. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

IV.11 Visible Emissions – The VE's were determined in accordance with U.S. EPA Reference Method 9. The observations were conducted by a certified VE observer (Richard D. Eerdmans) in accordance with the method. VE's were monitored on 7/28/21 (During the Cupola sampling). A copy of the observer's VE certification and data sheets can be found in Appendix D.

This report was prepared by:

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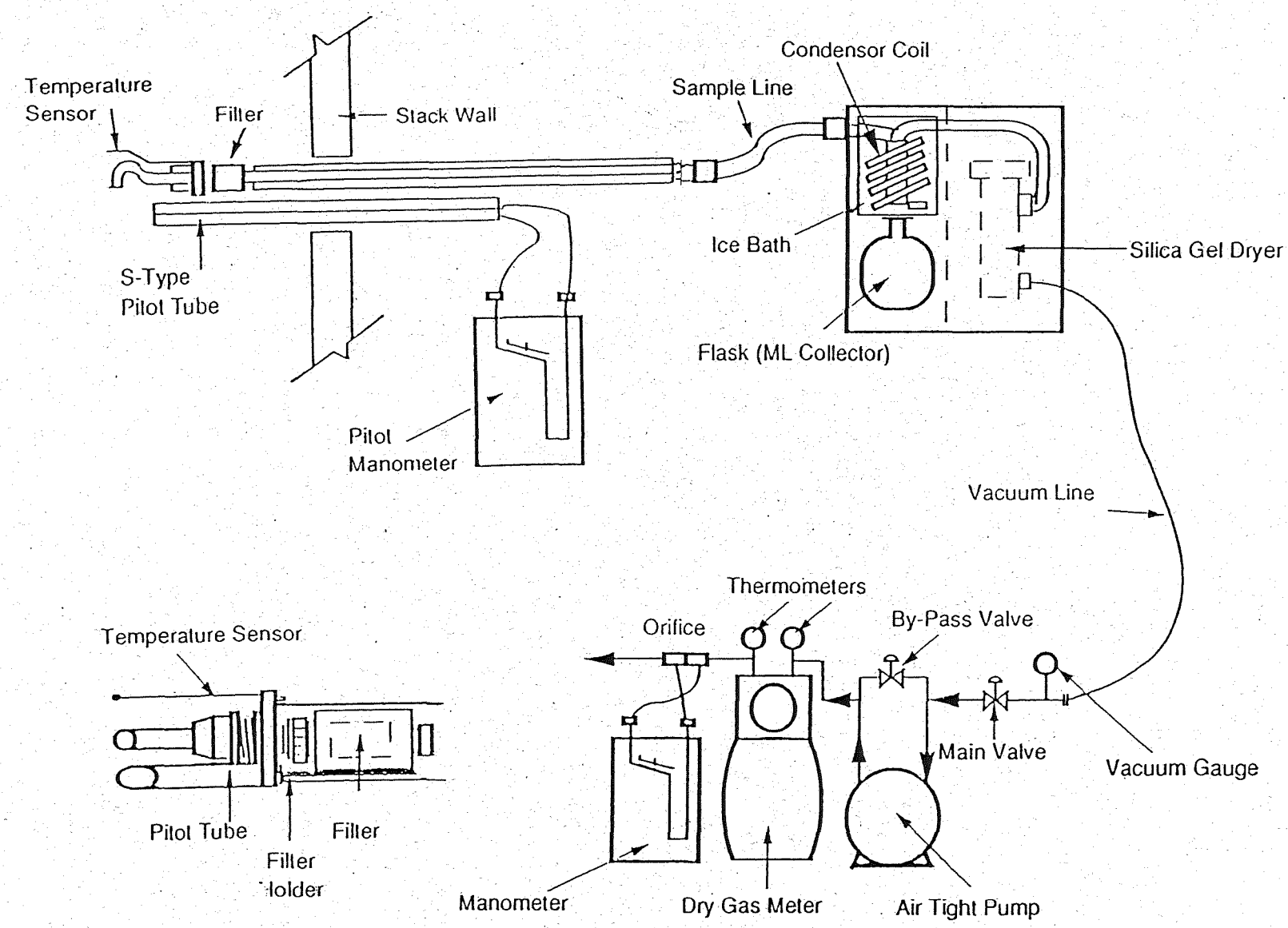

Figure 1

Particulate (Method 17) Sampling Train

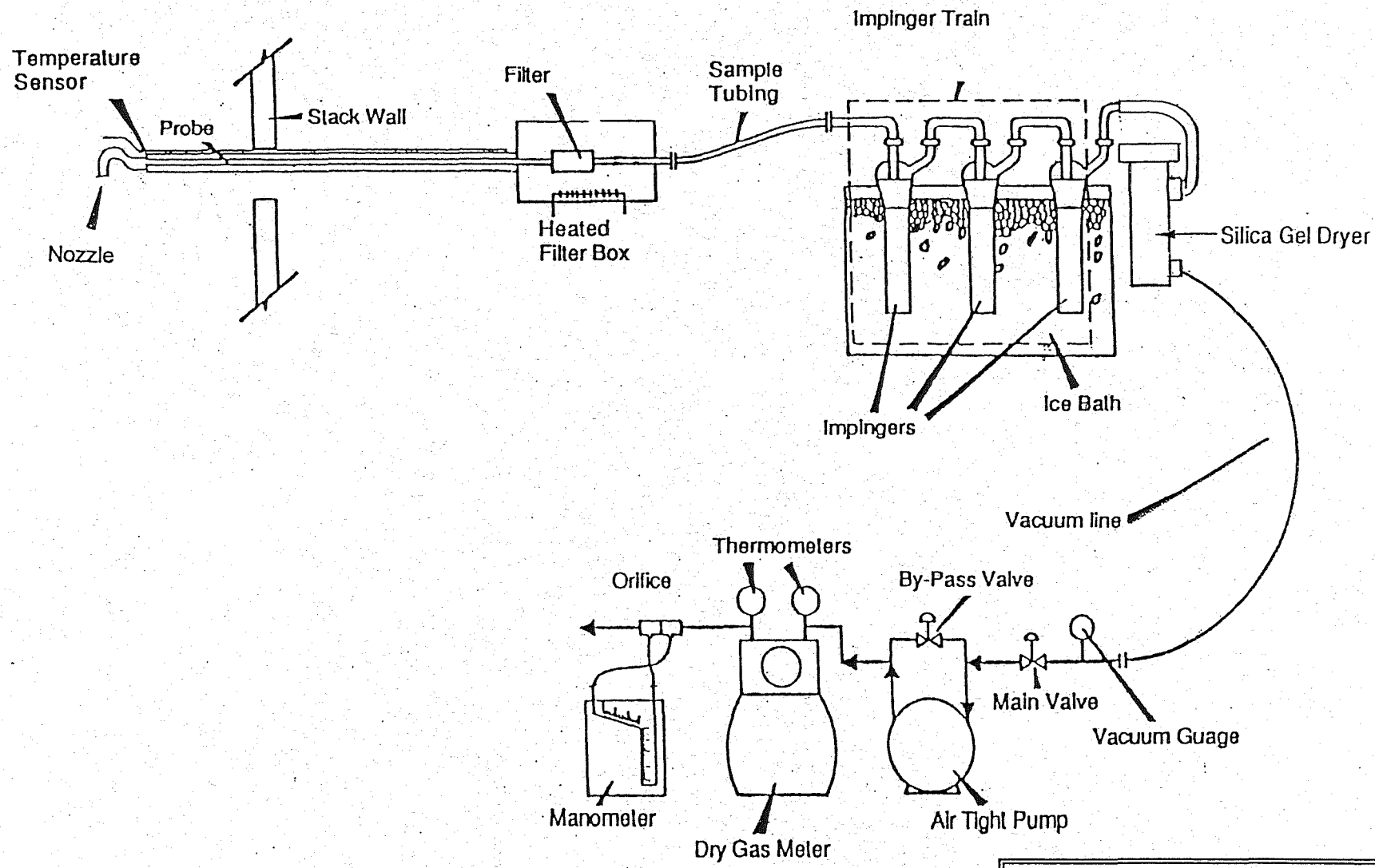

Figure 2

Particulate & Pb (Method 29) Sampling Train

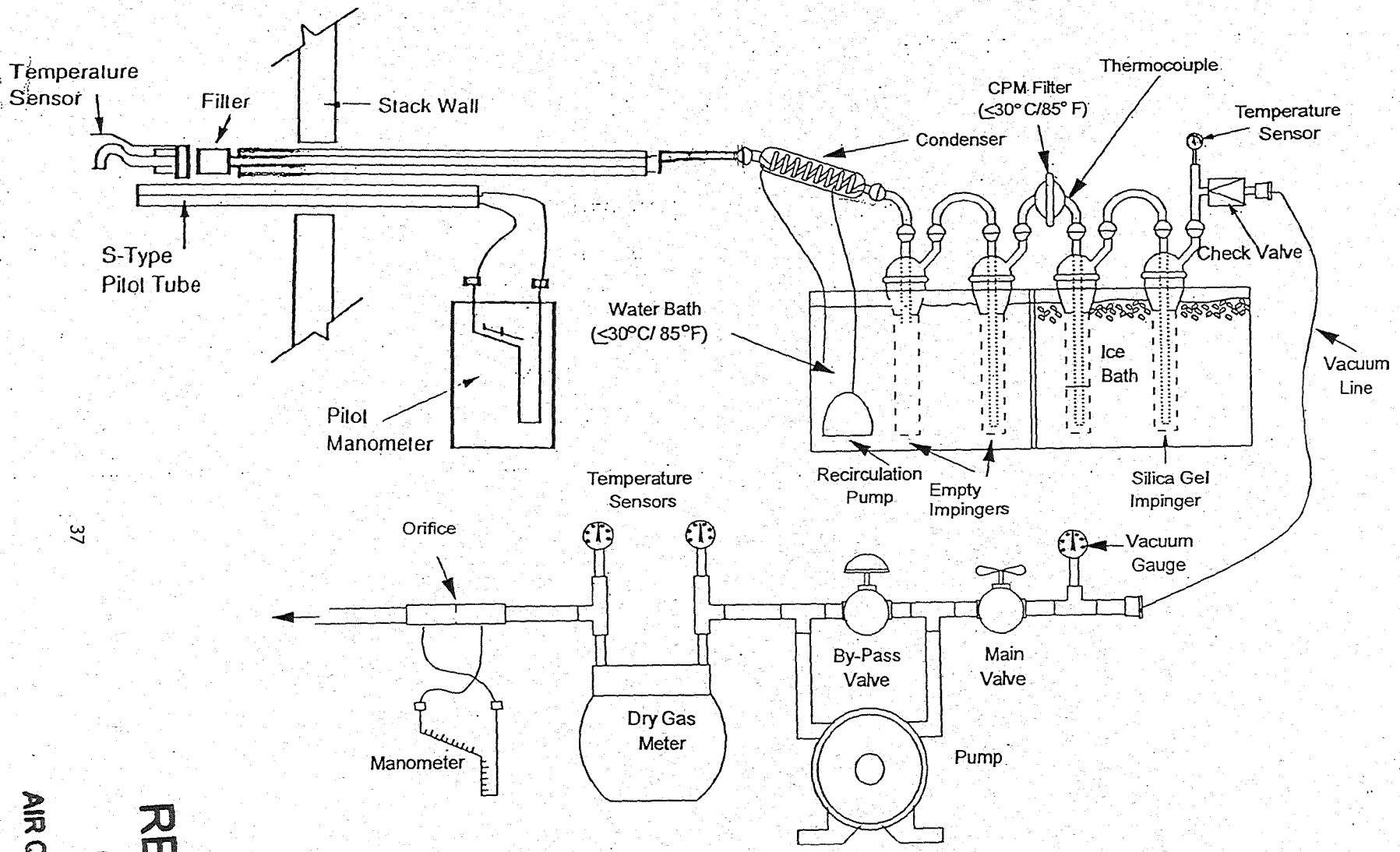

Figure 3

PM-10 (Method 17/202) Sampling Train

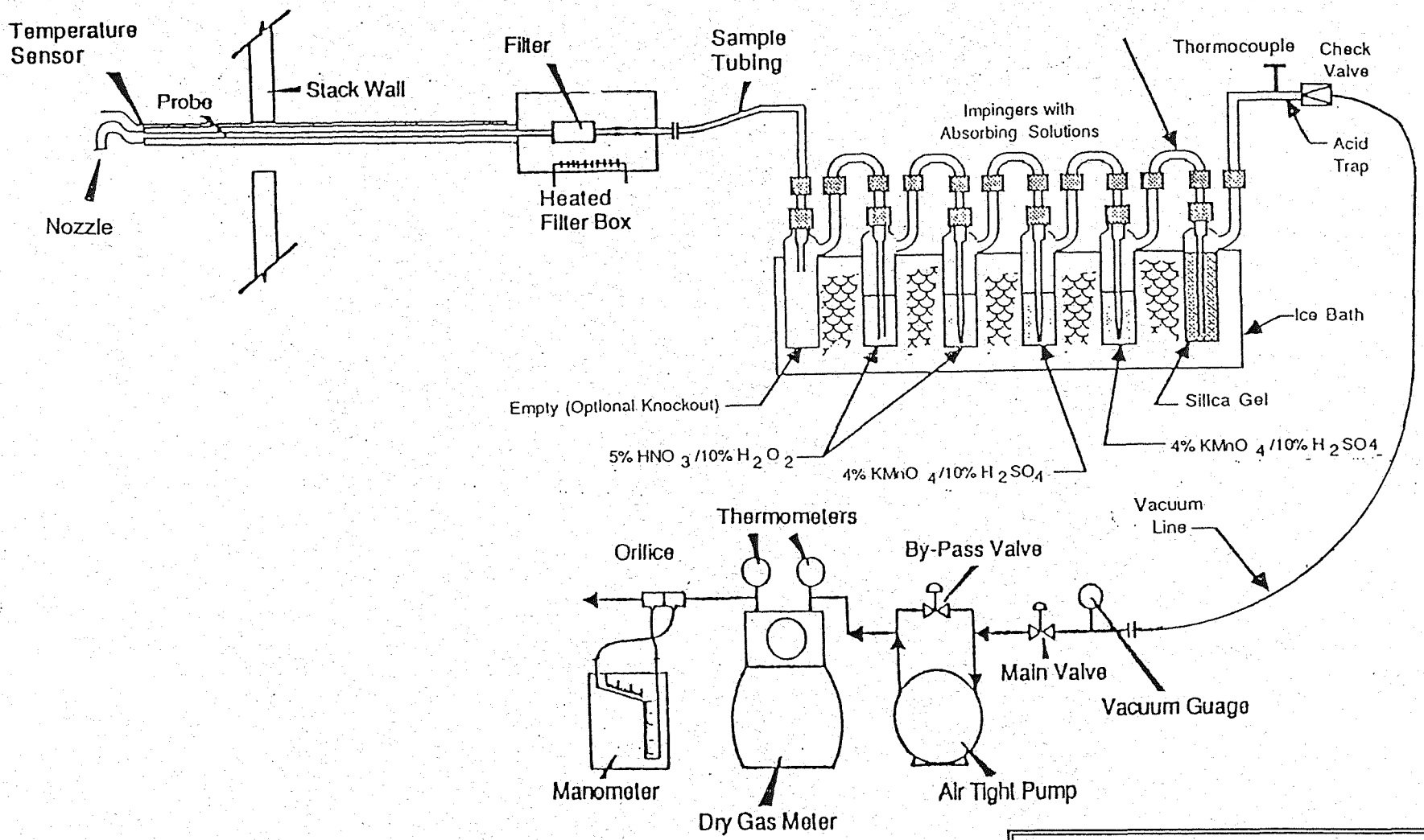

Figure 4

Particulate & Metals (Method 29) Sampling Train

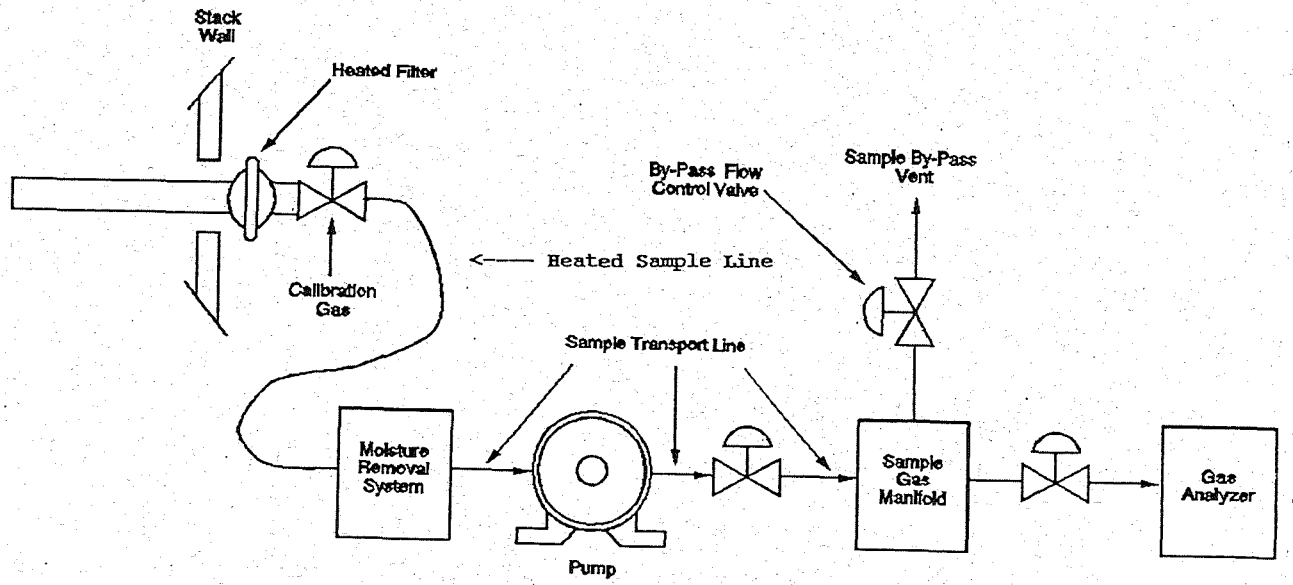

Figure 5

CO, SO_2, O_2 & CO_2 Sampling Train

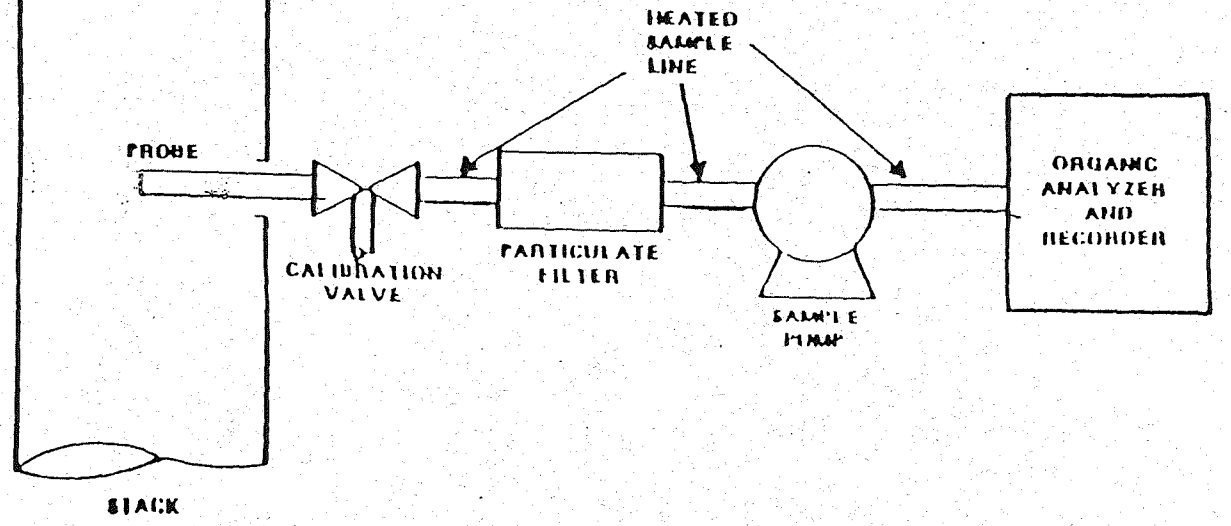

Figure 6

VOC & VO HAP's
Sampling Train

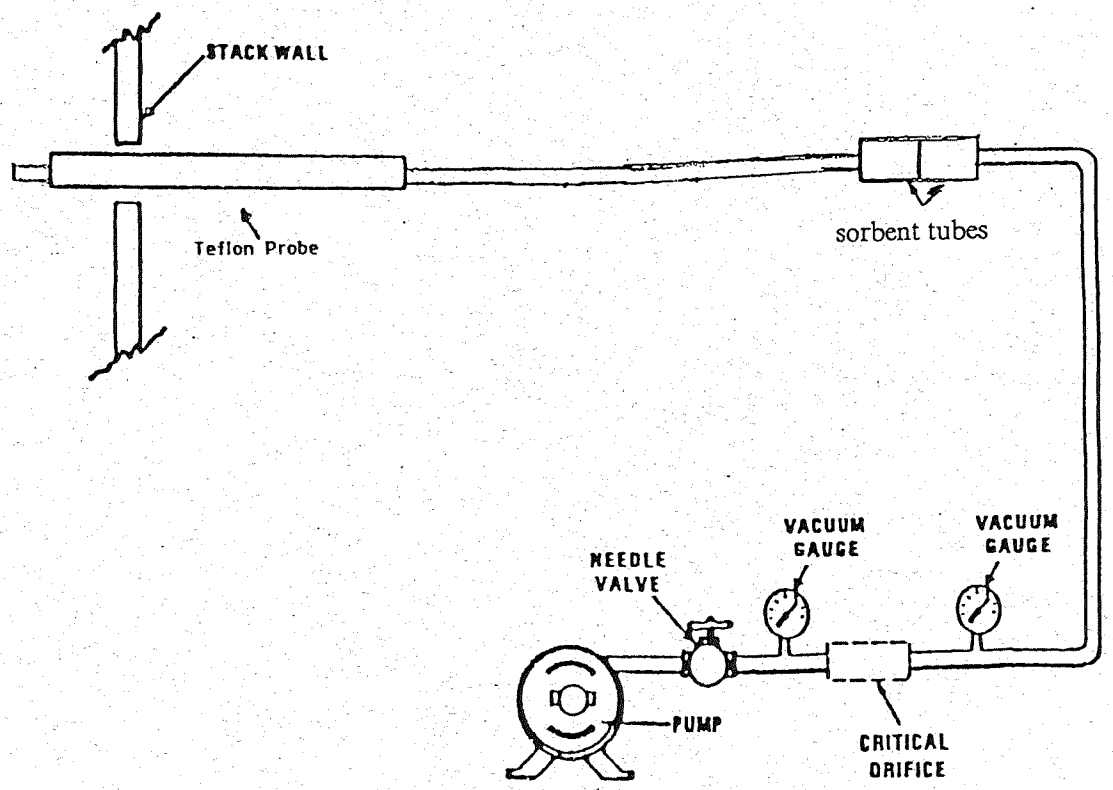

Figure 7

Benzene Sampling Train