Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Background Report Reference

AP-42 Section Number: 10.8

Background Report Section: 4

Reference Number: 9

Title: **Results of the September 1991 Air Emission Compliance Test on the Pole Treatment facility at the Bell Lumber and Pole Plant in New Brighton, MN**

Interpoll Laboratories, Inc.

October 24, 1991

AP-42 Section 10.8
Reference
Report Sect. 4
Reference 9

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

CAN'T DETERMINE
CF3 WOOD / CYCLE
i.e. CANT USE IT

RESULTS OF THE SEPTEMBER 1991 AIR EMISSION COMPLIANCE TEST ON THE POLE TREATMENT FACILITY AT THE BELL LUMBER & POLE PLANT IN NEW BRIGHTON, MINNESOTA

Submitted to:

BELL LUMBER AND POLE COMPANY
778 First Street Northwest
New Brighton, Minnesota 55112

Attention:
Daryle Thingvold

Reviewed by:

Daniel J. Despen
Manager
Field Testing Support Group

Report Number 1-3404
October 24, 1991
KE/kce

1 INTRODUCTION

On September 4 and 5, 1991, Interpoll Laboratories conducted air emission compliance tests on the Pole Treatment Scrubber at the Bell Pole & Lumber Company Pole Treatment Facility in New Brighton, Minnesota. The list of determinations performed were those specified by the Minnesota Pollution Control Agency (MPCA). On-site testing was performed by D. Van Hoever, M. Kaehler, and P. O'Neill. Coordination between testing activities and plant operation was provided by Clarence Westberg of Bell Pole. The tests were not witnessed by a representative of the Minnesota Pollution Control Agency (MPCA).

This facility treats poles by impregnating the outer surface with pentachlorophenol wood preservative in a pressurized retort cylinder. The exhaust from the retort cylinder along with exhausts from associated process equipment are combined and vented through a scrubber (Croll-Reynolds packed tower). A single stack vents emissions from storage tanks, vacuum pumps, and a retort cylinder that are utilized in a pressurized process that treats utility poles with an oil borne wood preservative (5-7% solution of pentachlorophenol in P-9 oil carrier). Emissions occur primarily when one of the tanks are in the process of filling during the treating process. Approximately 30000 to 35000 gallons of preservative are transferred between the storage tank and the treating cylinder each treatment cycle. Three treating cycles occur every 24 hours.

Particulate determinations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1990). Previous test data collected at this site was used to select the appropriate nozzle diameter for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to extract particulate samples by means of a heated glass-lined probe. Wet catch samples were collected in the back half of the Method 5 sampling train at the stack test site and analyzed as

per Minnesota Rules, Part 7005.0500.

Total gaseous hydrocarbon concentrations were determined instrumentally using a Ratfisch Model RS55 heated flame ionization detector (HFID) calibrated against propane in air standards. The THC concentration was continuously monitored by extracting a slipstream of exhaust gas by means of a heated probe and filter holder. A heat-traced teflon line was used to transport the sample gas from the filter holder outlet to the analyzer inlet.

Pentachlorophenol sampling was conducted in accordance with EPA Method 0010 SW846 USEPA Office of Solid Waste and Emergency Response 3rd Ed., November 1986: Test Methods for Evaluating Solid Waste Volume 2: Field Manual Physical and Chemical Methods. Samples were worked up as per Interpoll Labs Method II-8904. The analyses were performed as per EPA Method 8270 by HRGC/LRMS using electron impact (EI) with total ion monitoring. Quantification was performed using the six standard EPA M-8270 internal standards. In order to document sampling collection efficiency and field recovery, each XAD-2 resin cartridge was spiked with 20 ug of pentafluorophenol prior to sampling. Analytical accuracy and recovery (for extraction and cleanup) has been documented using the six EPA M-8270-recommended surrogate standards.

All of the testing was performed from two test ports oriented at 90 degrees on the 4-inch diameter stack (See Appendix B). For both the particulate and pentachlorophenol determinations nine traverse points were alternately sampled for two minute periods during each test run. Due to the low and variable flow rates from this source the particulate samples were isokinetically collected over periods of time sufficient to obtain a representative sample. For the pentachlorophenol determinations all three runs were 124 minutes in duration.

A summary and discussion of all of the important results of this compliance test is given in the following section. More detailed results are presented in Section 3, together with pertinent sampling parameters. Supplemental information such as field data sheets, laboratory results, procedures and calculation equations are presented in the appendices.

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All of the testing was performed from two test ports oriented at 90 degrees on the 4-inch diameter stack (See Appendix B). For both the particulate and pentachlorophenol determinations nine traverse points were alternately sampled for two minute periods during each test run. Due to the low and variable flow rates from this source the particulate samples were isokinetically collected over periods of time sufficient to obtain a representative sample. For the pentachlorophenol determinations all three runs were 124 minutes in duration.

A summary and discussion of all of the important results of this compliance test is given in the following section. More detailed results are presented in Section 3, together with pertinent sampling parameters. Supplemental information such as field data sheets, laboratory results, procedures and calculation equations are presented in the appendices.

2 SUMMARY AND DISCUSSION

Table 4 presents the batch times for each of the four batches which were tested on September 4 and 5. The run times for each of the three tests conducted is also presented for correlation of run times with the batches.

The results of the particulate emission test are presented in Table 1. The particulate concentration averaged 0.029 GR/DSCF. The particulate emission rate averaged 0.025 LB/HR.

A summary of the total hydrocarbon results is presented in Table 2. The THC concentration averaged 79 ppmC, w and the corresponding emission rate averaged 0.0180 LB C/HR. The emission rates were computed using the volumetric flows obtained during the particulate runs which were performed simultaneously.

The pentachlorophenol results are summarized in Table 3. The pentachlorophenol concentration averaged 3500 ug/Nm^3 and the emission rate averaged 0.00013 g/sec (17.2 10^{-6}LB/HR).

Table 1. Summary of the Results of the September 4, 1991 Particulate Emission Compliance Test on the Pole Treatment Scrubber at the Bell Lumber and Pole Company Located in New Brighton, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	09-04-91	09-04-91	09-04-91
Time runs were done (HRS)	1000/1210	1225/1358	1445/1810
Volumetric flow			
actual (ACFM)	93	196	88
standard (DSCFM)	86	178	80
Gas temperature (DEG-F)	80	86	84
Moisture content (%V/V)	3.53	4.29	3.96
Gas composition (%V/V,dry)			
carbon dioxide	0.03	0.03	0.03
oxygen	20.90	20.90	20.90
nitrogen	79.07	79.07	79.07
Isokinetic variation (%)	96.5	96.8	98.5
Particulate concentration			
actual (GR/ACF)	.0329	.0142	.0326
standard (GR/DSCF)	.0357	.0157	.0357
Part. emission rate (LB/HR)	0.026	0.024	0.025

Note: Dry + Organic Wet Catch

Table 2. Summary of the Results of the September 4, 1991 **Total Hydrocarbon Determinations** on the Pole Treatment Scrubber at the Bell Lumber & Pole Company in New Brighton, Minnesota.

Test/Run	Time (HRS)	Concentration (ppm,C)	Emission Rate (LB C/HR)
2/1	1000-1210	70	0.011
2/2	1225-1358	90	0.015
2/3	1445-1810	80	0.027
Avg		80	0.018

ppm C = ppm carbon or propane on a wet or actual basis

Table 3. Summary of the Results of the September 5, 1991 **Pentachlorophenol Determinations** on the Pole Treatment Scrubber at the Bell Lumber & Pole Company in New Brighton, Minnesota.

Test/Run	Time (HRS)	Concentration (ug/Nm^3)	Emission Rate (g/sec)
3/1	0755-1004	2100	0.000085
3/2	1020-1256	510	0.000042
3/3	1325-1530	8000	0.000260
Avg		3500	0.000130

Table 4. Pole Treatment Batch Times During the September 4 and 5, 1991 Air Emission Compliance Tests on the Pole Treatment Facility at the Bell Lumber and Pole Plant in New Brighton, Minnesota.

	Time (HRS)	Date
Batch 137	1000-1500 5 HRS	9-4-91
138	1430-1845 4.25 HRS	9-4-91
139	0745-1230 4.75 HRS	9-5-91
140	1240-1730 4.83 HRS	9-5-91
	AVG = 4.71 HRS	
Particulate Test		
Run 1	1000-1210	9-4-91
Run 2	1225-1358	9-4-91
Run 3	1445-1880	9-4-91
THC Test		
Run 1	1000-1210	9-4-91
Run 2	1225-1358	9-4-91
Run 3	1445-1810	9-4-91
PCP Test		
Run 1	0755-1004	9-5-91
Run 2	1020-1256	9-5-91
Run 3	1325-1530	9-5-91

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas moisture is presented first followed by the computer printout of the gas composition, particulate and pentachlorophenol sampling results. Orsat analyses were not performed on the exhaust gas stream from this source since it is ambient air. The known composition of air has been used to calculate gas density and dry molecular weights. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these program. Emission rates have been calculated using the product of the concentration times flow method.

3.3 Results of Pentachlorophenol Sampling

Test No. 3
Pole Treatment Scrubber Stack

Results of Pentachlorophenol Sampling----------EPA Method 0010 SW846

	Run 1	Run 2	Run 3
Date of run	09-05-91	09-05-91	09-05-91
Time run start/end.....(HRS)	755/1004	1020/1256	1325/1530
Static pressure.....(IN.WC)	-0.01	-0.01	-0.01
Cross sectional area (SQ.FT)	0.09	0.09	0.09
Pitot tube coefficient.....	0.840	0.840	0.840
Water in sample gas			
condenser.....(ML)	4.0	28.0	11.0
impingers.....(GRAMS)	11.0	0.0	5.0
desiccant.....(GRAMS)	0.0	11.0	0.0
total.....(GRAMS)	15.0	39.0	16.0
Gas meter coefficient.....	1.0043	1.0043	1.0043
Barometric pressure..(IN.HG)	29.02	29.02	29.02
Avg. orif.pres.drop..(IN.WC)	0.31	1.07	0.22
Avg. gas meter temp..(DEF-F)	76.7	72.2	78.8
Volume through gas meter....			
at meter conditions...(CF)	22.80	46.00	18.95
standard conditions.(DSCF)	21.86	44.56	18.09
standard conditions..(NM^3)	0.619	1.262	0.512
Total sampling time....(MIN)	124.00	124.00	124.00
Nozzle diameter.....(IN)	.183	.183	.183
Avg.stack gas temp ..(DEG-F)	77	75	80
Volumetric flow rate.....			
actual.....(ACFM)	93	188	74
dry standard.....(DSCFM)	86	174	68
Isokinetic variation.....(%)	97.6	98.6	103.1

3.1 Results of Orsat and Moisture Analyses

Test No. 1
Pole Treatment Scrubber Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	09-04-91	09-04-91	09-04-91
Dry basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.90	20.90	20.90
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.16	20.00	20.07
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	76.28	75.67	75.94
water vapor.....	3.53*	4.29*	3.96*
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.46	28.38	28.41
Specific gravity.....	0.983	0.980	0.981
Water mass flow.....(LB/HR)	12.41	26.39	11.21

* Free or condensed, water in the gas stream.

FO	0.000	0.000	0.000

Test No. 3
Pole Treatment Scrubber Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	09-05-91	09-05-91	09-05-91
Dry basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.90	20.90	20.90
nitrogen.....	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.25	20.26	20.15
nitrogen.....	76.59	76.65	76.24
water vapor.....	3.13	3.06*	3.57*
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.50	28.51	28.45
Specific gravity.....	0.984	0.985	0.983
Water mass flow.....(LB/HR)	0.00	0.00	0.00

* Free or condensed water in the gas stream.

FO	0.000	0.000	0.000

3.2 Results of Particulate Loading Determinations

Test No. 1
Pole Treatment Scrubber Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	09-04-91	09-04-91	09-04-91
Time run start/end.....(HRS)	1000/1210	1225/1358	1445/1810
Static pressure.....(IN.WC)	-0.01	-0.01	-0.01
Cross sectional area (SQ.FT)	0.09	0.09	0.09
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	7.0	27.0	24.0
desiccant.....(GRAMS)	17.0	11.0	11.0
total.....(GRAMS)	24.0	38.0	35.0
Total particulate material..			
.....collected(grams)	0.0510	0.0345	0.0769
Gas meter coefficient.....	1.0043	1.0043	1.0043
Barometric pressure..(IN.HG)	29.28	29.28	29.28
Avg. orif.pres.drop..(IN.WC)	0.31	1.13	0.20
Avg. gas meter temp..(DEF-F)	80.8	93.5	92.5
Volume through gas meter....			
at meter conditions...(CF)	22.98	36.03	35.35
standard conditions.(DSCF)	22.06	33.86	33.21
Total sampling time....(MIN)	124.00	92.00	196.00
Nozzle diameter.....(IN)	.185	.185	.185
Avg.stack gas temp ..(DEG-F)	80	86	84
Volumetric flow rate.....			
actual.....(ACFM)	93	196	88
dry standard.....(DSCFM)	86	178	80
Isokinetic variation.....(%)	96.5	96.8	98.5
Particulate concentration...			
actual.....(GR/ACF)	0.03292	0.01423	0.03261
dry standard.....(GR/DSCF)	0.03567	0.01572	0.03573
Particle mass rate...(LB/HR)	0.03	0.02	0.02

APPENDIX A

SAMPLING TRAIN CALIBRATION DATA

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: September 6, 1991

Meter Box No. : 6 (Rockwell Dry Test Meter Serial No. 64710)

Date of Last Calibration: August 15, 1991
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
August 17, 1991	1-3386	830.70	1004.46	173.76	173.76
August 27-30, 1991	1-3397	4.90	772.17	767.27	941.03
September 4, 1991	1-3404	773.00	972.65	199.65	1140.68

* Total volume through meter since last calibration.

Date 8-15-91

Bar. Press. 29.00 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 6
Serial No. DTM 64710
Wet Test Meter No. AL-20
Technician E. Tourbidge

ΔH (in. WC) nominal	ΔH (in. WC) actual	Gas Volume Wet Test Meter (ft^3)	* Cal. Index ♦ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3) V_{di}	Gas Volume Dry test meter (ft^3) V_{df}	Gas temperatures Wet Test t_w (°F)	Gas temperatures Dry Test t_{di} (°F)	Gas temperatures Dry Test t_{do} (°F)	Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔHθ	C_f
0.5	.5	2	99.70	0.01	813.800	815.804	74	78	75	4/57	.9983	1.78	
1.2	1.2	3	99.77	0.03	810.500	813.492	74	77	75	4/46	1.0009	1.77	
2.0	2.0	3	99.87	0.05	816.500	819.505	74	83	78	3/44	1.0039	1.79	
3.3	3.3	5	100.00	0.08	820.000	824.995	74	87	79	4/54	1.0092	1.81	
4.7	4.7	5	100.20	0.11	825.500	830.510	74	90	81	4/09	1.0092	1.84	
	2	3	4	5	6	7	8	9	10	11/12	1.0043	1.79	

Positive leak check performed by E.T.
Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by Daniel J. Dezen Date 8/20/91

* Based on AL-20 wet test meter calibration in August 1989 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 5/90

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job Bell Lumber & Pole Date 9/4/91

Operator DWH Module No. 6

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 29.28 in. Hg. γ = 1.0043 ^H@ 1.79 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F) Inlet	Meter Temp. (°F) Outlet
[redacted]	(773.00)	[redacted]	
2.5	774.90	64	63
5.0	776.81	66	64
7.5	778.74	69	65
10	780.60	70	66
[redacted]	V_m= 7.60	Avg(t_m)= 65.87 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(1.0043)(7.60)}\left[\frac{(65.87) + 460}{(29.28)}\right]^{0.5}$$

Y_{cn} = .9916

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

Interpoll Laboratories. Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job Bell Lumber & Pole Date 9/5/91

Operator DWH Module No. 6

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 29.02 in. Hg. γ = 1.0043 ^H@ 1.79 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(876)	[redacted]	
2.5	877.91	67	65
5.0	8	69	66
7.5	881.73	71	66
10	883.66	73	67
[redacted]	V_m = 7.66	Avg (t_m) = 67.88 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(1.0043)(7.66)}\left[\frac{(67.88) + 460}{(29.02)}\right]^{0.5}$$

Y_{cn} = .99

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 08-28-91 Nozzle Number 1-3
Technician: D. VanHoever

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	0.185
2	0.185
3	0.186
Average:	0.185

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 08-27-91 Nozzle Number MM5-3
Technician: D. VanHoever

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	0.179
2	0.179
3	0.178
Average:	0.179

Interpoll Inc.
(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 24-2½

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .459 IN.

Alignment:

4. $\alpha_1 < 10^o$ 0
5. $\alpha_2 < 10^o$ 0

6. $B_1 < 5^o$ 10
7. $B_2 < 5^o$ 20

8. Z <.125" .01
9. W <.0625" .01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 5.0 IN.
12. Pitot to thermocouple (parallel to probe) _____ IN.
13. Pitot to thermocouple (perpendicular to probe) _____ IN.

Date of Inspection: 6-26-90

Inspected by: [signature]

S-348(1)

Interpoll Laboratories
(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 2.5-mm5

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .462 IN.
3. Base to Side B opening plane (P_B) .463 IN.

Alignment:

4. $\alpha_1 < 10^o$ 0
5. $\alpha_2 < 10^o$ 0

6. $B_1 < 5^o$ 0
7. $B_2 < 5^o$ 2

8. Z <.125" .02
9. W <.0625" .01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .762 IN.

Date of Inspection: 2-1-91

Inspected by: E Crawford

S-348(1)

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:
Vendor Beckman
Model HD110 T
Serial Number 18
Range 0-1999 °F
Thermocouple Type K
Date of Calibration 6/1/91
Technician [illegible]

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	-0	-1	1	.21
100	100	96	4	.71
200	200	199	1	.15
300	300	297	3	.39
400	400	395	5	.58
500	500	494	6	.62
600	600	597	3	.28
700	700	698	2	.17
800	800	803	3	.24
900	900	905	5	.37
1000	1000	1010	10	.68
1100	1100	1114	14	.90
1200	1200	1220	20	1.20
1300	1300	1321	21	1.19
1400	1400	1425	25	1.34
1500	1500	1523	23	1.17
1600	1600	1625	25	1.21
1700	1700	1720	20	.93
1800	1800	1818	18	.79
1900	1900	1911	11	.47
2000	2000	—		
2100	2100	—		
		Averages:		.68%

OF = off scale response by unit under test (°F)
% dev = 100 Δt / (460 + t)

☐ Unit in tolerance
☐ Unit was not in tolerance; recalibrated - See new calibration sheet.

S-433

DVH's personal

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 7/8/91
Technician Duane Van Hoever
Mercury Column Barometer No. 1
Aneroid Barometer No. Ultimeter serial # 8C1216

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.27	70	.11	29.16	29.17	-.01

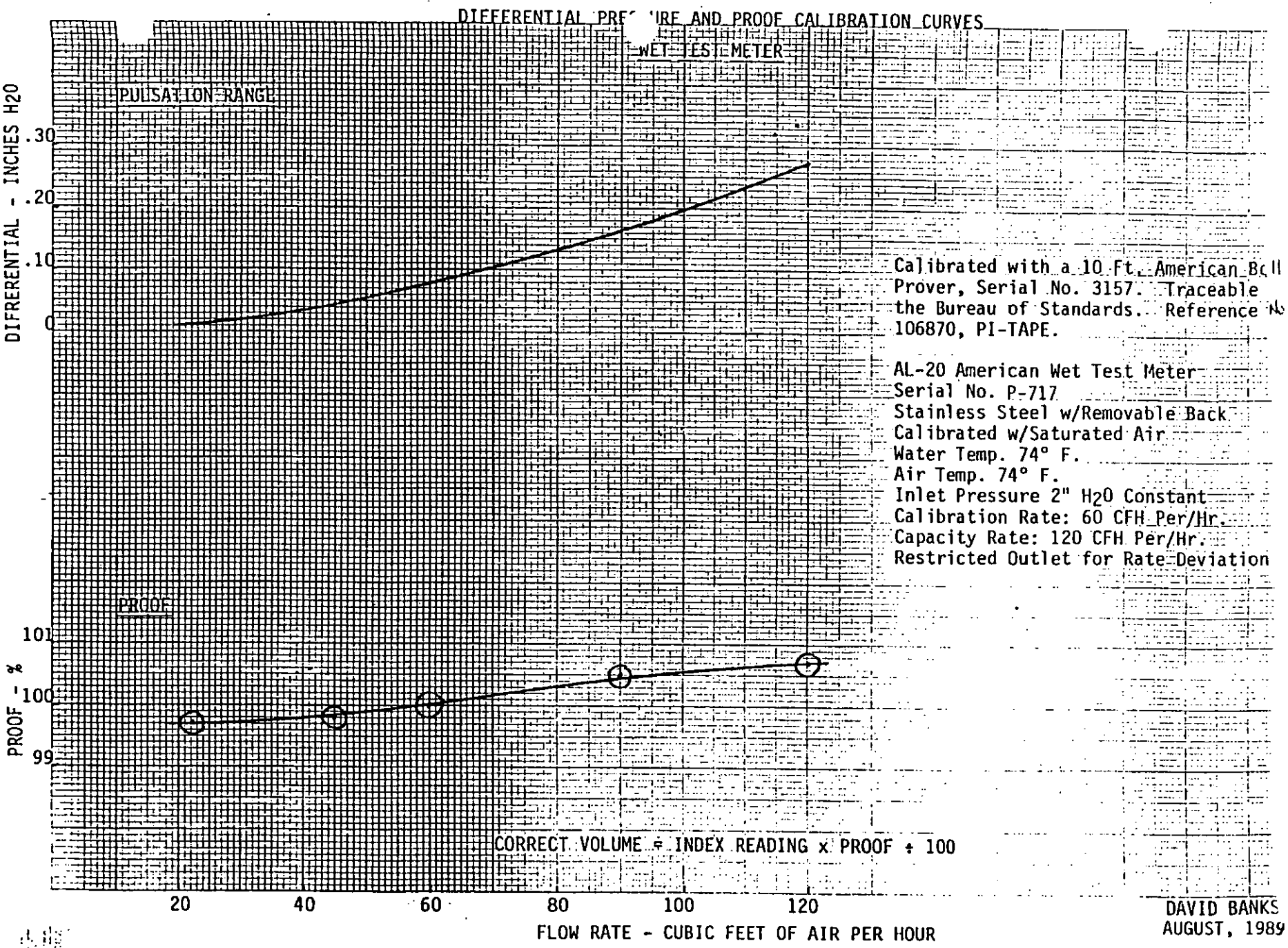
Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. No

Has problem been alleviated? Yes/No. How?

*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312


DIFFERENTIAL PRE' 'IRE AND PROOF CALIBRATION CURVES
WET TEST METER
PULSATION RANGE
DIFRERENTIAL - INCHES H20
.30
.20
.10
0
PROOF
101
100
99
PROOF - %
Calibrated with a 10 Ft. American Bell Prover, Serial No. 3157. Traceable the Bureau of Standards. Reference No 106870, PI-TAPE.
AL-20 American Wet Test Meter
Serial No. P-717
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H2O Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation
CORRECT VOLUME = INDEX READING x PROOF ÷ 100
20
40
60
80
100
120
FLOW RATE - CUBIC FEET OF AIR PER HOUR
DAVID BANKS
AUGUST, 1989

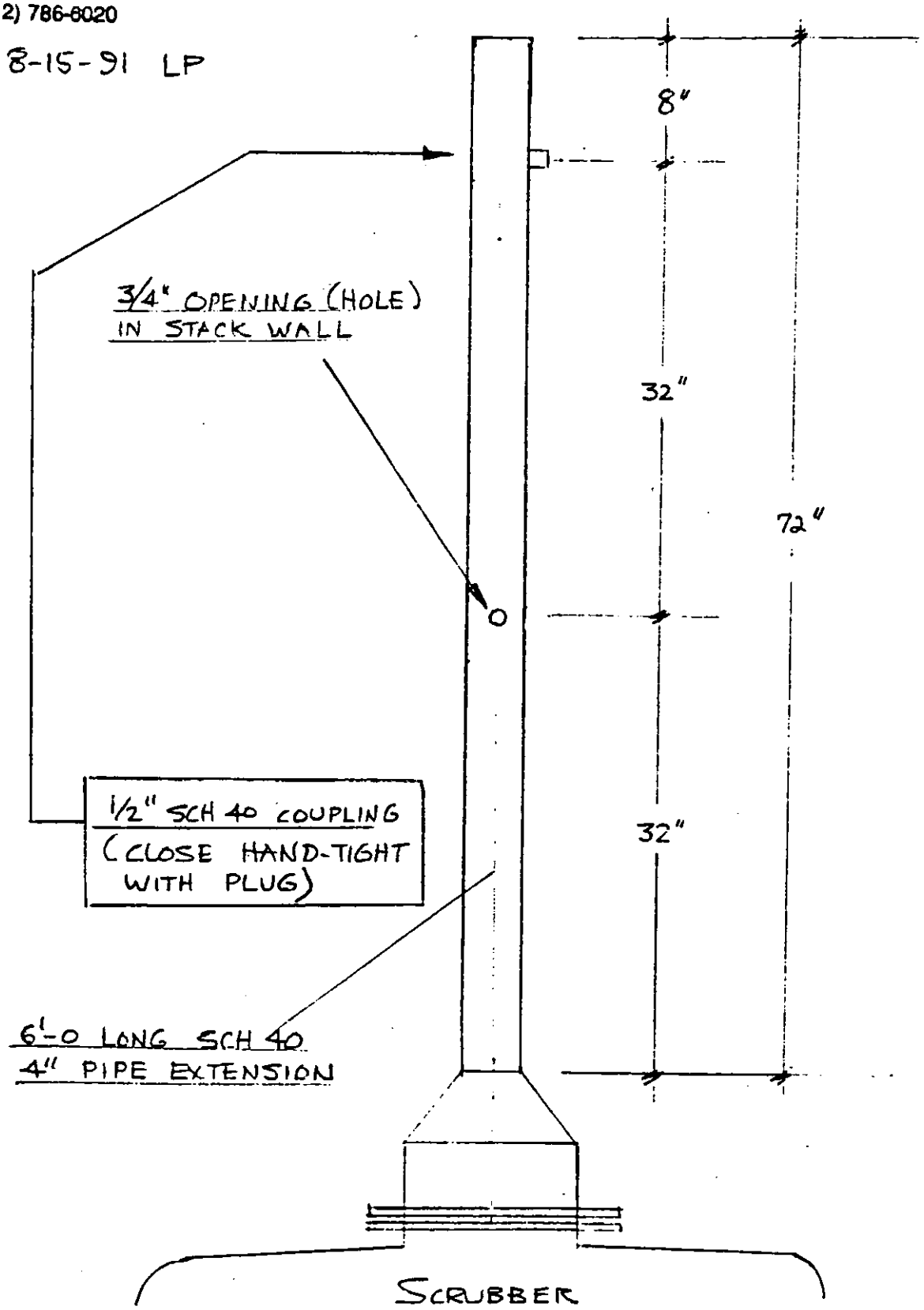
APPENDIX B

LOCATION OF TEST PORTS

ITERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MN 55014-1819
(612) 786-6020

BELL LUMBER & POLE

8-15-91 LP



ANY RAIN CAP MUST BE REMOVABLE & OFF ON THE DAY OF TEST!

APPENDIX C

FIELD DATA SHEETS

TABLE OF CONTENTS

Particulate 1
Pentachlorophenol 15

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job Bell Lumber & Pole

Source Pole Treatment Scrubber Stack

Test 1 Run 0 Date 9/4/91

Stack dimen. 4" IN.

Dry bulb ____ °F Wet bulb ____ °F

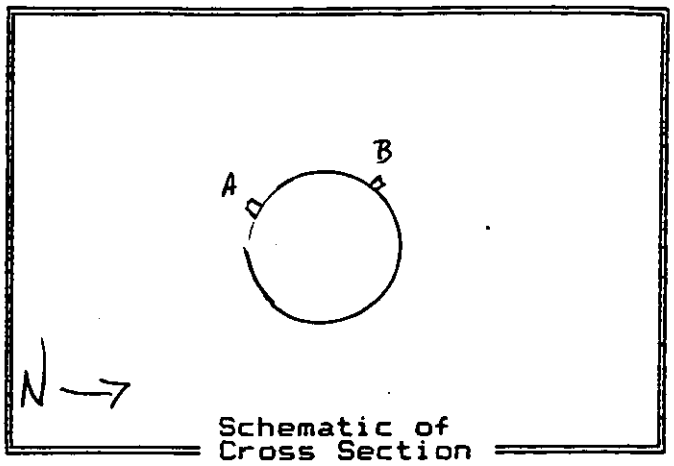
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.28 in Hg

Static pressure -.01 in WC

Operators D. Van Hoever & P. O'Neill

Pitot No. V24-25 Cp .84



Schematic of Cross Section

PARTICULATE TEST

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length:	.25 in.	Time start:	hrs
A 1	.067	.5	.75		
2	.25	1.0	1.25		
3	.75	3.0	3.25		
4	.93	3.50	3.75		
B 1					
2					
3					
4					
Cp					
Temp. meas. tool & S/N:				Time end:	hrs

R or nothing= reg. manometer; S= expanded; E = electronic S-392.1

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job 1 Bell Lumber & Pole Date 9/4/91 Test 1 Run 1
Source POLE TREATMENT SCRUBBER No. of traverse points 36
Method 5 Filter holder: glass STACK Filter type: glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 11 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DVH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	207	200	7
Impinger No. 3			
Condenser			
Desiccant	1475	1458	17
Total			24

Integrated Gas Sampling Data: - Ambient Air

Bag Pump No. _____ Box No. _____ Bag No. _____

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: _____ cc/min at _____ in. Hg.

Time start: _____ (HRS) Time end: _____ (HRS)

Sampling rate: _____ cc/min Operator: _____

S/N of O_2 Analyzer used to monitor train outlet: ___

CF-023

S-0046RR

Job: Bell Lumber & Pole
Source: Pole TREATMENT STACK
Date: 9/4/91 Test 1 Run 1

Operators: DVH & P.O
Meter Box No. 6 ΔH 1.79 IN WC
Counter coeff. 1.0043

Pitot No. V24-2.5 Cp .84
Bar. Press. 29.28 inHg H2O x
Nozzle No. 1-3 Nozzle Dia .185 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1000	780.72											
A 4	2	782.57	2.4	2.71	2.57	8	80	257	260	47	69	69	20.9
3	4	784.09	1.5	1.68	4.03	5	83				71	69	"
2	6	784.97	.55	.62	4.92	3	84				72	70	
1	8	785.52	1.15	.16	5.39	.5	85	258	261	49	72	70	
4	10	785.52	.0	0	5.39	0	85				72	70	
3	12	785.52	0	0	5.39	0	67				71	70	
2	14	785.66	.03	.03	5.60	0	73	259	260	50	71	70	
1	16	785.80	.03	.03	5.81	0	75				71	70	
CP	18	785.99	.02	.02	5.98	0	66				73	71	
4	20	786.17	.02	.02	6.16	0	66	260	261	53	74	72	
3	22	786.34	.02	.02	6.33	0	70				74	72	
2	24	786.55	.03	.03	6.54	0	70				75	73	
1	26	786.72	.02	.02	6.71	0	70	261	260	53	75	74	
4	28	786.99	.05	.05	6.99	0	70				76	74	
3	30	787.17	.02	.02	7.16	0	70				76	74	
2	32	787.50	.02	.02	7.34	0	70	261	262	54	77	75	
1	34	787.50	0	0	7.34	0	68				77	75	
CP	36	787.68	.02	.02	7.51	0	68				77	75	
B 4	38	787.79	.02	.02	7.68	0	68	261	263	53	76	76	
3	40	787.99	.02	.02	7.86	0	70				78	76	
2	42	788.11	.03	.03	8.07	0	74				79	76	
1	44	788.37	.03	.03	8.28	0	75	261	264	54	79	77	
4	46	790.40	3.3	3.77	0.49	9	80				87	79	
3	48	791.20	.30	.34	1.16	1	80				86	79	
	θ =	Vm =		ΔH =							Avg. =		

S-0037R

CF-D11

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: Bell Lumber & Pole
Source: POLE TREATMENT STACK
Date: 9/4/92 Test 1 Run 1

Operators
Meter Box No. ____ ^H@ ____ IN WC
Gasmeter coeff. ____

Pitot No. ____ Cp ____
Bar. Press. ____ inHg H2O ____ %
Nozzle No. ____ Nozzle Dia ____ IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
2	50	791.40	.02	.02	1.34	0	86	257	260	48	86	79	
1	52	791.55	.02	.02	1.51	0	87				82	79	
CP	54	791.72	.02	.02	1.68	0	87				82	79	
4	56	791.98	.03	.03	1.90	0	83	259	263	49	82	79	
3	58	792.24	.07	.08	2.22	0	87				82	80	
2	60	792.24	0	0	2.22	0	88				81	79	
1	62	792.24	0	0	2.22	0	88	258	261	50	81	80	
4	64	792.24	0	0	2.22	0	87				81	80	
3	66	792.42	.02	.02	2.39	0	81				81	80	
2	68	792.60	.02	.02	2.57	0	79	259	260	48	82	80	
1	70	792.60	0	0	2.57	0	79				81	80	
CP	72	792.60	0	0	2.57	0	78				81	81	
A4	74	792.57	.0	0	2.57	0	76	258	261	51	81	81	
3	76	792.57	.0	0	2.57	0	70				81	81	
2	78	792.77	.03	.03	2.78	0	71				82	81	
1	80	793.05	.05	.05	3.06	0	71	260	263	50	82	82	
B4	82	793.38	.06	.07	3.36	0	78				84	82	
3	84	793.66	.06	.07	3.66	0	78				85	82	
2	86	793.93	.02	.02	3.84	0	78	261	257	51	86	83	
1	88	794.12	.02	.02	4.01	0	80				86	85	
CP	90	795.71	2.0	2.29	5.75	6	88				91	85	
A4	92	797.80	2.9	3.33	7.84	9	88	260	258	51	95	86	
3	94	799.30	1.5	1.73	9.35		90				97	86	
2	96	800.35	.65	.75	0.35	2.5	92				95	87	
	θ =	Vm =		^H =							Avg. =		

S-0037R

Job: Bell Lumber & Pole
Source: POLE TREATMENT STACK
Date: 8/4/91 Test: 1 Run: 1

Operators: DVA & P.O
Meter Box No. ____ ΔH@ ____ IN WC
Counter cont't. ____

Pitot No. ____ Cp ____
Bar. Press. ____ inHg H2O ____ x
Nozzle No. ____ Nozzle Dia ____ IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
A1	98	801.24	.31	.35	1.04	1	92	258	260	51	94	87	
B4	100	801.75	.22	.25	1.62	1	94				95	87	
3	102	802.15	.10	.11	2.01	1	95			52	91	87	
2	104	802.47	.04	.04	2.26	0	95	257	261		91	87	
1	106	802.48	.03	.03	2.47	0	88				89	86	
A4	108	802.70	.03	.03	2.68	0	90				89	86	
3	110	802.83	.02	.02	2.86	0	84	258	259	53	89	87	
2	112	802.05	.01	.01	2.98	0	84				89	87	
1	114	803.28	01	.01	3.11	0	85				89	87	
CP	116	803.28	0	0	3.11	0	86	261	258	53	88	87	
B4	118	803.37	.01	.01	3.23	0	86				87	88	
3	120	803.51	.01	.01	3.36	0	86				89	87	
2	122	803.60	.01	.01	3.48	0	86	260	257	52	89	87	
1	124	803.70	.01	.01	3.60	0	80				89	87	
	1210												
	θ = 124	Vm = 22.98		ΔH = .31							Avg. = 80.8		

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Bell Lumber & Pole Date 9/4/91 Test 1 Run 2
Source POLE TREATMENT SCRUBBER STACK No. of traverse points 36
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DCH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	227	200	27
Impinger No. 3			
Condenser			
Desiccant	1519	1508	11
Total			38

Integrated Gas Sampling Data: Ambient Air

Bag Pump No. _____ Box No. _____ Bag No. _____

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: _____ cc/min at _____ in. Hg.

Time start: _____ (HRS) Time end: _____ (HRS)

Sampling rate: _____ cc/min Operator: _____

S/N of O_2 Analyzer used to monitor train outlet: ___

CF-023

S-0046RR

Job: Bell Lumber & Pole
Source: Pole TREATMENT SCRUBBER Stack
Date: 9/9/91 Test 1 Run 2

Operators: DUH & P.O
Meter Box No. 6 ΔH 1.79 IN WC
Gasmeter coeff. 1.0043

Pitot No. V24-25 Cp .84
Bar. Press. 29.28 inHg H2O 3 %
Nozzle No. 1-3 Nozzle Dia .185 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgs. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1225	803.92											
A 4	2	804.12	.01	.01	4.04	0	80	231	240	51	89	88	20.9
3	4	804.32	.01	.01	4.16	0	81				89	88	20.9
2	6	804.32	0	0	4.16	0	81				89	88	— " —
1	8	804.49	.01	.01	4.29	0	84	239	243	52	89	88	
4	10	804.66	.01	.01	4.41	0	84				89	88	
3	12	804.74	.01	.01	4.54	0	84				89	89	
2	14	804.89	.01	.01	4.66	0	82	251	247	50	89	89	
1	16	804.89	.0	.0	4.66	0	82				89	89	
CP	18	804.89	.0	0	4.66	0	82				89	89	
4	20	804.99	.03	.03	4.88	0	84	256	257	50	90	89	
3	22	805.30	.02	.02	5.05	0	83				90	89	
2	24	805.52	.02	.02	5.23	0	84				90	89	
1	26	805.60	.01	.01	5.35	0	84	257	256	50	90	89	
4	28	805.78	.01	.01	5.48	0	84				90	89	
3	30	805.91	.02	.02	5.65	0	83				91	90	
2	32	805.99	.02	.02	5.83	0	84	259	255	51	91	90	
1	34	805.16	.01	.01	5.95	0	83				91	90	
CP	36	806.28	.01	.01	6.08	0	84				91	90	
B 4	38	806.41	.02	.02	6.26	0	84	260	258	51	91	90	
3	40	806.41	0	.0	6.26	0	84				91	90	
2	42	806.41	0	0	6.26	0	74				91	90	
1	44	806.41	0	0	6.26	0	74	258	259	52	91	90	
4	46	806.41	0	0	6.26	0	74				91	90	
3	48	806.41	0	0	6.26	0	75				91	90	
	θ =	Vm =		ΔH =							Avg. =		

S-0037R

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: Bell Lumber & Pole
Source: POLE TREATMENT
Date: 9/4/91 Test: 2 Run: 2

Operators: DVH & P.O
Meter Box No. ____ ^H@ ____ IN WC
Gasmeter coeff. ____

Pitot No. ____ Cp ____
Bar. Press. ____ inHg H2O ____ %
Nozzle No. ____ Nozzle Dia ____ IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgm. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
2	50	806.41	0	0	6.26	0	73	254	261	51	91	90	20.9
1	52	806.41	0	0	6.26	0	74				91	90	
CP	54	806.50	.01	.01	6.38	0	73				91	91	
4	56	806.69	.01	.01	6.51	0	75	256	257	50	92	91	
3	58	808.71	3.0	3.49	8.65	9	85				98	92	
2	60	810.79	2.90	3.36	0.77	9	90				101	93	
1	62	812.80	2.60	3.03	2.77	8.5	90	259	258	51	101	93	
4	64	814.99	3.0	3.47	4.92	9	94				102	94	
3	68	817.08	3.0	3.47	7.07	9	94				103	95	
2	70	819.16	2.8	3.22	9.15	9	98	260	257	52	103	95	
1	72	821.20	2.4	2.77	1.08	8	98				104	95	
CP	74	823.17	2.85	3.28	3.17	8	99				104	96	
4	76	825.20	3.1	3.51	5.23	9	98	261	257	52	104	96	
3	78	827.45	3.0	3.45	7.47	9	99				105	97	
2	80	829.62	2.9	3.35	9.59	9	98				106	97	
1	82	831.71	2.4	2.78	1.52	9	98	260	258	51	106	97	
4	84	833.75	2.85	3.30	3.63	9	97				106	98	
3	86	835.94	3.3	3.82	5.90	9.5	97				106	98	
2	88	837.94	2.8	3.25	7.98	9	97	261	259	54	106	98	
1	90	839.77	2.0	2.33	9.76		96				104	98	
CP	92	839.95	.02	.02	9.93		94				103	97	
	(1358)												
	θ = 92	Vm = 36.03		^H = 1.13							Avg. = 93.5		

8-8-92

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Bell Lumber & Pole Date 9/4/91 Test 1 Run 3
Source POLE TREATMENT SCRUBBER Stack No. of traverse points 32
Method 5 Filter holder: Glass Filter type: Glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 3611

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DWH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	224	200	24
Impinger No. 3			
Condenser			
Desiccant	1486	1475	11
Total			35

Integrated Gas Sampling Data: Ambient Air

Bag Pump No. _____ Box No. _____ Bag No. _____

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: _____ cc/min at _____ in. Hg.

Time start: _____ (HRS) Time end: _____ (HRS)

Sampling rate: _____ cc/min Operator: _____

S/N of O_2 Analyzer used to monitor train outlet: ___

CF-023

S-0046RR

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: Bell Lumber & Pole
Source: Pole TREATMENT SCRUBBER Stack
Date: 9/4/91 Test: 1 Run: 3

Operators: D.V.M & D.O
Meter Box No.: 6 ΔH@: 1.79 IN WC
Gasmeter coeff.: 1.0043

Pitot No.: V24-2.5 Cp: .84
Bar. Press.: 29.28 inHg H2O: 3 %
Nozzle No.: 1-3 Nozzle Dia: .18 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1445	840.15											
A 4	2	842.08	2.40	2.80	2.07	7	86	258	261	50	90	90	20.9
3	4	844.03	2.40	2.78	3.99	7.5	86				91	90	
2	6	845.27	1.10	1.15	5.22	3	93				92	90	
1	8	846.17	.42	.48	6.02	1	93	258	262	50	93	91	
4	10	846.64	.10	.11	6.41	.5	93				93	91	
3	12	846.64	0	0	6.41	0	72				92	91	
2	14	846.64	0	0	6.41	0	72	260	261	50	92	91	
1	16	846.64	0	0	6.41	0	73				91	90	
CP	18	846.64	.03	.03	6.63	0	80				91	90	
4	20	846.85	.03	.03	6.85	0	80	259	260	51	91	90	
3	22	846.93	.01	.01	6.97	0	80				91	90	
2	24	847.21	.02	.02	7.15	0	79				92	91	
1	26	847.40	.01	.01	7.28	0	78	261	257	51	92	92	
4	28	847.69	.02	.02	7.45	0	79				91	92	
3	30	848.00	.01	.01	7.58	0	79				92	91	
2	32	848.08	.02	.02	7.76	0	81	260	257	50	93	91	
1	34	848.30	.02	.02	7.93	0	82				93	91	
CP	36	848.30	0	0	7.93	0	82				93	91	
B 4	38	848.30	.015	.01	8.09	0	75	261	257	50	92	91	
3	40	848.30	.01	.01	8.21	0	77				92	91	
2	42	848.56	.06	.07	8.52	0	79				92	91	
1	44	848.89	.02	.02	8.70	0	93	261	257	50	92	91	
4	46	849.10	.02	.02	8.87	0	93				94	92	
3	48	849.	.04	.04	9.12		91				94	92	
	θ =	Vm =		ΔH =							Avg. =		

S 00370

CF 1

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: Bell Lumber & Pole
Source: Tile TREATMENT SCRUBBER Stack
Date: 9/4/91 Test: 1 Run: 3

Operators: DUH & P.D
Meter Box No. ____ ^H# ____ IN WC
Gasmeter coeff.: ____

Pitot No. ____ Cp ____
Bar. Press. ____ inHg H2O ____ %
Nozzle No. ____ Nozzle Dia. ____ IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
2	50	849.36	.02	02	9.30	0	76	256	261	52	92	92	20.9
1	52	849.49	.01	.01	9.43	0	91				93	92	
CP	54	851.32	2.55	2.94	1.40	8	91				93	92	
B4	56	852.80	1.0	1.16	2.64	4	91	257	260	54	100	94	
3	58	852.13	.06	.07	2.95	0	92				98	93	
2	60	853.23	.02	.02	3.12	0	92				98	93	
1	62	853.31	.02	.02	3.30	0	90	258	261	53	95	93	
4	64	853.43	.01	.01	3.42	0	90				95	93	
3	66	853.56	.01	.01	3.55	0	87				95	93	
2	68	853.56	0	0	3.55	0	82	258	261	53	95	93	
1	70	853.68	.01	.01	3.68	0	80				95	93	
CP	72	853.80	.01	.01	3.80	0	80				95	94	
A4	74	853.80	.0	.0	3.80	0	80	259	260	54	95	94	
3	76	854.08	.04	.04	4.05	0	84				94	92	
2	78	854.40	.03	.03	4.27	0	77				94	92	
1	80	854.40	.0	0	4.27	0	79	261	257	54	94	92	
B4	82	854.40	.01	.01	4.40	0	78				94	92	
3	84	854.55	.01	.01	4.52	0	80				94	92	
2	86	854.66	.01	.01	4.65	0	80	260	258	54	94	92	
1	88	854.83	.01	.01	4.78	0	77				92	92	
CP	90	856.80	2.90	3.36	6.88	9	88				96	93	
A4	92	858.46	1.80	2.09	8.55	6.5	91	255	260	52	99	93	
3	94	859.69	.82	.95	9.68		94				99	94	
2	96	860.51	.36	.41	0.47		98				99	94	
	θ =	Vm =		^H =							Avg. =		

CF-D11

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job Bell Lumber & Pole
Source POLE TREATMENT SCRUBBER Stack
Date 9/4/91 Test 4 Run 3

Operators DUH & P.O
Meter Box No. ____ ^H@ ____ IN WC
Counter confit. ____

Pitot No. ____ Cp ____
Bar. Press. ____ inHg H2O ____ %
Nozzle No. ____ Nozzle Dia ____ IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
1	98.	860.99	.19	.21	0.96	15	98	251	256	51	98	93	20.9
B 4	100	861.45	.15	.17	1.45	.5	98				97	93	
3	102	861.64	.02	.02	1.62	0	90				97	93	
2	104	861.80	.02	.02	1.80	0	90	253	258	54	95	92	
1	106	861.96	.02	.02	1.98	0	90				95	92	
CP	108	862.14	.02	.02	2.15	0	90				95	93	
A 4	110	862.45	.02	.02	2.33	0	90	254	259	52	95	93	
3	112	862.65	.02	.02	2.51	0	86				95	93	
2	114	862.82	.01	.01	2.63	0	86				95	92	
1	116	862.97	.02	.02	2.81	0	86	256	257	52	95	92	
4	118	863.14	.02	.02	2.99	0	88				95	92	
3	120	863.39	.02	.02	3.16	0	88				95	92	
2	122	863.61	.02	.02	3.34	0	88	257	260	52	94	92	
1	124	863.79	.02	.02	3.52	0	88				94	92	
CP	126	863.86	.02	.02	3.69	0	88				94	92	
B 4	128	864.17	.03	.03	3.91	0	86	260	257	53	94	92	
3	130	864.34	.02	.02	4.09	0	86				94	91	
2	132	864.52	.02	.02	4.26	0	86				93	91	
1	134	864.69	.02	.02	4.44	0	86	261	258	53	93	92	
4	136	864.86	.02	.02	4.62	0	86				93	92	
3	138	864.99	.02	.02	4.79	0	86				93	92	
2	140	865.21	.01	.01	4.92		86				93	92	
1	142	865.39	.02	.02	5.10		81				93	91	
CP	144	865.60	.02	.02	5.27		81				93	91	
	θ =	Vm =		^H =							Avg. =		

Pg 1 of 7

CF

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: Bell Lumber & Pole
Source: Pole TREATMENT Stack
Date: 9/4/91 Test: 1 Run: 3

Operators: DWH 47.0
Meter Box No. ____ ΔH ____ IN WC
Counter confit. ____

Pitot No. ____ Cp ____
Bar. Press. ____ inHg H2O ____ %
Nozzle No. ____ Nozzle Dia ____ IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
A 4	146	865.81	.02	.02	5.46	0	81	257	261	52	93	91	20.9
3	148	866.00	.02	.02	5.63	0	81				93	91	
2	150	866.16	.02	.02	5.81	0	81				93	91	
1	152	866.32	.03	.03	6.02	0	81	260	258	51	93	91	
4	154	866.50	.03	.03	6.24	0	80				91	90	
3	156	866.67	.02	.02	6.42	0	80				91	90	
2	158	866.84	.02	.02	6.59	0	80	261	257	52	91	90	
1	160	867.02	.02	.02	6.77	0	80				91	90	
CP	162	867.19	.01	.01	6.90	0	15				91	90	
B 4	164	867.36	.02	.02	7.07	0	81	259	258	52	91	90	
3	166	867.54	.01	.01	7.20	0	80				91	90	
2	168	867.70	.02	.02	7.38	0	80				91	90	
1	170	867.86	.02	.02	7.55	0	80	261	259	52	91	90	
4	172	868.06	.01	.01	7.68	0	80				91	90	
3	174	868.24	.01	.01	7.80	0	80				91	90	
2	176	868.42	.01	.01	7.93	0	80	260	258	52	91	90	
1	178	868.42	0	0	7.93	0	77				91	90	
A CP	180	868.42	0	0	7.93	0	73				91	90	
4	182	868.42	0	0	7.93	0	73	260	257	54	91	90	
3	184	868.42	0	0	7.93	0	72				91	90	
2	186	868.42	0	0	7.93	0	72				91	90	
1	188	868.42	0	0	7.93	0	72	257	257	55	91	90	
4	190	869.25	1.30	1.52	9.35	4	84				93	90	
3	192	871.40	2.9	3.38	1.46	9	84				98	92	
2	194	873.45	2.80	3.25	3.53		90	256	257	56	99	92	
	θ =	Vm =		ΔH =							Avg. =		

CF-D11

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job Bell Lumber & Pole
Source POLE TREATMENT SCRUBBER Stack
Date 9/4/91 Test 1 Run 3

Operators
Meter Box No. ____ ^H@ ____ IN WC
Counter confl. ____

Pitot No. ____ Cp ____
Bar. Press. ____ inHg H2O ____ x
Nozzle No. ____ Nozzle Dia ____ IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Water (inWC)	Dgs. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
1	196	875.50	2.5	2.88	5.49		94				100	93	
	1810												
	θ = 196	Vm = 35.35		^H =							Avg. =		

S 00270

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job Bell Lumber & Pole

Source Pole Treatment Scrubber Stack

Test 3 Run ____ Date 9/5/91

Stack dimen. 4" IN.

Dry bulb ____ °F Wet bulb ____ °F

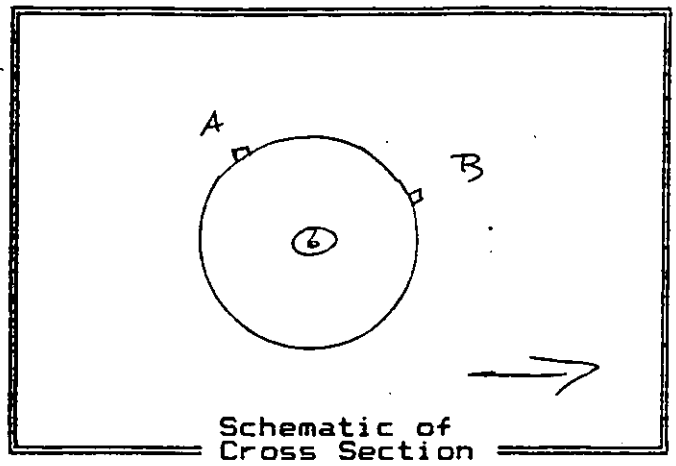
Manometer: ☒ Reg. ☒ Exp. ☐ Elec.

Barometric pressure 29.02 in Hg

Static pressure -.01 in WC

Operators D VanHoever & P. O'Neill

Pitot No. MM5-25 Cp .84



Schematic of Cross Section

PCP TEST

Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: .25 in.		Time start: hrs	
	A 1	.067	.5	.75		
	2	.25	1	1.25		
	3	.75	3	3.25		
	4	.933	3.5	3.75		
	CD	½	2	2.25		
Temp. meas. tool & S/N:					Time end: hrs	

R or nothing= reg. manometer; S= expanded; E = electronic S-392.1

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 SAMPLE LOG SHEET

Job Bell Lumber & Pole — Date 9/5/91 — Test 3 — Run 1
Source POLE TREATMENT SCRUBBER Stack — No. of traverse points 62
Cyclone: ☐ Yes ☒ No — Filter holder: MM5 — Filter type: 4" Glass fiber
Analytes: P.C.P. — XAD-2 resin: ___ g Batch No. ___
Field recovery spike added: ☒ Yes ☐ No — Reference: EPA SW-846 Method 0010

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 15 in. Hg. (vac) ☒

Semivolatile Catch Data:

No.s of filters used: ___ Recovery solvent(s)

☒ MeCl2 * ~~MeOH (50:50 v/v)~~
☒ other(s) ACETONE

No. of bottles for condensate trap catch: 1
Samples recovered by: DWT & MK

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate trap	4	0	4
Condensate trap			
Condensate trap			
Impingers	1510	1499	11
Desiccant			
Total			15

Integrated Gas Sampling Data: — Ambient Air

Bag Pump No. ___ Box No. ___ Bag No. ___

Bag Material: 4-layer Aluminized Tedlar Size: 44 L

Pretest leak check: ___ cc/min at ___ in. Hg.

Time start: ___ (HRS) Time end: ___ (HRS)

Sampling rate: ___ cc/min O2 Analyzer S/N: ___

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INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 FIELD DATA SHEET

Job Bell Lumber & Pole — Operators DUH + PO + MK — Nozzle No. M.M.5 - 3 — Pitot No. MM5-2.5
Source POLE TREATMENT SCRUBBER STACK — Meter Box No. 6 - ΔH@ 1.79 — Nozzle Dia. .183 in. — Cp .84
Date 9/5/91 — Test 3 — Run 1 — Gasmeter coeff. 1.0043 — Bar. Pres. 29.02 in. Hg — H_2O 5 %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	XAD2	Imp.	Meter (In/Out)		Oxygen (%v/v)
	0755	883.80												
4	2	885.54	2.40	2.59	5.62	10	81	249	251	50	52	66	66	20.9
3	4	887.25	1.90	2.03	7.23	9	83					68	66	20.9
2	6	888.31	.77	.82	8.35	4	83					70	67	
1	8	888.99	.36	.38	8.96	1	92	251	253	47	51	71	67	
4	10	888.99	0	0	8.96	0	75					69	67	
3	12	888.99	0	0	8.96	0	75					69	67	
2	14	888.99	0	0	88.96	0	75	253	257	48	55	68	67	
1	16	889.20	.02	.02	9.13	6	70					68	67	
CP	18	889.40	.02	.02	9.29	6	70					68	67	
4	20	889.60	.03	.03	9.50	6	70					68	67	
3	22	889.78	.02	.02	9.67	6	68					69	68	
2	24	889.97	.02	.02	9.84	0	65	255	261	49	56	69	68	
1	26	890.12	.02	.02	0.01	0	65					71	69	
4	28	890.37	.02	.02	0.18	0	67					70	69	
3	30	890.49	.02	.02	0.35	0	67					71	69	
2	32	890.76	.02	.02	0.52	0	67					71	69	
1	34	890.76	0	0	0.52	0	67	254	263	50	56	71	69	
CP	36	890.80	.01	.01	0.64	0	65					71	69	
4	38	890.94	.01	.01	0.76	0	65					71	70	
3	40	890.28	.02	.02	0.93	0	67					71	70	
2	42	891.44	.02	.02	1.10	0	67					72	70	
1	44	891.65	.02	.02	1.27	0	67	257	265	50	54	72	70	
4	46	893.64	3.8	4.06	3.54	15	86					72	70	
3	48	894.44	.41	.44	4.30	2.5	88					79	72	
	θ=	Vm=		^H=								Avg.=		

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 FIELD DATA SHEET

Job Bell Lumber & Pole
Source Pole Treatment Scrubber Stack
Date 9/5/91 Test 3 Run 1

Operators DW & DO & M.K.
Meter Box No.
Gasmeter coeff.

Nozzle No.
Nozzle Dia. in.
Bar. Pres. in. Hg

Pitot No.
Cp
H_2O %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	XAD2	Imp.	Meter (In/Out)		Oxygen (%v/v)
2	50	894.65	.02	.02	4.47	0	80	254	258	49	51	74	71	20.9
1	52	894.83	.04	.04	4.71	0	77					74	71	
CP	54	894.99	.01	.01	4.83	0	84					73	71	
4	56	895.19	.03	.03	5.03	0	84					73	71	
3	58	896.19	.95	1.03	6.18	6	83					73	71	
2	60	896.66	.08	.08	6.52	1	85	256	256	49	52	77	72	
1	62	896.92	.02	.02	6.69	0	85					74	72	
B 4	64	896.92	.0	0	6.69	0	79					73	72	
3	66	896.92	.01	.01	6.81	0	79					73	72	
2	68	896.92	0	0	6.81	0	80					73	72	
1	70	896.92	.01	.01	6.92	0	81	257	259	50	53	72	71	
CP	72	897.03	.01	.01	7.04	0	81					72	71	
4	74	897.19	.01	.01	7.16	0	81					72	71	
3	76	897.32	.02	.02	7.33	0	81					73	72	
2	78	897.50	.02	.02	7.50	0	71					73	72	
1	80	897.50	0	0	7.50	0	71	260	258	51	53	72	72	
4	82	897.63	.01	.01	7.62	0	71					72	72	
3	84	897.84	.02	.02	7.79	0	73					73	72	
2	86	897.94	.01	.01	7.91	0	73					73	72	
1	88	898.11	.02	.02	8.08	0	73					73	72	
CP	90	898.23	.01	.01	8.20	0	73	258	261	51	53	73	72	
4	92	898.40	.01	.01	8.32	0	75					73	72	
3	94	898.52	.01	.01	8.44		75					73	72	
2	96	898.64	.01	.01	8.56		71					73	71	
	θ=	Vm=		^H=								Avg.=		

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INTERPOLL LABORATORIES' EPA MODIFIED METHOD 5 FIELD DATA SHEET

Job: Bell Lumber + Pole Operators: DWH & P.O & M.K Nozzle No. ____ Pitot No. ____
Source: POLE TREATMENT SCRUBBER STACK Meter Box No. ____ Nozzle Dia. ____ in. Cp ____
Date: 9/5/91 Test: 3 Run: 1 Gasmeter coeff. ____ Bar. Pres. ____ in. Hg H_2O ____ %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	XAD2	Imp.	Meter (In/Out)		Oxygen (%v/v)
1	98	900.54	2.4	2.60	0.39	11	82	260	261	50	51	73	72	
4	100	902.29	2.0	2.15	2.05	10	85					74	79	
3	102	903.47	1.10	1.19	3.30	7	85					80	74	
2	104	904.35	.55	.60	4.19	4	85					79	74	
1	106	904.82	.28	.30	4.82	2.5	88					78	74	
CP	108	905.30	.14	.15	5.26	1.5	88	262	261	52	52	77	74	
4	110	905.44	.03	.03	5.47	0	87					76	73	
3	112	905.68	.02	.02	5.64	0	83					76	73	
2	114	905.86	.02	.02	5.80	0	83					75	73	
1	116	906.23	.01	.01	5.92	0	83					75	73	
4	118	906.15	.01	.01	6.04	0	83	259	261	53	54	75	73	
3	120	906.41	.01	.01	6.16	0	83					74	72	
2	122	906.52	.01	.01	6.28	0	83					74	72	
1	124	906.60	.01	.01	6.40	0	83					74	72	
	(100)													
	θ= 124	Vm= 2280		ΔH= .31								Avg.= 76.7		

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 SAMPLE LOG SHEET

Job Bell Lumber & Pole
Source POLE TREATMENT SCRUBBER Stack
Cyclone: ☐ Yes ☒ No Filter holder: MM5
Analytes: PCP
Field recovery spike added: ☒ Yes ☐ No

Date 9/5/91 Test 3 Run 2
No. of traverse points 62
Filter type: 4" Glass fiber
XAD-2 resin: ___ g Batch No. ___
Reference: EPA SW-846 Method 0010

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 16 in. Hg. (vac) ☒

Semivolatile Catch Data:

No.s of filters used: Recovery solvent(s)

☒ MeCl2 * ~~MeOH (50:50 v/v)~~
☒ other(s) ACETONE

No. of bottles for condensate trap catch: 1
Samples recovered by: MK & DVH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate trap	28	0	28
Condensate trap			
Condensate trap			
Impingers			
Desiccant	1496	1485	11
Total			39

Integrated Gas Sampling Data: - Ambient Air

Bag Pump No. ___ Box No. ___ Bag No. ___

Bag Material: 4-layer Aluminized Tedlar Size: 44 L

Pretest leak check: ___ cc/min at ___ in. Hg.

Time start: ___ (HRS) Time end: ___ (HRS)

Sampling rate: ___ cc/min O2 Analyzer S/N: ___

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INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 FIELD DATA SHEET

Job Bell Lumber & Pole
Source Pole Treatment Scrubber Stack
Date 9/5/91 Test 3 Run 2

Operators DVA & P.O & MK
Meter Box No. 6
Gasmeter coeff. 1.0243

Nozzle No. MM5-3
Nozzle Dia. .183 in.
Bar. Pres. 29.02 in. Hg

Pitot No. MM5-2.5
Cp .84
H_2O 4 %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Gas. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	XAD2	Imp.	Meter (In/Out)		Oxygen (%v/v)
	1020	906.90												
4	2	907.04	.01	.01	7.01	0	80	231	240	46	50	71	71	20.9
3	4	907.10	.01	.01	7.13	0	80					71	70	
2	6	907.28	.01	.01	7.25	0	75					71	70	
1	8	907.44	.02	.02	7.42	0	75					71	71	
4	10	907.59	.015	.01	7.57	0	75					71	71	
3	12	907.78	.01	.01	7.69	0	73	234	239	46	51	71	71	
2	14	907.98	.025	.02	7.88	0	73					71	71	
1	16	908.12	.015	.01	8.03	0	70					71	71	
CP	18	908.24	.015	.01	8.18	0	70					71	71	
4	20	908.49	.01	.01	8.30	0	70					71	71	
3	22	908.65	.015	.01	8.45	0	70	238	250	46	51	71	71	
2	24	908.84	.01	.01	8.57	0	70					71	71	
1	26	908.86	.005	0	8.57	0	68					71	71	
4	28	908.99	.01	.01	8.68	0	68					71	71	
3	30	909.09	.01	.01	8.81	0	69					71	71	
2	32	909.25	.01	.01	8.93	0	69	247	251	47	51	71	71	
1	34	909.40	.01	.01	9.05	0	68					71	71	
CP	36	909.56	.015	.01	9.20	0	68					71	71	
4	38	909.75	.01	.01	9.32	0	68					71	71	
3	40	909.85	.01	.01	9.44	0	68					71	71	
2	42	909.99	.01	.01	9.56	0	68	253	254	46	51	71	71	
1	44	910.04	.01	.01	9.68	0	68					71	71	
4	46	910.13	.01	.01	9.80	0	68					71	71	
3	48	910.22	.01	.01	9.92		67					71	71	
	θ=	Vm=		^H=								Avg.=		

Pg 2 of 3

INTERPOLL LABORATORIES/ EPA MODIFIED METHOD 5 FIELD DATA SHEET

Job Bell Lumber
Source Pole Treatment Scrubber Stack
Date 9/5/91 Test 3 Run 2

Operators DJH & P.O & M.K
Meter Box No.
Gasmeter coeff.

Nozzle No.
Nozzle Dia. in.
Bar. Pres. in. Hg

Pitot No.
Cp
H_2O %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	XAD2	Imp.	Meter (In/Out)		Oxygen (%v/v)
2	50	910.22	0	0	9.92	0	67	256	258	49	51	71	71	20.9
1	52	910.22	0	0	9.92	0	64					71	71	
CP	54	910.22	0	0	9.92	0	64					71	71	
4	56	910.22	0	0	9.92	0	64					71	71	
3	58	910.22	0	0	9.92	0	64					71	71	
2	60	910.22	0	0	9.92	0	64	258	255	48	52	71	71	
1	62	910.22	0	0	9.92	0	63					71	71	
4	64	910.22	.01	.01	0.05	0	63					71	71	
3	66	910.40	.01	.01	0.12	0	64					71	71	
2	68	910.49	.01	.01	0.29	0	64					71	71	
1	70	910.65	.01	.01	0.41	0	64	260	252	49	52	71	71	
CP	72	910.78	.005	.00	0.50	0	62					71	71	
4	74	912.15	2.20	2.43	2.26	10	79					76	72	
3	76	914.44	3.50	3.88	4.50	15	79					78	73	
2	78	916.50	3.70	4.08	6.79	16	83					79	73	
1	80	919.01	3.70	4.08	9.08	16	83	261	254	50	52	80	74	
4	82	921.30	3.60	3.94	1.34	15	89					80	74	
3	84	923.41	3.50	3.82	3.56	15	90					80	74	
2	86	925.56	3.50	3.81	5.79	15	91					80	74	
1	88	927.77	3.40	3.71	7.98	15	91					80	74	
CP	90	929.86	3.40	3.70	0.16	15	92	260	256	50	52	80	74	
4	92	932.08	3.40	3.70	2.35	15	92					80	74	
3	94	934.24	3.40	3.70	4.54	15	92					80	75	
2	96	936.49	3.40	3.70	6.73	15	92					80	75	
	θ=	Vm=		^H=								Avg.=		

Pd icf

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 FIELD DATA SHEET

Job Bell Lumber & Pole
Source Pole TREATMENT SCRUBBER Stack
Date _____ Test 3 Run 2

Operator: DW & P.O & MK
Meter Box No. _____
Gasmeter coeff. _____

Nozzle No. _____
Nozzle Dia. _____ in.
Bar. Pres. _____ in. Hg

Pitot No. _____
Cp _____
H_2O _____ %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	XAD2	Imp.	Meter (In/Out)		Oxygen (%v/v)
1	98	938.63	3.35	3.66	8.91	15	91	260	257	49	51	80	75	20.9
4	100	940.86	3.40	3.71	1.10	15	91					80	75	
3	102	943.26	3.50	3.82	3.32	15	91					79	75	
2	104	945.46	3.50	3.81	5.52	15	91					79	75	
1	106	945.75	.02	.02	5.71	0	84					79	75	
CP	108	945.88	.02	.02	5.88	0	90	261	258	49	50	76	74	
Restart 1240 → 4	110	947.65	2.10	2.32	7.62	10	83					71	71	
3	112	949.55	2.60	2.84	9.53	13	84					71	71	
2	114	951.43	2.20	2.41	1.29	13	84					74	72	
1	116	952.69	.95	1.04	2.45	7	86					74	72	
4	118	952.69	0	0	2.45	0	86	261	259	52	54	74	72	
3	120	952.69	0	0	2.45	0	64					72	72	
2	122	952.69	0	0	2.45		64					73	72	
1	124	952.90	.03	.03	2.66		71					73	72	
	(1256)													
	θ= 124	Vm= 46.00		^H= 1.07								Avg.= 72.2		

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 SAMPLE LOG SHEET

Job Poll Lumber & Pole
Source POLE TREATMENT SCRUBBER STACK
Cyclone: ☐ Yes ☒ No Filter holder: MMS
Analytes: PCP
Field recovery spike added: ☒ Yes ☐ No

Date 9/5/91 Test 3 Run 3
No. of traverse points 62
Filter type: 4" Glass fiber
XAD-2 resin: ___ g Batch No. ___
Reference: EPA SW-846 Method 0010

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 16 in. Hg. (vac) ☒

Semivolatile Catch Data:

No.s of filters used: ___

Recovery solvent(s)

☒ MeCl2 ~~+ MeOH (50:50 v/v)~~
☒ other(s) ACETONE

No. of bottles for condensate trap catch: 1
Samples recovered by: DVN & MK

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Condensate trap	11	0	11
Condensate trap			
Condensate trap			
Impingers	1515	1510	5
Desiccant			
Total			16

Integrated Gas Sampling Data: — Ambient Air

Bag Pump No. ___ Box No. ___ Bag No. ___

Bag Material: 4-layer Aluminized Tedlar Size: 44 L

Pretest leak check: ___ cc/min at ___ in. Hg.

Time start: ___ (HRS) Time end: ___ (HRS)

Sampling rate: ___ cc/min O2 Analyzer S/N: ___

Rev.1 CF-026

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 FIELD DATA SHEET

Job: Bell Lumber & Pole
Source: Pole Treatment Scrubber Stack
Date: 9/5/91 Test: 3 Run: 3

Operators: DUH & P.O & M.K
Meter Box No.: 6 - AHQ 1.74
Gasmeter coeff.: 1.0043

Nozzle No.: mm5-3
Nozzle Dia.: .183 in.
Bar. Pres.: 29.02 in. Hg

Pitot No.: mm5-2.5
Cp: .84
H_2O: 4 %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	XAD2	Imp.	Meter (In/Out)		Oxygen (%v/v)
	1325	953.70												
4	2	953.82	.01	.01	3.82	0	78	227	245	60	51	72	72	20.9
3	4	956.60	.4	.80	6.29	15	84					78	74	
2	6	956.74	.04	.04	6.53	0	86					76	74	
1	8	956.83	.015	.01	6.68	0	82					75	74	
4	10	956.96	.010	.01	6.80	0	78					75	74	
3	12	957.14	.1000	.11	7.18	0	78	239	252	50	52	75	74	
2	14	957.29	.01	.01	7.30	0	78					75	74	
1	16	957.58	.025	.02	7.50	0	74					75	74	
CP	18	957.77	.01	.01	7.62	0	74					75	74	
4	20	958.39	.37	.42	8.36	0	70					75	74	
3	22	958.91	.17	.18	8.85	1	85	249	254	50	52	76	75	
2	24	959.08	.01	.01	8.97	0	85					76	75	
1	26	959.12	.01	.01	9.09	0	72					76	75	
4	28	959.17	.015	.01	9.24	0	72					76	75	
3	30	959.30	.01	.01	9.36	0	72					76	75	
2	32	959.48	.01	.01	9.48	0	72	256	255	49	52	76	75	
1	34	959.67	.01	.01	9.61	0	72					76	75	
CP	36	959.87	.01	.01	9.73	0	70					77	76	
4	38	960.04	.01	.01	9.85	0	70					77	76	
3	40	960.04	0	0	9.85	0	70					77	76	
2	42	960.04	0	0	9.85	0	65					77	76	
1	44	960.13	.01	.01	9.97	0	67	258	254	50	52	77	76	
4	46	960.24	.015	.01	0.12	0	67					77	76	
3	48	960.35	.01	.01	0.24		70					77	76	
	θ=	Vm=		^H=								Avg.=		

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 FIELD DATA SHEET

Job Bell Lumber & Pole
Source Pole treatment Scrubber Stack
Date 9/5/91 Test 3 Run 3

Operators DW & P.O & MK
Meter Box No.
Gasmeter coeff.

Nozzle No.
Nozzle Dia. in.
Bar. Pres. in. Hg

Pitot No.
Cp
H_2O %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	XAD2	Imp.	Meter (In/Out)		Oxygen (%v/v)
2	50	960.42	.02	.02	0.42	0	74	251	261	51	52	77	76	20.9
1	52	960.52	.01	.01	0.54	0	74					78	76	
CP	54	960.67	.01	.01	0.66	0	75					78	77	
4	56	960.79	.01	.01	0.78	0	75					78	77	
3	58	962.54	2.10	2.32	2.52	8	85					79	77	
2	60	964.23	2.10	2.32	4.26	8	85	257	260	54	55	87	80	
1	62	965.60	1.30	1.46	5.65	5	85					88	80	
4	64	966.60	.55	.61	6.55	4	88					89	81	
3	66	967.57	.59	.66	7.48	4	88					89	81	
2	68	967.95	.10	.11	7.87	4	88					89	80	
1	70	968.39	.17	.18	8.37	1	89	256	257	50	53	84	80	
CP	72	968.94	.22	.24	8.94	1	89					84	80	
4	74	968.99	.0	0	8.94	0	90					84	80	
3	76	968.99	0	0	8.94	0	89					82	79	
2	78	969.19	.01	.01	9.06	0	89					82	79	
1	80	969.35	.01	.01	9.18	0	88	258	259	49	53	82	79	
4	82	969.53	.01	.01	9.30	0	88					82	80	
3	84	969.59	.015	.01	9.45	0	87					82	81	
2	86	969.90	.015	.01	9.60	0	86					82	81	
1	88	970.08	.01	.01	9.72	0	86					82	81	
CP	90	970.27	.01	.01	9.83	0	86	259	260	50	52	82	81	
4	92	970.44	.01	.01	9.95	0	84					82	81	
3	94	970.61	.015	.01	0.10	0	84					83	82	
2	96	970.81	.01	.01	0.23		84					83	82	
	θ=	Vm=		^H=								Avg.=		

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 FIELD DATA SHEET

Job Bell Lumber & Pole
Source Pole Treatment Scrubber Stack
Date 9/5/91 Test 3 Run 3

Operators DWH & MK @ 7:10
Meter Box No. _____
Gasmeter coeff. _____

Nozzle No. _____
Nozzle Dia. _____ in.
Bar. Pres. _____ in. Hg

Pitot No. _____
Cp _____
H_2O _____ %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	XAD2	Imp.	Meter (In/Out)		Oxygen (%v/v)
1	98	970.98	.01	.01	0.35	0	84	260	261	50	53	83	82	20.9
4	100	971.10	.01	.01	0.47	6	84					84	82	
3	102	971.26	.01	.01	0.59	0	84					84	82	
2	104	971.41	.015	.01	0.74	0	80					84	82	
1	106	971.55	.01	.01	0.86	0	80					84	82	
CP	108	971.71	.01	.01	0.99	0	82	261	263	50	53	84	82	
4	110	971.84	.01	.01	1.11	0	82					84	83	
3	112	971.98	.01	.01	1.23	0	82					84	83	
2	114	972.11	.01	.01	1.35	0	82					84	83	
1	116	972.27	.01	.01	1.48	0	82					85	83	
4	118	972.41	.015	.01	1.63	0	81	260	254	50	54	85	83	
3	120	972.55	.015	.01	1.78	0	81					85	83	
2	122	972.65	.01	.01	1.90	0	77					85	83	
1	124	972.65	.0	.00	1.90	0	81					85	83	
	1530													
	θ= 124	Vm= 18.95		^H=.22								Avg.= 78.8		

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL DATA

TABLE OF CONTENTS

Particulate 1

Pentachlorophenol 4

Sample Deposition Sheets 7

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job: Bell Lumber + Pole
Team Leader: DUH
Date Submitted: 9-5-91
Test No.: 1
Date of Analysis: 9-9-91
Transport Leakage ☒ None ☐ _____ ml

Source: Pole Treatment
Test Site: Scrubber Stack
Date of Test: 9-4-91
No. of Runs Completed: 3
Technician: M. Hamer
Solvent: Acetone

0	Test 1 Run 0 Field Blank Log Number 411496-01 Vol. of Solvent 145 ml *Solvent Residue 2.1 ug/ml	Dish No. 69 Dish Tare Wt. 47.9902 g Dish+Sample Wt. 47.9905 g Sample Wt. 0.0003 g
1	Test 1 Run 1 Vol. of Solvent 160 ml Log Number -04 Comments	Dish No. 26 Dish Tare Wt. 48.3858 g Dish+Sample Wt. 48.4199 g Sample Wt. 0.0341 g
2	Test 1 Run 2 Vol. of Solvent 160 ml Log Number -07 Comments	Dish No. 115 Dish Tare Wt. 45.06816 g Dish+Sample Wt. 45.07516 g Sample Wt. 0.0070 g
3	Test 1 Run 3 Vol. of Solvent 100 ml Log Number -10 Comments	Dish No. 402 Dish Tare Wt. 47.5804 g Dish+Sample Wt. 47.6022 g Sample Wt. 0.0218 g
4	Test ____ Run ____ Vol. of Solvent ____ ml Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

*Solvent Residue 2.1 ug/ml = [(Sample Wt. 0.0003 g)(10⁶)]/Vol. of Sol. 145 ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0338	0.0067	0.0216		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job: Bell Lumber & Pole
Team Leader: DVH
Date Submitted: 9-5-91
Test No.: 1
Date of Analysis: 9-12-91

Source: Pole Treatment
Test Site: Scrubber Stack
Date of Test: 9-4-91
No. of Runs Completed: 3
Technician: R. Cole

0	Test 1 Run 0 Field Blank Log Number 4146-03 Comments	Dish No. 3 Dish Tare Wt. 52.1222 g Dish+Sample Wt. 52.1224 g Sample Wt. 0.0002 g
1	Test 1 Run 1 Log Number -06 Comments	Dish No. 62 Dish Tare Wt. 50.8920 g Dish+Sample Wt. 50.9050 g Sample Wt. 0.0130 g
2	Test 1 Run 2 Log Number -09 Comments	Dish No. 110 Dish Tare Wt. 49.7367 g Dish+Sample Wt. 49.7640 g Sample Wt. 0.0273 g
3	Test 1 Run 3 Log Number -12 Comments	Dish No. 117 Dish Tare Wt. 47.3733 g Dish+Sample Wt. 47.4237 g Sample Wt. 0.0504 g
4	Test Run Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test Run Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

Blank Solvent Wt. 0.0002 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0128	0.0271	D-1 0.0502		

LSC-03.GF

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job: Bell Lumber + Pole
Team Leader: DVH
Date Submitted: 9-5-91
Test No.: 1
Date of Analysis: 9-5-91

Source: Pole Treatment
Test Site: Scrubber Stack
Date of Test: 9-4-91
No. of Runs Completed: 3
Technician: MH

0	Test 1 Run 0 Field Blank Log Number 4146-02 Comments	Filter No. 3657 Filter Type 4"GF Filter Tare Wt. .9124 g Filter+Sample Wt. .9124 g Sample Wt. .0001 g
1	Test 1 Run 1 Log Number -05 Comments	Filter No. 3636 Filter Type 4"GF Filter Tare Wt. .8772 g Filter+Sample Wt. .8816 g Sample Wt. 0.0044 g
2	Test 1 Run 2 Log Number -08 Comments	Filter No. 3648 Filter Type 4"GF Filter Tare Wt. .9068 g Filter+Sample Wt. .9075 g Sample Wt. 0.0007 g
3	Test 1 Run 3 Log Number -11 Comments	Filter No. 3611 Filter Type 4"GF Filter Tare Wt. .8906 g Filter+Sample Wt. .8957 g Sample Wt. 0.0051 g
4	Test ____ Run ____ Log Number Comments	Filter No. Filter Type Filter Tare Wt. g Filter+Sample Wt. g Sample Wt. g
5	Test ____ Run ____ Log Number Comments	Filter No. Filter Type Filter Tare Wt. g Filter+Sample Wt. g Sample Wt. g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0044	0.0007	0.0051		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0510	0.0345	0.0769		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

XAD-2 & VOST Trap Preparation Work Order Form

Project Name: Bell Pole! lumber Order Date: 9/3/91
Date Required: 9/3/91 Delivery Date: 9/3/91

Number of XAD-2 Traps Required: 4

Number of VOST Tubes Required: ___ Tenax
___ Tenax/Charcoal

XAD-2 TRAP HISTORY

XAD-2 Lot Number: 1277 Date of Spiking: 9/3/91
XAD-2 Lot Date: Jan 91 Technician: TM
XAD-2 Lot Technician: Alltech

Nature of Spiking Material	Spike Concentration	Spike Volume	Total Mass of Spike
D_{10}-Fluorathene			
Pentafluorophenol	1.0 ug/uL	20 uL	20 ug

VOST TUBE HISTORY

Date of Thermal Disorption: _____ Technician: _____

Total Hydrocarbon Analysis: ____ ppm

SPECIAL REQUIREMENTS

→ Pole Treatment Plant

**Please return this form with the samples.

LOA-10RR

INTERPOLL LABORATORIES, INC.
(612)786-6020

Bell Lumber & Pole
Laboratory Log No. 4146

Results of Pentachlorophenol Analysis[1]

Test: 3

Source: Pole Treatment Scrubber Stack

Sample Type: MM-5 Train Catch

	Total Mass of Pentachlorophenol (ug)			
Analyte	Field Blank	Run 1	Run 2	Run 3
(Log No.)	(4146-29)	(4146-30)	(4146-31)	(4146-32)
Pentachlorophenol	< 2.8	1300	640	4100

[1]EPA Method SW-846, 8270.

< = less than

INTERPOLL LABORATORIES, INC.
(612)786-6020

Bell Lumber & Pole
Laboratory Log No. 4146

Results of Field Spiked Surrogate Pentafluorophenol Analysis[1]

Test: 3
Source: Pole Treatment Scrubber Stack
Sample Type: MM-5 Train Catch

Analyte	Spike Conc. (ug/uL)	Total Mass of Pentafluorophenol (ug) Field Blank	Run 1	Run 2	Run 3
(Log No.)		(4146-29)	(4146-30)	(4146-31)	(4146-32)
Pentafluorophenol	1.0	< 2.3	< 2.3	< 2.3	< 2.3

Note: The recovered MM-5 train sample extracts contained high concentrations of intermediate boiling range hydrocarbons even after GPC clean up. The hydrocarbons degraded the analytical chromatographic separation on the GC and prevented both the quantitation of target analytes and their positive identification by MS.

The sample extracts were diluted to eliminate this hydrocarbon interference. However, this resulted in the field spiked surrogate (PFP) being diluted to a concentration below its instrumental detection limit. No field spiked surrogate recovery could be determined. The dilution did not adversely affect the quantitation of pentachlorophenol which was present at high concentrations or the laboratory spiked surrogates, the recoveries all of which were within EPA QC acceptance criteria.

[1]EPA Method SW-846, 8270.
< = less than

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job: Bell Lumber & Pole
Team Leader: DVH
Date Submitted: 9/4/91
Test No.: 1

Source: Pole Treatment
Test Site: Scrubber Stack
Date of Test: 9/4/91
No. of Runs Completed: 3

No. of Samples	Type of Sample	Analysis Required	Comments
4	Probe Wash: ☒ Acetone ☐ D.I. Water	☐ As per EPA M-5 ☐ Other _____	
4	Filter: ☒ 4" G.F. ☐ S.S. Thimble ☐ 2.5" G.F. ☐ 47 mm G.F.	☐ As per EPA M-5 ☐ As per EPA M-17 ☐ Other _____	
4	Impinger Catch: ☒ D.I. Water ☐ 3% H_2O_2 ☐ 4M5 Hg Only ☐ 4M5 Metals ☐ 1.0 N NaOH ☐ Other _____	☒ MN Protocol ☐ WI Protocol ☐ EPA M-6 or 8 ☐ Acid Gases ☐ Formaldehyde ☐ Metals ☐ Other _____	
	Integrated Gas sample	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	Date _____ Time (HRS) _____
	☐ Fuel Sample ☐ Aggregate	☐ Attached fuel Form #S-0163RRR	
	Particle Size	☐ X-Ray Sedigraph ☐ Bahco Method ☐ Other _____	
	Audit Samples ☐ Sulfur Dioxide ☐ Oxides of Nit. ☐ Other _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other _____
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other none
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain _____

S-278RRRR

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job Bell Lumber + Pole / New Brighton, MN

Date of Sampling 9-4-91 Site Pole Treatment Scrubber / Stack

Test 3 Run 0 Team Leader Duane VanHeever

Type of Sample Train: Modified Method 5

Sample Collection/Recovery

Person performing sample recovery:

Signature Mark Baehler Title Field Engineer

Location at which recovery was done Quality Control Room

Special transport/storage requirements? Teflon + Chain of Custody Seals

	Sample Description	No. of Items	Assigned Log Number
Composite 4146-29	1. Solvent Rinse	1	4146-13
	2. 4" Glass Fiber Filter No. 7012	1	-14
	3. XAD-2 Resin	1	-15
	4. Condensate Trap	1	-16
	5.		
	6.		
	7.		
	8.		
	9.		
	10.		
	11.		
	12.		
	13.		
	14.		
	15.		
	16.		
	17.		
	18.		

Sample Transport

Method of transport Company Van

Recipient of samples upon recovery (if not recovery person):

Signature _____ Title _____

Date of receipt _____ Time of receipt _____ HRS

S-0157RR-1

Sample Check-In at Interpoll Labs

Laboratory person receiving samples:

Signature Bill Drake Title Lab Analyst

Date of receipt 9-6-91 Time of receipt 0800 HRS

Sample storage location secured walk-in cooler

Special storage conditions?

Analysis

	Sample Log No.	Date of Analysis	Method of Analysis	Initials of Analyst
composite 4146-29	1. 4146-13	10/8/91	8270	RWW
	2. -14			
	3. -15			
	4. -16			
	5.			
	6.			
	7.			
	8.			
	9.			
	10.			
	11.			
	12.			
	13.			
	14.			
	15.			
	16.			
	17.			
	18.			

Signature of each analyst:

Initials	Signature
RWW	Robert W. Wyman

S-0157RR-2

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job Bell Lumber + Pole / New Brighton, MN

Date of Sampling 9-5-91 Site Pole Treatment Scrubber / Stack

Test 3 Run 1 Team Leader Duane VanHoever

Type of Sample Train: Modified Method 5

Sample Collection/Recovery

Person performing sample recovery:

Signature Mark Kaehler Title Field Engineer

Location at which recovery was done Quality Control Room

Special transport/storage requirements? Teflon + Chain of Custody Seals

	Sample Description	No. of Items	Assigned Log Number
composite 4146-30	1. Solvent Rinse	1	4146-17
	2. 4" Glass Fiber Filter No. 2000	1	-18
	3. XAD-2 Resin	1	-19
	4. Condensate Trap	1	-20
	5.		
	6.		
	7.		
	8.		
	9.		
	10.		
	11.		
	12.		
	13.		
	14.		
	15.		
	16.		
	17.		
	18.		

Sample Transport

Method of transport Company Van

Recipient of samples upon recovery (if not recovery person):

Signature _____ Title _____

Date of receipt _____ Time of receipt _____ HRS

S-0157RR-1

Sample Check-In at Interpoll Labs

Laboratory person receiving samples:

Signature Bill Drake Title Lab Analyst

Date of receipt 9-6-91 Time of receipt 0800 HRS

Sample storage location secured walk-in cooler

Special storage conditions?

Analysis

	Sample Log No.	Date of Analysis	Method of Analysis	Initials of Analyst
composite 4146-30 1.	4146-17	10/8/91	8270	RWW
2.	-18			
3.	-19			
4.	-20			
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

Signature of each analyst:

Initials	Signature
RWW	Robert W. Vigne

S-0157RR-2

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job Bell Lumber + Pole / New Brighton, MN

Date of Sampling 9-8-91 Site Pole Treatment Scrubber / Stack

Test 3 Run 2 Team Leader Duane Van Hoever

Type of Sample Train: Modified Method 5

Sample Collection/Recovery

Person performing sample recovery:

Signature Mark Baehler Title Field Engineer

Location at which recovery was done Quality Control Room

Special transport/storage requirements? Teflon + Chain of Custody Seals

	Sample Description	No. of Items	Assigned Log Number
Composite 4146-31	1. Solvent Rinse	1	4146-21
	2. 4" Glass Fiber Filter No. 7014	1	-22
	3. XAD-2 Resin	1	-23
	4. Condensate Trap	1	-24
	5.		
	6.		
	7.		
	8.		
	9.		
	10.		
	11.		
	12.		
	13.		
	14.		
	15.		
	16.		
	17.		
	18.		

Sample Transport

Method of transport Company Van

Recipient of samples upon recovery (if not recovery person):

Signature _____ Title _____

Date of receipt _____ Time of receipt _____ HRS

S-0157RR-1

Sample Check-In at Interpoll Labs

Laboratory person receiving samples:

Signature Bill Drake Title Lab Analyst

Date of receipt 9-6-91 Time of receipt 0800 HRS

Sample storage location Secured walk-in cooler

Special storage conditions?

Analysis

	Sample Log No.	Date of Analysis	Method of Analysis	Initials of Analyst
composite 4146-31	1. 4146-21	10/8/91	8270	[illegible]
	2. -22			
	3. -23			
	4. -24			
	5.			
	6.			
	7.			
	8.			
	9.			
	10.			
	11.			
	12.			
	13.			
	14.			
	15.			
	16.			
	17.			
	18.			

Signature of each analyst:

Initials	Signature
RWW	Robert W. Wayne

S-0157RR-2

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job Bell Lumber + Pole / New Brighton, MN

Date of Sampling 9-9-91 Site Pole Treatment Scrubber / Stack

Test 3 Run 3 Team Leader Duane Van Hoever

Type of Sample Train: Modified Method 5

Sample Collection/Recovery

Person performing sample recovery:

Signature Mark Bachler Title Field Engineer

Location at which recovery was done Quality Control Room

Special transport/storage requirements? Teflon + Chain of Custody Seals

	Sample Description	No. of Items	Assigned Log Number
composite 4146-32	1. Solvent Rinse	1	4146-25
	2. 4" Glass Fiber Filter No. 2015	1	-26
	3. XAD-2 Resin	1	-27
	4. Condensate Trap	1	-28
	5.		
	6.		
	7.		
	8.		
	9.		
	10.		
	11.		
	12.		
	13.		
	14.		
	15.		
	16.		
	17.		
	18.		

Sample Transport

Method of transport Company Van

Recipient of samples upon recovery (if not recovery person):

Signature _____ Title _____

Date of receipt _____ Time of receipt _____ HRS

S-0157RR-1

Sample Check-In at Interpoll Labs

Laboratory person receiving samples:

Signature Bill Drake Title Lab Analyst

Date of receipt 9-6-91 Time of receipt 0800 HRS

Sample storage location Secured walk-in cooler

Special storage conditions?

Analysis

	Sample Log No.	Date of Analysis	Method of Analysis	Initials of Analyst
composite 4146-32 1.	4146-25	10/9/91	8270	RWW
2.	-26			
3.	-27			
4.	-28			
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

Signature of each analyst:

Initials	Signature
RWW	Robert W. Wynne

S-0157RR-2

APPENDIX E

MPCA EXHIBIT C

RECEIVED

OCT 2 1991

INTERPOLL LABORATORIES

Interpoll Laboratories
(612)786-6020

MPCA Exhibit C for Process Emissions

JOB BELL LUMBER & POLE CO

SOURCE

DATE 9/10 & 9/11 1992

C. Equipment & Operating Data

1. Process Equip. No./Ident. SN 90142.
2. Process Equip. Description PRESSURE RETORT FOR WOOD PRESERVATION WITH PENTACHLOROPHENOL.
3. Process equipment operating under normal operating conditions: No____. Yes ✓.

D. Instrument Data on Process Equipment

1. Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, lbs. per hour, pressure, air flow, etc.

E. Air Pollution Control Equipment

1. Type/model control equipment 30T-6H PACKED TOWER.
2. Air pressure drop across the control equipment_____.
3. Air flow through the control equipment_____.
4. Was the control equipment operating normally? YES.
5. Data of last major maintenance/cleaning of control equipment NEW EQUIPMENT - NEW INSTALLATION.

F. Plant Manager's Certification

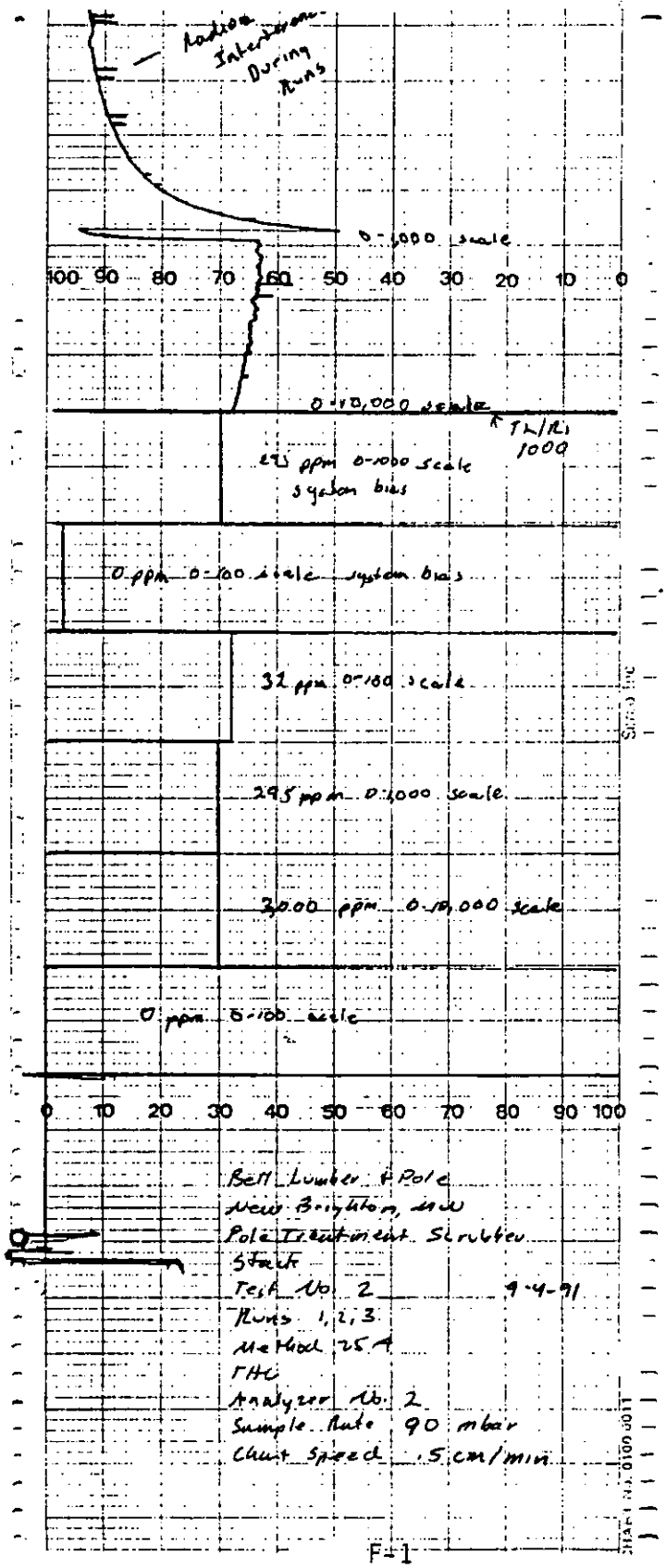
I certify that the information submitted herein is accurate and correct and that no information requested was withheld from MPCA, Division of Air Quality.

By [signature], Position PLANT MANAGER

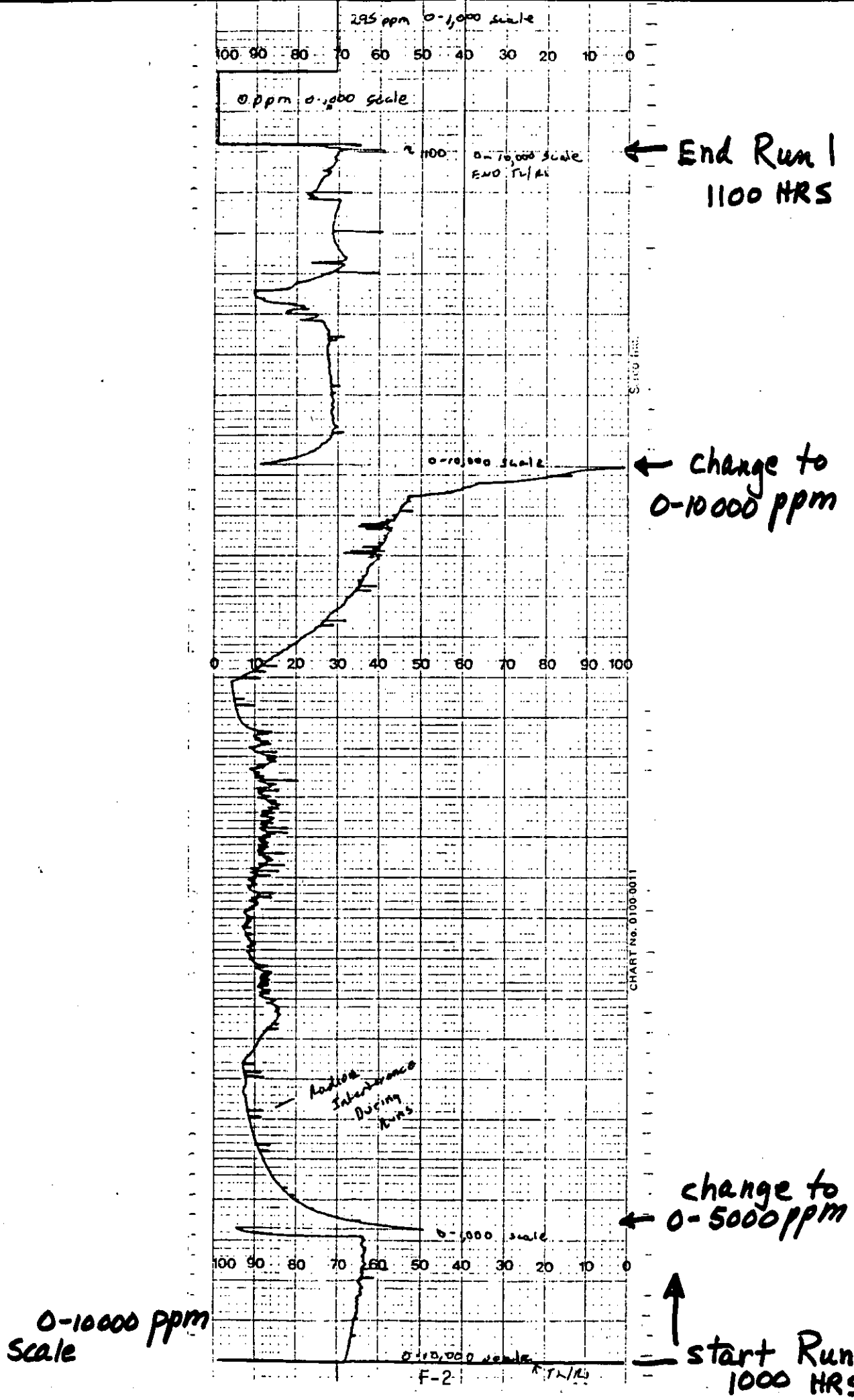
S-349R

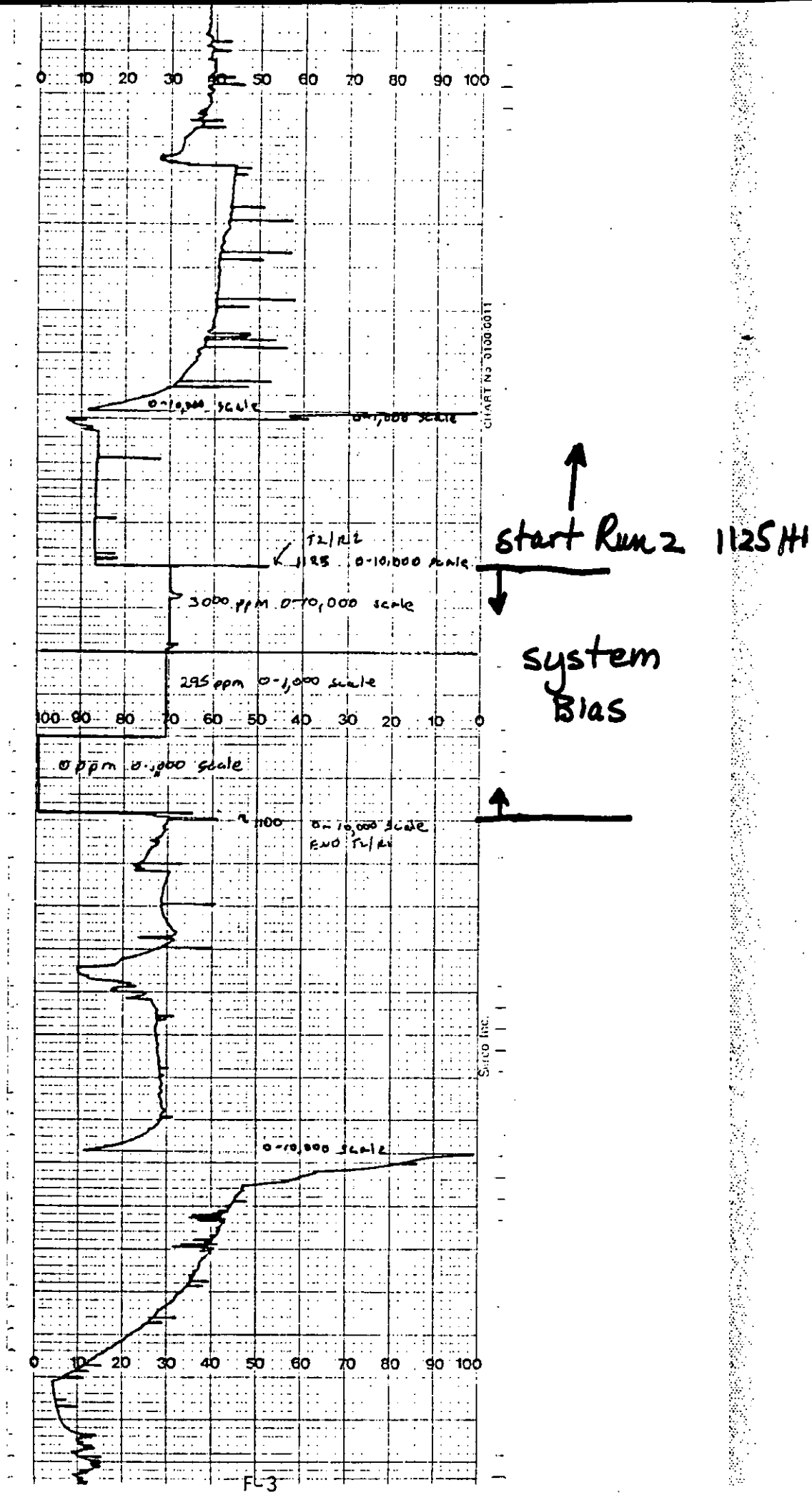
APPENDIX F

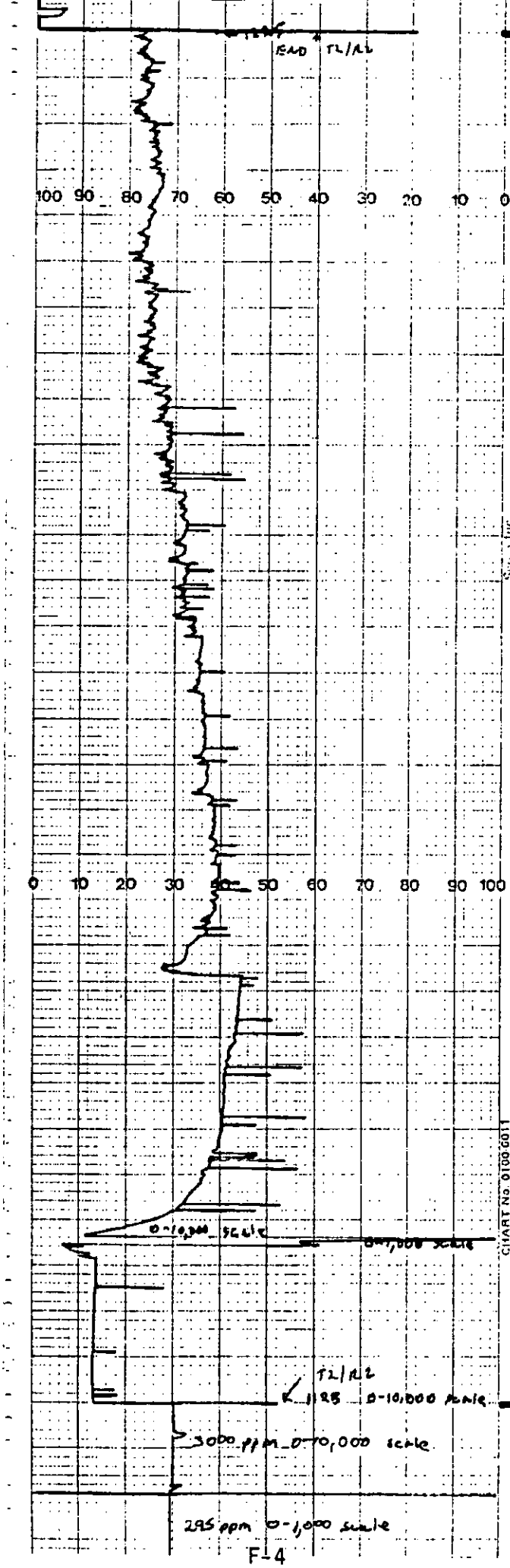
THC STRIPCHART



calibration DATA


295 ppm 0-1,000 scale
100 90 80 70 60 50 40 30 20 10 0
0 ppm 0-1,000 scale
≈ 100
0-10,000 scale
END TRIAL
End Run 1
1100 HRS
0-10,000 scale
change to
0-10000 ppm
0 10 20 30 40 50 60 70 80 90 100
CHART No. 0100 0011
Radio Interference During Runs
change to
0-5000 ppm
0-1,000 scale
100 90 80 70 60 50 40 30 20 10 0
0-10000 ppm
Scale
0-10,000 scale
START TRIAL
start Run 1
1000 HRS

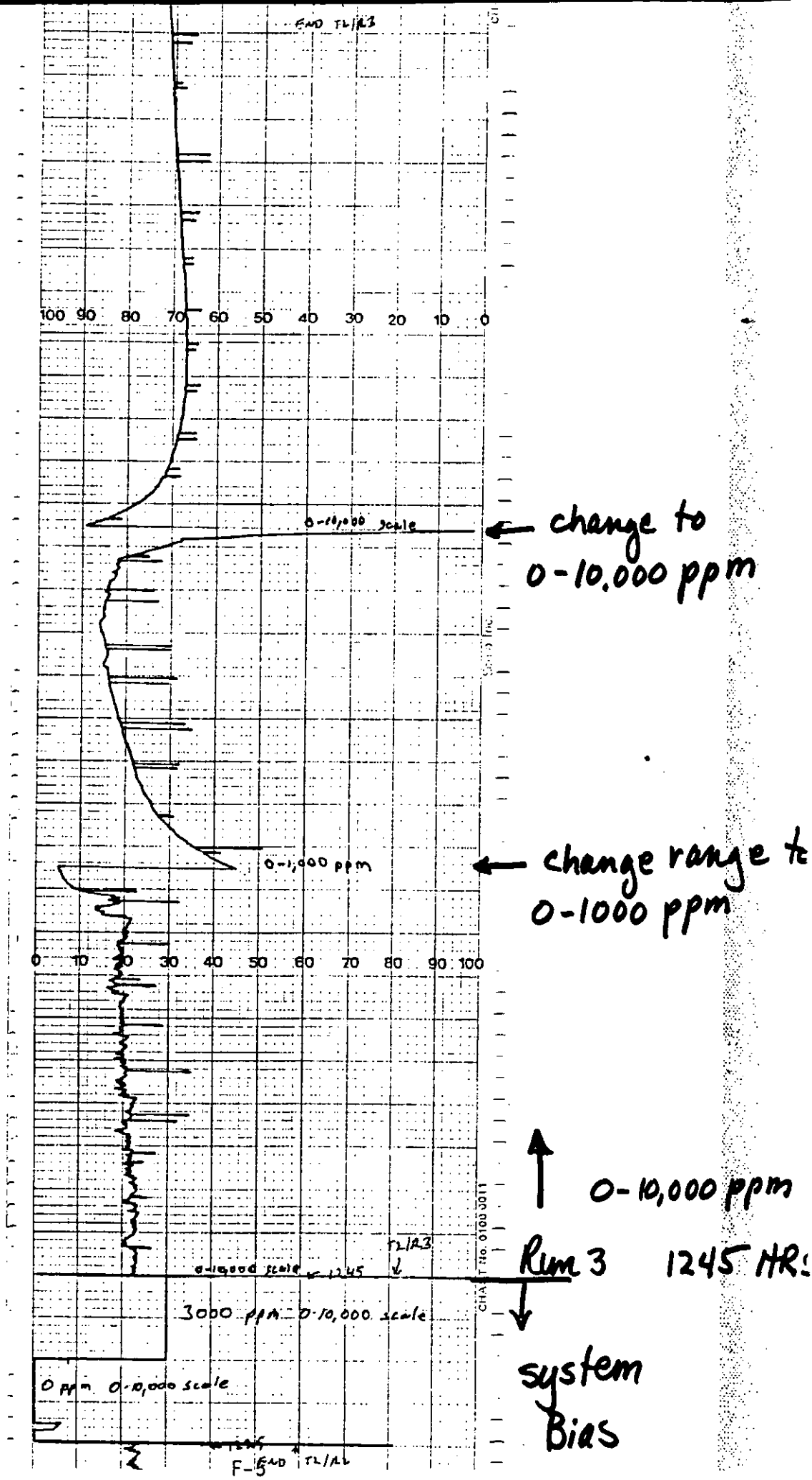

0 10 20 30 40 50 60 70 80 90 100
0-10,000 scale
0-1,000 scale
start Run 2 1125 HI
T2/R2
1125 0-10,000 scale
3000 ppm 0-10,000 scale
system Bias
295 ppm 0-1,000 scale
100 90 80 70 60 50 40 30 20 10 0
0 ppm 0-1,000 scale
~100 0-10,000 scale
END T2/R2
0-10,000 scale
0 10 20 30 40 50 60 70 80 90 100

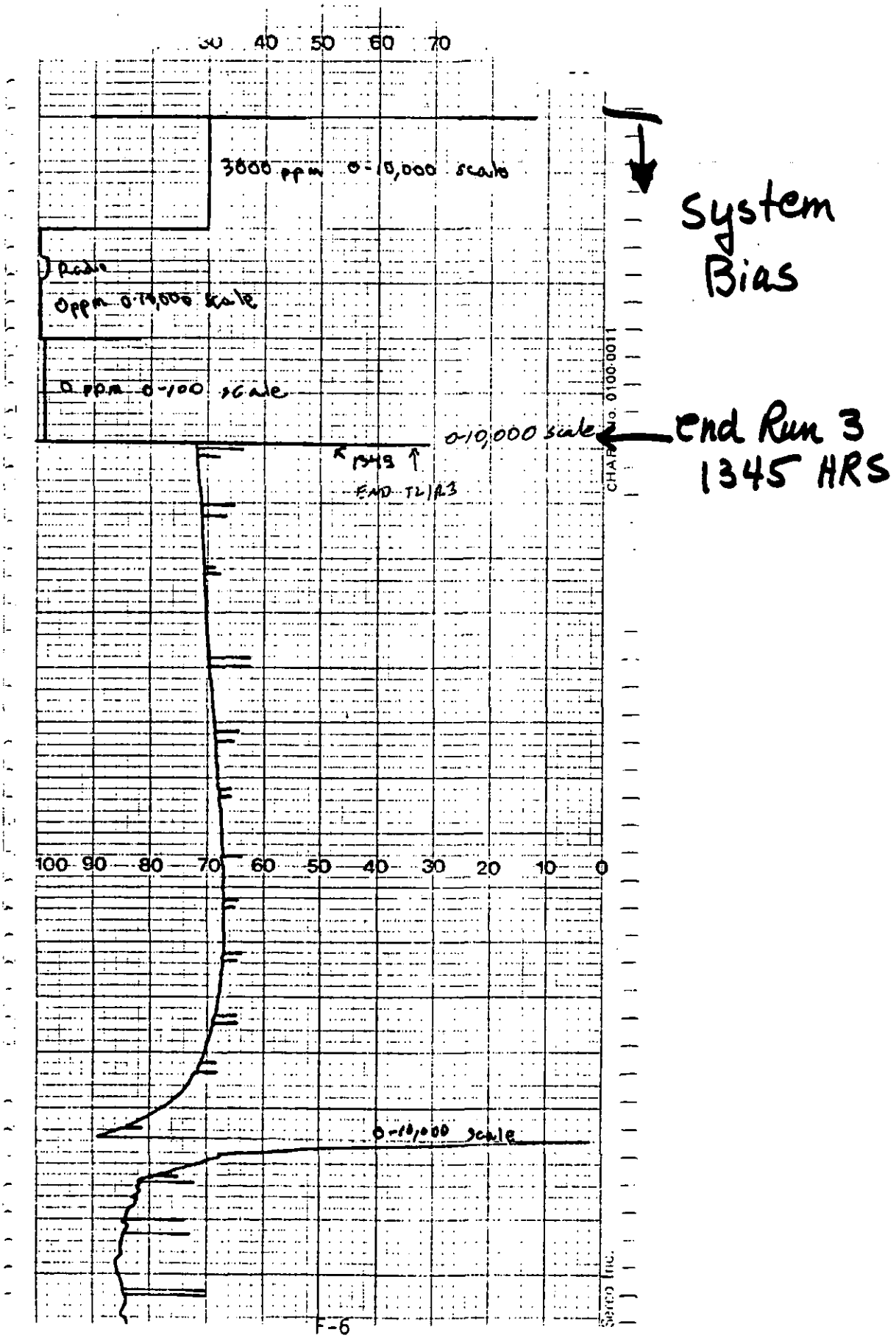


End Run 2
1225 HRS

scale =
0-10,000 ppm,
as propane

Start Run 2 1125 HRS


END TL/R3
100 90 80 70 60 50 40 30 20 10 0
0-10,000 scale
change to 0-10,000 ppm
0-1,000 ppm
change range to 0-1000 ppm
0 10 20 30 40 50 60 70 80 90 100
0-10,000 ppm
TL/R3
0-10,000 scale 1245
Run 3 1245 HRS
3000 ppm 0-10,000 scale
system Bias
0 ppm 0-10,000 scale
END TL/R3


30 40 50 60 70
3000 ppm 0-10,000 scale
0ppm 0-10,000 scale
0 ppm 0-100 scale
0-10,000 scale
END TL/R3
100 90 80 70 60 50 40 30 20 10 0
0-10,000 scale
System Bias
End Run 3
1345 HRS

APPENDIX G

MEASUREMENT SYSTEM PERFORMANCE SPECIFICATIONS

INTERFACE LABORATORIES
EPA Method 25A
Calibration Error Check & Drift Determination

Job Bell Lumber & Pole / New Brighton, MN

Test 2 Run 0 Date 9-4-91
Operator M. Koehler

THC Calibration (Low Range): Time(HRS) 0800

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	100	0
Low level	32	31	1	100	1
Mid level	295	300	5	1,000	.5
High level	3000	3,000	0	10,000	0

THC Calibration (High Range): Time(HRS) _____

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0				
Span					

O_2 Calibration: Time(HRS) _____

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero gas	0				
Mid level					
High level					

CO_2 Calibration: Time(HRS) _____

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero gas	0				
Mid level					
High level					

Must be within 2% of the span for each calibration gas S-420-14

INTERPOLL LABORATORIES
(612) 786-6020

System Bias Check

Job Bell Lumber + Pole / New Brighton Source Pole Treatment
Test 2 Run 1,2,3 Date 9-4-91 Site Stack
Operator M. Saehler

Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Resp (ppm)		Diff. CE-SB (ppm)	Span Val (PPM)	% of span
				Cal Err	Sys Bias			
1	0830	Zero gas	0	0	3	3	100	3
		Upscale	295	300	300	0	1000	0
2	1115	Zero gas	0	0	4	4	100	4
		Upscale	295	300	299	1	1,000	.1
3		Zero gas	0	0	—	—	—	—
		Upscale	3000	3000	3000	0	10,000	0
4	1240	Zero gas	0	0	5	5	100	5
		Upscale	3000	3000	3000	0	10,000	0
5	1400	Zero gas	0	0	1.5	1.5	100	1.5
		Upscale	3000	3000	3000	0	10,000	0
6		Zero gas	0					
		Upscale						
7		Zero gas	0					
		Upscale						
8		Zero gas	0					
		Upscale						
9		Zero gas	0					
		Upscale						
10		Zero gas	0					
		Upscale						
11		Zero gas	0					
		Upscale						
12		Zero gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

S420-11R

APPENDIX H

THC ANALYZER SPECIFICATIONS

Ratfisch INSTRUMENTE

TOTAL HYDROCARBON ANALYZER (FLAME IONIZATIC
Model RS 55

TECHNICAL DATES

MAINS : 115V/60H
RECORDER OUTPUT : 0 - 5 V / 4-20mA

MODEL: X Manual switching
___ Solenoid valves
HOUSING: ___ Case, ___ 19"-Rack
MEASURING RANGES: 1 = 0 - 10 C_1
2 = 0 - 100 C_1
3 = 0 - 1,000 C_1
4 = 0 - 10,000 C_1

SPECIAL OPTIONS:

Flame out alarm .....
1 Alarm .....
Sample line .....
.....

ANALYZER CONDITIONS:

Temperature : 160 °C

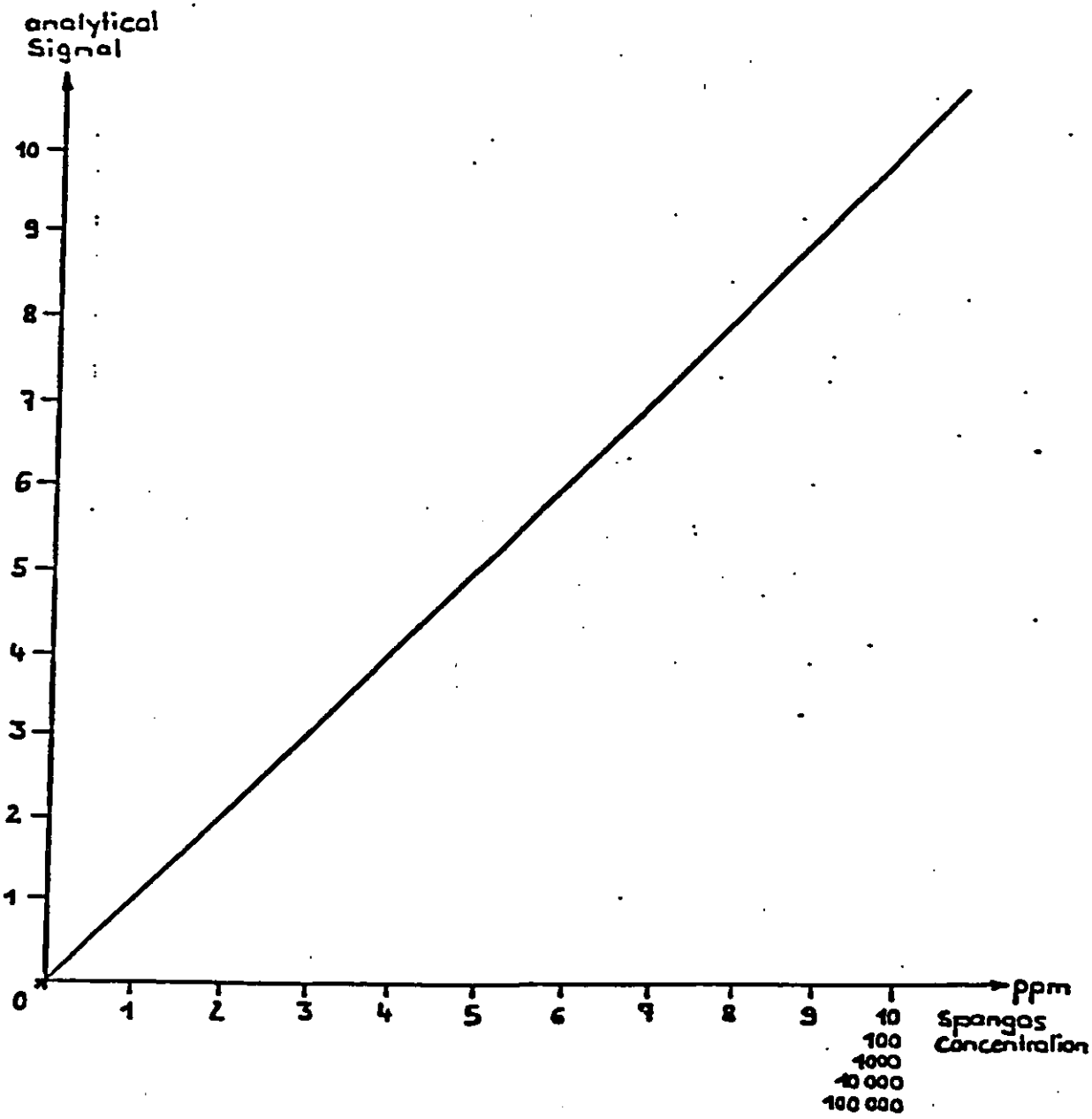
Zero Point : 3,90
Gain : 7,70

Pressure Setting : Sample/Spangas/Zerogas : 200 mbar
Fuel: Hydrogen : 0,35 bar
Combustion Air : 0,80 bar

Span Gases : 300 ppm C_1
24 000 ppm C_1

INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MN 55014-1819
(612) 786-6020

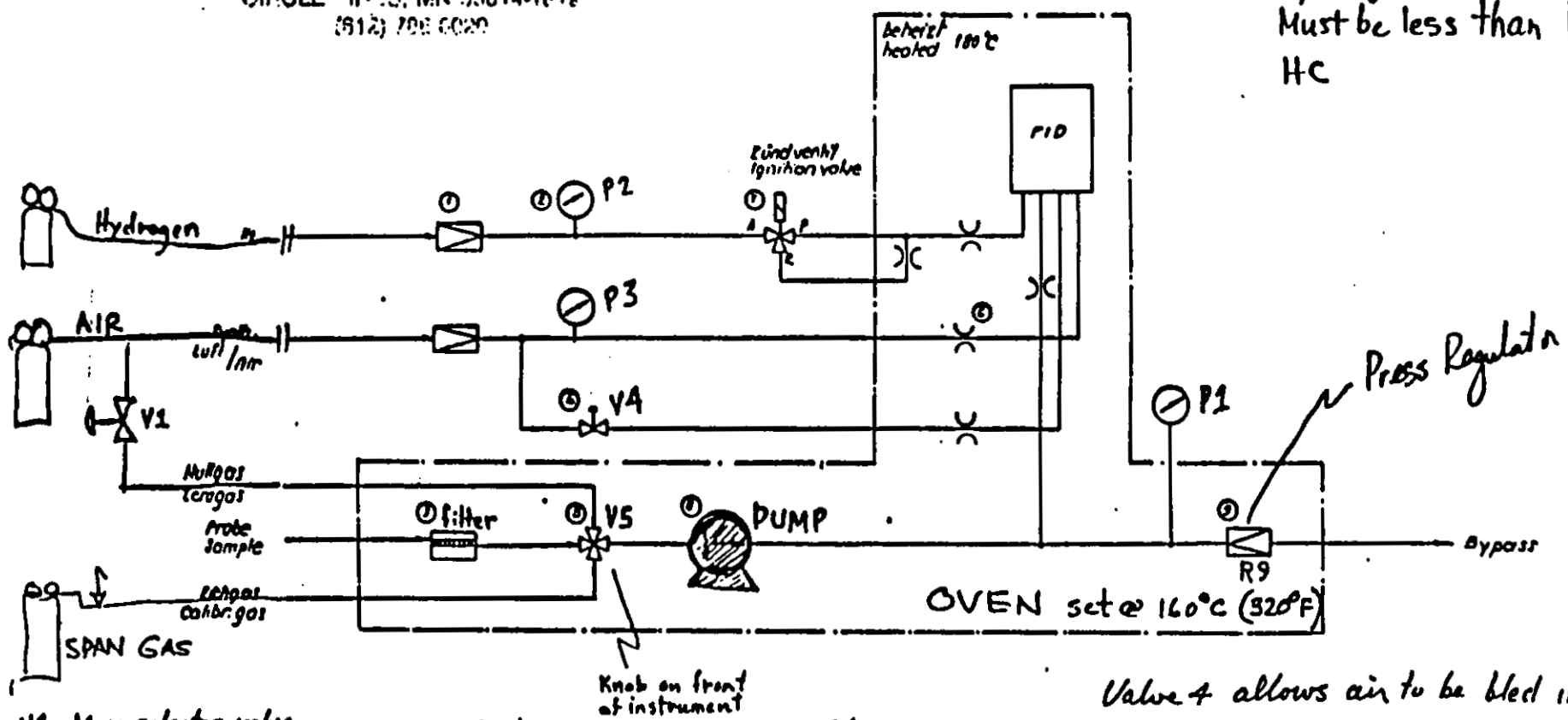
CALIBRATION DIAGRAMM



INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MN 55014-1819
(612) 786-6020

INTERNATIONAL [illegible]
[illegible] BALL ROAD N.E.
CIRCLE PIPES, MN 55014-1818
(612) 786 6020

Hydrogen & Air
Must be less than 1 ppm
HC



V1 Move selector valve. V5 to zero gas and open V1 until pressure on P1 is identical to that for sample gas

1 Druckregler
Pressure regulator
2 Manometer
Gauge
3 Filter
4 Nadelventil
Needle valve
5 3 Wege Ventil
3 way valve
6 Kapillare
capillary
7 Magnet Ventil
Solenoid valve
8 Pumpe
pump
9 Rückdruckregler
Back pressure regulator

Zündventil
Ignition valve

P-A angezogen
energised
R-A stromlos
at rest

Valve 4 allows air to be bled into sample gas with very low O_2s and very high HC conc, which might not combust completely before passing by the collector electrodes ($O_2 < 0.5\%$) and THC > 5000 ppm)

* Must hold ignition switch in until red light goes off!

Handumschaltung
Manuel switching

Ratfisch INSTRUMENTE

FLAMMEN IONISATIONS DETEKTOR
Flame Ionisation Detector

Fließplan
Flowdiagram

RS 55
13.04.88

RANGE 2 = 100 ppm Range 3 = 1000 ppm Range 4 = 10.000

APPENDIX I

CALIBRATION GAS CERTIFICATION SHEETS

LINDE

Union Carbide Industrial Gases, Inc.
Linde Division
4880 Kennedy Avenue
East Chicago, IN 46312

DATE : JUNE 25, 1990

TO: OXYGEN SERVICE COMPANY
1111 PIERCE BUTLER ROUTE
ST PAUL, MN 55104

LINDE ORDER NUMBER : 166.053.01
CUSTOMER PO NUMBER : 1834WW
CUSTOMER REL NUMBER :

DEAR SIR/MADAM:

THIS IS YOUR CERTIFICATE OF ANALYSIS FOR:

CYLINDER NUMBER	MIXTURE COMPONENTS	REQUESTED COMPOSITION	CERTIFIED COMPOSITION	CERTIFICATION ACCURACY
H 7968	PROPANE AIR	30 PPM BALANCE	32 PPM BALANCE	± 1% RELATIVE

APPROVED BY

DA-6MP

IMPORTANT
The information contained herein has been prepared at your request by qualified experts within the Linde Division of Union Carbide Corporation who we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed. We make no warranty or representation as to the suitability of the information for any other use or purpose. [illegible]

GS# 148

LINDE

Union Carbide Industrial Gases, Inc.
Linde Division
4550 Kennedy Avenue
East Chicago, IN 46312

DATE : FEBRUARY 7, 1990

TO: OXYGEN SERVICE COMPANY
1111 PIERCE BUTLER ROUTE
ST PAUL, MN 55104

LINDE ORDER NUMBER : 030.043.01
CUSTOMER PO NUMBER : 9742SA
CUSTOMER REL NUMBER :

DEAR SIR/MADAM:

THIS IS YOUR CERTIFICATE OF ANALYSIS FOR:

CYLINDER NUMBER	MIXTURE COMPONENTS	REQUESTED COMPOSITION	CERTIFIED COMPOSITION	CERTIFICATION ACCURACY
HA 6720	PROPANE AIR	300 PPM BALANCE	295 PPM BALANCE	± 1% RELATIVE

RECEIVED
FEB 15 1990
INTERPOLL LABORATORIES

Dale A. Kugler
APPROVED BY

COA-6MP

IMPORTANT
The information contained herein has been prepared at your request by qualified experts within the Linde Division of Union Carbide Corporation. While we believe that the information is accurate within the limits of the analytical methods employed and is correct to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall Union Carbide's liability arising out of the use of the information contained herein exceed the fee established for providing such information.

GS # 150

LINDE

Union Carbide Industrial Gases, Inc.
Linde Division
4550 Kennedy Avenue
East Chicago, IN 46312

DATE : FEBRUARY 7, 1990

I : OXYGEN SERVICE COMPANY
1111 PIERCE BUTLER ROUTE
ST PAUL, MN 55104

LINDE ORDER NUMBER : 030.043.03
CUSTOMER PO NUMBER : 9742SA
CUSTOMER REL NUMBER :

DEAR SIR/MADAM:

THIS IS YOUR CERTIFICATE OF ANALYSIS FOR:

CYLINDER NUMBER	MIXTURE COMPONENTS	REQUESTED COMPOSITION	CERTIFIED COMPOSITION	CERTIFICATION ACCURACY
B 0940	PROPANE AIR	3,000 PPM BALANCE	3,000 PPM BALANCE	± 1% RELATIVE

RECEIVED
FEB 15 1990
INTERPOLL LABORATORIES

Dale A. Kugler
APPROVED BY

OA-6MP

IMPORTANT
The information contained herein has been prepared at your request by qualified experts within the Linde Division of Union Carbide Corporation. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall Union Carbide's liability arising out of the use of the information contained herein exceed the fee established for providing such information.

BELL LUMBER & POLE COMPANY
NEW BRIGHTON, MN

DAILY TREATING REPORT

Date 9-4-91 Cycle 3 CH# 137

Time 3:00 P.M. Wind Dir/Speed W-9 Temp 76 Weather CLEAR

	Max Pressure	Inches of Vacuum	Min Temp	Max Temp	Hours / Min
Hot Cycle		—	175	175	1 20
Press Cycle	38		176	179	1 20
Expansion Bath		24	174	175	1 20
Final Vacuum		28	142	170	1 20

Total Cubes 2593 Gallons in Combo 388

If adding Penta, record pounds of Penta added to system _____

TANK READINGS

	Total Gallons	Before Temp	Factor	Gallons	Total Gallons	After Temp	Factor	Gallons	Total Usage
Work Tank	38401	184	.9517	36546	37135	188	.9502	35285	1261
Penta Mix									
P-9 #1									

Order No.	Customer	Quantity Class/Length
#34	N.S.P STOCK	13-5/35 9-2/45 73-4/40
		8-3/45

Out of Cylinder - Date/Time 9-4-91 / 14:30

Unloaded - Date/Time 9-4-91 / 15:30

Total Time on Drip Pad 1HR Operator [signature]

BELL LUMBER & POLE COMPANY
NEW BRIGHTON, MN

DAILY TREATING REPORT

Date 9/4/91 Cycle #3 CH# 138

Time 7:45 PM. Wind Dir/Speed west 7-20 Temp 72° Weather CLEAR

	Max Pressure	Inches of Vacuum	Min Temp	Max Temp	Hours / Min
Hot Cycle		—	175	176	1 20
Press Cycle	44		176	175	1 15
Expansion Bath		19	174	175	1 20
Final Vacuum		22	145	165	1 20

Total Cubes 2835 Gallons in Combo 425

If adding Penta, record pounds of Penta added to system _____

TANK READINGS

	Total Gallons	Before Temp	Factor	Gallons	Total Gallons	After Temp	Factor	Gallons	Total Usage
Work Tank	37135	188	.9502	35285	36489	182	.9524	34733	552
Penta Mix									
P-9 #1									

Order No.	Customer	Quantity Class/Length
5748	CIPSCO	19-3/55, 5-1/60, 2-2/60, 8-3/60,
		10-2/65, 1-1/70, 2-2/75, 1-3/75,
		1-2/80

Out of Cylinder - Date/Time 9-4-91 / 19:30 HRS

Unloaded - Date/Time 9-5-91 / 07:00

Total Time on Drip Pad 11 HRS 30 MIN Operator SC + UE + LH

BELL LUMBER & POLE COMPANY
NEW BRIGHTON, MN

DAILY TREATING REPORT

Date 9-5-91 Cycle 3 CH# 139

Time 12:30 PM Wind Dir/Speed CALM Temp 76° Weather CLEAR

	Max Pressure	Inches of Vacuum	Min Temp	Max Temp	Hours / Min
Hot Cycle		—	168	169	/ 20
Press Cycle	41		168	170	/ 20
Expansion Bath		20	164	165	/ 20
Final Vacuum		29	130	156	1 / 25

Total Cubes 2480 Gallons in Combo 372

If adding Penta, record pounds of Penta added to system _____

TANK READINGS

	Total Gallons	Before Temp	Factor	Gallons	Total Gallons	After Temp	Factor	Gallons	Total Usage
Work Tank	36347	178	.9540	34675	35272	179	.9536	33635	1040
Penta Mix									
P-9 #1									

Order No.	Customer	Quantity Class/Length
5725-2	[illegible] RIVER-[illegible] COUNTY	72 - 6/35 10 - 5/40
# 34	NSP	10 - 3/45
5771	DOW CHEMICAL	14 - 1/55

Out of Cylinder - Date/Time 9-5-91 / 12:15

Unloaded - Date/Time 9-5-91 / 14:00

Total Time on Drip Pad 1HR 45min Operator [signature]

BELL LUMBER & POLE COMPANY
NEW BRIGHTON, MN

DAILY TREATING REPORT

Date 9-5-91 Cycle 3 CH# 140

Time 5:15 Wind Dir/Speed N-5 Temp 70 Weather CLEAR

	Max Pressure	Inches of Vacuum	Min Temp	Max Temp	Hours / Min
Hot Cycle		—	170	172	/ 20
Press Cycle	43		170	172	/ 20
Expansion Bath		19	168	168	/ 20
Final Vacuum		28	136	158	1 / 20

Total Cubes 2446 Gallons in Combo 367

If adding Penta, record pounds of Penta added to system _____

TANK READINGS

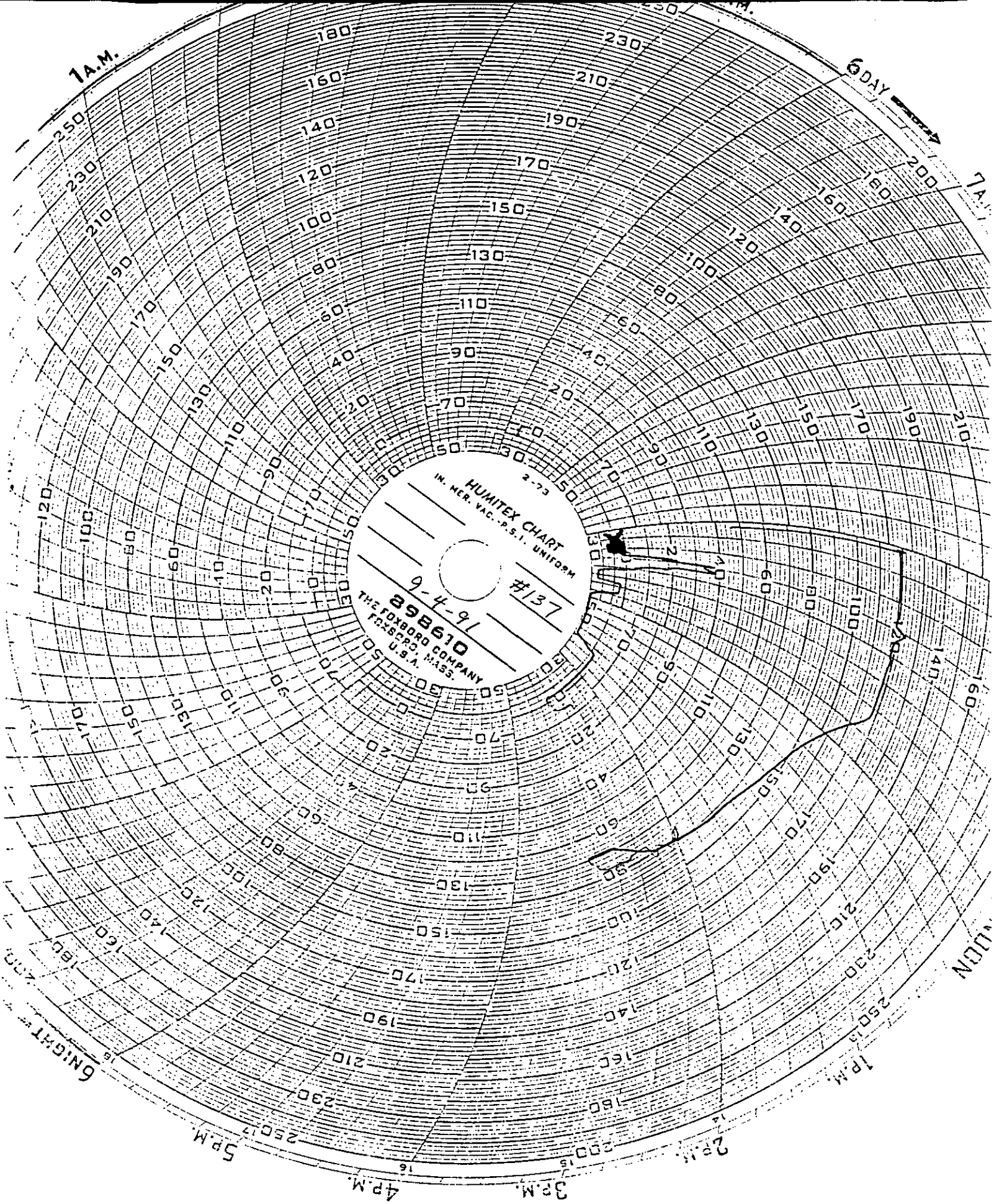
	Total Gallons	Before Temp	Factor	Gallons	Total Gallons	After Temp	Factor	Gallons	Total Usage
Work Tank	35272	179	.9536	33635	34729	177	.9543	33141	494
Penta Mix									
P-9 #1									

Order No.	Customer	Quantity Class/Length
5752	NSP	11-1/65 7-1/70 1-1/80 1-1/95
5771	DOW CHEMICAL	9-1/55

Out of Cylinder - Date/Time 9-5-91 / 1645

Unloaded - Date/Time 9-6-91 / 08:30

Total Time on Drip Pad 15 HRS 45 min Operator [signature]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THE FOXBORO COMPANY
FOXBORO, MASS.
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7A.
NOON
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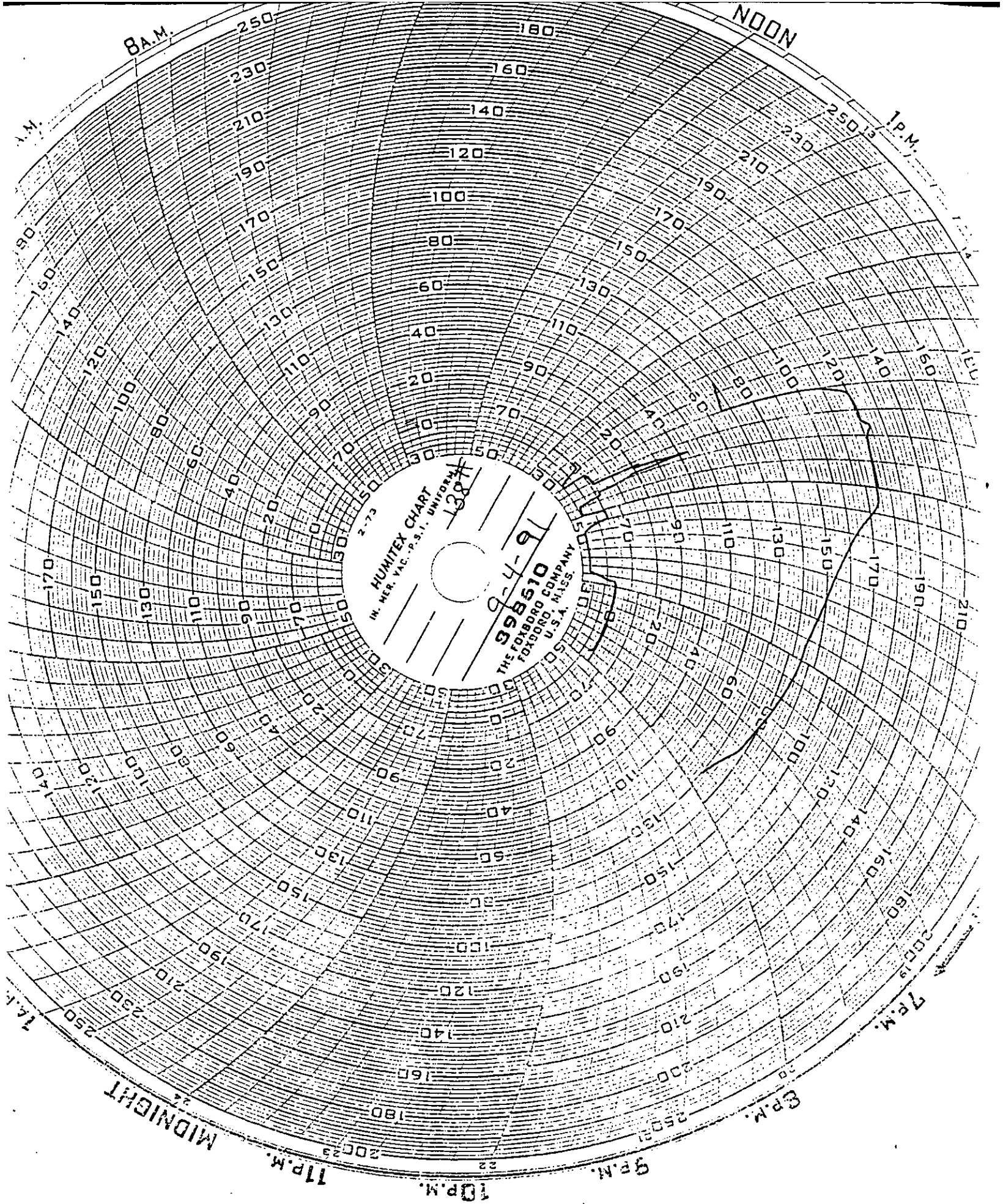
2P.M.
3P.M.
4P.M.
5P.M.
6NIGHT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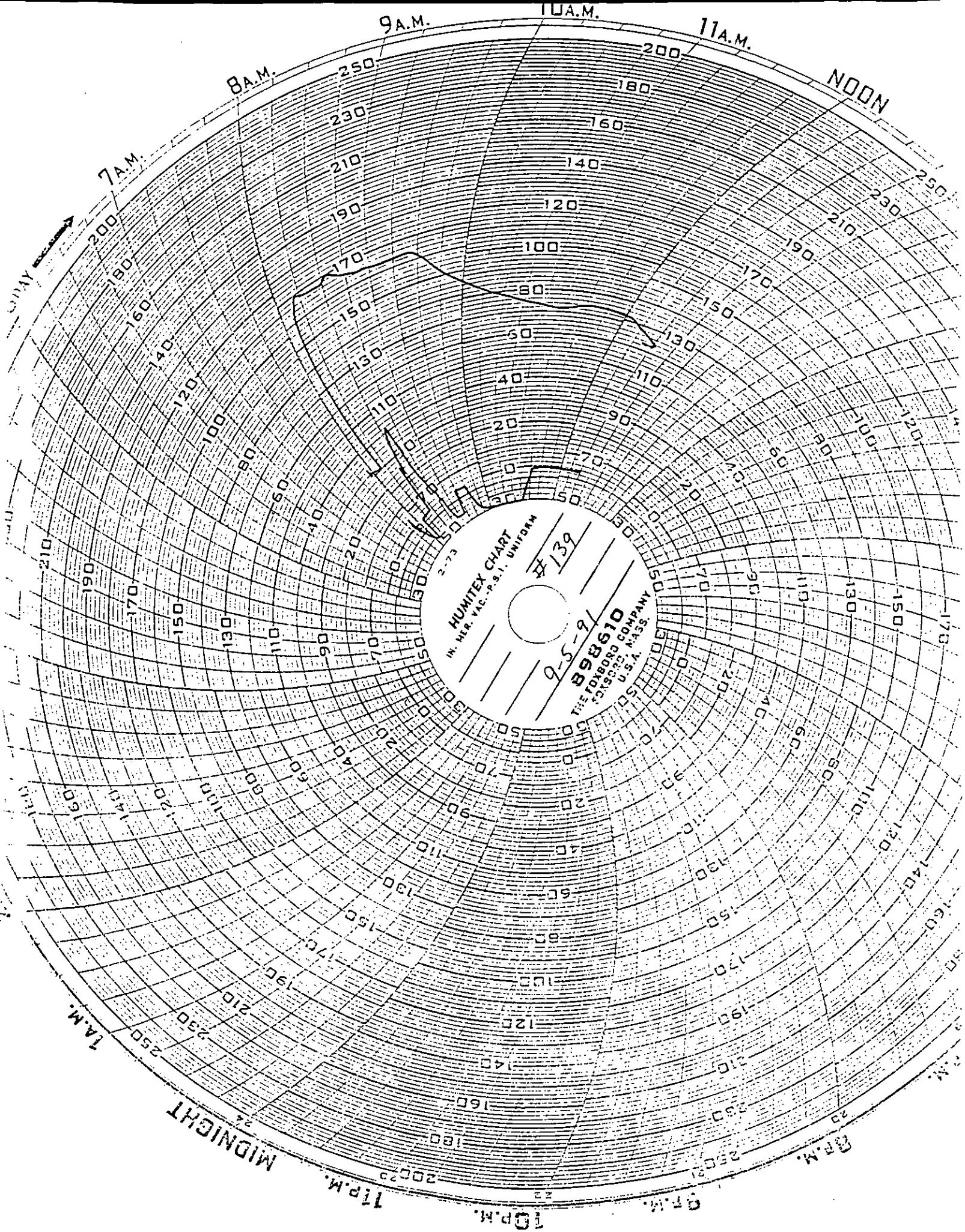
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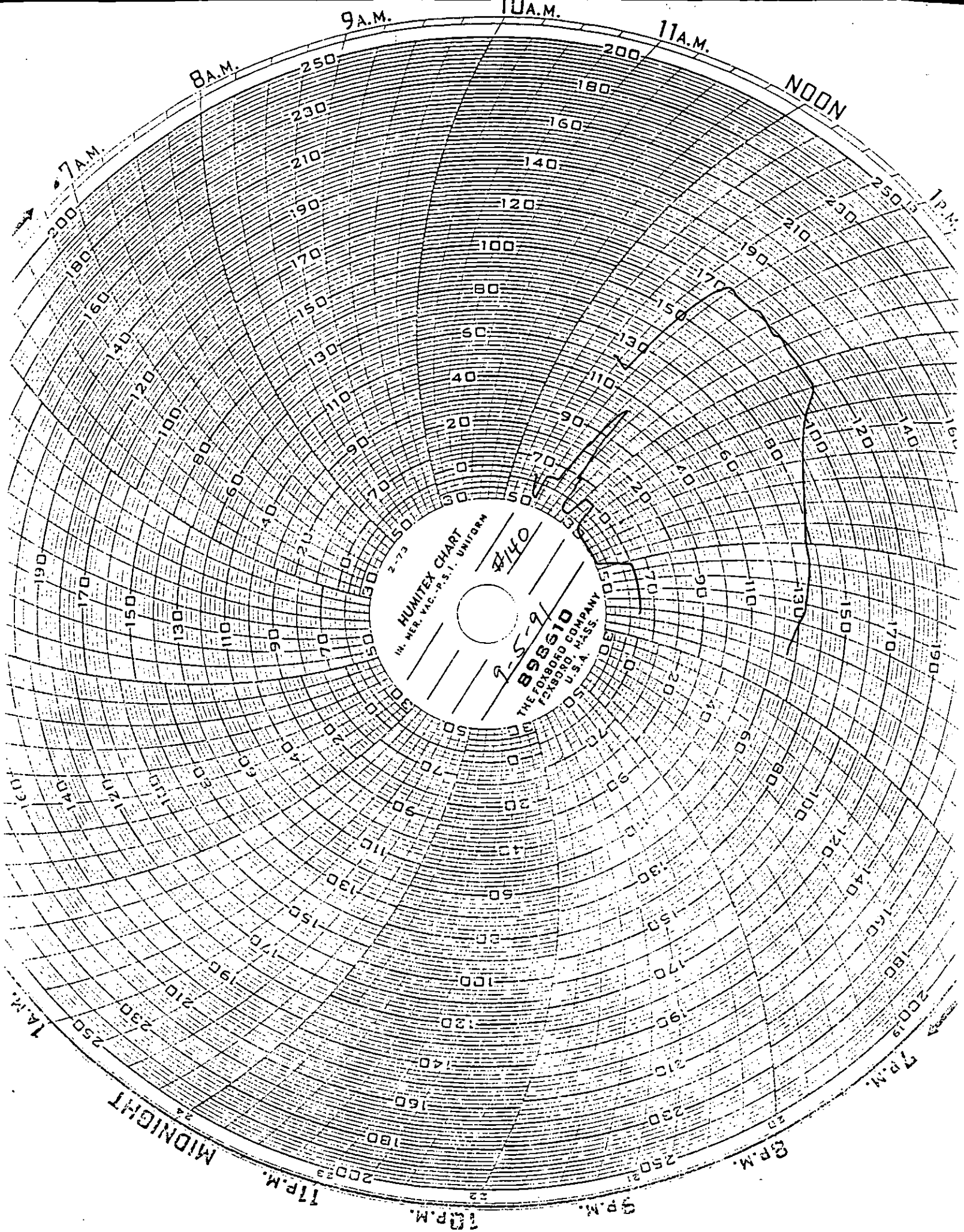
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FOXBORO, MASS.
U.S.A.

APPENDIX K

PROCEDURES

Particulate Loadings and Emission Rates

The particulate emission rates were determined per EPA Methods 1-5, CFR title 40, Part 60, Appendix A (revised July 1, 1987). In this procedure, a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. In addition, the sampling module also houses the impinger case and a Drierite drying column. The sampling module is connected by means of an umbilical cord to the control module which houses the dry test gasmeter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples were collected as follows: The sample gas was drawn in through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter. The particulates were removed at this point and collected on the filter. The gases then passed through an ice-cooled impinger train and a desiccant-packed drying column which quantitatively absorb all moisture from the sample gas stream after which the sample gas passes through the pump and the dry test gasmeter which integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides instantaneous flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each site such that an isokinetic sampling condition prevails. Nomographs are used to aid in the rapid determination of the sampling rate.

When sampling is complete the filter is removed with tweezers and placed in a clean container. The nozzle, pitot tube and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and the rinse is transferred to a tared 120 cc porcelain evaporating dish. The acetone is then evaporated off at 97 - 105 °F. At this elevated temperature condensation of atmospheric moisture is prevented. The acetone-free sample is then dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and weighed to the nearest 0.01 mg. The filter sample is transferred to a 6 inch watch glass and dried at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest 0.01 mg. All weighings are performed in a balance room where the relative humidity is maintained at less than 50%. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse blank is subtracted from the samples. The Drierite column is weighed on-site and the water absorbed by the Drierite is added to the condensate to give the total amount of absorbed water.

3aP2(7)

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Condensible Organic Compounds Analysis

(State of Minnesota - MPCA Exhibit C)

Method II-8672-MN

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a 17 mm stem

Evaporating dish(es) - 200 cc or 250 cc beaker

Reagents: Diethyl ether - reagent grade

Chloroform - reagent grade

Sodium sulfate - (ACS) granular anhydrous

Toluene - (if 3% hydrogen peroxide is used to collect the samples)

Glass wool (Pyrex microfiber)

PREPARATION

1. Place 1 kg of granular anhydrous sodium sulfate in a shallow tray and heat to 200 ^{o}C for at least four hours. Store in a tightly sealed glass container.

2. Place a plug of clean glass wool in the stem of the powder funnel. The plug must be of sufficient size so that it is held snuggly in place by its own pressure. Add a one-inch layer of dry sodium sulfate.

SAMPLING

An all-glass impinger assembly is used in the back half of the EPA Method 5 sampling train when an organic wet catch is to be collected. The impinger assembly consists of a modified impinger, a Greenburg Smith impinger followed by another modified impinger. The third impinger should have a temperature measuring device at the outlet upstream of a final impinger or desiccant column to monitor the temperature of the outlet gas stream. Prior to the start of the test, each of the first two impingers should be charged with 100 g of Class I water. The Method 5 train should be operated as provided for in EPA Method 5. Ice should be added to the impinger bath to keep the temperature of the gas at the outlet at or less than 68 ^{o}F. After the post test leak check, the impinger train is removed and impinger contents poured into a tared all-glass sample bottle and closed with a Teflon-lined cap. The sample bottle is then weighed and the total condensate calculated by subtraction of the bottle tare weight and the weight of initial water added to the impingers (200 g). A label is affixed and the sample is returned to the laboratory for analysis. The sample should be stored at 4 ^{o}C if the analysis is not conducted within 48 hours.

ANALYSIS

I. Organics

Caution! Work in vented hood!!!

A. Organic Blank Determination

1. Pour 125 mL of ethyl ether and 125 mL of chloroform into a tared beaker.
2. Evaporate solvent in hood at 70 °F or less until no solvent remains.
3. Desiccate the sample in dish for two hours.
4. Weigh the sample to nearest 0.1 mg, record and report on Form LSC-036.

B. Organic Sample Determination

1. Test for peroxide in sample ether using KI strips. (If KI strip shows positive, contact your supervisor before proceeding.)
2. Transfer the sample solution quantitatively to a 500 mL separatory funnel. Use the first of three 25 mL chloroform aliquots to rinse the sample container.
3. Extract with three 25 mL portions of chloroform. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Bottom layer is chloroform.) Draw off the bottom layer, transferring the solvent with a funnel containing a plug of sodium sulfate into a tared beaker. (Do not draw off any of the aqueous layer.)

4. After the three chloroform extractions, use two 25 mL portions of chloroform to rinse the sodium sulfate, collecting the rinses in the same tared beaker as the extracts.

5. Next extract the sample three times with 25 mL aliquots of ethyl ether. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Top layer is ethyl ether.) Draw off the bottom layer (aqueous) into another separatory funnel taking less than 1 mL of the ethyl ether layer with. Decant the ethyl ether, passing it through sodium sulfate and collecting the ethyl ether in the same tared dish as the chloroform.

6. After the three ethyl ether extractions, take two 25 mL portions of ethyl ether and rinse the sodium sulfate collecting the rinses in the same tared beaker as the extracts.

7. Evaporate the solvents (chloroform and ethyl ether) in the tared beaker in the hood at 70 ^{o}F or less until no solvent remains. (Use no heat and have no sources of ignition in the hood when doing this procedure.) Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point of water, otherwise, water will be condensed out in the container.

8. Desiccate to constant weight (two hours). Record and report the final weight to the nearest 0.1 mg on Form LSC-036.

II. Inorganics

If inorganic residue information is required, the following procedure should be conducted:

A. Inorganic Blank Determination

1. Vent the remaining aqueous phase from the organic extraction in the hood to remove residual organic solvents (usually overnight).
2. Decant the impinger catch into a tared evaporating dish.
3. Evaporate all of the water in the sample in an oven at 100 ^{o}C. Take care not to boil to prevent bumping and loss of sample.
4. Cool the dried sample in the desiccator and desiccate until a constant weight is obtained.
5. Report the results to the nearest 0.1 mg on Form LSC-036.

B. Inorganic Sample Determination

Follow steps 1-5 in Section A above.

NOTES

1. For the organics determination, in the rare event that the impinger catch resulted from a Modified Method 6 determination (SO_2), whereby the solution contains dilute hydrogen peroxide ($\geq$ 3%), do not use ether as an extraction solvent. Substitute toluene for ethyl ether in Section I. (Ether in the presence of peroxide forms explosive hydroperoxide.)

2. In the organics determination, more than three extractions may be required to extract all of the organics. Additional extractions should be performed if the aqueous phase is still cloudy.

3. Special state requirements:

   Michigan - Total sample evaporated in tared evaporating dish on steam bath.

   Iowa - Organics and inorganics separately, as required.

   Wisconsin - Use Method II-8672-WI.

   Rest of states - Organics only.

REFERENCES

Proposed Standards of Performance for New Stationary Sources, Federal Register 36(159) Part II, August 1, 1979.

Minnesota Pollution Control Agency, Exhibit C.

METHOD 25A—DETERMINATION OF TOTAL GASEOUS ORGANIC CONCENTRATION USING A FLAME IONIZATION ANALYZER

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 Principle. A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. *Definitions*

2.1 Measurement System. The total equipment required for the determination of the gas concentration. The system consists of the following major subsystems:

2.1.1 Sample Interface. That portion of the system that is used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzer from the effects of the stack effluent.

2.1.2 Organic Analyzer. That portion of the system that senses organic concentration and generates an output proportional to the gas concentration.

2.2 Span Value. The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations. The span value is established in the applicable regulation and is usually 1.5 to 2.5 times the applicable emission limit. If no span value is provided, use a span value equivalent to 1.5 to 2.5 times the expected concentration. For convenience, the span value should correspond to 100 percent of the recorder scale.

2.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

2.4 Zero Drift. The difference in the measurement system response to a zero level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.5 Calibration Drift. The difference in the measurement system response to a mid-level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair or adjustment took place.

2.6 Response Time. The time interval from a step change in pollutant concentration at the inlet to the emission measurement system to the time at which 95 percent of the corresponding final value is reached as displayed on the recorder.

2.7 Calibration Error. The difference between the gas concentration indicated by the measurement system and the known concentration of the calibration gas.

3. *Apparatus*

A schematic of an acceptable measurement system is shown in Figure 25A-1. The essential components of the measurement system are described below:

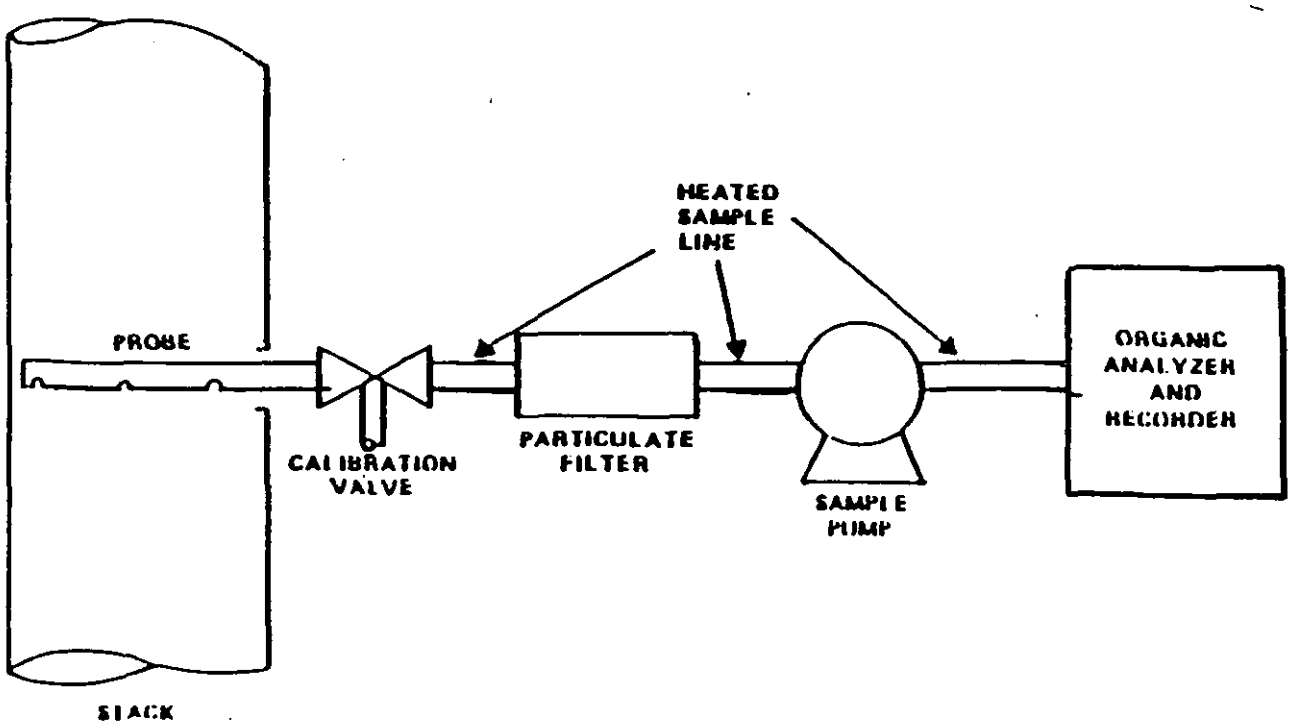

Figure 25A-1 Organic Concentration Measurement System.

3.1 Organic Concentration Analyzer. A flame ionization analyzer (FIA) capable of meeting or exceeding the specifications in this method.

3.2 Sample Probe. Stainless steel, or equivalent, three-hole rake type. Sample holes shall be 4 mm in diameter or smaller and located at 16.7, 50, and 83.3 percent of the equivalent stack diameter. Alternatively, a single opening probe may be used so that a gas sample is collected from the centrally located 10 percent area of the stack cross-section.

3.3 Sample Line. Stainless steel or Teflon* tubing to transport the sample gas to the analyzer. The sample line should be heated, if necessary, to prevent condensation in the line.

3.4 Calibration Valve Assembly. A three-way valve assembly to direct the zero and calibration gases to the analyzers is recommended. Other methods, such as quick-connect lines, to route calibration gas to the analyzers are applicable.

3.5 Particulate Filter. An in-stack or an out-of-stack glass fiber filter is recommended if exhaust gas particulate loading is significant. An out-of-stack filter should be heated to prevent any condensation.

3.6 Recorder. A strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute. Note: This method is often applied in highly explosive areas. Caution and care should be exercised in choice of equipment and installation.

4. *Calibration and Other Gases*

Gases used for calibrations, fuel, and combustion air (if required) are contained in compressed gas cylinders. Preparation of calibration gases shall be done according to the procedure in Protocol No. 1, listed in Reference 9.2. Additionally, the manufacturer of the cylinder should provide a recommended shelf life for each calibration gas cylinder over which the concentration does not change more than ±2 percent from the certified value. For calibration gas values not generally available (i.e., organics between 1 and 10 percent by volume), alternative methods for preparing calibration gas mixtures, such as dilution systems, may be used with prior approval of the Administrator.

Calibration gases usually consist of propane in air or nitrogen and are determined in terms of the span value. Organic compounds other than propane can be used following the above guidelines and making the appropriate corrections for response factor.

4.1 Fuel. A 40 percent H_2/60 percent He or 40 percent H_2/60 percent N_2 gas mixture is recommended to avoid an oxygen synergism effect that reportedly occurs when oxygen concentration varies significantly from a mean value.

4.2 Zero Gas. High purity air with less than 0.1 parts per million by volume (ppmv) of organic material (propane or carbon equivalent) or less than 0.1 percent of the span value, whichever is greater.

4.3 Low-level Calibration Gas. An organic calibration gas with a concentration equivalent to 25 to 35 percent of the applicable span value.

4.4 Mid-level Calibration Gas. An organic calibration gas with a concentration equivalent to 45 to 55 percent of the applicable span value.

4.5 High-level Calibration Gas. An organic calibration gas with a concentration equivalent to 80 to 90 percent of the applicable span value.

5. *Measurement System Performance Specifications*

5.1 Zero Drift. Less than ±3 percent of the span value.

5.2 Calibration Drift. Less than ±3 percent of span value.

5.3 Calibration Error. Less than ±5 percent of the calibration gas value.

6. *Pretest Preparations*

6.1 Selection of Sampling Site. The location of the sampling site is generally specified by the applicable regulation or purpose of the test; i.e., exhaust stack, inlet line, etc. The sample port shall be located at least 1.5 meters or 2 equivalent diameters upstream of the gas discharge to the atmosphere.

6.2 Location of Sample Probe. Install the sample probe so that the probe is centrally located in the stack, pipe, or duct and is sealed tightly at the stack port connection.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

FIA equipment can be calibrated for almost any range of total organics concentrations. For high concentrations of organics (>1.0 percent by volume as propane) modifications to most commonly available analyzers are necessary. One accepted method of equipment modification is to decrease the size of the sample to the analyzer through the use of a smaller diameter sample capillary. Direct and continuous measurement of organic concentration is a necessary consideration when determining any modification design.

6.4 Calibration Error Test. Immediately prior to the test series, (within 2 hours of the start of the test) introduce zero gas and

* Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level responses. Then introduce low-level and mid-level calibration gases successively to the measurement system. Record the analyzer responses for low-level and mid-level calibration gases and determine the differences between the measurement system responses and the predicted responses. These differences must be less than 5 percent of the respective calibration gas value. If not, the measurement system is not acceptable and must be replaced or repaired prior to testing. No adjustments to the measurement system shall be conducted after the calibration and before the drift check (Section 7.3). If adjustments are necessary before the completion of the test series, perform the drift checks prior to the required adjustments and repeat the calibration following the adjustments. If multiple electronic ranges are to be used, each additional range must be checked with a mid-level calibration gas to verify the multiplication factor.

6.5 Response Time Test. Introduce zero gas into the measurement system at the calibration valve assembly. When the system output has stabilized, switch quickly to the high-level calibration gas. Record the time from the concentration change to the measurement system response equivalent to 95 percent of the step change. Repeat the test three times and average the results.

7. *Emission Measurement Test Procedure*

7.1 Organic Measurement. Begin sampling at the start of the test period, recording time and any required process information as appropriate. In particular, note on the recording chart periods of process interruption or cyclic operation.

7.2 Drift Determination. Immediately following the completion of the test period and hourly during the test period, reintroduce the zero and mid-level calibration gases, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until after both the zero and calibration drift checks are made.) Record the analyzer response. If the drift values exceed the specified limits, invalidate the test results preceding the check and repeat the test following corrections to the measurement system. Alternatively, recalibrate the test measurement system as in Section 6.4 and report the results using both sets of calibration data (i.e., data determined prior to the test period and data determined following the test period).

8. *Organic Concentration Calculations*

Determine the average organic concentration in terms of ppmv as propane or other calibration gas. The average shall be determined by the integration of the output recording over the period specified in the applicable regulation.

If results are required in terms of ppmv as carbon, adjust measured concentrations using Equation 25A-1.

$$C_c = K\ C_{meas} \qquad \text{Eq. 25A-1}$$

Where:

C_c = Organic concentration as carbon, ppmv.

C_{meas} = Organic concentration as measured, ppmv.

K = Carbon equivalent correction factor,

K = 2 for ethane.

K = 3 for propane.

K = 4 for butane.

K = Appropriate response factor for other organic calibration gases.

9. *Bibliography*

9.1 Measurement of Volatile Organic Compounds—Guideline Series. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. EPA-450/2-78-041. June 1978. p. 46-54.

9.2 Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors (Protocol No. 1). U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. Research Triangle Park, NC. June 1978.

9.3 Gasoline Vapor Emission Laboratory Evaluation—Part 2. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. EMB Report No. 75-GAS-6. August 1975.

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Fascimile (612)786-7854

COLLECTION OF SEMIVOLATILE COMPOUNDS

EPA METHOD 0010

(Interpoll Method II-8788 - Version 1.0)

EPA Method SW846 USEPA Office of Solid Waste and Emergency Response 3rd Ed., November 1986: Test Methods for Evaluating Solid Waste Volume 2: Field Manual Physical/Chemical Methods Method 0010.

METHOD 0010

MODIFIED METHOD 5 SAMPLING TRAIN

1.0 SCOPE AND APPLICATION

1.1 This method is applicable to the determination of Destruction and Removal Efficiency (DRE) of semivolatile Principal Organic Hazardous Compounds (POHCs) from incineration systems (PHS, 1967). This method also may be used to determine particulate emission rates from stationary sources as per EPA Method 5 (see References at end of this method).

2.0 SUMMARY OF METHOD

2.1 Gaseous and particulate pollutants are withdrawn from an emission source at an isokinetic sampling rate and are collected in a multicomponent sampling train. Principal components of the train include a high-efficiency glass- or quartz-fiber filter and a packed bed of porous polymeric adsorbent resin. The filter is used to collect organic-laden particulate materials and the porous polymeric resin to adsorb semivolatile organic species. Semivolatile species are defined as compounds with boiling points >100°C.

2.2 Comprehensive chemical analyses of the collected sample are conducted to determine the concentration and identity of the organic materials.

3.0 INTERFERENCES

3.1 Oxides of nitrogen (NO_x) are possible interferents in the determination of certain water-soluble compounds such as dioxane, phenol, and urethane; reaction of these compounds with NO_x in the presence of moisture will reduce their concentration. Other possibilities that could result in positive or negative bias are (1) stability of the compounds in methylene chloride, (2) the formation of water-soluble organic salts on the resin in the presence of moisture, and (3) the solvent extraction efficiency of water-soluble compounds from aqueous media. Use of two or more ions per compound for qualitative and quantitative analysis can overcome interference at one mass. These concerns should be addressed on a compound-by-compound basis before using this method.

4.0 APPARATUS AND MATERIALS

4.1 Sampling train:

4.1.1 A schematic of the sampling train used in this method is shown in Figure 1. This sampling train configuration is adapted from EPA Method 5 procedures, and, as such, the majority of the required equipment

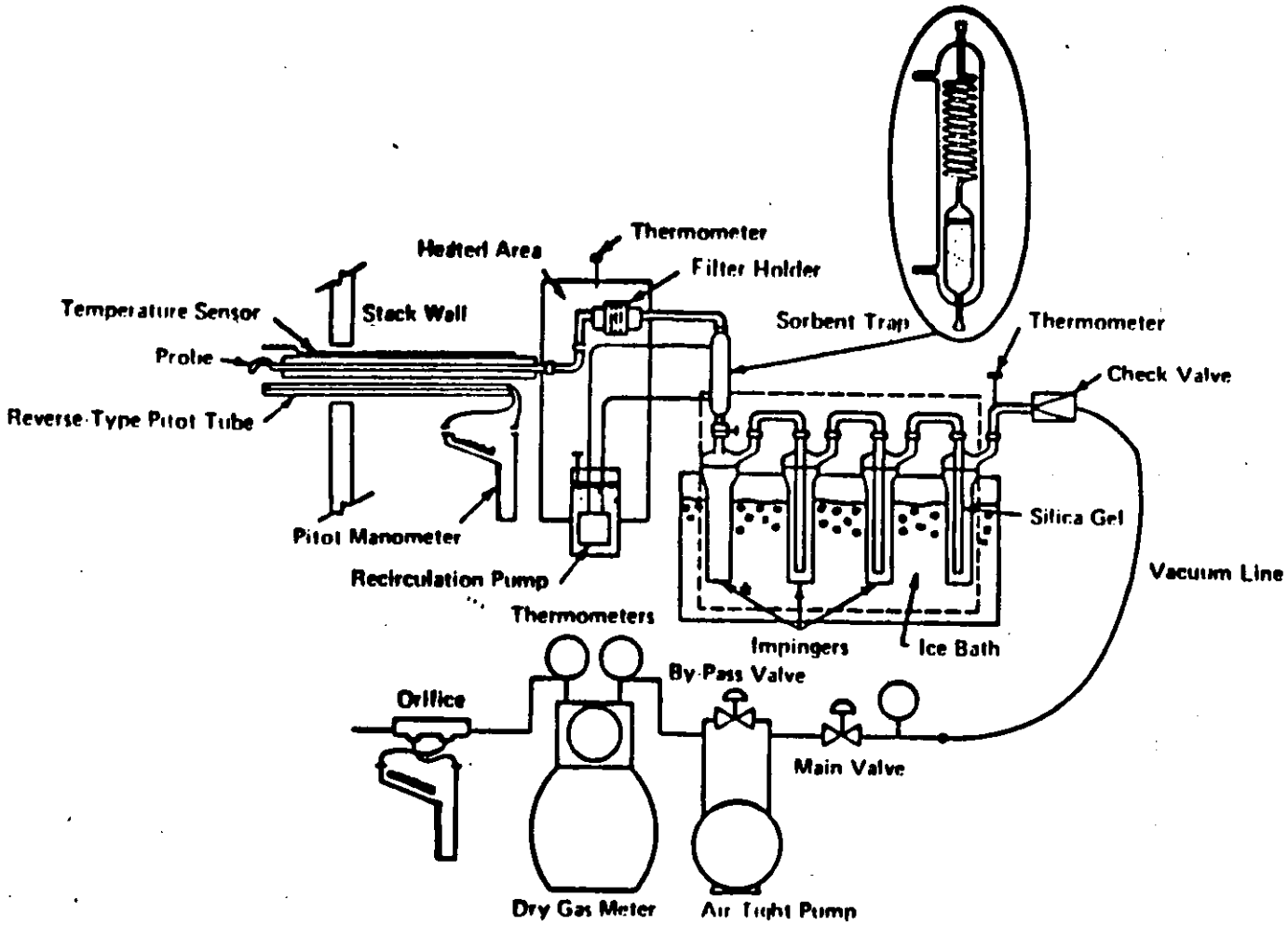

Figure 1. Modified Method 5 Sampling Train.

is identical to that used in EPA Method 5 determinations. The new components required are a condenser coil and a sorbent module, which are used to collect semivolatile organic materials that pass through the glass- or quartz-fiber filter in the gas phase.

4.1.2 Construction details for the basic train components are given in APTD-0581 (see Martin, 1971, in Section 13.0, References); commercial models of this equipment are also available. Specifications for the sorbent module are provided in the following subsections. Additionally, the following subsections list changes to APTD-0581 and identify allowable train configuration modifications.

4.1.3 Basic operating and maintenance procedures for the sampling train are described in APTD-0576 (see Rom, 1972, in Section 13.0, References). As correct usage is important in obtaining valid results, all users should refer to APTD-0576 and adopt the operating and maintenance procedures outlined therein unless otherwise specified. The sampling train consists of the components detailed below.

4.1.3.1 Probe nozzle: Stainless steel (316) or glass with sharp, tapered (30° angle) leading edge. The taper shall be on the outside to preserve a constant I.D. The nozzle shall be buttonhook or elbow design and constructed from seamless tubing (if made of stainless steel). Other construction materials may be considered for particular applications. A range of nozzle sizes suitable for isokinetic sampling should be available in increments of 0.16 cm (1/16 in.), e.g., 0.32-1.27 cm (1/8-1/2 in.), or larger if higher volume sampling trains are used. Each nozzle shall be calibrated according to the procedures outlined in Paragraph 9.1.

4.1.3.2 Probe liner: Borosilicate or quartz-glass tubing with a heating system capable of maintaining a gas temperature of 120 ± 14°C (248 ± 25°F) at the exit end during sampling. (The tester may opt to operate the equipment at a temperature lower than that specified.) Because the actual temperature at the outlet of the probe is not usually monitored during sampling, probes constructed according to APTD-0581 and utilizing the calibration curves of APTD-0576 (or calibrated according to the procedure outlined in APTD-0576) are considered acceptable. Either borosilicate or quartz-glass probe liners may be used for stack temperatures up to about 480°C (900°F). Quartz liners shall be used for temperatures between 480 and 900°C (900 and 1650°F). (The softening temperature for borosilicate is 820°C (1508°F), and for quartz 1500°C (2732°F).) Water-cooling of the stainless steel sheath will be necessary at temperatures approaching and exceeding 500°C.

4.1.3.3 Pitot tube: Type S, as described in Section 2.1 of EPA Method 2, or other appropriate devices (Vollaro, 1976). The pitot tube shall be attached to the probe to allow constant monitoring of the stack-gas velocity. The impact (high-pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plane (see EPA Method 2, Figure 2-6b) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in Section 4 of EPA Method 2.

4.1.3.4 Differential pressure gauge: Inclined manometer or equivalent device as described in Section 2.2 of EPA Method 2. One manometer shall be used for velocity-head (ΔP) readings and the other for orifice differential pressure (ΔH) readings.

4.1.3.5 Filter holder: Borosilicate glass, with a glass frit filter support and a sealing gasket. The sealing gasket should be made of materials that will not introduce organic material into the gas stream at the temperature at which the filter holder will be maintained. The gasket shall be constructed of Teflon or materials of equal or better characteristics. The holder design shall provide a positive seal against leakage at any point along the filter circumference. The holder shall be attached immediately to the outlet of the cyclone or cyclone bypass.

4.1.3.6 Filter heating system: Any heating system capable of maintaining a temperature of 120 ± 14°C (248 ± 25°F) around the filter holder during sampling. Other temperatures may be appropriate for particular applications. Alternatively, the tester may opt to operate the equipment at temperatures other than that specified. A temperature gauge capable of measuring temperature to within 3°C (5.4°F) shall be installed so that the temperature around the filter holder can be regulated and monitored during sampling. Heating systems other than the one shown in APTD-0581 may be used.

4.1.3.7 Organic sampling module: This unit consists of three sections, including a gas-conditioning section, a sorbent trap, and a condensate knockout trap. The gas-conditioning system shall be capable of conditioning the gas leaving the back half of the filter holder to a temperature not exceeding 20°C (68°F). The sorbent trap shall be sized to contain approximately 20 g of porous polymeric resin (Rohm and Haas XAD-2 or equivalent) and shall be jacketed to maintain the internal gas temperature at 17 ± 3°C (62.5 ± 5.4°F). The most commonly used coolant is ice water from the impinger ice-water bath, constantly circulated through the outer jacket, using rubber or plastic tubing and a peristaltic pump. The sorbent trap should be outfitted with a glass well or depression, appropriately sized to accommodate a small thermocouple in the trap for monitoring the gas entry temperature. The condensate knockout trap shall be of sufficient size to collect the condensate following gas conditioning. The organic module components shall be oriented to direct the flow of condensate formed vertically downward from the conditioning section, through the adsorbent media, and into the condensate knockout trap. The knockout trap is usually similar in appearance to an empty impinger directly underneath the sorbent module; it may be oversized but should have a shortened center stem (at a minimum, one-half the length of the normal impinger stems) to collect a large volume of condensate without bubbling and overflowing into the impinger train. All surfaces of the organic module wetted by the gas sample shall be fabricated of borosilicate glass, Teflon, or other inert materials. Commercial versions of the

complete organic module are not currently available, but may be assembled from commercially available laboratory glassware and a custom-fabricated sorbent trap. Details of two acceptable designs are shown in Figures 2 and 3 (the thermocouple well is shown in Figure 2).

4.1.3.8 Impinger train: To determine the stack-gas moisture content, four 500-mL impingers, connected in series with leak-free ground-glass joints, follow the knockout trap. The first, third, and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with a 1.3-cm (1/2-in.) I.D. glass tube extending about 1.3 cm (1/2 in.) from the bottom of the outer cylinder. The second impinger shall be of the Greenburg-Smith design with the standard tip. The first and second impingers shall contain known quantities of water or appropriate trapping solution. The third shall be empty or charged with a caustic solution, should the stack gas contain hydrochloric acid (HCl). The fourth shall contain a known weight of silica gel or equivalent desiccant.

4.1.3.9 Metering system: The necessary components are a vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3°C (5.4°F), dry-gas meter capable of measuring volume to within 1%, and related equipment, as shown in Figure 1. At a minimum, the pump should be capable of 4 cfm free flow, and the dry-gas meter should have a recording capacity of 0-999.9 cu ft with a resolution of 0.005 cu ft. Other metering systems capable of maintaining sampling rates within 10% of isokineticity and of determining sample volumes to within 2% may be used. The metering system must be used in conjunction with a pitot tube to enable checks of isokinetic sampling rates. Sampling trains using metering systems designed for flow rates higher than those described in APTD-0581 and APTD-0576 may be used, provided that the specifications of this method are met.

4.1.3.10 Barometer: Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases the barometric reading may be obtained from a nearby National Weather Service station, in which case the station value (which is the absolute barometric pressure) is requested and an adjustment for elevation differences between the weather station and sampling point is applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30-m (100 ft) elevation increase (vice versa for elevation decrease).

4.1.3.11 Gas density determination equipment: Temperature sensor and pressure gauge (as described in Sections 2.3 and 2.4 of EPA Method 2), and gas analyzer, if necessary (as described in EPA Method 3). The temperature sensor ideally should be permanently attached to the pitot tube or sampling probe in a fixed configuration such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal.

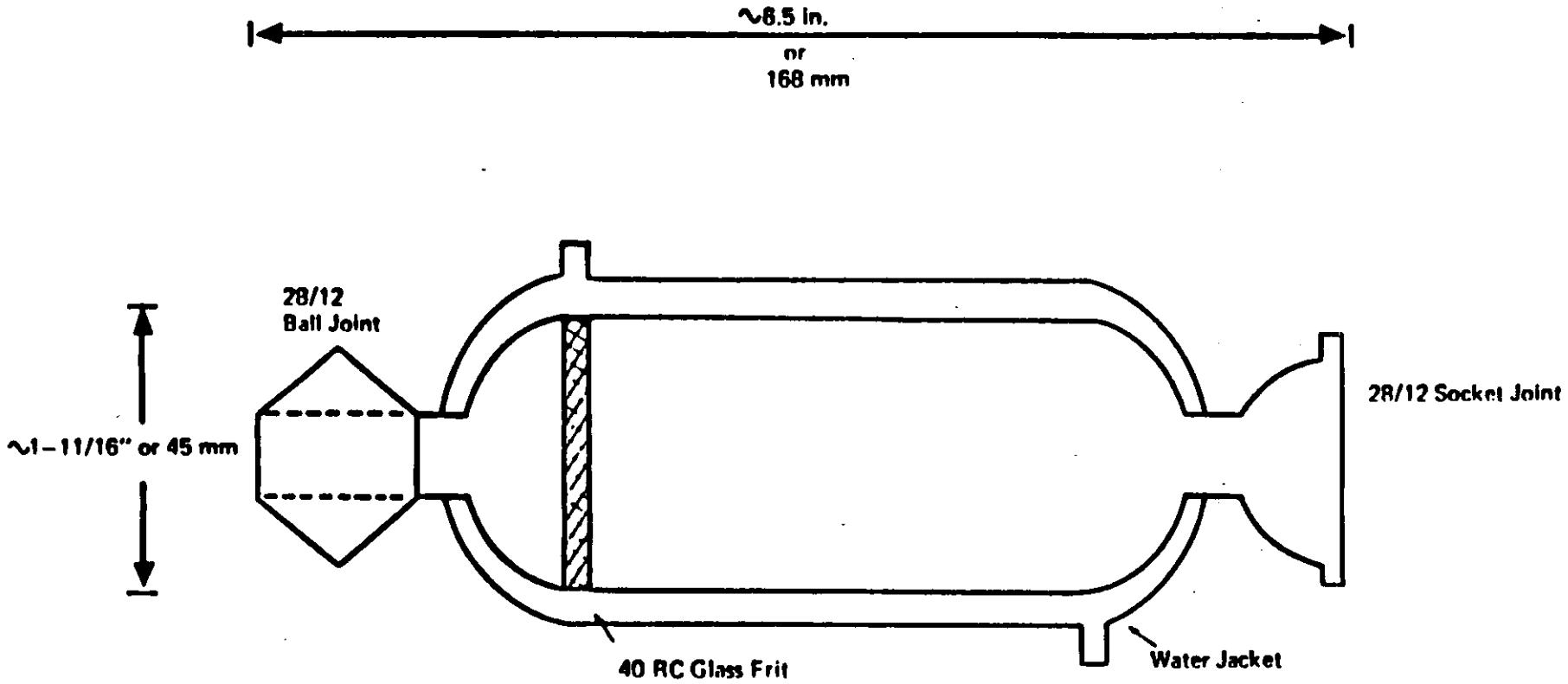

Figure 2. Adsorbent Sampling System.

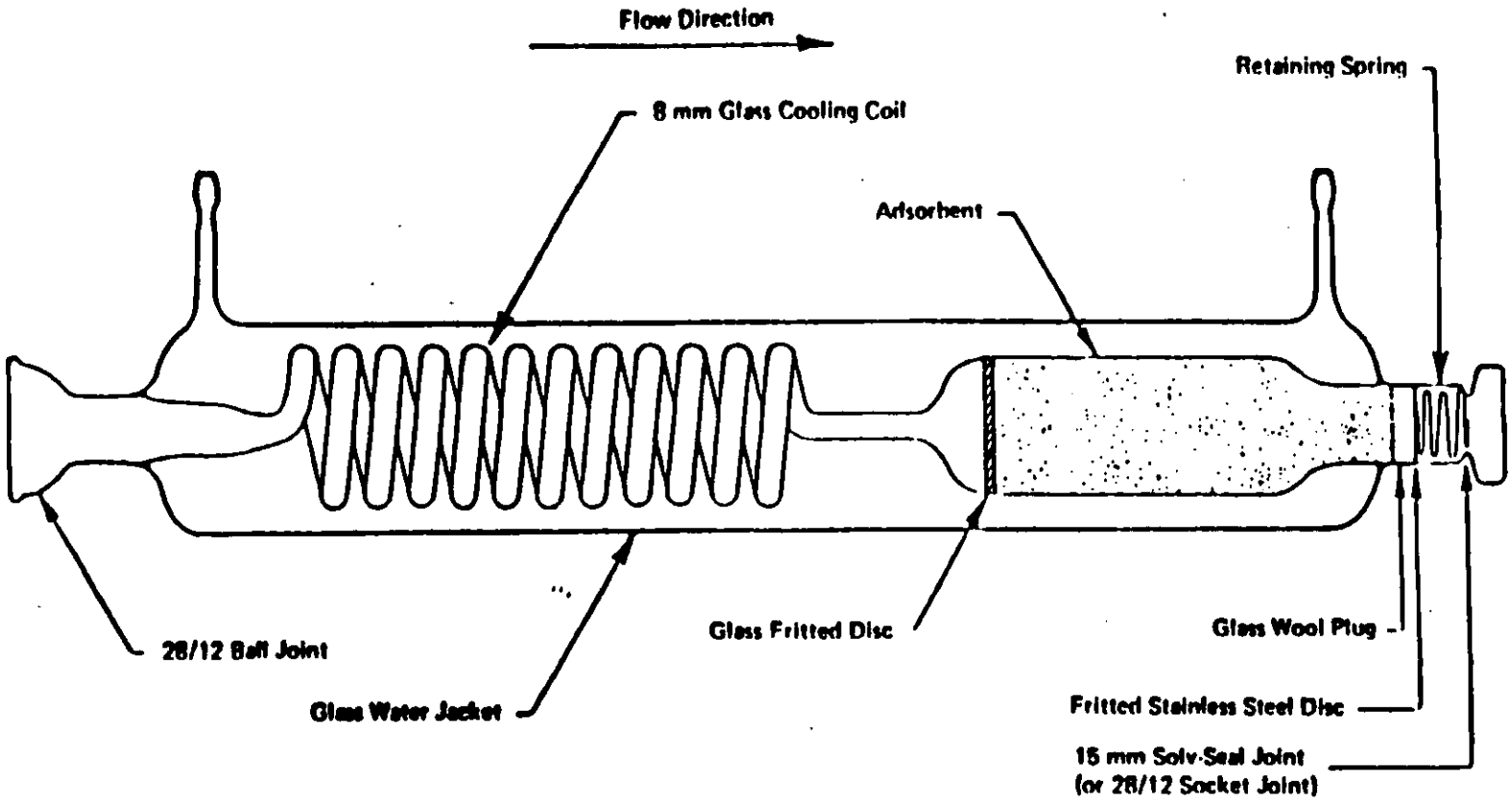

Figure 3. Adsorbent Sampling System.

Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type S pitot tube openings (see EPA Method 2, Figure 2-7). As a second alternative, if a difference of no more than 1% in the average velocity measurement is to be introduced, the temperature gauge need not be attached to the probe or pitot tube.

4.1.3.12 Calibration/field-preparation record: A permanently bound laboratory notebook, in which duplicate copies of data may be made as they are being recorded, is required for documenting and recording calibrations and preparation procedures (i.e., filter and silica gel tare weights, clean XAD-2, quality assurance/quality control check results, dry-gas meter, and thermocouple calibrations, etc.). The duplicate copies should be detachable and should be stored separately in the test program archives.

4.2 Sample Recovery:

4.2.1 Probe liner: Probe nozzle and organic module conditioning section brushes; nylon bristle brushes with stainless steel wire handles are required. The probe brush shall have extensions of stainless steel, Teflon, or inert material at least as long as the probe. The brushes shall be properly sized and shaped to brush out the probe liner, the probe nozzle, and the organic module conditioning section.

4.2.2 Wash bottles: Three. Teflon or glass wash bottles are recommended; polyethylene wash bottles should not be used because organic contaminants may be extracted by exposure to organic solvents used for sample recovery.

4.2.3 Glass sample storage containers: Chemically resistant, borosilicate amber and clear glass bottles, 500-mL or 1,000-mL. Bottles should be tinted to prevent action of light on sample. Screw-cap liners shall be either Teflon or constructed so as to be leak-free and resistant to chemical attack by organic recovery solvents. Narrow-mouth glass bottles have been found to exhibit less tendency toward leakage.

4.2.4 Petri dishes: Glass, sealed around the circumference with wide (1-in.) Teflon tape, for storage and transport of filter samples.

4.2.5 Graduated cylinder and/or balances: To measure condensed water to the nearest 1 mL or 1 g. Graduated cylinders shall have subdivisions not >2 mL. Laboratory triple-beam balances capable of weighing to ±0.5 g or better are required.

4.2.6 Plastic storage containers: Screw-cap polypropylene or polyethylene containers to store silica gel.

4.2.7 Funnel and rubber policeman: To aid in transfer of silica gel to container (not necessary if silica gel is weighed in field).

4.2.8 Funnels: Glass, to aid in sample recovery.

4.3 Filters: Glass- or quartz-fiber filters, without organic binder, exhibiting at least 99.95% efficiency (<0.05% penetration) on 0.3-um dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM standard method D2986-71. Test data from the supplier's quality control program are sufficient for this purpose. In sources containing SO_2 or SO_3, the filter material must be of a type that is unreactive to SO_2 or SO_3. Reeve Angel 934 AH or Schleicher and Schwell #3 filters work well under these conditions.

4.4 Crushed ice: Quantities ranging from 10-50 lb may be necessary during a sampling run, depending on ambient air temperature.

4.5 Stopcock grease: Solvent-insoluble, heat-stable silicone grease. Use of silicone grease upstream of the module is not permitted, and amounts used on components located downstream of the organic module shall be minimized. Silicone grease usage is not necessary if screw-on connectors and Teflon sleeves or ground-glass joints are used.

4.6 Glass wool: Used to plug the unfritted end of the sorbent module. The glass-wool fiber should be solvent-extracted with methylene chloride in a Soxhlet extractor for 12 hr and air-dried prior to use.

5.0 REAGENTS

5.1 Adsorbent resin: Porous polymeric resin (XAD-2 or equivalent) is recommended. These resins shall be cleaned prior to their use for sample collection. Appendix A of this method should be consulted to determine appropriate precleaning procedure. For best results, resin used should not exhibit a blank of higher than 4 mg/kg of total chromatographable organics (TCO) (see Appendix B) prior to use. Once cleaned, resin should be stored in an airtight, wide-mouth amber glass container with a Teflon-lined cap or placed in one of the glass sorbent modules tightly sealed with Teflon film and elastic bands. The resin should be used within 4 wk of the preparation.

5.2 Silica gel: Indicating type, 6-16 mesh. If previously used, dry at 175°C (350°F) for 2 hr before using. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

5.3 Impinger solutions: Distilled organic-free water (Type II) shall be used, unless sampling is intended to quantify a particular inorganic gaseous species. If sampling is intended to quantify the concentration of additional species, the impinger solution of choice shall be subject to Administrator approval. This water should be prescreened for any compounds of interest. One hundred mL will be added to the specified impinger; the third impinger in the train may be charged with a basic solution (1 N sodium hydroxide or sodium acetate) to protect the sampling pump from acidic gases. Sodium acetate should be used when large sample volumes are anticipated because sodium hydroxide will react with carbon dioxide in aqueous media to form sodium carbonate, which may possibly plug the impinger.

5.4 Sample recovery reagents:

5.4.1 Methylene chloride: Distilled-in-glass grade is required for sample recovery and cleanup (see Note to 5.4.2 below).

5.4.2 Methyl alcohol: Distilled-in-glass grade is required for sample recovery and cleanup.

NOTE: Organic solvents from metal containers may have a high residue blank and should not be used. Sometimes suppliers transfer solvents from metal to glass bottles; thus blanks shall be run prior to field use and only solvents with low blank value (<0.001%) shall be used.

5.4.3 Water: Water (Type II) shall be used for rinsing the organic module and condenser component.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 Because of complexity of this method, field personnel should be trained in and experienced with the test procedures in order to obtain reliable results.

6.2 Laboratory preparation:

6.2.1 All the components shall be maintained and calibrated according to the procedure described in APTD-0576, unless otherwise specified.

6.2.2 Weigh several 200- to 300-g portions of silica gel in airtight containers to the nearest 0.5 g. Record on each container the total weight of the silica gel plus containers. As an alternative to preweighing the silica gel, it may instead be weighed directly in the impinger or sampling holder just prior to train assembly.

6.2.3 Check filters visually against light for irregularities and flaws or pinhole leaks. Label the shipping containers (glass Petri dishes) and keep the filters in these containers at all times except during sampling and weighing.

6.2.4 Desiccate the filters at 20 ± 5.6°C (68 ± 10°F) and ambient pressure for at least 24 hr, and weigh at intervals of at least 6 hr to a constant weight (i.e., <0.5-mg change from previous weighing), recording results to the nearest 0.1 mg. During each weighing the filter must not be exposed for more than a 2-min period to the laboratory atmosphere and relative humidity above 50%. Alternatively (unless otherwise specified by the Administrator), the filters may be oven-dried at 105°C (220°F) for 2-3 hr, desiccated for 2 hr, and weighed.

6.3 Preliminary field determinations:

6.3.1 Select the sampling site and the minimum number of sampling points according to EPA Method 1 or as specified by the Administrator. Determine the stack pressure, temperature, and range of velocity heads using EPA Method 2. It is recommended that a leak-check of the pitot lines (see EPA Method 2, Section 3.1) be performed. Determine the stack-gas moisture content using EPA Approximation Method 4 or its alternatives to establish estimates of isokinetic sampling-rate settings. Determine the stack-gas dry molecular weight, as described in EPA Method 2, Section 3.6. If integrated EPA Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the sample run.

6.3.2 Select a nozzle size based on the range of velocity heads so that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. During the run, do not change the nozzle. Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2 of EPA Method 2).

6.3.3 Select a suitable probe liner and probe length so that all traverse points can be sampled. For large stacks, to reduce the length of the probe, consider sampling from opposite sides of the stack.

6.3.4 A minimum of 3 dscm (105.9 dscf) of sample volume is required for the determination of the Destruction and Removal Efficiency (DRE) of POHCs from incineration systems. Additional sample volume shall be collected as necessitated by analytical detection limit constraints. To determine the minimum sample volume required, refer to sample calculations in Section 10.0.

6.3.5 Determine the total length of sampling time needed to obtain the identified minimum volume by comparing the anticipated average sampling rate with the volume requirement. Allocate the same time to all traverse points defined by EPA Method 1. To avoid timekeeping errors, the length of time sampled at each traverse point should be an integer or an integer plus one-half min.

6.3.6 In some circumstances (e.g., batch cycles) it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas-sample volumes. In these cases, the Administrator's approval must first be obtained.

6.4 Preparation of collection train:

6.4.1 During preparation and assembly of the sampling train, keep all openings where contamination can occur covered with Teflon film or aluminum foil until just prior to assembly or until sampling is about to begin.

6.4.2 Fill the sorbent trap section of the organic module with approximately 20 g of clean adsorbent resin. While filling, ensure that the trap packs uniformly, to eliminate the possibility of channeling. When freshly cleaned, many adsorbent resins carry a static charge, which will cause clinging to trap walls. This may be minimized by filling the trap in the presence of an antistatic device. Commercial antistatic devices include Model-204 and Model-210 manufactured by the 3M Company, St. Paul, Minnesota.

6.4.3 If an impinger train is used to collect moisture, place 100 mL of water in each of the first two impingers, leave the third impinger empty (or charge with caustic solution, as necessary), and transfer approximately 200-300 g of preweighed silica gel from its container to the fourth impinger. More silica gel may be used, but care should be taken to ensure that it is not entrained and carried out from the impinger during sampling. Place the container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

6.4.4 Using a tweezer or clean disposable surgical gloves, place a labeled (identified) and weighed filter in the filter holder. Be sure that the filter is properly centered and the gasket properly placed to prevent the sample gas stream from circumventing the filter. Check the filter for tears after assembly is completed.

6.4.5 When glass liners are used, install the selected nozzle using a Viton-A O-ring when stack temperatures are <260°C (500°F) and a woven glass-fiber gasket when temperatures are higher. See APTD-0576 (Rom, 1972) for details. Other connecting systems utilizing either 316 stainless steel or Teflon ferrules may be used. When metal liners are used, install the nozzle as above, or by a leak-free direct mechanical connection. Mark the probe with heat-resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

6.4.6 Set up the train as in Figure 1. During assembly, do not use any silicone grease on ground-glass joints that are located upstream of the organic module. A very light coating of silicone grease may be used on all ground-glass joints that are located downstream of the organic module, but it should be limited to the outer portion (see APTD-0576) of the ground-glass joints to minimize silicone-grease contamination. Subject to the approval of the Administrator, a glass cyclone may be used between the probe and the filter holder when the total particulate catch is expected to exceed 100 mg or when water droplets are present in the stack. The organic module condenser must be maintained at a temperature of 17 ± 3°C. Connect all temperature sensors to an appropriate potentiometer/display unit. Check all temperature sensors at ambient temperature.

6.4.7 Place crushed ice around the impingers and the organic module condensate knockout.

6.4.8 Turn on the sorbent module and condenser coil coolant recirculating pump and begin monitoring the sorbent module gas entry temperature. Ensure proper sorbent module gas entry temperature before proceeding and again before any sampling is initiated. It is extremely important that the XAD-2 resin temperature never exceed 50°C (122°F), because thermal decomposition will occur. During testing, the XAD-2 temperature must not exceed 20°C (68°F) for efficient capture of the semivolatile species of interest.

6.4.9 Turn on and set the filter and probe heating systems at the desired operating temperatures. Allow time for the temperatures to stabilize.

6.5 Leak-check procedures

6.5.1 Pre-test leak-check:

6.5.1.1 Because the number of additional intercomponent connections in the Semi-VOST train (over the M5 Train) increases the possibility of leakage, a pre-test leak-check is required.

6.5.1.2 After the sampling train has been assembled, turn on and set the filter and probe heating systems at the desired operating temperatures. Allow time for the temperatures to stabilize. If a Viton A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 381-mm Hg (15-in. Hg) vacuum.
(NOTE: A lower vacuum may be used, provided that it is not exceeded during the test.)

6.5.1.3 If an asbestos string is used, do not connect the probe to the train during the leak-check. Instead, leak-check the train by first attaching a carbon-filled leak-check impinger (shown in Figure 4) to the inlet of the filter holder (cyclone, if applicable) and then plugging the inlet and pulling a 381-mm Hg (15-in. Hg) vacuum. (Again, a lower vacuum may be used, provided that it is not exceeded during the test.) Then, connect the probe to the train and leak-check at about 25-mm Hg (1-in. Hg) vacuum; alternatively, leak-check the probe with the rest of the sampling train in one step at 381-mm Hg (15-in. Hg) vacuum. Leakage rates in excess of 4% of the average sampling rate or >0.00057 m^3/min (0.02 cfm), whichever is less, are unacceptable.

6.5.1.4 The following leak-check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with fine-adjust valve fully open and coarse-adjust valve completely closed. Partially open the coarse-adjust valve and slowly close the fine-adjust valve until the desired vacuum is reached. Do <u>not</u> reverse direction of the fine-adjust valve; this will cause water to back up into the organic module. If the desired vacuum is exceeded, either leak-check at this higher vacuum or end the leak-check, as shown below, and start over.

CROSS SECTIONAL VIEW

Leak Testing Apparatus

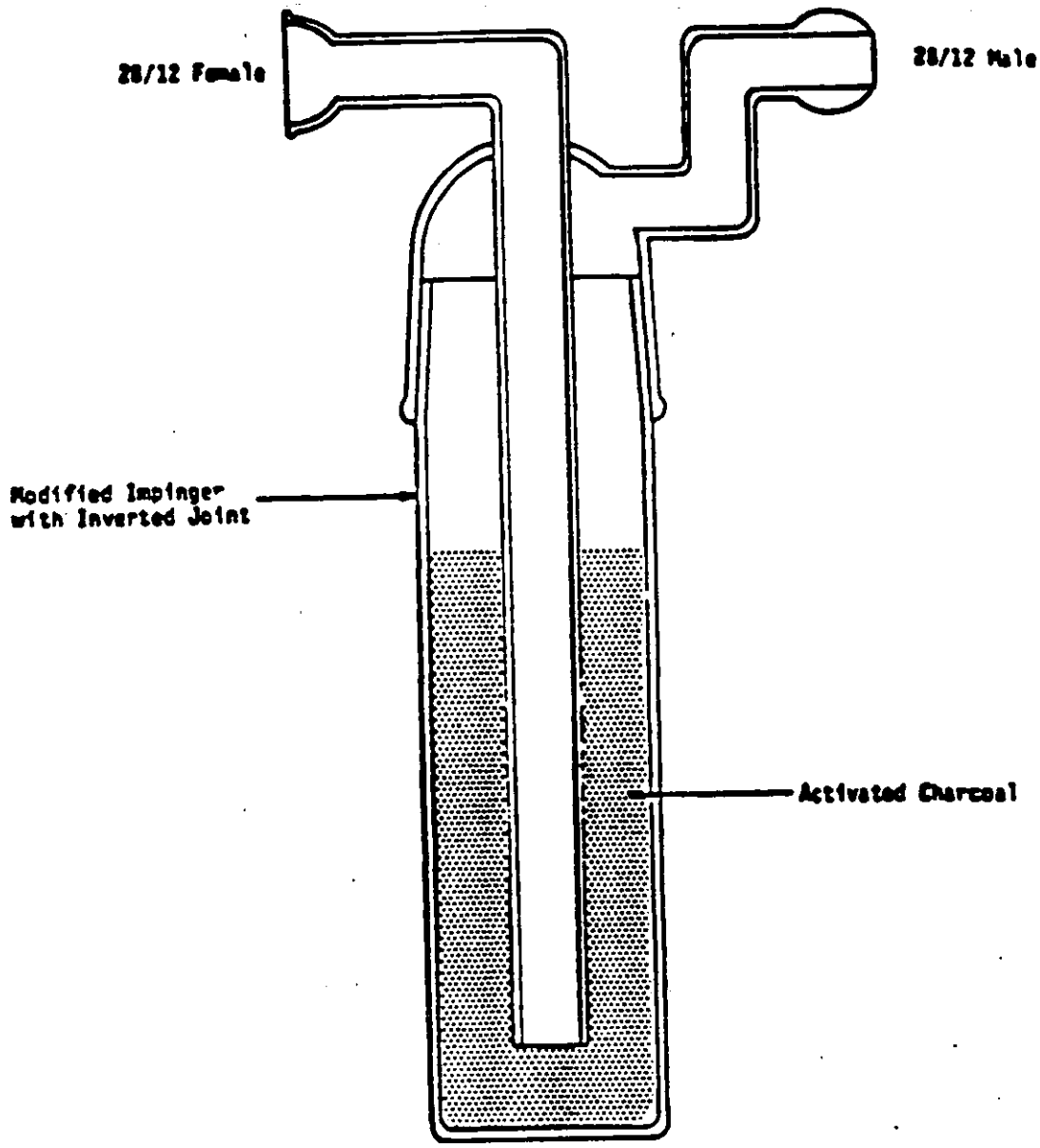

Figure 4. Leak-check impinger.

6.5.1.5 When the leak-check is completed, first slowly remove the plug from the inlet to the probe, filter holder, or cyclone (if applicable). When the vacuum drops to 127 mm (5 in.) Hg or less, immediately close the coarse-adjust valve. Switch off the pumping system and reopen the fine-adjust valve. Do not reopen the fine-adjust valve until the coarse-adjust valve has been closed. This prevents the water in the impingers from being forced backward into the organic module and silica gel from being entrained backward into the third impinger.

6.5.2 Leak-checks during sampling run:

6.5.2.1 If, during the sampling run, a component (e.g., filter assembly, impinger, or sorbent trap) change becomes necessary, a leak-check shall be conducted immediately after the interruption of sampling and before the change is made. The leak-check shall be done according to the procedure outlined in Paragraph 6.5.1, except that it shall be done at a vacuum greater than or equal to the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable, and no correction will need to be applied to the total volume of dry gas metered. If a higher leakage rate is obtained, the tester shall void the sampling run. (It should be noted that any "correction" of the sample volume by calculation by calculation reduces the integrity of the pollutant concentrations data generated and must be avoided.)

6.5.2.2 Immediately after a component change, and before sampling is reinitiated, a leak-check similar to a pre-test leak-check must also be conducted.

6.5.3 Post-test leak-check:

6.5.3.1 A leak-check is mandatory at the conclusion of each sampling run. The leak-check shall be done with the same procedures as those with the pre-test leak-check, except that it shall be conducted at a vacuum greater than or equal to the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, the tester shall either record the leakage rate, correct the sample volume (as shown in the calculation section of this method), and consider the data obtained of questionable reliability, or void the sampling run.

6.6 Sampling-train operation:

6.6.1 During the sampling run, maintain an isokinetic sampling rate to within 10% of true isokinetic, unless otherwise specified by the Administrator. Maintain a temperature around the filter of 120 ± 14°C (248 ± 25°F) and a gas temperature entering the sorbent trap at a maximum of 20°C (68°F).

6.6.2 For each run, record the data required on a data sheet such as the one shown in Figure 5. Be sure to record the initial dry-gas meter reading. Record the dry-gas meter readings at the beginning and end of each sampling time increment, when changes in flow rates are made before and after each leak-check, and when sampling is halted. Take other readings required by Figure 5 at least once at each sample point during each time increment and additional readings when significant changes (20% variation in velocity-head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

6.6.3 Clean the stack access ports prior to the test run to eliminate the chance of sampling deposited material. To begin sampling, remove the nozzle cap, verify that the filter and probe heating systems are at the specified temperature, and verify that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point, with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs, which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations, are available. These nomographs are designed for use when the Type S pitot-tube coefficient is 0.84 $\pm$ 0.02 and the stack-gas equivalent density (dry molecular weight) is equal to 29 $\pm$ 4. APTD-0576 details the procedure for using the nomographs. If the stack-gas molecular weight and the pitot-tube coefficient are outside the above ranges, do not use the nomographs unless appropriate steps (Shigehara, 1974) are taken to compensate for the deviations.

6.6.4 When the stack is under significant negative pressure (equivalent to the height of the impinger stem), take care to close the coarse-adjust valve before inserting the probe into the stack, to prevent water from backing into the organic module. If necessary, the pump may be turned on with the coarse-adjust valve closed.

6.6.5 When the probe is in position, block off the openings around the probe and stack access port to prevent unrepresentative dilution of the gas stream.

6.6.6 Traverse the stack cross section, as required by EPA Method 1 or as specified by the Administrator, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the access port, in order to minimize the chance of extracting deposited material.

6.6.7 During the test run, make periodic adjustments to keep the temperature around the filter holder and the organic module at the proper levels; add more ice and, if necessary, salt to maintain a temperature of <20°C (68°F) at the condenser/silica gel outlet. Also, periodically check the level and zero of the manometer.

Plant _____
Location _____
Operator _____
Date _____
Run No. _____
Sample Box No. _____
Meter Box No. _____
Meter $\Delta H@$ _____
C Factor _____
Pitot Tube Coefficient C_p _____

Schematic of Stack Cross Section

Ambient Temperature _____
Barometric Pressure _____
Assumed Moisture % _____
Probe Length, m (ft) _____
Nozzle Identification No. _____
Average Calibrated Nozzle Diameter, cm (in) _____
Probe Heater Setting _____
Leak Rate, m^3/min, (cfm) _____
Probe Liner Material _____
Static Pressure, mm Hg (in. Hg) _____
Filter No. _____

Traverse Point Number	Sampling Time (θ) min.	Vacuum mm Hg (in. Hg)	Stack Temperature (T_s) °C(°F)	Velocity Head (P_s) mm (in) H_2O	Pressure Differential Across Orifice Meter mm (H_2O) (in H_2O)	Gas Sample Volume m^3 (ft^3)	Gas Sample Temp. at Dry Gas Meter Inlet °C(°F)	Gas Sample Temp. at Dry Gas Meter Outlet °C(°F)	Filter Holder Temperature °C(F°)	Temperature of Gas Entering Sorbet Trap °C(F°)	Temperature of Gas Leaving Condenser or Last Impinger
Total							Avg.	Avg.			
Average											

Figure 5. Particulate field data.

6.6.8 If the pressure drop across the filter or sorbent trap becomes too high, making isokinetic sampling difficult to maintain, the filter/sorbent trap may be replaced in the midst of a sample run. Using another complete filter holder/sorbent trap assembly is recommended, rather than attempting to change the filter and resin themselves. After a new filter/sorbent trap assembly is installed, conduct a leak-check. The total particulate weight shall include the summation of all filter assembly catches.

6.6.9 A single train shall be used for the entire sample run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or in cases where equipment failure necessitates a change of trains. In all other situations, the use of two or more trains will be subject to the approval of the Administrator.

6.6.10 Note that when two or more trains are used, separate analysis of the front-half (if applicable) organic-module and impinger (if applicable) catches from each train shall be performed, unless identical nozzle sizes were used on all trains. In that case, the front-half catches from the individual trains may be combined (as may the impinger catches), and one analysis of front-half catch and one analysis of impinger catch may be performed.

6.6.11 At the end of the sample run, turn off the coarse-adjust valve, remove the probe and nozzle from the stack, turn off the pump, record the final dry-gas meter reading, and conduct a post-test leak-check. Also, leak-check the pitot lines as described in EPA Method 2. The lines must pass this leak-check in order to validate the velocity-head data.

6.6.12 Calculate percent isokineticity (see Section 10.8) to determine whether the run was valid or another test run should be made.

7.0 SAMPLE RECOVERY

7.1 Preparation:

7.1.1 Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool. When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over the tip to prevent losing or gaining particulate matter. Do not cap the probe tip tightly while the sampling train is cooling down because this will create a vacuum in the filter holder, drawing water from the impingers into the sorbent module.

7.1.2 Before moving the sample train to the cleanup site, remove the probe from the sample train and cap the open outlet, being careful not to lose any condensate that might be present. Cap the filter inlet.

Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used between the organic module and the filter holder, disconnect the line at the filter holder and let any condensed water or liquid drain into the organic module.

7.1.3 Cap the filter-holder outlet and the inlet to the organic module. Separate the sorbent trap section of the organic module from the condensate knockout trap and the gas-conditioning section. Cap all organic module openings. Disconnect the organic-module knockout trap from the impinger train inlet and cap both of these openings. Ground-glass stoppers, Teflon caps, or caps of other inert materials may be used to seal all openings.

7.1.4 Transfer the probe, the filter, the organic-module components, and the impinger/condenser assembly to the cleanup area. This area should be clean and protected from the weather to minimize sample contamination or loss.

7.1.5 Save a portion of all washing solutions (methanol/methylene chloride, Type II water) used for cleanup as a blank. Transfer 200 mL of each solution directly from the wash bottle being used and place each in a separate, prelabeled glass sample container.

7.1.6 Inspect the train prior to and during disassembly and note any abnormal conditions.

7.2 Sample containers:

7.2.1 Container no. 1: Carefully remove the filter from the filter holder and place it in its identified Petri dish container. Use a pair or pairs of tweezers to handle the filter. If it is necessary to fold the filter, ensure that the particulate cake is inside the fold. Carefully transfer to the Petri dish any particulate matter or filter fibers that adhere to the filter-holder gasket, using a dry nylon bristle brush or sharp-edged blade, or both. Label the container and seal with 1-in.-wide Teflon tape around the circumference of the lid.

7.2.2 Container no. 2: Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover particulate matter or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components first with methanol/methylene chloride (1:1 v/v) into a glass container. Distilled water may also be used. Retain a water and solvent blank and analyze in the same manner as with the samples. Perform rinses as follows:

7.2.2.1 Carefully remove the probe nozzle and clean the inside surface by rinsing with the solvent mixture (1:1 v/v methanol/-methylene chloride) from a wash bottle and brushing with a nylon bristle brush. Brush until the rinse shows no visible particles; then make a final rinse of the inside surface with the solvent mix. Brush and rinse the inside parts of the Swagelok fitting with the solvent mix in a similar way until no visible particles remain.

7.2.2.2 Have two people rinse the probe liner with the solvent mix by tilting and rotating the probe while squirting solvent into its upper end so that all inside surfaces will be wetted with solvent. Let the solvent drain from the lower end into the sample container. A glass funnel may be used to aid in transferring liquid washes to the container.

7.2.2.3 Follow the solvent rinse with a probe brush. Hold the probe in an inclined position and squirt solvent into the upper end while pushing the probe brush through the probe with a twisting action; place a sample container underneath the lower end of the probe and catch any solvent and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible particulate matter is carried out with the solvent or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above-prescribed manner at least six times (metal probes have small crevices in which particulate matter can be entrapped). Rinse the brush with solvent and quantitatively collect these washings in the sample container. After the brushing, make a final solvent rinse of the probe as described above.

7.2.2.4 It is recommended that two people work together to clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

7.2.2.5 Clean the inside of the front half of the filter holder and cyclone/cyclone flask, if used, by rubbing the surfaces with a nylon bristle brush and rinsing with methanol/methylene chloride (1:1 v/v) mixture. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone and cyclone flask (if applicable). Brush and rinse any particulate material adhering to the inner surfaces of these components into the front-half rinse sample. After all solvent washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that solvent will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Label the container to identify its contents.

7.2.3 Container no. 3: The sorbent trap section of the organic module may be used as a sample transport container, or the spent resin may be transferred to a separate glass bottle for shipment. If the sorbent trap itself is used as the transport container, both ends should be sealed with tightly fitting caps or plugs. Ground-glass stoppers or Teflon caps may be used. The sorbent trap should then be labeled, covered with aluminum foil, and packaged on ice for transport to the laboratory. If a separate bottle is used, the spent resin should be quantitatively transferred from the trap into the clean bottle. Resin that adheres to the walls of the trap should be recovered using a rubber policeman or spatula and added to this bottle.

7.2.4 Container no. 4: Measure the volume of condensate collected in the condensate knockout section of the organic module to within ±1 mL by using a graduated cylinder or by weighing to within ±0.5 g using a triple-beam balance. Record the volume or weight of liquid present and note any discoloration or film in the liquid catch. Transfer this liquid to a prelabeled glass sample container. Inspect the back half of the filter housing and the gas-conditioning section of the organic module. If condensate is observed, transfer it to a graduated or weighing bottle and measure the volume, as described above. Add this material to the condensate knockout-trap catch.

7.2.5 Container no. 5: All sampling train components located between the high-efficiency glass- or quartz-fiber filter and the first wet impinger or the final condenser system (including the heated Teflon line connecting the filter outlet to the condenser) should be thoroughly rinsed with methanol/methylene chloride (1:1 v/v) and the rinsings combined. This rinse shall be separated from the condensate. If the spent resin is transferred from the sorbent trap to a separate sample container for transport, the sorbent trap shall be thoroughly rinsed until all sample-wetted surfaces appear clean. Visible films should be removed by brushing. Whenever train components are brushed, the brush should be subsequently rinsed with solvent mixture and the rinsings added to this container.

7.2.6 Container no. 6: Note the color of the indicating silica gel to determine if it has been completely spent and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere strongly to the impinger wall. Because the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, weigh the container and its contents to 0.5 g or better.

7.3 Impinger water:

7.3.1 Make a notation of any color or film in the liquid catch. Measure the liquid in the first three impingers to within ±1 mL by using a graduated cylinder or by weighing it to within ±0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

7.3.2 Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see Paragraph 4.1.3.7). Amber glass containers should be used for storage of impinger catch, if required.

7.3.3 If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

7.4 Sample preparation for shipment: Prior to shipment, recheck all sample containers to ensure that the caps are well secured. Seal the lids of all containers around the circumference with Teflon tape. Ship all liquid samples upright on ice and all particulate filters with the particulate catch facing upward. The particulate filters should be shipped unrefrigerated.

8.0 ANALYSIS

8.1 Sample preparation:

8.1.1 General: The preparation steps for all samples will result in a finite volume of concentrated solvent. The final sample volume (usually in the 1- to 10-mL range) is then subjected to analysis by GC/MS. All samples should be inspected and the appearance documented. All samples are to be spiked with surrogate standards as received from the field prior to any sample manipulations. The spike should be at a level equivalent to 10 times the MDL when the solvent is reduced in volume to the desired level (i.e., 10 mL). The spiking compounds should be the stable isotopically labeled analog of the compounds of interest or a compound that would exhibit properties similar to the compounds of interest, be easily chromatographed, and not interfere with the analysis of the compounds of interest. Suggested surrogate spiking compounds are: deuterated naphthalene, chrysene, phenol, nitrobenzene, chlorobenzene, toluene, and carbon-13-labeled pentachlorophenol.

8.1.2 Condensate: The "condensate" is the moisture collected in the first impinger following the XAD-2 module. Spike the condensate with the surrogate standards. The volume is measured and recorded and then transferred to a separatory funnel. The pH is to be adjusted to pH 2 with 6 N sulfuric acid, if necessary. The sample container and graduated cylinder are sequentially rinsed with three successive 10-mL aliquots of the extraction solvent and added to the separatory funnel. The ratio of solvent to aqueous sample should be maintained at 1:3. Extract the sample by vigorously shaking the separatory funnel for 5 min. After complete separation of the phases, remove the solvent and transfer to a Kuderna-Danish concentrator (K-D), filtering through a bed of precleaned, dry sodium sulfate. Repeat the extraction step two additional times. Adjust the pH to 11 with 6 N sodium hydroxide and reextract combining the acid and base extracts. Rinse the sodium sulfate into the K-D with fresh solvent and discard the desiccant. Add Teflon boiling chips and concentrate to 10 mL by reducing the volume to slightly less than 10 mL and then bringing to volume with fresh solvent. In order to achieve the necessary detection limit, the sample volume can be further reduced to 1 mL by using a micro column K-D or nitrogen blow-down. Should the sample start to exhibit precipitation, the concentration step should be stopped and the sample redissolved with fresh solvent taking the volume to some finite amount. After adding a standard (for the purpose of quantitation by GC/MS), the sample is ready for analysis, as discussed in Paragraph 8.2.

8.1.3 **Impinger:** Spike the sample with the surrogate standards; measure and record the volume and transfer to a separatory funnel. Proceed as described in Paragraph 8.1.2.

8.1.4 **XAD-2:** Spike the resin directly with the surrogate standards. Transfer the resin to the all-glass thimbles by the following procedure (care should be taken so as not to contaminate the thimble by touching it with anything other than tweezers or other solvent-rinsed mechanical holding devices). Suspend the XAD-2 module directly over the thimble. The glass frit of the module (see Figure 2) should be in the up position. The thimble is contained in a clean beaker, which will serve to catch the solvent rinses. Using a Teflon squeeze bottle, flush the XAD-2 into the thimble. Thoroughly rinse the glass module with solvent into the beaker containing the thimble. Add the XAD-2 glass-wool plug to the thimble. Cover the XAD-2 in the thimble with a precleaned glass-wool plug sufficient to prevent the resin from floating into the solvent reservoir of the extractor. If the resin is wet, effective extraction can be accomplished by loosely packing the resin in the thimble. If a question arises concerning the completeness of the extraction, a second extraction, without a spike, is advised. The thimble is placed in the extractor and the rinse solvent contained in the beaker is added to the solvent reservoir. Additional solvent is added to make the reservoir approximately two-thirds full. Add Teflon boiling chips and assemble the apparatus. Adjust the heat source to cause the extractor to cycle 5-6 times per hr. Extract the resin for 16 hr. Transfer the solvent and three 10-mL rinses of the reservoir to a K-D and concentrate as described in Paragraph 8.1.2.

8.1.5 **Particulate filter (and cyclone catch):** If particulate loading is to be determined, weigh the filter (and cyclone catch, if applicable). The particulate filter (and cyclone catch, if applicable) is transferred to the glass thimble and extracted simultaneously with the XAD-2 resin.

8.1.6 **Train solvent rinses:** All train rinses (i.e., probe, impinger, filter housing) using the extraction solvent and methanol are returned to the laboratory as a single sample. If the rinses are contained in more than one container, the intended spike is divided equally among the containers proportioned from a single syringe volume. Transfer the rinse to a separatory funnel and add a sufficient amount of organic-free water so that the methylene chloride becomes immiscible and its volume no longer increases with the addition of more water. The extraction and concentration steps are then performed as described in Paragraph 8.1.2.

8.2 Sample analysis:

8.2.1 The primary analytical tool for the measurement of emissions from hazardous waste incinerators is GC/MS using fused-silica capillary GC columns, as described in Method 8270 in Chapter Four of this manual. Because of the nature of GC/MS instrumentation and the cost associated

with sample analysis, prescreening of the sample extracts by gas chromatography/flame ionization detection (GC/FID) or with electron capture (GC/ECD) is encouraged. Information regarding the complexity and concentration level of a sample prior to GC/MS analysis can be of enormous help. This information can be obtained by using either capillary columns or less expensive packed columns. However, the FID screen should be performed with a column similar to that used with the GC/MS. Keep in mind that GC/FID has a slightly lower detection limit than GC/MS and, therefore, that the concentration of the sample can be adjusted either up or down prior to analysis by GC/MS.

8.2.2 The mass spectrometer will be operated in a full scan (40-450) mode for most of the analyses. The range for which data are acquired in a GC/MS run will be sufficiently broad to encompass the major ions, as listed in Chapter Four, Method 8270, for each of the designated POHCs in an incinerator effluent analysis.

8.2.3 For most purposes, electron ionization (EI) spectra will be collected because a majority of the POHCs give reasonable EI spectra. Also, EI spectra are compatible with the NBS Library of Mass Spectra and other mass spectral references, which aid in the identification process for other components in the incinerator process streams.

8.2.4 To clarify some identifications, chemical ionization (CI) spectra using either positive ions or negative ions will be used to elucidate molecular-weight information and simplify the fragmentation patterns of some compounds. In no case, however, should CI spectra alone be used for compound identification. Refer to Chapter Four, Method 8270, for complete descriptions of GC conditions, MS conditions, and quantitative and quantitative identification.

9.0 CALIBRATION

9.1 Probe nozzle: Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the inside diameter of the nozzle to the nearest 0.025 mm (0.001 in.). Make measurements at three separate places across the diameter and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in.). When nozzles become nicked, dented, or corroded, they shall be reshaped, sharpened, and recalibrated before use. Each nozzle shall be permanently and uniquely identified.

9.2 Pitot tube: The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Section 4 of EPA Method 2, or assigned a nominal coefficient of 0.84 if it is not visibly nicked, dented, or corroded and if it meets design and intercomponent spacing specifications.

9.3 Metering system:

9.3.1 Before its initial use in the field, the metering system shall be calibrated according to the procedure outlined in APTD-0576. Instead of physically adjusting the dry-gas meter dial readings to correspond to the wet-test meter readings, calibration factors may be used to correct the gas meter dial readings mathematically to the proper values. Before calibrating the metering system, it is suggested that a leak-check be conducted. For metering systems having diaphragm pumps, the normal leak-check procedure will not detect leakages within the pump. For these cases the following leak-check procedure is suggested: Make a 10-min calibration run at 0.00057 m^3/min (0.02 cfm); at the end of the run, take the difference of the measured wet-test and dry-gas meter volumes and divide the difference by 10 to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

9.3.2 After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single intermediate orifice setting (based on the previous field test). The vacuum shall be set at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet-test meter and the inlet of the metering system. Calculate the average value of the calibration factor. If the calibration has changed by more than 5%, recalibrate the meter over the full range of orifice settings, as outlined in APTD-0576.

9.3.3 Leak-check of metering system: That portion of the sampling train from the pump to the orifice meter (see Figure 1) should be leak-checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. The following procedure is suggested (see Figure 6): Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing attached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13-18 cm (5-7 in.) water column by blowing into the rubber tubing. Pinch off the tubing and observe the manometer for 1 min. A loss of pressure on the manometer indicates a leak in the meter box. Leaks, if present, must be corrected.

NOTE: If the dry-gas-meter coefficient values obtained before and after a test series differ by >5%, either the test series shall be voided or calculations for test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

9.4 Probe heater: The probe-heating system shall be calibrated before its initial use in the field according to the procedure outlined in APTD-0576. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used.

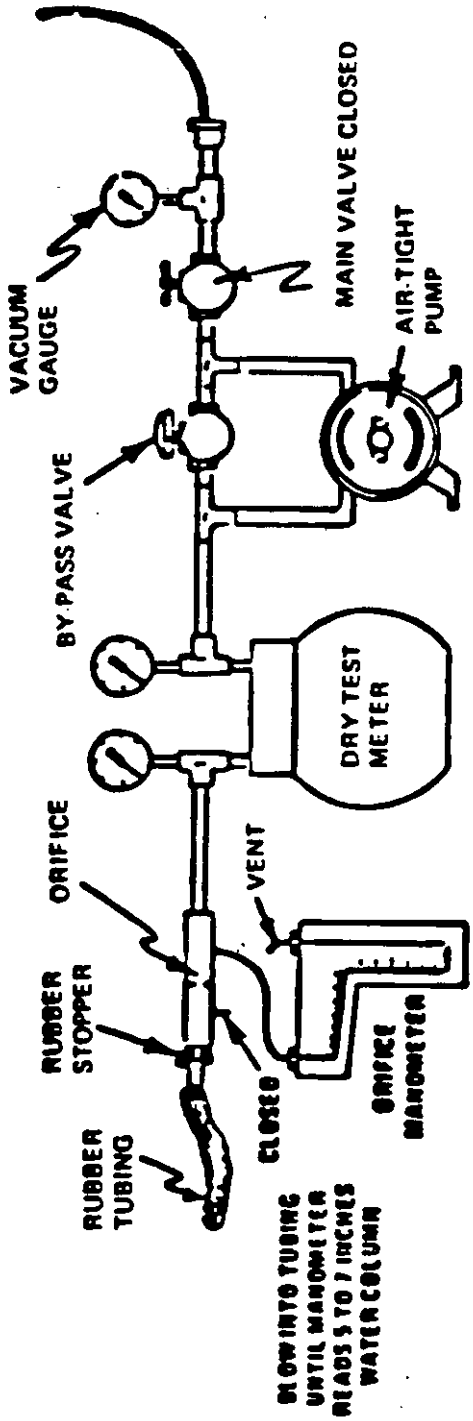

Figure 6. Leak-check of meter box.

9.5 Temperature gauges: Each thermocouple must be permanently and uniquely marked on the casting; all mercury-in-glass reference thermometers must conform to ASTM E-1 63C or 63F specifications. Thermocouples should be calibrated in the laboratory with and without the use of extension leads. If extension leads are used in the field, the thermocouple readings at ambient air temperatures, with and without the extension lead, must be noted and recorded. Correction is necessary if the use of an extension lead produces a change >1.5%.

9.5.1 Impinger, organic module, and dry-gas meter thermocouples: For the thermocouples used to measure the temperature of the gas leaving the impinger train and the XAD-2 resin bed, three-point calibration at ice-water, room-air, and boiling-water temperatures is necessary. Accept the thermocouples only if the readings at all three temperatures agree to ±2°C (3.6°F) with those of the absolute value of the reference thermometer.

9.5.2 Probe and stack thermocouple: For the thermocouples used to indicate the probe and stack temperatures, a three-point calibration at ice-water, boiling-water, and hot-oil-bath temperatures must be performed; it is recommended that room-air temperature be added, and that the thermometer and the thermocouple agree to within 1.5% at each of the calibration points. A calibration curve (equation) may be constructed (calculated) and the data extrapolated to cover the entire temperature range suggested by the manufacturer.

9.6 Barometer: Adjust the barometer initially and before each test series to agree to within ±25 mm Hg (0.1 in. Hg) of the mercury barometer or the corrected barometric pressure value reported by a nearby National Weather Service Station (same altitude above sea level).

9.7 Triple-beam balance: Calibrate the triple-beam balance before each test series, using Class-S standard weights; the weights must be within ±0.5% of the standards, or the balance must be adjusted to meet these limits.

10.0 CALCULATIONS

10.1 Carry out calculations. Round off figures after the final calculation to the correct number of significant figures.

10.2 Nomenclature:

A_n = Cross-sectional area of nozzle, m^2 (ft^2).

B_{ws} = Water vapor in the gas stream, proportion by volume.

C_d = Type S pitot tube coefficient (nominally 0.84 ± 0.02), dimensionless.

I = Percent of isokinetic sampling.

L_a = Maximum acceptable leakage rate for a leak-check, either pre-test or following a component change; equal to 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate, whichever is less.

L_i = Individual leakage rate observed during the leak-check conducted prior to the "i^{th}" component change (i = 1, 2, 3...n) m^3/min (cfm).

L_p = Leakage rate observed during the post-test leak-check, m^3/min (cfm).

M_d = Stack-gas dry molecular weight, g/g-mole (lb/lb-mole).

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).

P_s = Absolute stack-gas pressure, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 mm Hg-m^3/K-g-mole (21.85 in. Hg-ft^3/°R-lb-mole).

T_m = Absolute average dry-gas meter temperature (see Figure 6), K (°R).

T_s = Absolute average stack-gas temperature (see Figure 6), K (°R).

T_{std} = Standard absolute temperature, 293K (528°R).

V_{lc} = Total volume of liquid collected in the organic module condensate knockout trap, the impingers, and silica gel, mL.

V_m = Volume of gas sample as measured by dry-gas meter, dscm (dscf).

$V_{m(std)}$ = Volume of gas sample measured by the dry-gas meter, corrected to standard conditions, dscm (dscf).

$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).

V_s = Stack-gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 5, m/sec (ft/sec).

W_a = Weight of residue in acetone wash, mg.

γ = Dry-gas-meter calibration factor, dimensionless.

ΔH = Average pressure differential across the orifice meter (see Figure 2), mm H_2O (in. H_2O).

ρ_w = Density of water, 0.9982 g/mL (0.002201 lb/mL).

θ = Total sampling time, min.

θ_1 = Sampling time interval from the beginning of a run until the first component change, min.

θ_i = Sampling time interval between two successive component changes, beginning with the interval between the first and second changes, min.

θ_p = Sampling time interval from the final (n^{th}) component change until the end of the sampling run, min.

13.6 = Specific gravity of mercury.

60 = sec/min.

100 = Conversion to percent.

10.3 Average dry-gas-meter temperature and average orifice pressure drop: See data sheet (Figure 5, above).

10.4 Dry-gas volume: Correct the sample measured by the dry-gas meter to standard conditions (20°C, 760 mm Hg [68°F, 29.92 in. Hg]) by using Equation 1:

$$V_{m(std)} = V_m \gamma \frac{T_{std}}{T_m} \frac{P_{bar} + \Delta H/13.6}{P_{std}} = K_1 V_m \gamma \frac{P_{bar} + \Delta H/13.6}{T_m} \qquad (1)$$

where:

K_1 = 0.3858 K/mm Hg for metric units, or
K_1 = 17.64°R/in. Hg for English units.

It should be noted that Equation 1 can be used as written, unless the leakage rate observed during any of the mandatory leak-checks (i.e., the post-test leak-check or leak-checks conducted prior to component changes) exceeds L_a. If L_p or L_i exceeds L_a, Equation 1 must be modified as follows:

a. Case I (no component changes made during sampling run): Replace V_m in Equation 1 with the expression:

$$V_m - (L_p - L_a)$$

b. Case II (one or more component changes made during the sampling run): Replace V_m in Equation 1 by the expression:

$$V_m - (L_1 - L_a)\theta_1 - \sum_{i=2}^{n} (L_i - L_a)\theta_1 - (L_p - L_a)\theta_p$$

and substitute only for those leakage rates (L_1 or L_p) that exceed L_a.

10.5 Volume of water vapor:

$$V_{w(std)} = V_{1c} \frac{P_w}{M_w} \frac{RT_{std}}{P_{std}} = K_2 V_{1c} \qquad (2)$$

where:

K_2 = 0.001333 m^3/mL for metric units, or
K_2 = 0.04707 ft^3/mL for English units.

10.6 Moisture content:

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}} \qquad (3)$$

NOTE: In saturated or water-droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one from the impinger analysis (Equation 3) and a second from the assumption of saturated conditions. The lower of the two values of B_w shall be considered correct. The procedure for determining the moisture content based upon assumption of saturated conditions is given in the Note to Section 1.2 of Method 4. For the purposes of this method, the average stack-gas temperature from Figure 6 may be used to make this determination, provided that the accuracy of the in-stack temperature sensor is ±1°C (2°F).

10.7 Conversion factors:

From	To	Multiply by
scf	m^3	0.02832
g/ft^3	gr/ft^3	15.43
g/ft^3	lb/ft^3	2.205×10^{-3}
g/ft^3	g/m^3	35.31

10.8 Isokinetic variation:

10.8.1 Calculation from raw data:

$$I = \frac{100\ T_s[K_3F_{1c} + (V_m/T_m)\ (P_{bar} + \Delta H/13.6)]}{60\theta V_s P_s A_n} \qquad (4)$$

where:

K_3 = 0.003454 mm Hg-m^3/mL-K for metric units, or
K_3 = 0.002669 in. Hg-ft^3/mL-°R for English units.

10.8.2 Calculation for intermediate values:

$$I = \frac{T_s V_{m(std)} P_{std} 100}{T_{std} V_s \theta A_n P_s 60(1-B_{ws})} \qquad (5)$$

$$= K_4 \frac{T_s V_{m(std)}}{P_s V_s A_n \theta (1-B_{ws})}$$

where:

K_4 = 4.320 for metric units, or
K_4 = 0.09450 for English units.

10.8.3 Acceptable results: If 90% $\leq$ I $\leq$ 110%, the results are acceptable. If the results are low in comparison with the standard and I is beyond the acceptable range, or if I is less than 90%, the Administrator may opt to accept the results.

10.9 To determine the minimum sample volume that shall be collected, the following sequence of calculations shall be used.

10.9.1 From prior analysis of the waste feed, the concentration of POHCs introduced into the combustion system can be calculated. The degree of destruction and removal efficiency that is required is used to determine the maximum amount of POHC allowed to be present in the effluent. This may be expressed as:

$$\frac{(WF)\ (POHC_1\ conc)}{100}\ \frac{(100-\%DRE)}{100} = Max\ POHC_1\ Mass \qquad (6)$$

where:

WF = mass flow rate of waste feed per hr, g/hr (lb/hr).

$POHC_1$ = concentration of Principal Organic Hazardous Compound (wt %) introduced into the combustion process.

DRE = percent Destruction and Removal Efficiency required.

Max POHC = mass flow rate (g/hr [lb/hr]) of POHC emitted from the combustion source.

10.9.2 The average discharge concentration of the POHC in the effluent gas is determined by comparing the Max POHC with the volumetric flow rate being exhausted from the source. Volumetric flow rate data are available as a result of preliminary Method 1-4 determinations:

$$\frac{\text{Max POHC}_i \text{ Mass}}{DV_{eff(std)}} = \text{Max POHC}_i \text{ conc} \qquad (7)$$

where:

$DV_{eff(std)}$ = volumetric flow rate of exhaust gas, dscm (dscf).

$POHC_i$ conc = anticipated concentration of the POHC in the exhaust gas stream, g/dscm (lb/dscf).

10.9.3 In making this calculation, it is recommended that a safety margin of at least ten be included:

$$\frac{LDL_{POHC} \times 10}{POHC_i \text{ conc}} = V_{TBC} \qquad (8)$$

where:

LDL_{POHC} = detectable amount of POHC in entire sampling train.
NOTE: The whole extract from an XAD-2 cartridge is seldom if ever, injected at once. Therefore, if aliquoting factors are involved, the LDL_{POHC} is not the same as the analytical (or column) detection limit.

V_{TBC} = minimum dry standard volume to be collected at dry-gas meter.

10.10 <u>Concentration of any given POHC in the gaseous emissions of a combustion process</u>:

1) Multiply the concentration of the POHC as determined in Method 8270 by the final concentration volume, typically 10 mL.

C_{POHC} (ug/mL) x sample volume (mL) = amount (ug) of POHC in sample (9)

where:

C_{POHC} = concentration of POHC as analyzed by Method 8270.

2) Sum the amount of POHC found in all samples associated with a single train.

Total (ug) = XAD-2 (ug) + condensate (ug) + rinses (ug) + impinger (ug) (10)

3) Divide the total ug found by the volume of stack gas sampled (m^3).

(Total ug)/(train sample volume) = concentration of POHC (ug/m^3) (11)

11.0 QUALITY CONTROL

11.1 Sampling: See EPA Manual 600/4-77-027b for Method 5 quality control.

11.2 Analysis: The quality assurance program required for this study includes the analysis of field and method blanks, procedure validations, incorporation of stable labeled surrogate compounds, quantitation versus stable labeled internal standards, capillary column performance checks, and external performance tests. The surrogate spiking compounds selected for a particular analysis are used as primary indicators of the quality of the analytical data for a wide range of compounds and a variety of sample matrices. The assessment of combustion data, positive identification, and quantitation of the selected compounds are dependent on the integrity of the samples received and the precision and accuracy of the analytical methods employed. The quality assurance procedures for this method are designed to monitor the performance of the analytical method and to provide the required information to take corrective action if problems are observed in laboratory operations or in field sampling activities.

11.2.1 Field Blanks: Field blanks must be submitted with the samples collected at each sampling site. The field blanks include the sample bottles containing aliquots of sample recovery solvents, unused filters, and resin cartridges. At a minimum, one complete sampling train will be assembled in the field staging area, taken to the sampling area, and leak-checked at the beginning and end of the testing (or for the same total number of times as the actual test train). The filter housing and probe of the blank train will be heated during the sample test. The train will be recovered as if it were an actual test sample. No gaseous sample will be passed through the sampling train.

11.2.2 Method blanks: A method blank must be prepared for each set of analytical operations, to evaluate contamination and artifacts that can be derived from glassware, reagents, and sample handling in the laboratory.

11.2.3 Refer to Method 8270 for additional quality control considerations.

12.0 METHOD PERFORMANCE

12.1 Method performance evaluation: Evaluation of analytical procedures for a selected series of compounds must include the sample-preparation procedures and each associated analytical determination. The analytical procedures should be challenged by the test compounds spiked at appropriate levels and carried through the procedures.

12.2 Method detection limit: The overall method detection limits (lower and upper) must be determined on a compound-by-compound basis because different compounds may exhibit different collection, retention, and extraction efficiencies as well as instrumental minimum detection limit (MDL). The method detection limit must be quoted relative to a given sample volume. The upper limits for the method must be determined relative to compound retention volumes (breakthrough).

12.3 Method precision and bias: The overall method precision and bias must be determined on a compound-by-compound basis at a given concentration level. The method precision value would include a combined variability due to sampling, sample preparation, and instrumental analysis. The method bias would be dependent upon the collection, retention, and extraction efficiency of the train components. From evaluation studies to date using a dynamic spiking system, method biases of -13% and -16% have been determined for toluene and 1,1,2,2-tetrachloroethane, respectively. A precision of 19.9% was calculated from a field test data set representing seven degrees of freedom which resulted from a series of paired, unspiked Semivolatile Organic Sampling trains (Semi-VOST) sampling emissions from a hazardous waste incinerator.

13.0 REFERENCES

1. Addendum to Specifications for Incinerator Testing at Federal Facilities, PHS, NCAPC, December 6, 1967.

2. Bursey, J., Homolya, J., McAllister, R., and McGangley, J., Laboratory and Field Evaluation of the Semi-VOST Method, Vols. 1 and 2, U.S. Environmental Protection Agency, EPA/600/4-851/075A, 075B (1985).

3. Martin, R.M., Construction Details of Isokinetic Source-Sampling Equipment, Research Triangle Park, NC, U.S. Environmental Protection Agency, April 1971, PB-203 060/BE, APTD-0581, 35 pp.

4. Rom, J.J., Maintenance, Calibration, and Operation of Isokinetic Source-Sampling Equipment, Research Triangle Park, NC, U.S. Environmental Protection Agency, March 1972, PB-209 022/BE, APTD-0576, 39 pp.

5. Schlickenrieder, L.M., Adams, J.W., and Thrun, K.E., Modified Method 5 Train and Source Assessment Sampling System: Operator's Manual, U.S. Environmental Protection Agency, EPA/600/8-85/003, (1985).

6. Shigehara, R.T., Adjustments in the EPA Nomography for Different Pitot Tube Coefficients and Dry Molecular Weights, Stack Sampling News, 2:4-11 (October 1974).

7. U.S. Environmental Protection Agency, CFR 40 Part 60, Appendix A, Methods 1-5.

8. Vollaro, R.F., A Survey of Commercially Available Instrumentation for the Measurement of Low-Range Gas Velocities, Research Triangle Park, NC, U.S. Environmental Protection Agency, Emissions Measurement Branch, November 1976 (unpublished paper).

METHOD 0010, APPENDIX A

PREPARATION OF XAD-2 SORBENT RESIN

1.0 SCOPE AND APPLICATION

1.1 XAD-2 resin as supplied by the manufacturer is impregnated with a bicarbonate solution to inhibit microbial growth during storage. Both the salt solution and any residual extractable monomer and polymer species must be removed before use. The resin is prepared by a series of water and organic extractions, followed by careful drying.

2.0 EXTRACTION

2.1 Method 1: The procedure may be carried out in a giant Soxhlet extractor. An all-glass thimble containing an extra-coarse frit is used for extraction of XAD-2. The frit is recessed 10-15 mm above a crenellated ring at the bottom of the thimble to facilitate drainage. The resin must be carefully retained in the extractor cup with a glass-wool plug and stainless steel screen because it floats on methylene chloride. This process involves sequential extraction in the following order.

Solvent	Procedure
Water	Initial rinse: Place resin in a beaker, rinse once with Type II water, and discard. Fill with water a second time, let stand overnight, and discard.
Water	Extract with H_2O for 8 hr.
Methyl alcohol	Extract for 22 hr.
Methylene chloride	Extract for 22 hr.
Methylene chloride (fresh)	Extract for 22 hr.

2.2 Method 2:

2.2.1 As an alternative to Soxhlet extraction, a continuous extractor has been fabricated for the extraction sequence. This extractor has been found to be acceptable. The particular canister used for the apparatus shown in Figure A-1 contains about 500 g of finished XAD-2. Any size may be constructed; the choice is dependent on the needs of the sampling programs. The XAD-2 is held under light spring tension between a pair of coarse and fine screens. Spacers under the bottom screen allow for even distribution of clean solvent. The three-necked flask should be of sufficient size (3-liter in this case) to hold solvent

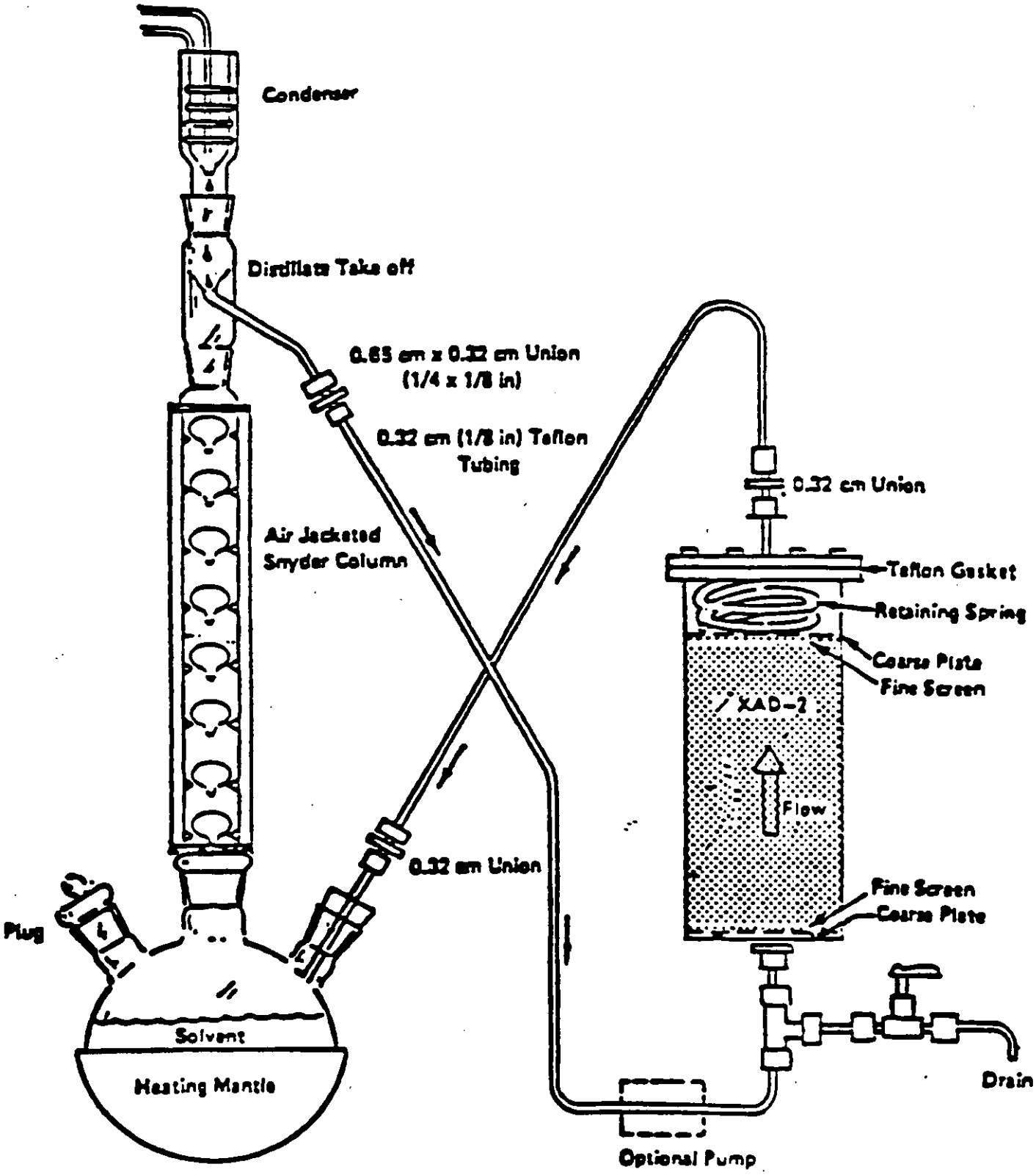

Figure A-1. XAD-2 cleanup extraction apparatus.

equal to twice the dead volume of the XAD-2 canister. Solvent is refluxed through the Snyder column, and the distillate is continuously cycled up through the XAD-2 for extraction and returned to the flask. The flow is maintained upward through the XAD-2 to allow maximum solvent contact and prevent channeling. A valve at the bottom of the canister allows removal of solvent from the canister between changes.

2.2.2 Experience has shown that it is very difficult to cycle sufficient water in this mode. Therefore the aqueous rinse is accomplished by simply flushing the canister with about 20 liters of distilled water. A small pump may be useful for pumping the water through the canister. The water extraction should be carried out at the rate of about 20-40 mL/min.

2.2.3 After draining the water, subsequent methyl alcohol and methylene chloride extractions are carried out using the refluxing apparatus. An overnight or 10- to 20-hr period is normally sufficient for each extraction.

2.2.4 All materials of construction are glass, Teflon, or stainless steel. Pumps, if used, should not contain extractable materials. Pumps are not used with methanol and methylene chloride.

3.0 DRYING

3.1 After evaluation of several methods of removing residual solvent, a fluidized-bed technique has proved to be the fastest and most reliable drying method.

3.2 A simple column with suitable retainers, as shown in Figure A-2, will serve as a satisfactory column. A 10.2-cm (4-in.) Pyrex pipe 0.6 m (2 ft) long will hold all of the XAD-2 from the extractor shown in Figure A-1 or the Soxhlet extractor, with sufficient space for fluidizing the bed while generating a minimum resin load at the exit of the column.

3.3 Method 1: The gas used to remove the solvent is the key to preserving the cleanliness of the XAD-2. Liquid nitrogen from a standard commercial liquid nitrogen cylinder has routinely proved to be a reliable source of large volumes of gas free from organic contaminants. The liquid nitrogen cylinder is connected to the column by a length of precleaned 0.95-cm (3/8-in.) copper tubing, coiled to pass through a heat source. As nitrogen is bled from the cylinder, it is vaporized in the heat source and passes through the column. A convenient heat source is a water bath heated from a steam line. The final nitrogen temperature should only be warm to the touch and not over 40°C. Experience has shown that about 500 g of XAD-2 may be dried overnight by consuming a full 160-liter cylinder of liquid nitrogen.

3.4 Method 2: As a second choice, high-purity tank nitrogen may be used to dry the XAD-2. The high-purity nitrogen must first be passed through a bed

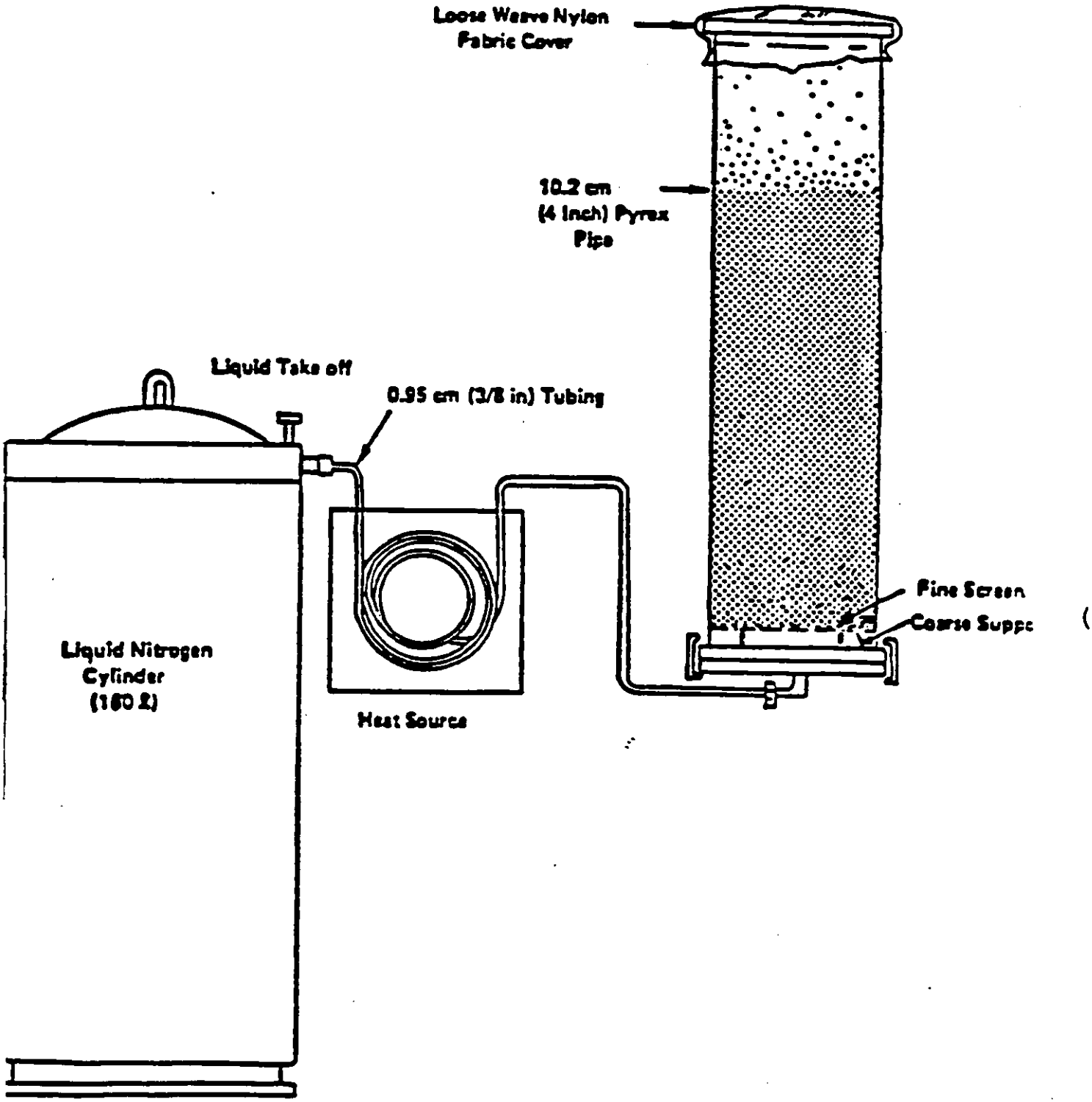

Figure A-2. XAD-2 fluidized-bed drying apparatus.

resin will float out unless well plugged.) The thimble containing the resin is extracted for 24 hr with 200-mL of pesticide- grade methylene chloride (Burdick and Jackson pesticide-grade or equivalent purity). The 200-mL extract is reduced in volume to 10-mL using a Kuderna-Danish concentrator and/or a nitrogen evaporation stream. Five uL of that solution are analyzed by gas chromatography using the TCO analysis procedure. The concentrated solution should not contain >20 ug/mL of TCO extracted from the XAD-2. This is equivalent to 10 ug/g of TCO in the XAD-2 and would correspond to 1.3 mg of TCO in the extract of the 130-g XAD-2 module. Care should be taken to correct the TCO data for a solvent blank prepared (200 mL reduced to 10 mL) in a similar manner.

4.4.2 Experimental: Use the TCO analysis conditions described in the revised Level 1 manual (EPA 600/7-78-201).

4.5 GC/MS Screen: The extract, as prepared in paragraph 4.4.1, is subjected to GC/MS analysis for each of the individual compounds of interest. The GC/MS procedure is described in Chapter Four, Method 8270. The extract is screened at the MDL of each compound. The presence of any compound at a concentration >25 ug/mL in the concentrated extract will require the XAD-2 to be recleaned by repeating the methylene chloride step.

4.6 Methodology for residual gravimetric determination: After the TCO value and GC/MS data are obtained for the resin batch by the above procedures, dry the remainder of the extract in a tared vessel. There must be <0.5 mg residue registered or the batch of resin will have to be extracted with fresh methylene chloride again until it meets this criterion. This level corresponds to 25 ug/g in the XAD-2, or about 3.25 mg in a resin charge of 130 g.

METHOD 0010, APPENDIX B

TOTAL CHROMATOGRAPHABLE ORGANIC MATERIAL ANALYSIS

1.0 SCOPE AND APPLICATION

1.1 In this procedure, gas chromatography is used to determine the quantity of lower boiling hydrocarbons (boiling points between 90° and 300°C) in the concentrates of all organic solvent rinses, XAD-2 resin and LC fractions - when Method 1 is used (see References, Method 0010) - encountered in Level 1 environmental sample analyses. Data obtained using this procedure serve a twofold purpose. First, the total quantity of the lower boiling hydrocarbons in the sample is determined. Then whenever the hydrocarbon concentrations in the original concentrates exceed 75 ug/m^3, the chromatography results are reexamined to determine the amounts of individual species.

The extent of compound identification is limited to representing all materials as normal alkanes based upon comparison of boiling points. Thus the method is not qualitative. In a similar manner, the analysis is semiquantitative; calibrations are prepared using only one hydrocarbon. They are replicated but samples routinely are not.

1.2 Application: This procedure applies solely to the Level 1 C7-C16 gas chromatographic analysis of concentrates of organic extracts, neat liquids, and of LC fractions. Throughout the procedure, it is assumed the analyst has been given a properly prepared sample.

1.3 Sensitivity: The sensitivity of this procedure, defined as the slope of a plot of response versus concentration, is dependent on the instrument and must be verified regularly. TRW experience indicates the nominal range is of the order of 77 uV·V·sec·uL/ng of n-heptane and 79 uV·sec·ul/ng of n-hexadecane. The instrument is capable of perhaps one hundredfold greater sensitivity. The level specified here is sufficient for Level 1 analysis.

1.4 Detection limit: The detection limit of this procedure as written is 1.3 ng/uL for a 1 uL injection of n-decane. This limit is arbitrarily based on defining the minimum detectable response as 100 uv·sec. This is an easier operational definition than defining the minimum detection limit to be that amount of material which yields a signal twice the noise level.

1.5 Range: The range of the procedure will be concentrations of 1.3 ng/uL and greater.

1.6 Limitations

1.6.1 Reporting limitations: It should be noted that a typical environmental sample will contain compounds which: (a) will not elute in the specified boiling ranges and thus will not be reported, and/or (b)

will not elute from the column at all and thus will not be reported. Consequently, the organic content of the sample as reported is a lower bound and should be regarded as such.

1.6.2 Calibration limitations: Quantitation is based on calibration with n-decane. Data should therefore be reported as, e.g., mg C8/m^3 as n-decane. Since response varies linearly with carbon number (over a wide range the assumption may involve a 20% error), it is clear that heptane (C7) detected in a sample and quantitated as decane will be overestimated. Likewise, hexadecane (C16) quantitated as decane will be underestimated. From previous data, it is estimated the error involved is on the order of 6-7%.

1.6.3 Detection limitations: The sensitivity of the flame ionization detector varies from compound to compound. However, n-alkanes have a greater response than other classes. Consequently, using an n-alkane as a calibrant and assuming equal responses of all other compounds tends to give low reported values.

2.0 SUMMARY OF METHOD

2.1 A mL aliquot of all 10-mL concentrates is disbursed for GC-TCO analysis. With boiling point-retention time and response-amount calibration curves, the data (peak retention times and peak areas) are interpreted by first summing peak areas in the ranges obtained from the boiling point-retention time calibration. Then, with the response-amount calibration curve, the area sums are converted to amounts of material in the reported boiling point ranges.

2.2 After the instrument is set up, the boiling point-retention time calibration is effected by injecting a mixture of n-C7 through n-C16 hydrocarbons and operating the standard temperature program. Response-quantity calibrations are accomplished by injecting n-decane in n-pentane standards and performing the standard temperature program.

2.3 Definitions

2.3.1 GC: Gas chromatography or gas chromatograph.

2.3.2 C7-C16 n-alkanes: Heptane through hexadecane.

2.3.3 GCA temperature program: 4 min isothermal at 60°C, 10°C/min from 60° to 220°C.

2.3.4 TRW temperature program: 5 min isothermal at room temperature, then program from 30°C to 250°C at 15°C/min.

3.0 INTERFERENCES

Not applicable.

4.0 APPARATUS AND MATERIALS

4.1 Gas chromatograph: This procedure is intended for use on a Varian 1860 gas chromatograph, equipped with dual flame ionization detectors and a linear temperature programmer. Any equivalent instrument can be used provided that electrometer settings, etc., be changed appropriately.

4.2 Gases:

4.2.1 Helium: Minimum quality is reactor grade. A 4A or 13X molecular sieve drying tube is required. A filter must be placed between the trap and the instrument. The trap should be recharged after every third tank of helium.

4.2.2 Air: Zero grade is satisfactory.

4.2.3 Hydrogen: Zero grade.

4.3 Syringe: Syringes are Hamilton 701N, 10 uL, or equivalent.

4.4 Septa: Septa will be of such quality as to produce very low bleed during the temperature program. An appropriate septum is Supelco Microsep 138, which is Teflon-backed. If septum bleed cannot be reduced to a negligible level, it will be necessary to install septum swingers on the instrument.

4.5 Recorder: The recorder of this procedure must be capable of not less than 1 mV full-scale display, a 1-sec time constant and 0.5 in. per min chart rate.

4.6 Integrator: An integrator is required. Peak area measurement by hand is satisfactory but too time-consuming. If manual integration is required, the method of "height times width at half height" is used.

4.7 Columns:

4.7.1 Preferred column: 6 ft x 1/8 in. O.D. stainless steel column of 10% OV-101 on 100/120 mesh Supelcoport.

4.7.2 Alternate column: 6 ft x 1/8 in. O.D. stainless steel column of 10% OV-1 (or other silicon phase) on 100/120 mesh Supelcoport.

4.8 Syringe cleaner: Hamilton syringe cleaner or equivalent connected to a suitable vacuum source.

5.0 REAGENTS

5.1 Pentane: "Distilled-in-Glass" (reg. trademark) or "Nanograde" (reg. trademark) for standards and for syringe cleaning.

5.2 Methylene chloride: "Distilled-in-Glass" (reg. trademark) or "Nanograde" (reg. trademark) for syringe cleaning.

6.0 SAMPLING HANDLING AND PRESERVATION

6.1 The extracts are concentrated in a Kuderna-Danish evaporator to a volume less than 10 mL. The concentrate is then quantitatively transferred to a 10-mL volumetric flask and diluted to volume. A 1-mL aliquot is taken for both this analysis and possible subsequent GC/MS analysis and set aside in the sample bank. For each GC-TCO analysis, obtain the sample sufficiently in advance to allow it to warm to room temperature. For example, after one analysis is started, return that sample to the sample bank and take the next sample.

7.0 PROCEDURES

7.1 Setup and checkout: Each day, the operator will verify the following:

7.1.1 That supplies of carrier gas, air and hydrogen are sufficient, i.e., that each tank contains > 100 psig.

7.1.2 That, after replacement of any gas cylinder, all connections leading to the chromatograph have been leak-checked.

7.1.3 That the carrier gas flow rate is 30 ± 2 mL/min, the hydrogen flow rate is 30 ± 2 mL/min, and the air flow rate is 300 ± 20 mL/min.

7.1.4 That the electrometer is functioning properly.

7.1.5 That the recorder and integrator are functioning properly.

7.1.6 That the septa have been leak-checked (leak-checking is effected by placing the soap bubble flow meter inlet tube over the injection port adaptors), and that no septum will be used for more than 20 injections.

7.1.7 That the list of samples to be run is ready.

7.2 Retention time calibration:

7.2.1 To obtain the temperature ranges for reporting the results of the analyses, the chromatograph is given a normal boiling point-retention time calibration. The n-alkanes, their boiling points, and data reporting ranges are given in the table below:

	NBP,°C	Reporting Range,°C	Report As
n-heptane	98	90-110	C7
n-octane	126	110-140	C8
n-nonane	151	140-160	C9
n-decane	174	160-180	C10
n-undecane	194	180-200	C11
n-dodecane	214	200-220	C12
n-tridecane	234	220-240	C13
n-tetradecane	252	240-260	C14
n-pentadecane	270	260-280	C15
n-hexadecane	288	280-300	C16

7.2.2 Preparation of standards: Preparing a mixture of the C7-C16 alkanes is required. There are two approaches: (1) use of a standards kit (e.g., Polyscience Kit) containing bottles of mixtures of selected n-alkanes which may be combined to produce a C7-C16 standard; or (2) use of bottles of the individual C7-C16 alkanes from which accurately known volumes may be taken and combined to give a C7-C16 mixture.

7.2.3 Procedure for retention time calibration: This calibration is performed at the start of an analytical program; the mixture is chromatographed at the start of each day. To attain the required retention time precision, both the carrier gas flow rate and the temperature program specifications must be observed. Details of the procedure depend on the instrument being used. The general procedure is as follows:

7.2.3.1 Set the programmer upper limit at 250°C. If this setting does not produce a column temperature of 250°C, find the correct setting.

7.2.3.2 Set the programmer lower limit at 30°C.

7.2.3.3 Verify that the instrument and samples are at room temperature.

7.2.3.4 Inject 1 uL of the n-alkane mixture.

7.2.3.5 Start the integrator and recorder.

7.2.3.6 Allow the instrument to run isothermally at room temperature for five min.

7.2.3.7 Shut the oven door.

7.2.3.8 Change the mode to Automatic and start the temperature program.

7.2.3.9 Repeat Steps 1-9 a sufficient number of times so that the relative standard deviation of the retention times for each peak is <5%.

7.3 Response calibration:

7.3.1 For the purposes of a Level 1 analysis, response-quantity calibration with n-decane is adequate. A 10-uL volume of n-decane is injected into a tared 10 mL volumetric flask. The weight injected is obtained and the flask is diluted to the mark with n-pentane. This standard contains about 730 ng n-decane per uL n-pentane. The exact concentration depends on temperature, so that a weight is required. Two serial tenfold dilutions are made from this standard, giving standards at about 730, 73, and 7.3 ng n-decane per uL n-pentane, respectively.

7.3.2 Procedure for response calibration: This calibration is performed at the start of an analytical program and monthly thereafter. The most concentrated standard is injected once each day. Any change in calibration necessitates a full calibration with new standards. Standards are stored in the refrigerator locker and are made up monthly.

7.3.2.1 Verify that the instrument is set up properly.

7.3.2.2 Set electrometer at 1×10^{-10} A/mV.

7.3.2.3 Inject 1 uL of the highest concentration standard.

7.3.2.4 Run standard temperature program as specified above.

7.3.2.5 Clean syringe.

7.3.2.6 Make repeated injections of all three standards until the relative standard deviations of the areas of each standard are ≤5%.

7.4 Sample analysis procedure:

7.4.1 The following apparatus is required:

7.4.1.1 Gas chromatograph set up and working.

7.4.1.2 Recorder, integrator working.

7.4.1.3 Syringe and syringe cleaning apparatus.

7.4.1.4 Parameters: Electrometer setting is 1×10^{-10} A/mV; recorder is set at 0.5 in./min and 1 mV full-scale.

7.4.2 Steps in the procedure are:

7.4.2.1 Label chromatogram with the data, sample number, etc.

7.7.1.2 Plot average retention times as abscissae versus normal boiling points as ordinates.

7.7.1.3 Draw in calibration curve.

7.7.1.4 Locate and record retention times corresonding to boiling ranges 90-100, 110-140, 140-160, 160-180, 180-200, 200-220, 220-240, 240-260, 260-280, 280-300°C.

7.7.2 **Response-amount calibration:** The required data for this calibration are on the chromatogram and on the data sheet. The data reduction is performed as follows:

7.7.2.1 Average the area responses of each standard and calculate relative standard deviations.

7.7.2.2 Plot response (uv·sec) as ordinate versus ng/uL as abscissa.

7.7.2.3 Draw in the curve. Perform least squares regression and obtain slope (uV·sec·uL/ng).

7.7.3 **Total C7-C16 hydrocarbons analysis:** The required data for this calculation are on the chromatogram and on the data sheet. The data reduction is performed as follows:

7.7.3.1 Sum the areas of all peaks within the retention time range of interest.

7.7.3.2 Convert this area (uV·sec) to ng/uL by dividing by the weight response for n-decane (uV·sec.uL/ng).

7.7.3.3 Multiply this weight by the total concentrate volume (10 mL) to get the weight of the C7-C16 hydrocarbons in the sample.

7.7.3.4 Using the volume of gas sampled or the total weight of sample acquired, convert the result of Step 7.7.3.3 above to ug/m^3.

7.7.3.5 If the value of total C7-C16 hydrocarbons from Step 7.7.3.4 above exceeds 75 ug/m^3, calculate individual hydrocarbon concentrations in accordance with the instructions in Paragraph 7.7.5.5 below.

7.7.4 **Individual C7-C16 n-Alkane Equivalent Analysis:** The required data from the analyses are on the chromatogram and on the data sheet. The data reduction is performed as follows:

7.7.4.1 Sum the areas of peaks in the proper retention time ranges.

vp_{twb} = Vapor pressure at T_{wb}, IN. HG

$\overline{\Delta H}$ = Average pressure differential across the orifice meter, IN. WC.

ΔP = Velocity pressure of stack gas, IN. WC.

γ = Dry test meter correction coefficient, dimensionless

ρ = Actual gas density, LB/ACF

Method 25A

Total Gaseous Organics Calculation Equations

$$GR\ C/SCF = 2.180 \times 10^{-4}\ (ppm,w)$$

$$GR\ C/DSCF = 2.180 \times 10^{-4}\ (ppm,w)/(1 - MC/100)$$

$$LB\ C/HR = 8.5714 \times 10^{-3}\ (GR/DSCF)\ (DSCFM)$$

where:

GR C/SCF = grains of total gaseous organics as carbon per actual (wet) standard cubic foot

GR C/DSCF = grains of total gaseous organics as carbon per dry standard cubic foot

LB C/HR = pounds of total gaseous organics as carbon emitted per hour

Note 1: The Ratfisch Model RS55 Heated FID Analyzer as normally operated with a heated filter, heated sample line and heated detector oven gives ppm,w.

Note 2: ppm,C = ppm as carbon = ppm methane