Report of...

ROP Compliance Emission Sampling

Performed for...

Cadillac Casting, Inc.

Cadillac, Michigan

On...

Various Sources

May 2-11, 2016

029.45

Network Environmental, Inc.
Grand Rapids, MI

performed for

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TABLE OF CONTENTS

Appendices

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 State of Michigan Renewable Operating Permit (ROP) Number MI-ROP-B2178-2014.

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

Source	Compound(s) 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
EUFINISHING (40K Baghouse & 12K Baghouse)	Particulate	Particulate: 0.03 Lbs/1000 Lbs, 7 Lbs/Hr, 2.5 Tons/Month & 29.8 Tons/Year
EUSPOSHAKEOUT (S. Multiwash Scrubber Exhaust)	Particulate, Total Hydrocarbons (VOC) & Carbon Monoxide (CO)	Particulate: 0.27 Lbs/Ton of Metal Processed & 24.0 Tons/Year; CO: 2.78 Lbs/Ton & 250 Tons/Year; VOC: 60.0 Lbs/Hr & 107.0 Tons/Year
EUSPOGREENSAND (N. Multiwash Scrubber Exhaust & Carter Day Baghouse)	Particulate	Particulate: 0.36 Lbs/Ton of Metal Processed & 32.0 Tons/Year

The sampling in the study was conducted over the period of May 2-11, 2016 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. Shane Nixon and Mr. Jeremy Howe of the MDEQ – Air Quality Division were present to observe portions of the sampling and source operation.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
PARTICULATE EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
MAY 2-3, 2016

Sample	Time	Air Flow Rate DSCFM	Particulate Concentration Grains/DSCF	Particulate Mass Rates	
				Lbs/Hr	Lbs/Ton Poured
1	19:46-21:28	92,084	0.00059	0.47	0.038
2	22:04-23:48	89,130	0.00047	0.36	0.039
3	00:32-02:13	88,657	0.00058	0.44	0.034
Average		**89,957**	**0.00055**	**0.42**	**0.037**

(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 12.47 Tons/Hr For Sample 1, 9.17 Tons/Hr For Sample 2 & 12.89 Tons/Hr For Sample 3.

II.2 TABLE 2
PM-10 (TOTAL FILTERABLE & CONDENSABLE) EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
MAY 4-5, 2016

Sample	Time	Air Flow Rate DSCFM	PM-10 Concentration Grains/DSCF	PM-10 Mass Rates	
				Lbs/Hr	Lbs/Ton Poured
1	20:07-21:12	91,761	0.0026	2.05	0.18
2	21:45-22:49	91,293	0.0023	1.82	0.24
3	23:20-00:24	90,480	0.0016	1.21	0.10
Average		**91,178**	**0.0022**	**1.69**	**0.17**

(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 11.54 Tons/Hr For Sample 1, 7.50 Tons/Hr For Sample 2 & 12.00 Tons/Hr For Sample 3.

II.3 TABLE 3
LEAD EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
MAY 2-3, 2016

Sample	Time	Air Flow Rate DSCFM	Lead Concentration Mg/M^3	Lead Mass Rates	
				Lbs/Hr	Lbs/Ton
1	19:46-21:28	92,084	0.0026	9.11E-04	7.31E-05
2	22:04-23:48	89,130	0.0026	8.72E-04	9.51E-05
3	00:32-02:13	88,657	0.0042	1.39E-03	1.08E-04
Average		**89,957**	**0.0031**	**1.06E-03**	**9.20E-05**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Mg/M^3 = 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 12.47 Tons/Hr For Sample 1, 9.17 Tons/Hr For Sample 2 & 12.89 Tons/Hr For Sample 3.

II.4 TABLE 4
CARBON MONOXIDE (CO) EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
MAY 4, 2016

Sample	Time	Air Flow Rate DSCFM	CO Concentration PPM	CO Mass Rates	
				Lbs/Hr	Lbs/Ton Poured
1	19:39-20:39	91,761	15.6	6.22	0.56
2	20:56-21:56	91,293	16.0	6.35	0.50
3	22:23-23:23	90,480	12.5	4.92	0.72
Average		**91,178**	**14.7**	**5.83**	**0.59**

(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 11.20 Tons/Hr For Sample 1, 12.80 Tons/Hr For Sample 2 & 6.80 Tons/Hr For Sample 3.

II.5 TABLE 5
TOTAL HYDROCARBON (VOC) EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
MAY 4, 2016

Sample	Time	Air Flow Rate SCFM	VOC Concentration PPM	VOC Mass Rates	
				Lbs/Hr	Lbs/Ton Poured
1	19:39-20:39	92,992	26.5	16.84	1.50
2	20:56-21:56	92,762	19.1	12.11	0.95
3	22:23-23:23	91,940	16.3	10.24	1.51
Average		**92,565**	**20.6**	**13.06**	**1.32**

(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 11.20 Tons/Hr For Sample 1, 12.80 Tons/Hr For Sample 2 & 6.80 Tons/Hr For Sample 3.

II.6 TABLE 6
BENZENE EMISSION RESULTS
RTO EXHAUST
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN
MAY 2-3, 2016

Sample	Time	Air Flow Rate DSCFM	Benzene Concentration Mg/M^3	Benzene Mass Rates	
				Lbs/Hr	Lbs/Ton Poured
1	20:58-21:58	92,084	0.911	0.314	0.024
2	23:04-00:04	89,130	0.895	0.299	0.023
3	01:32-02:32	88,657	0.896	0.297	0.024
Average		89,957	0.900	0.303	**0.024**

(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 13.20 Tons/Hr For Sample 1, 13.20 Tons/Hr For Sample 2 & 12.40 Tons/Hr For Sample 3.

II.7 TABLE 7
PARTICULATE EMISSION RESULTS
EUFINISHING
CADILLAC CASTING, INC.
CADILLAC, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate SCFM (1)	Particulate Concentration Lbs/1000 Lbs, Dry (2)	Particulate Mass Rate Lbs/Hr (3)
40K Baghouse	1	5/11/16	09:17-10:26	29,992	0.0022	0.30
	2	5/11/16	10:39-11:47	29,883	0.0025	0.33
	3	5/11/16	11:59-13:06	29,947	0.0031	0.41
	Average			**29,941**	**0.0026**	**0.34**
12K Baghouse	1	5/3/16	12:10-13:25	13,366	0.0034	0.20
	2	5/3/16	13:52-15:06	13,570	0.0028	0.17
	3	5/3/16	15:17-16:19	14,638	0.0027	0.17
	Average			**13,858**	**0.0030**	**0.18**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Lbs/1000 Lbs, Dry = Pounds of Particulate Per Thousand Pounds of Exhaust Gas On a Dry Basis
(3) Lbs/Hr = Pounds of Particulate Per Hour

II.8 TABLE 8
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	5/10/16	08:52-09:56	53,966	2.16	0.088
	2	5/10/16	10:19-11:24	58,496	1.45	0.055
	3	5/10/16	11:46-12:50	52,873	0.76	0.034
	Average			**55,112**	**1.46**	**0.059**

(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 24.47 Tons/Hr For Sample 1, 26.40 Tons/Hr For Sample 2 & 22.03 Tons/Hr For Sample 3.

II.9 TABLE 9
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	5/10/16	09:01-10:01	52,168	43.2	9.80	0.39
	2	5/10/16	10:22-11:22	56,376	29.6	7.25	0.25
	3	5/10/16	11:42-12:42	50,734	30.7	6.77	0.26
	Average			**53,093**	**34.5**	**7.94**	**0.30**

(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 25.00 Tons/Hr For Sample 1, 28.90 Tons/Hr For Sample 2 & 25.60 Tons/Hr For Sample 3.

II.10 TABLE 10
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	5/10/16	09:01-10:01	53,966	20.0	7.37	0.29
	2	5/10/16	10:22-11:22	58,496	19.4	7.75	0.27
	3	5/10/16	11:42-12:42	52,873	17.7	6.39	0.25
	Average			**55,112**	**19.0**	**7.17**	**0.27**

(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 25.00 Tons/Hr For Sample 1, 28.90 Tons/Hr For Sample 2 & 25.60 Tons/Hr For Sample 3.

II.11 TABLE 11
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	5/11/16	08:52-09:56	58,716	1.12	0.057
	2	5/11/16	10:10-11:14	59,447	0.55	0.019
	3	5/11/16	11:30-12:33	63,851	1.29	0.042
	Average			**60,671**	**0.99**	**0.039**
Carter Day Baghouse	1	5/10/16	09:19-10:25	13,406	0.26	0.0107
	2	5/10/16	10:37-11:41	13,341	0.25	0.0088
	3	5/10/16	12:12-13:15	13,390	0.19	0.0071
	Average			**13,379**	**0.23**	**0.0089**

(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 19.59 Tons/Hr For Sample 1, 28.22 Tons/Hr For Sample 2 & 30.57 Tons/Hr For Sample 3. Carter Day Calculated Using Pouring Rates of 24.27 Tons/Hr For Sample 1, 28.41 Tons/Hr For Sample 2 & 26.76 Tons/Hr For Sample 3.

III. DISCUSSION OF RESULTS

The results of the emission sampling are summarized in Tables 1 through 11 (Sections II.1 through II.11). The results are presented as follows:

III.1 RTO Particulate Emission Results (Table 1)

Table 1 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.2 RTO PM-10 Emission Results (Table 2)

Table 2 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 RTO Lead (Pb) Emission Results (Table 3)

Table 3 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.4 RTO Carbon Monoxide (CO) Emission Results (Table 4)

Table 4 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.5 RTO Total Hydrocarbon (VOC) Emission Results (Table 5)

Table 5 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.6 RTO Benzene Emission Results (Table 6)

Table 6 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.7 EUFINISHING Particulate Emission Results (Table 7)

Table 7 summarizes the EUFINISHING (40K & 12K Baghouses) 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 Concentration (Lbs/1000 Lbs, Dry) – Pounds of Particulate Per Thousand Pounds of Exhaust Gas On a Dry Basis
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour

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

III.8 EUSPOSHAKEOUT Particulate Emission Results (Table 8)

Table 3 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.9 EUSPOSHAKEOUT Carbon Monoxide (CO) Emission Results (Table 9)

Table 9 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.10 EUSPOSHAKEOUT Total Hydrocarbon (VOC) Emission Results (Table 10)

Table 10 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.11 EUSPOGREENSAND Particulate Emission Results (Table 11)

Table 11 summarizes the EUSPOGREENSAND (North Multiwash & Carter Day Baghouse) 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.

IV. SAMPLING AND ANALYTICAL PROTOCOL

The sampling location for each source was as follows:

- 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

- EUFINISHING (12K Baghouse) – 28 inch I.D. exhaust at a location that meets the 8 duct diameters downstream and 2 duct diameters upstream requirement. Twelve (12) sampling points were used for the isokinetic sampling.

- EUFINISHING (40K Baghouse) – 48 inch I.D. exhaust at a location that meets the 7 duct diameters downstream and 2 duct diameters upstream requirement. Sixteen (16) sampling points were used for the isokinetic sampling.

- 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.

- EUSPOGREENSAND (Carter Day Baghouse) – A 36 inch I.D. diameter exhaust stack with 2 sample ports in a location that meets the 8 duct diameters downstream and 2 duct diameters upstream requirement. Twelve (12) sampling points were used for the isokinetic sampling.

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

- Particulate (All Sources Except RTO Exhaust) – U.S. EPA Method 17
- Particulate (RTO Exhaust) – U.S. EPA Method 5 (Combined with Method 29)
- PM-10 – U.S. EPA Methods 17 & 202
- Lead (Pb) – U.S. EPA Method 29 (Multiple Metals Train)
- Total Hydrocarbons (VOC's) – U.S. EPA Method 25A
- Carbon Monoxide (CO) – U.S. EPA Method 10
- Benzene – U.S. EPA Method 18
- Exhaust Gas Parameters (air flow, temperature, moisture & density) - U.S. EPA Methods 1-4

IV.1 Particulate (All Sources Except RTO Exhaust)

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 (RTO Exhaust)

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 the RTO exhaust. The samples were ninety-six (96) minutes in duration. Each sample had a minimum sample volume of sixty (60) dry standard cubic feet to meet the MACT requirement. 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 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 a Thermo Environmental Model 48C portable stack gas monitor. This analyzer is 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. The analyzer was calibrated on the 0-100 PPM range. A span gas of 92.97 PPM was used to establish the initial instrument calibration. A calibration gas of 49.66 PPM was 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 49.66 PPM gas to determine the system bias. After each sample, a system zero and system injection of 49.66 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 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 4.

IV.5 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 96.49 PPM Propane was used to establish the initial instrument calibration. Calibration gases of 29.17 PPM & 50.19 PPM Propane were used to determine the calibration error of the analyzer. After each sample, a system zero and system injection of 29.17 PPM Propane 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 sampled. 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 5 is a diagram of the VOC sampling train.

IV.6 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 = 94.28%, Sample 2 = 94.93% & Sample 3 = 93.03%) 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 6 is a diagram of the benzene sampling train

IV.7 Oxygen & Carbon Dioxide (RTO Exhaust) – 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 exhaust. Each sample was sixty (60) minutes in duration.

The analyzers were calibrated by direct injection prior to the testing. Span gases of 20.96% and 20.42% CO_2 were used to establish the initial instrument calibrations. Calibration gases of 12.1% O_2/6.02% CO_2 and 5.95% 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 the 12.1% O_2/6.02% CO_2 gas to determine the system bias. After each sample, a system zero and system injection of 12.1% O_2/6.02% CO_2 were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

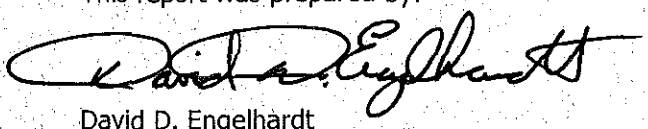
The analyzers were calibrated to the output of the data acquisition system (DAS) used to collect the data from the exhaust. The analyzer averages were corrected for calibration error and drift using formula EQ.7E-5 from 40 CFR Part 60, Appendix A, Method 7E. A diagram of the sampling train is shown in Figure 4.

IV.8 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.

All the sources except the RTO 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 all the sources except the RTO exhaust.

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.

This report was prepared by:



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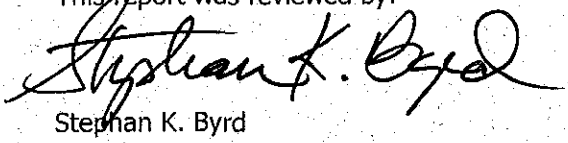

Stephan K. Byrd
President

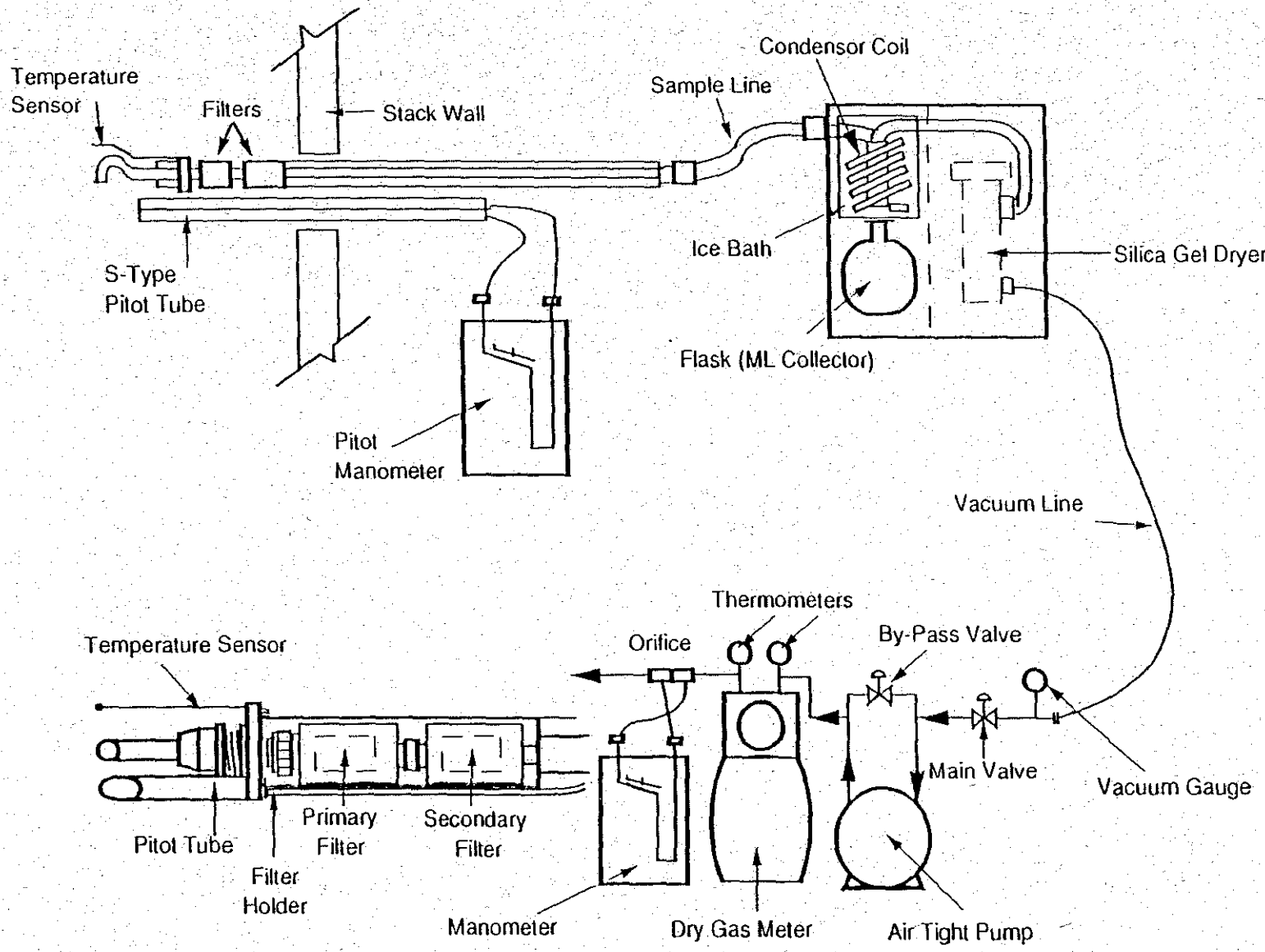

Figure 1

Particulate (Method 17) Sampling Train

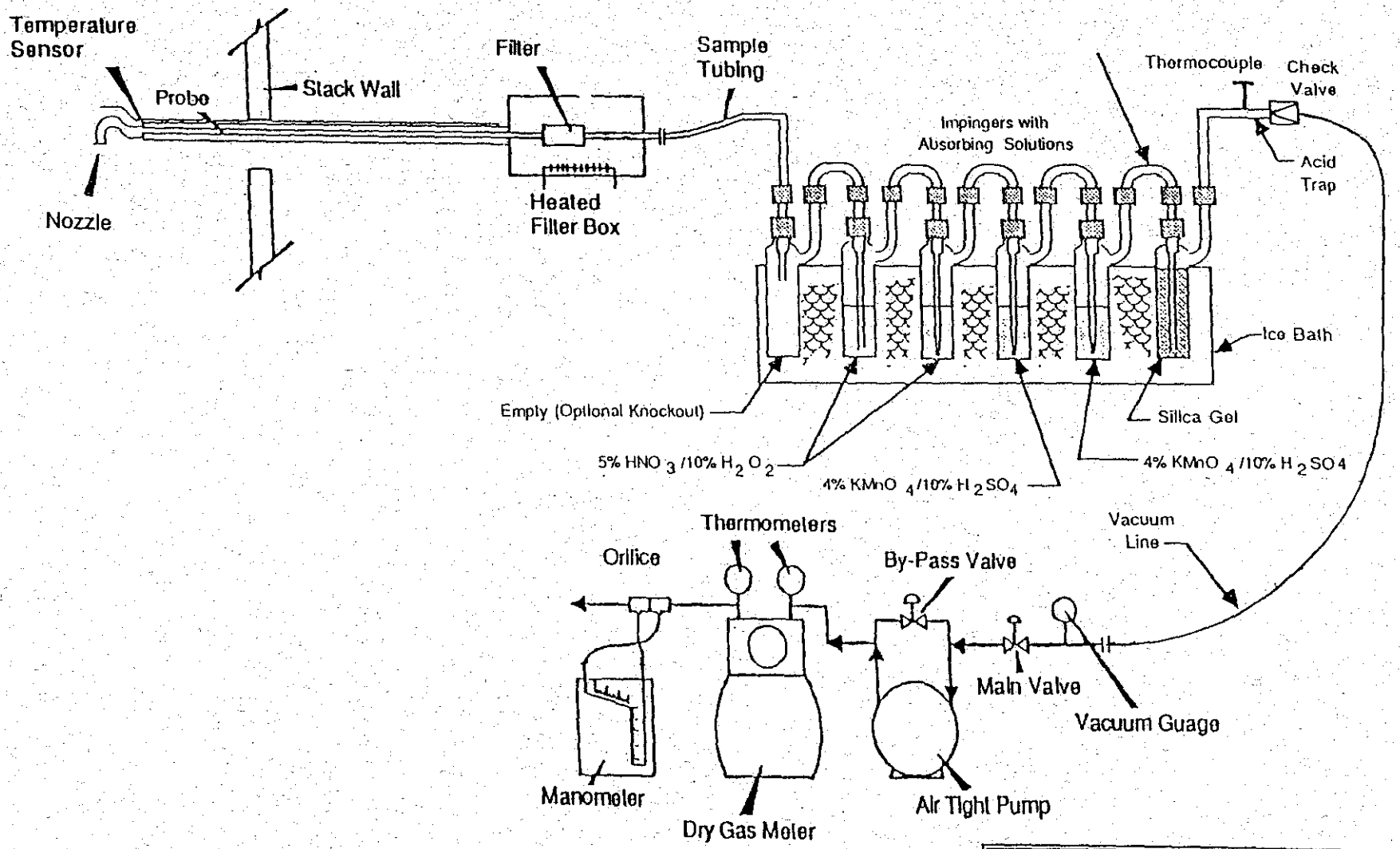

Figure 2

Particulate & Lead (Method 29) Sampling Train

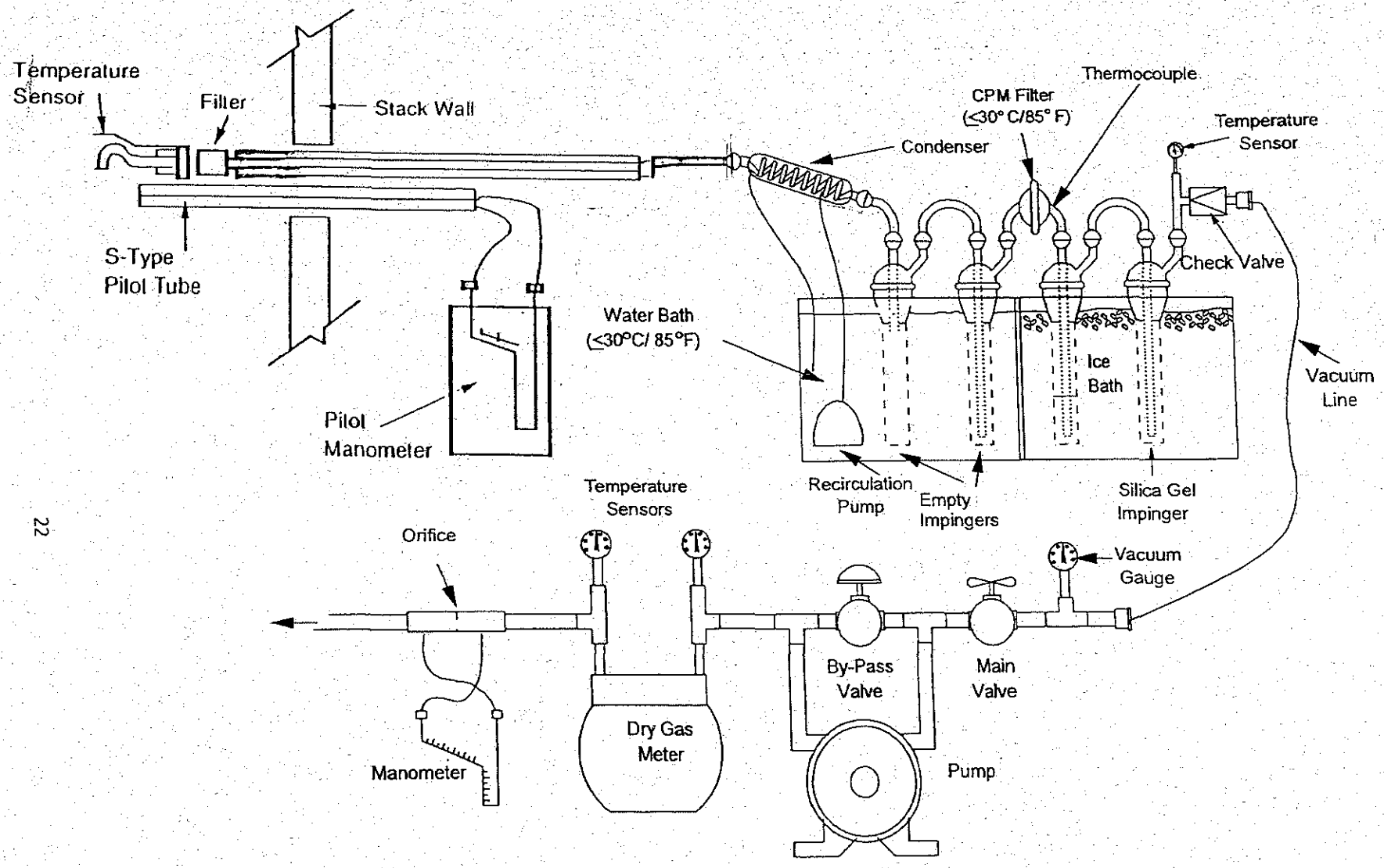

Figure 3

PM-10 (Methods 17 & 202) Sampling Train

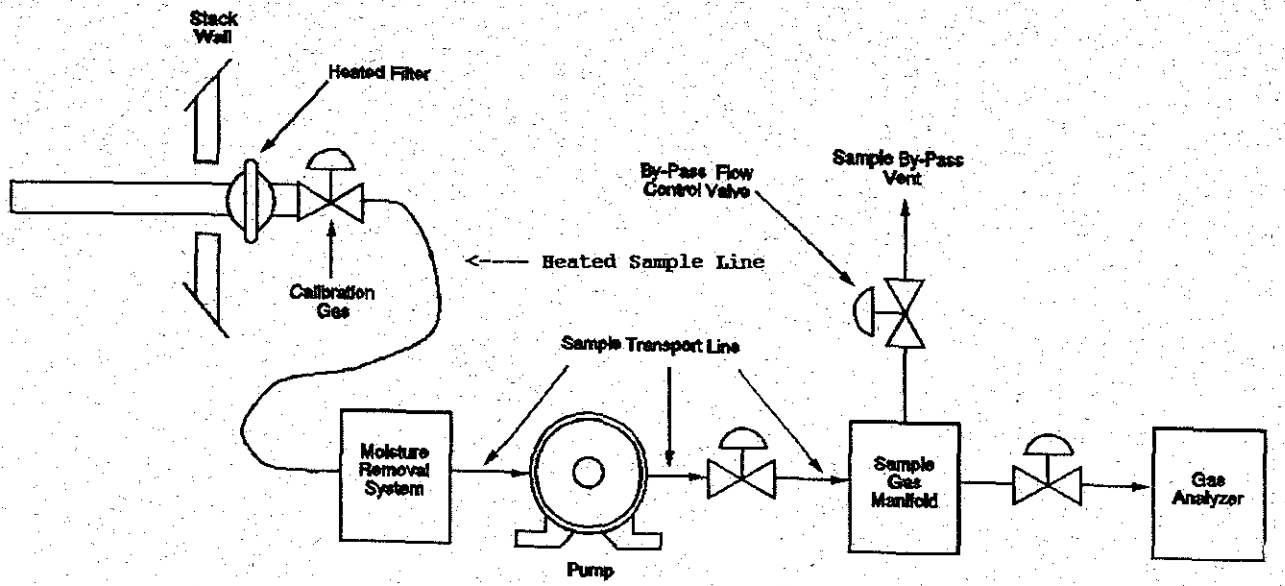

Figure 4

CO, O_2 & CO_2 (Methods 10 & 3A) Sampling Train

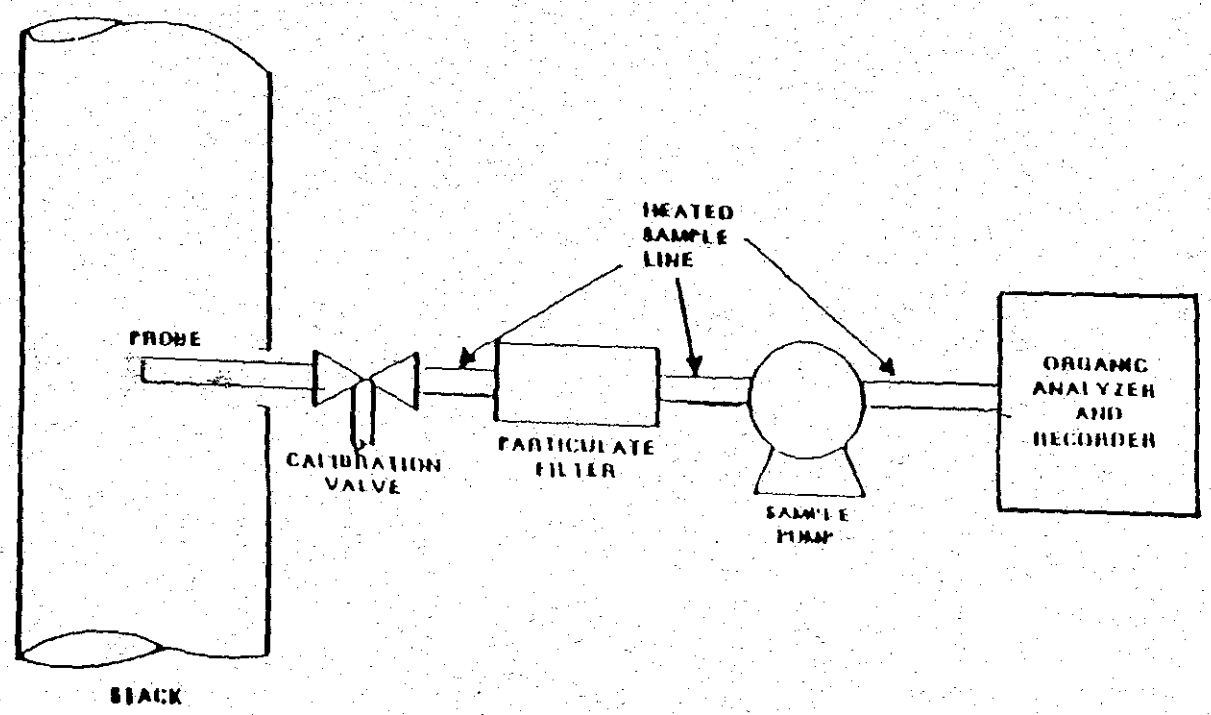

Figure 5

VOC (Method 25A)
Sampling Train

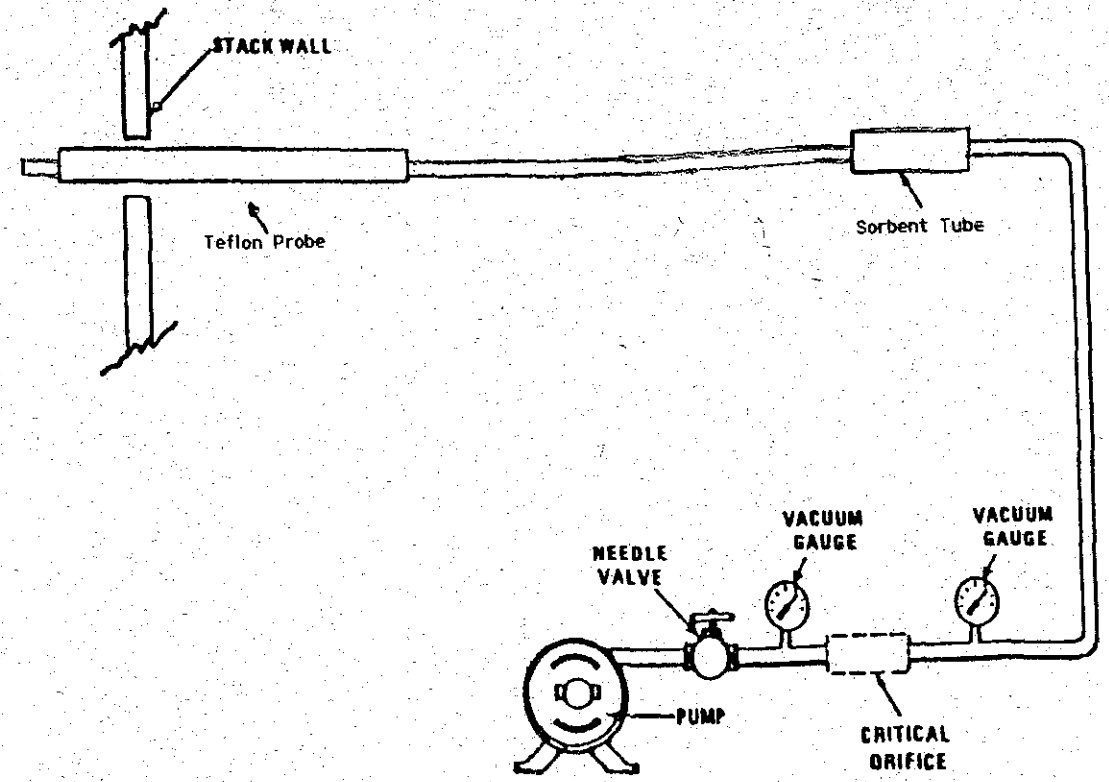

Figure 6

Benzene (Method 18) Sampling Train