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**RESULTS OF THE AUGUST 17-19, 1993
AIR EMISSION COMPLIANCE TESTS
AT THE LOUISIANA PACIFIC WAFERBOARD
PLANT IN TOMAHAWK, WISCONSIN**

Submitted to:

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ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10 ⁶ BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm ³	milligrams per dry standard cubic meter
ug/Nm ³	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	≤ (when following a number)

Standard conditions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

1 INTRODUCTION

During the Period August 17 - 19, 1993 Interpoll Laboratories personnel conducted air emission compliance tests on the Dryers, Press Vent and Thermal Oil Heater at the Louisiana Pacific Corporation (LP) Waferboard Plant located in Tomahawk, Wisconsin. On-site testing was performed by D. Van Hoeve, M. Kaehler, S. Bainville, D. Brennan, G. Hove, J. Bergstrom and K. Rosenthal. Coordination between testing activities and plant operation was provided by Sue Somers of LP. The test was witnessed by Biren Patel and Neal Baudhuin of the Wisconsin DNR.

The Dryers tested are Model 1260 TNW/L dryers manufactured by MEC Company. Particulate emissions from the wafer dryers are controlled by primary cyclones followed by secondary multicyclones. Cleaned flue gas is emitted to the atmosphere by a 100-foot high radial steel stack which has a diameter of 59 inches.

The press vents tested are the exhaust from general ventilators positioned over the board press and unloader. The press and unloader vent exhausts are emitted to the atmosphere via a common stack which has a diameter of 62.5 inches.

The Thermal Oil Heater tested was manufactured by GEKA in 1992. It is equipped with a ram-type stoker and is fired with a mixture of wet bark and wood. The unit has a design heat input capacity of 30×10^6 BTU/HR. Particulate emissions from the GEKA are controlled by a large diameter cyclone in series with a fabric filter dust collector manufactured by C.E. Preheater. The baghouse has a pulsed air cleaning system. Cleaned flue gas is emitted to the atmosphere by a 75-foot high radial steel stack which has a diameter of 42 inches.

Particulate evaluations were performed in accordance with EPA Methods 2-5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). A preliminary determination of the gas linear velocity profile was made at each test location before the first particulate determination to allow selection of 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 isokinetically 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 and analyzed in accordance with Wisconsin DNR protocol.

The oxides of nitrogen samples were collected using an all-glass Method 7 sampling train. A heated stainless steel probe was used to extract the samples from the exhaust stream. A plug of glass-wool was used in the end of the probe to remove particulate material.

The NO_x samples were collected in volume-calibrated two-liter all-glass flasks. An aliquot of 25 cc of absorbing solution was added to each flask on-site; the flask was closed; inserted into the sampling train; and evacuated. The probe was then purged and the sample collected over a 15 second interval. The flask was then closed; the flask removed from the sampling train; shook for two minutes and then secured for transport to the laboratory.

Upon arrival at the laboratory, the NO_x samples are logged in, placed in a designated area and maintained at 72 °F for 24 hours to allow completion of the conversion of NO to NO_2 and absorption in the acidified peroxide reagent. The flasks are then shook to complete absorption; attached to a mercury manometer and the static pressure and temperature recorded. The samples are then recovered and analyzed by ion chromatography.

Formaldehyde samples were collected using EPA Method 0011 (SW 846 3rd Ed.). The samples were collected isokinetically using a Method 5

sampling train with an aqueous acidic 2,4-dinitrophenylhydrazine absorbing solution and analyzed by high performance liquid chromatography.

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.

Benzene sampling was conducted in accordance with EPA Method 18 Section 7.4 using charcoal tubes. The samples were analyzed by GC/FID.

Polyaromatic hydrocarbons sampling was conducted using the EPA Modified Method 5 sampling procedure as per EPA Method 010 SW 846. The four-part sample and field blank were extracted, concentrated to 1000 μ l and cleaned up as required (column chromatography as per Interpoll. Labs Method II-8904-2 or GPC) prior to final concentration and analysis. The samples were then further concentrated to 100 μ l and analyzed in accordance with EPA Method 8270 by HRGC/LRMS using electron impact (EI) with total ion monitoring (TIM). Quantification was performed using the six standard M-8270 internal standards. Each XAD-2 resin cartridge was field spiked with 20 μ g of d_{10} -fluoranthene in order to document overall collection and analytical efficiency and recovery. Analytical accuracy and recovery for extraction and cleanup was documented using the six m-8270-recommended surrogate standards.

Phenol concentrations were determined using a Method 5 sampling train with neutral buffered absorbing reagent followed by extraction with methylene chloride and direct analysis by GC/MS with no concentration (EPA Method 8270). The samples were field spiked with 5.33 mg of phenol d_5 .

Integrated flue gas samples were extracted from the dryer and thermal oil heater exhaust gas streams using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags housed in a protective aluminum container. After sampling was complete, the bags were sealed and analyzed on site or returned to the laboratory for Orsat analysis. Prior to sampling, the Tedlar bags are leak checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable inleakage are discarded. The integrated flue gas samples collected at each test site were also analyzed for carbon monoxide in accordance with EPA Method 10 (NDIR).

Particulate, formaldehyde and total hydrocarbons testing at each of the E-Tube Inlets was conducted from two test ports oriented at 90 degrees and located on vertical sections of ducting between the primary and secondary cyclones. A 24 point traverse was used at each test site. Each traverse point was sampled 2.5 minutes for a total sampling time of 60 minutes per run.

Testing at the Dryer Stack was also conducted from two test ports oriented at 90 degrees on the stack. These test ports are located 5.0 stack diameters downstream of the nearest flow disturbance and 5.0 stack diameters upstream of the stack exit. A 20-point traverse was used to collect the particulate, formaldehyde and PAHs samples. Each traverse point was sampled 3 minutes for the particulate and formaldehyde testing to give a total sampling time of sixty minutes per run. Each traverse point was sampled 6 minutes for the PAHs sampling for a total sampling time of 120 minutes per run. A 3-point traverse was used for the benzene, phenol and THC sampling. Each traverse point was sampled for 20 minutes for a total sampling time of 60 minutes.

Testing on the Press Vent was conducted from two test ports oriented at 90 degrees on the stack. These test ports are located 3.85 stack diameters downstream of the nearest flow disturbance and 3.85 diameters upstream of the stack exit. A 24-point traverse was used to collect the

particulate and formaldehyde samples. Each traverse point was sampled 2.5 minutes for a total sampling time of 60 minutes per run.

Testing on the Thermal Oil Heater was also conducted from two test ports oriented at 90 degrees on the stack. These test ports are located 6.1 stack diameters from the nearest flow disturbance and 2.3 diameters from the stack exit. A 24-point traverse was used to collect representative samples. Each traverse point was sampled for 2.5 minutes for the particulate and formaldehyde testing to give a total sampling time of 60 minutes per run. Each traverse point was sampled 5 minutes for the PAHs testing for a total sampling time of 120 minutes per run. A 3-point traverse was used to collect the benzene and phenol samples. Each traverse point was sampled 20 minutes for a total sampling time of 60 minutes per run.

Visible emission determinations were performed on each source by G. Hove or J. Bergstrom, EPA-certified observers.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The important results of the air emission compliance tests are summarized in Tables 1 - 13. A summary of the average emission rates is presented below:

Parameter	Mass Rate		Emission Factor
	(LB/TFP)	(LB/TDF)	(LB/10 ⁶ BTU)
Particulate			
E-Tube Inlet SUR (dry + wet)	7.41	-	-
E-Tube Inlet SUR (dry)	6.51	-	-
E-Tube Inlet COR (drt + wet)	12.8	-	-
E-Tube Inlet COR (dry)	12.5	-	-
Dryer (dry + wet)	0.397	-	-
Dryer (dry)	0.292	-	-
Press (dry + wet)	0.399	-	-
Press (dry)	0.221	-	-
GEKA (dry + wet)	-	7.15	0.301
GEKA (dry)	-	6.03	0.253
Oxides of Nitrogen			
Dryer	-	3.9	-
GEKA	-	6.0	-
Carbon Monoxide			
Dryer	-	12.4	-
Press	0.083	-	-
GEKA	-	4.9	0.19
Formaldehyde			
E-TUBE Inlet (SUR)	0.052	-	-
E-TUBE Inlet (COR)	0.032	-	-
Dryer	0.13	-	-
Press	0.038	-	-
GEKA	-	0.0068	-

Parameter	Mass Rate		Emission Factor
	(LB/TFP)	(LB/TDF)	(LB/10 ⁶ BTU)
Phenol			
Dryer	<0.012	<0.060	-
Press	0.10	-	-
GEKA	-	<0.070	-
Total Hydrocarbons			
E-TUBE Inlet (SUR)	0.88	-	-
E-TUBE Inlet (COR)	0.20	-	-
Dryer	0.51	-	-
Press	0.25	-	-
GEKA	-	≤0.24	-
Benzene			
Dryer	0.0019	0.0056	-
GEKA	-	≤0.0031	-
PAHs			
Dryer	Not Detected		
GEKA	Not Detected		

No difficulties were encountered in the field by Interpoll Labs or in the laboratory evaluation of the samples which were conducted by Interpoll Labs. On the basis of this fact and a complete review of the entire data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

Table 1a. Summary of the Results of the August 17, 1993 Particulate Loading Determinations at the Face Inlet Duct at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-17-93	08-17-93	08-17-93
Time runs were done (HRS)	1540/1642	1742/1850	1922/2024
Process rate (TPP/HR)	6.56	6.56	6.56
Volumetric flow actual (ACFM)	41066	41664	41750
standard (DSCFM)	23511	22657	22680
Gas temperature (DEG-F)	236	237	234
Moisture content (%V/V)	19.78	23.69	24.00
Gas composition (%V/V, dry)			
carbon dioxide	3.00	3.40	3.80
oxygen	17.60	17.10	16.90
nitrogen	79.40	79.50	79.30
Isokinetic variation (%)	97.6	104.7	101.1
Particulate concentration actual (GR/ACF)	0.131	0.136	0.143
standard (GR/DSCF)	0.228	0.250	0.263
part. emission rate (LB/HR)	46.01	48.60	51.21
			48.60

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22949

Note: Dry + organic/inorganic wet catch

Table 1a. Summary of the Results of the August 17, 1993 Particulate Loading Determinations at the Face Inlet Duct at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-17-93	08-17-93	08-17-93
Time runs were done (HRS)	1540/1642	1742/1850	1922/2024
Process rate (TFP/HR)	6.56	6.56	6.56
Volumetric flow actual (ACFM)	41066	41664	41750
standard (DSCFM)	23511	22657	22680
Gas temperature (DEG-F)	236	237	234
Moisture content (%V/V)	19.78	23.69	24.00
Gas composition (%V/V, dry)			
carbon dioxide	3.00	3.40	3.80
oxygen	17.60	17.10	16.90
nitrogen	79.40	79.50	79.30
Isokinetic variation (%)	97.6	104.7	101.1
Particulate concentration			
actual (GR/ACF)	0.119	0.122	0.120
standard (GR/DSCF)	0.207	0.224	0.220
Part. emission rate (LB/HR)	41.80	43.45	42.83
			42.69

Note: Dry catch only

Table 1b. Summary of the Results of the August 17, 1993 Particulate Loading Determinations at the Core Inlet Duct at the Louisiana Pacific plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-17-93	08-17-93	08-17-93
Time runs were done (HRS)	1540/1641	1745/1850	1922/2030
Process rate (TFP/HR)	5.37	5.37	5.37
Volumetric flow actual (ACFM)	41120	40133	40028
standard (DSCFM)	24697	23919	24070
Gas temperature (DEG-F)	207	209	208
Moisture content (%V/V)	19.02	19.43	18.79
Gas composition (%V/V, dry)			
carbon dioxide	2.50	2.80	2.60
oxygen	18.00	18.00	18.10
nitrogen	79.50	79.20	79.30
Isokinetic variation (%)	102.2	100.8	99.0
Particulate concentration			
actual (GR/ACF)	0.170	0.214	0.211
standard (GR/DSCF)	0.283	0.359	0.351
Part. emission rate (LB/HR)	59.99	73.64	72.37
			68.67

Note: Dry + organic/inorganic wet catch

Table 1b. Summary of the Results of the August 17, 1993 Particulate Loading Determinations at the Core Inlet Duct at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-17-93	08-17-93	08-17-93
Time runs were done (HRS)	1540/1641	1745/1850	1922/2030
Process rate (TFP/HR)	5.37	5.37	5.37
Volumetric flow actual (ACFM) standard (DSCFM)	41120 24697	40133 23919	40028 24070
Gas temperature (DEG-F)	207	209	208
Moisture content (%V/V)	19.02	19.43	18.79
Gas composition (%V/V.dry) carbon dioxide oxygen nitrogen	2.50 18.00 79.50	2.80 18.00 79.20	2.60 18.10 79.30
Isokinetic variation (%)	102.2	100.8	99.0
Particulate concentration actual (GR/ACF) standard (GR/DSCF)	0.167 0.277	0.209 0.351	0.206 0.343
Part. emission rate (LB/HR)	58.74	72.02	70.82
			67.19

Note: Dry catch only

Table 1c. Summary of the Results of the August 17, 1993 Particulate Emission Compliance Test on the Dryer at the Louisiana Pacific plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-17-93	08-17-93	08-17-93
Time runs were done (HRS)	1540/1722	1742/1846	1922/2025
Process rate (TFP/HR)	11.9	11.9	11.9
Volumetric flow actual (ACFM)	79033	79745	80417
standard (DSCFM)	55614	54227	54425
Gas temperature (DEG-F)	138	137	138
Moisture content (%V/V)	16.28	19.25	19.55
Gas composition (%V/V, dry)			
carbon dioxide	2.20	2.20	2.50
oxygen	18.60	18.40	18.30
nitrogen	79.20	79.40	79.20
Isokinetic variation (%)	98.0	102.2	101.5
Particulate concentration			
actual (GR/ACF)	.00685	.00763	.00632
standard (GR/DSCF)	.00973	.0112	.00934
part. emission rate (LB/HR)	4.64	5.22	4.36
(LB/TFP)	0.389	0.438	0.365

79732
54755

4.74

Note: Dry + organic/inorganic wet catch

Table 1c. Summary of the Results of the August 17, 1993 Particulate Emission Compliance Test on the Dryer at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-17-93	08-17-93	08-17-93
Time runs were done (HRS)	1540/1722	1742/1846	1922/2025
Process rate (TFP/HR)	11.9	11.9	11.9
Volumetric flow actual (ACFM)	79033	79745	80417
standard (DSCFM)	55614	54227	54425
Gas temperature (DEG-F)	138	137	138
Moisture content (%V/V)	16.28	19.25	19.55
Gas composition (%V/V, dry)			
carbon dioxide	2.20	2.20	2.50
oxygen	18.60	18.40	18.30
nitrogen	79.20	79.40	79.20
Isokinetic variation (%)	98.0	102.2	101.5
Particulate concentration			
actual (GR/ACF)	.00430	.00567	.00535
standard (GR/DSCF)	.00611	.00834	.00791
Part. emission rate (LB/HR)	2.91	3.87	3.69
(LB/TFP)	0.244	0.324	0.309

3.99

Note: Dry catch only

Table 2. Summary of the Results of the August 18, 1993 Particulate Emission Compliance Test on the Press Vent at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-18-93	08-18-93	08-18-93
Time runs were done (HRS)	1425/1528	1550/1653	1801/1904
Process rate	11.7	11.7	11.7
Volumetric flow actual standard	98674 87008	100918 88477	98989 86932
Gas temperature (DEG-F)	92	95	97
Moisture content (%V/V)	3.26	3.39	2.77
Gas composition (%V/V, dry) carbon dioxide oxygen nitrogen	0.03 20.90 79.07	0.03 20.90 79.07	0.03 20.90 79.07
Isokinetic variation (%)	101.6	101.3	99.5
Particulate concentration actual standard (GR/DSCF)	.00672 .00763	.00526 .00600	.00444 .00505
part. emission rate (LB/HR) (LB/TFP)	5.69 0.486	4.55 0.389	3.77 0.322

Note: Dry + organic/inorganic wet catch

Table 2. Summary of the Results of the August 18, 1993 Particulate Emission Compliance Test on the Press Vent at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-18-93	08-18-93	08-18-93
Time runs were done (HRS)	1425/1528	1550/1653	1801/1904
Process rate (TFP/HR)	11.7	11.7	11.7
Volumetric flow actual (ACFM)	98674	100918	98989
standard (DSCFM)	87008	88477	86932
Gas temperature (DEG-F)	92	95	97
Moisture content (%V/V)	3.26	3.39	2.77
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 (%)	101.6	101.3	99.5
Particulate concentration			
actual (GR/ACF)	.00353	.00327	.00229
standard (GR/DSCF)	.00400	.00373	.00261
Part. emission rate (LB/HR)	2.98	2.83	1.94
(LB/TFP)	0.255	0.242	0.166

Note: Dry catch only

Table 3. Summary of the Results of the August 19, 1993 Particulate Emission Compliance Test on the GEKA Thermal Oil Heater at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-19-93	08-19-93	08-19-93
Time runs were done (HRS)	1255/1359	1600/1701	1745/1850
Process rate (TDF/HR)	0.8	0.8	0.8
Volumetric flow actual standard (ACFM) (DSCFM)	33854 19839	31250 18315	31924 18778
Gas temperature (DEG-F)	340	337	337
Moisture content (%V/V)	6.68	7.04	6.73
Gas composition (%V/V, dry) carbon dioxide oxygen nitrogen	3.00 17.80 79.20	3.10 17.70 79.20	3.00 17.90 79.10
Isokinetic variation (%)	100.0	100.8	99.9
Particulate concentration actual standard (GR/ACF) (GR/DSCF)	.0210 .0358	.0197 .0337	.0187 .0319
Part. emission rate (LB/HR) (LB/TDF)	6.09 7.91	5.29 6.87	5.13 6.66
Part. emission factor (LB/106BTU)	0.319	0.291	0.293

5.50

Note: Dry + organic/inorganic wet catch

Emission Factor calculated using the dry oxygen F-Factor method (F-Factor = 9240 DSCF/106BTU)

Table 3. Summary of the Results of the August 19, 1993 Particulate Emission Compliance Test on the GEKA Thermal Oil Heater at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	08-19-93	08-19-93	08-19-93
Time runs were done (HRS)	1255/1359	1600/1701	1745/1850
Process rate (TDF/HR)	0.8	0.8	0.8
Volumetric flow actual (ACFM) standard (DSCFM)	33854 19839	31250 18315	31924 18778
Gas temperature (DEG-F)	340	337	337
Moisture content (%V/V)	6.68	7.04	6.73
Gas composition (%V/V, dry) carbon dioxide oxygen nitrogen	3.00 17.80 79.20	3.10 17.70 79.20	3.00 17.90 79.10
Isokinetic variation (%)	100.0	100.8	99.9
Particulate concentration actual (GR/ACF) standard (GR/DSCF)	.0187 .0319	.0155 .0264	.0159 .0270
Part. emission rate (LB/HR) (LB/TDF)	5.43 7.05	4.14 5.38	4.35 5.65
Part. emission factor (LB/106BTU)	0.284	0.228	0.248

Note: Dry catch only

Emission Factor calculated using the dry oxygen F-Factor method (F-Factor = 9240 DSCF/10⁶BTU)

Table 4. Summary of the Oxides of Nitrogen Emission Determinations at the Louisiana Pacific Waferboard Plant in Tomahawk, Wisconsin.

	Concentration	Emission Rate	
Time	(ppm,d)	(LB/HR)	(LB/TDF)
(Dryer 8/17/93)			
0900-1006	21	8.2	3.7
1103-1206	25	9.7	4.4
1335-1447	21	8.3	3.7
Avg.	22	8.7	3.9
(GEKA 8/19/93)			
1255-1359	36	5.2	6.8
1600-1701	32	4.2	5.5
1745-1850	32	4.2	5.6
Avg.	33	4.6	6.0

Note: TDF = Tons Dry Fuel (Dryer test = 2.22 TDF/HR, GEKA Test 0.77 TDF/HR)

Table 5. Summary of the Carbon Monoxide Emission Determinations at the Louisiana Pacific Waferboard Plant in Tomahawk, Wisconsin.

Time	Concentration (ppm,d)	Emission Rate (LB/HR)(LB/TDF)		Emission Factor (LB/10 ⁶ BTU)
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(Dryer 8/17/93)

1540-1722	105	25	10.5	NA
1742-1845	134	32	13.4	NA
1922-2025	135	32	12.4	NA
Avg.	125	30	12.4	NA

(GEKA 8/19/93)

1255-1359	42	3.6	5.0	0.18
1600-1701	45	3.6	5.0	0.20
1745-1850	40	3.3	4.8	0.19
Avg.	42	3.5	4.9	0.19

Time	Concentration (ppm,d)	Emission Rate (LB/HR)(LB/TFP)		Emission Factor (LB/10 ⁶ BTU)
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(Press 8/18/93)

1625-1626	2.7	1.0	0.085	NA
1650-1653	2.6	1.0	0.085	NA
1801-1901	2.4	0.91	0.078	NA
Avg.	2.6	0.97	0.083	NA

Note: TDF = Tons Dry Fuel (Dryer test = 2.38 TDF/HR, GEKA Test 0.72 TDF/HR) TFP = Tons Finished Product (Press Test. 11.7 TFP/HR)

Table 6. Summary of the Formaldehyde Emission Determinations at the Louisiana Pacific Waferboard Plant in Tomahawk, Wisconsin.

Time	Concentration	Emission Rate	
	(ppm,d)	(LB/HR)	(LB/TFP)
(E-Tube Inlet Surface Dryer 8/17/93)			
0900-1003	4.3	0.47	0.074
1103-1207	1.3	0.14	0.022
1345-1448	3.5	0.39	0.061
Avg.	3.0	0.33	0.052
(E-Tube Inlet Core Dryer 8/17/93)			
0900-1008	1.7	0.19	0.036
1105-1207	1.6	0.18	0.034
1345-1448	1.2	0.14	0.027
Avg.	1.5	0.17	0.032
(Dryer Stack 8/17/93)			
0900-1006	6.2	1.6	0.14
1103-1206	6.4	1.7	0.14
1345-1447	4.2	1.1	0.095
Avg.	5.6	1.5	0.13
(Press Vent 8/18/93)			
0940-1045	1.2	0.50	0.043
1115-1220	0.56	0.23	0.020
1245-1348	1.4	0.58	0.050
Avg.	1.1	0.44	0.038

Note: TFP = Tons Finished Product (SUR Dryer 6.35 TFP/HR, COR Dryer 5.23 TFP/HR, Dryer Stack 11.52 TFP/HR, Press 11.7 TFP/HR)

Table 7. Summary of the Formaldehyde Emission Determinations at the Louisiana Pacific Waferboard Plant in Tomahawk, Wisconsin.

<u>Time</u>	<u>Concentration</u>	<u>Emission Rate</u>	
	(ppm,d)	(LB/HR)	(LB/TDF)
(GEKA 8/18/93)			
0757-0905	0.05	0.0045	0.0058
0955-1058	0.03	0.0027	0.0035
<u>1118-1221</u>	<u>0.10</u>	<u>0.0053</u>	<u>0.011</u>
Avg.	0.06	0.0053	0.0068

Note: TDF = Tons Dry Fuel (GEKA - 0.77 TDF/HR)

Table 8. Summary of the Phenol Emission Determinations at the Louisiana Pacific Waferboard Plant in Tomahawk, Wisconsin.

Time	Concentration (ppm,d)	Emission Rate		
		(LB/HR)	(LB/TFP)	(LB/TDF)
(Dryer 8/18/93)				
0800-0900	<0.18	<0.14	<0.012	<0.060
0910-1010	<0.18	<0.14	<0.012	<0.060
1015-1115	<0.18	<0.14	<0.012	<0.060
Avg.	<0.18	<0.14	<0.012	<0.060
(Press 8/18/93)				
0945-1045	1.0	1.04	0.089	NA
1105-1205	1.0	1.43	0.12	NA
1210-1310	1.0	1.14	0.097	NA
Avg.	1.0	1.20	0.10	
(GEKA 8/18/93)				
0900-1000	<0.17	<0.050	NA	<0.069
1045-1145	<0.17	<0.051	NA	<0.071
1210-1310	<0.17	<0.051	NA	<0.071
Avg.	<0.17	<0.051		<0.070

Note: TDF = Tons Dry Fuel (Dryer 2.32 TDF/HR, GEKA 0.72 TDF/HR) TFP = Tons Finished Product (Dryer 12.00 TFP/HR, Press 11.7 TFP/HR)

Table 9. Summary of the Total Hydrocarbons Emission Determinations at the Louisiana Pacific Waferboard Plant in Tomahawk, Wisconsin.

	Concentration	Emission Rate	
Time	(ppmC.w)	(LBC/HR)	(LBC/TFP)
(E-Tube Inlet Surface Dryer 8/17/93)			
1030-1130	123	6.77	1.02
1205-1306	113	6.27	0.94
1350-1523	81	4.43	0.67
Avg.	106	5.84	0.88
(E-Tube Inlet Core Dryer 8/17/93)			
1030-1130	21	1.18	0.22
1205-1306	26	1.46	0.27
1350-1523	11	0.63	0.12
Avg.	19	1.09	0.20
(Dryer Stack 8/17/93)			
1030-1130	48	5.96	0.49
1205-1306	50	6.35	0.52
1350-1523	50	6.35	0.53
Avg.	49	6.22	0.51
(Press Vent 8/18/93)			
1120-1220	18	3.06	0.26
1225-1325	18	3.09	0.26
1335-1435	16	2.77	0.24
Avg.	17	2.97	0.25

Note: TFP = Tons Finished Product (SUR Dryer 6.66 TFP/HR, COR Dryer 5.45 TFP/HR, Dryer Stack 12.10 TFP/HR, Press 11.7 TFP/HR)

Table 10. Summary of the Total Hydrocarbons Emission Determinations at the Louisiana Pacific Waferboard Plant in Tomahawk, Wisconsin.

<u>Time</u>	<u>Concentration</u>	<u>Emission Rate</u>	
	(ppm,d)	(LB/HR)	(LB/TDF)
(GEKA 8/19/93)			
0840-0940	7.5	0.29	0.36
0955-1055	<3.0	<0.12	<0.16
1102-1206	3.8	0.15	0.19
Avg.	≤4.8	≤0.19	≤0.24

Note: TDF = Tons Dry Fuel (GEKA test = 0.77 TDF/HR)

Table 11. Summary of the Benzene Emission Determinations at the Louisiana Pacific Waferboard Plant in Tomahawk, Wisconsin.

Time	Concentration (ppm,d)	Emission Rate		
		(LB/HR)	(LB/TFP)	(LB/TDF)
(Dryer 8/17/93)				
1540-1632	0.022	0.015	0.0013	0.0063
1742-1846	0.027	0.018	0.0015	0.0076
1922-2025	0.053	0.035	0.0029	0.0029
Avg.	0.034	0.023	0.0019	0.0056
(GEKA 8/19/93)				
0757-0905	<0.0098	<0.0023	NA	<0.0031
0955-1058	<0.0098	<0.0024	NA	<0.0031
1118-1221	<0.0099	<0.0024	NA	<0.0031
Avg.	<0.0098	<0.0024		<0.0031

0.015

0.0027

Note: TFP = Tons Finished Product (Dryer Test 11.93 TFP/HR)
TDF = Tons Dry Fuel (Dryer Test 2.38 TDF/HR, GEKA test - 0.77 TDF/HR)

Table 12 Summary of the Results of the August 17, 1993 PAH Determinations on the Dryer at the Louisiana Pacific Corporation Plant in Tomahawk, Wisconsin.

Item	RUN 1	RUN 2	RUN 3
(Concentration ug/Nm ³)			
Benzo-a-anthracene	.59<	.61<	.6<
Benzo-b-fluoranthene	.32<	.33<	.33<
✓ Benzo-a-pyrene	.38<	.4<	.39<
Dibenzo-a,h-anthracene	.28<	.29<	.28<
Indeno,1,2,3-pyrene	.29<	.3<	.29<
Dibenzo-a,i-pyrene	6.4<	6.7<	6.5<
Dibenzo-a,h-acridine	4.8<	5<	4.9<
Dibenzo-a,j-acridine	.51<	.53<	.52<
7H-Dibenzo-c,g-carbazole	.38<	.4<	.39<
Dibenzo-a,h-pyrene	6.4<	6.7<	6.5<
(Emission Rate 10 ⁻⁶ g/sec)			
Benzo-a-anthracene	15<	15<	15<
Benzo-b-fluoranthene	8.3<	8.4<	8.5<
✓ Benzo-a-pyrene	10<	10<	10<
Dibenzo-a,h-anthracene	7.2<	7.3<	7.3<
Indeno,1,2,3-pyrene	7.5<	7.6<	7.5<
Dibenzo-a,i-pyrene	166<	169<	169<
Dibenzo-a,h-acridine	125<	126<	127<
Dibenzo-a,j-acridine	13<	13<	14<
7H-Dibenzo-c,g-carbazole	10<	10<	10<
Dibenzo-a,h-pyrene	166<	169<	169<

Table 13 Summary of the Results of the August 19, 1993 PAH Determinations on the GEKA at the Louisiana Pacific Corporation Plant in Tomahawk, Wisconsin.

Item	RUN 1	RUN 2	RUN 3
(Concentration ug/Nm ³)			
Benzo-a-anthracene	.25<	.24<	.24<
Benzo-b-fluoranthene	.14<	.14<	.13<
Benzo-a-pyrene	.17<	.16<	.15<
Dibenzo-a,h-anthracene	.12<	.12<	.11<
Indeno,1,2,3-pyrene	.12<	.12<	.12<
Dibenzo-a,i-pyrene	2.8<	2.7<	2.6<
Dibenzo-a,h-acridine	2.1<	2.0<	2<
Dibenzo-a,j-acridine	.22<	.22<	.21<
7H-Dibenzo-c,g-carbazole	.17<	.16<	.16<
Dibenzo-a,h-pyrene	2.3<	2.7<	2.6<
(Emission Rate 10 ⁻⁶ g/sec)			
Benzo-a-anthracene	2.3<	2.3<	2.2<
Benzo-b-fluoranthene	1.3<	1.3<	1.2<
Benzo-a-pyrene	1.6<	1.5<	1.5<
Dibenzo-a,h-anthracene	1.1<	1.1<	1.1<
Indeno,1,2,3-pyrene	1.2<	1.1<	1.1<
Dibenzo-a,i-pyrene	20<	25<	25<
Dibenzo-a,h-acridine	19<	19<	19<
Dibenzo-a,j-acridine	2.1<	2.0<	2<
7H-Dibenzo-c,g-carbazole	1.6<	1.5<	1.5<
Dibenzo-a,h-pyrene	20<	25<	25<

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition (orsat and moisture) are presented first followed by the computer printout of the particulate, oxides of nitrogen, opacity, carbon monoxide, formaldehyde, phenol and PAHs sampling data results. 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 programs.

The emission rates have been calculated using the product of the concentration times flow method.

3.1 Results of Orsat and Moisture Determinations

Test No. 1 (Formaldehyde)
Face Inlet

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

	Run 1	Run 2	Run 3
Date of run	08-17-93	08-17-93	08-17-93

Dry basis (orsat)

carbon dioxide.....	3.40	3.20	3.00
oxygen.....	17.40	17.50	17.60
nitrogen.....	79.20	79.30	79.40

Wet basis (orsat)

carbon dioxide.....	2.68	2.48	2.42
oxygen.....	13.71	13.56	14.22
nitrogen.....	62.40	61.45	64.16
water vapor.....	21.22	22.51	19.20
Dry molecular weight.....	29.24	29.21	29.18
Wet molecular weight.....	26.86	26.69	27.04
Specific gravity.....	0.928	0.922	0.934

FO	1.029	1.062	1.100
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Test No. 1 (Formaldehyde)
Core Inlet

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

Date of run	Run 1 08-17-93	Run 2 08-17-93	Run 3 08-17-93
Dry basis (orsat)			
carbon dioxide.....	2.60	2.40	2.00
oxygen.....	18.00	18.20	18.60
nitrogen.....	79.40	79.40	79.40
Wet basis (orsat)			
carbon dioxide.....	2.13	1.95	1.61
oxygen.....	14.71	14.77	14.97
nitrogen.....	64.90	64.41	63.90
water vapor.....	18.26	18.87	19.53
Dry molecular weight.....	29.14	29.11	29.06
Wet molecular weight.....	27.10	27.01	26.90
Specific gravity.....	0.936	0.933	0.929
FO	1.115	1.125	1.150

Test No. 1 (Formaldehyde)
Dryer Stack

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

	Run 1	Run 2	Run 3
Date of run	08-17-93	08-17-93	08-17-93

Dry basis (orsat)

carbon dioxide.....	2.40	2.40	2.00
oxygen.....	18.50	18.50	18.90
nitrogen.....	79.10	79.10	79.10

Wet basis (orsat)

carbon dioxide.....	1.97	1.96	1.64
oxygen.....	15.15	15.11	15.49
nitrogen.....	64.78	64.61	64.83
water vapor.....	18.11*	18.32*	18.04*

Dry molecular weight.....	29.12	29.12	29.08
Wet molecular weight.....	27.11	27.09	27.08
Specific gravity.....	0.936	0.936	0.935

* Free or condensed water in the gas stream.

FO	1.000	1.000	1.000
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Test No. 4 (Particulate)
Face Inlet

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

Date of run	Run 1 08-17-93	Run 2 08-17-93	Run 3 08-17-93
Dry basis (orsat)			
carbon dioxide.....	3.00	3.40	3.80
oxygen.....	17.60	17.10	16.90
nitrogen.....	79.40	79.50	79.30
Wet basis (orsat)			
carbon dioxide.....	2.41	2.59	2.89
oxygen.....	14.12	13.05	12.84
nitrogen.....	63.69	60.67	60.27
water vapor.....	19.78	23.69	24.00
Dry molecular weight.....	29.18	29.23	29.28
Wet molecular weight.....	26.97	26.57	26.58
Specific gravity.....	0.932	0.918	0.918
Water mass flow.....(LB/HR)	16265	19724	20091
FO	1.100	1.118	1.053

Test No. 4 (Particulate)
Core Inlet

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

	Run 1	Run 2	Run 3
Date of run	08-17-93	08-17-93	08-17-93

Dry basis (orsat)

carbon dioxide.....	2.50	2.80	2.60
oxygen.....	18.00	18.00	18.10
nitrogen.....	79.50	79.20	79.30

Wet basis (orsat)

carbon dioxide.....	2.02	2.26	2.11
oxygen.....	14.58	14.50	14.70
nitrogen.....	64.38	63.81	64.40
water vapor.....	19.02	19.43	18.79
Dry molecular weight.....	29.12	29.17	29.14
Wet molecular weight.....	27.00	27.00	27.05
Specific gravity.....	0.933	0.933	0.934
Water mass flow.....(LB/HR)	16274	16178	15621

FO	1.160	1.036	1.077
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Test No. 4 (Particulate)
Dryer Stack

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

	Run 1	Run 2	Run 3
Date of run	08-17-93	08-17-93	08-17-93

Dry basis (orsat)

carbon dioxide.....	2.20	2.20	2.50
oxygen.....	18.60	18.40	18.30
nitrogen.....	79.20	79.40	79.20

Wet basis (orsat)

carbon dioxide.....	1.84	1.78	2.01
oxygen.....	15.57	14.86	14.72
nitrogen.....	66.31	64.11	63.71
water vapor.....	16.28	19.25*	19.55*

Dry molecular weight.....	29.10	29.09	29.13
Wet molecular weight.....	27.29	26.95	26.96
Specific gravity.....	0.943	0.931	0.931
Water mass flow.....(LB/HR)	30336	41486	41871

* Free or condensed water in the gas stream.

FO	1.045	1.136	1.040
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Test No. 6 (Phenol)
Dryer Stack

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

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93

Dry basis (orsat)

carbon dioxide.....	2.50	2.60	2.60
oxygen.....	18.20	18.20	18.20
nitrogen.....	79.30	79.20	79.20

Wet basis (orsat)

carbon dioxide.....	2.00	2.11	2.08
oxygen.....	14.53	14.79	14.57
nitrogen.....	63.30	64.38	63.40
water vapor.....	20.18	18.71	19.95
Dry molecular weight.....	29.13	29.14	29.14
Wet molecular weight.....	26.88	27.06	26.92
Specific gravity.....	0.929	0.935	0.930

FO	1.080	1.038	1.038
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Test No. 8 (Formaldehyde)
Press Vent Stack

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

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93

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.....	20.45	20.41	20.42
nitrogen.....	77.36	77.22	77.24
water vapor.....	2.16	2.34	2.31
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.61	28.59	28.59
Specific gravity.....	0.988	0.987	0.988

Test No. 9 (Phenol)
Press Vent Stack

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

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93

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.....	20.36	20.16	20.29
nitrogen.....	77.01	76.29	76.75
water vapor.....	2.60	3.52	2.94
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.56	28.46	28.52
Specific gravity.....	0.986	0.983	0.985

Test No. 11 (Particulate)
Press Vent Stack

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

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93

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.....	20.22	20.19	20.32
nitrogen.....	76.49	76.39	76.88
water vapor.....	3.26	3.39	2.77

Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.49	28.47	28.54
Specific gravity.....	0.984	0.984	0.986
Water mass flow.....(LB/HR)	8224	8720	6956

Test No. 12
GEKA Stack

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

	Run 1	Run 2	Run 3
Date of run	08-19-93	08-19-93	08-19-93

Dry basis (orsat)

carbon dioxide.....	3.00	3.10	3.00
oxygen.....	17.80	17.70	17.90
nitrogen.....	79.20	79.20	79.10

Wet basis (orsat)

carbon dioxide.....	2.80	2.88	2.80
oxygen.....	16.61	16.45	16.69
nitrogen.....	73.91	73.62	73.77
water vapor.....	6.68	7.04	6.73

Dry molecular weight.....	29.19	29.20	29.20
Wet molecular weight.....	28.44	28.42	28.44
Specific gravity.....	0.983	0.982	0.982
Water mass flow.....(LB/HR)	3985	3891	3802

FO	1.033	1.032	1.000
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Test No. 13 (PAHs)
Geka Stack

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

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93

Dry basis (orsat)

carbon dioxide.....	3.00	3.10	3.20
oxygen.....	17.80	17.70	17.60
nitrogen.....	79.20	79.20	79.20

Wet basis (orsat)

carbon dioxide.....	2.79	2.89	2.99
oxygen.....	16.56	16.48	16.42
nitrogen.....	73.68	73.76	73.91
water vapor.....	6.97	6.87	6.68
Dry molecular weight.....	29.19	29.20	29.22
Wet molecular weight.....	28.41	28.43	28.47
Specific gravity.....	0.981	0.982	0.983

FO	1.033	1.032	1.031
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Test No. 18 (Formaldehyde)
Geka Stack

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

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93

Dry basis (orsat)

carbon dioxide.....	3.20	3.30	3.20
oxygen.....	17.50	17.40	17.60
nitrogen.....	79.30	79.30	79.20

Wet basis (orsat)

carbon dioxide.....	3.00	3.10	2.99
oxygen.....	16.39	16.34	16.42
nitrogen.....	74.27	74.47	73.90
water vapor.....	6.34	6.09	6.69
Dry molecular weight.....	29.21	29.22	29.22
Wet molecular weight.....	28.50	28.54	28.47
Specific gravity.....	0.985	0.986	0.983

FO	1.062	1.061	1.031
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3.2 Results of Particulate Determinations

Test No. 4
Face Inlet

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

	Run 1 08-17-93	Run 2 08-17-93	Run 3 08-17-93
Date of run			
Time run start/end.....(HRS)	1540/1642	1742/1850	1922/2024
Static pressure.....(IN.WC)	-6.00	-6.00	-6.00
Cross sectional area (SQ.FT)	9.39	9.39	9.39
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	135.0	174.0	172.0
desiccant.....(GRAMS)	8.0	12.0	11.0
total.....(GRAMS)	143.0	186.0	183.0
Total particulate material..collected(grams)	0.4045	0.4583	0.4664
Gas meter coefficient.....	1.0006	1.0006	1.0006
Barometric pressure..(IN.HG)	28.57	28.57	28.57
Avg. orif.pres.drop..(IN.WC)	0.78	0.83	0.79
Avg. gas meter temp..(DEF-F)	94.5	96.2	96.7
Volume through gas meter....			
at meter conditions...(CF)	30.00	31.10	30.10
standard conditions.(DSCF)	27.34	28.26	27.32
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.185	.185	.185
Avg.stack gas temp ..(DEG-F)	236	237	234
Volumetric flow rate.....			
actual.....(ACFM)	41066	41664	41750
dry standard.....(DSCFM)	23511	22657	22680
Isokinetic variation.....(%)	97.6	104.7	101.1
Particulate concentration...			
actual.....(GR/ACF)	0.13066	0.13603	0.14303
dry standard.....(GR/DSCF)	0.22831	0.25026	0.26341
Particle mass rate...(LB/HR)	46.009	48.600	51.206

Test No. 4
Core Inlet

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

	Run 1 08-17-93	Run 2 08-17-93	Run 3 08-17-93
Date of run			
Time run start/end.....(HRS)	1540/1641	1745/1850	1922/2030
Static pressure.....(IN.WC)	-7.10	-7.10	-7.10
Cross sectional area (SQ.FT)	9.39	9.39	9.39
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	130.0	147.0	140.0
desiccant.....(GRAMS)	28.0	8.0	7.0
total.....(GRAMS)	158.0	155.0	147.0
Total particulate material..collected(grams)	0.5824	0.7055	0.6810
Gas meter coefficient.....	1.0075	1.0075	1.0057
Barometric pressure..(IN.HG)	28.57	28.57	28.57
Avg. orif.pres.drop..(IN.WC)	1.03	0.93	0.93
Avg. gas meter temp..(DEF-F)	93.7	95.0	96.1
Volume through gas meter....			
at meter conditions...(CF)	34.49	33.05	32.79
standard conditions.(DSCF)	31.71	30.31	29.96
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.190	.190	.190
Avg.stack gas temp ..(DEG-F)	207	209	208
Volumetric flow rate.....			
actual.....(ACFM)	41120	40133	40028
dry standard.....(DSCFM)	24697	23919	24070
Isokinetic variation.....(%)	102.2	100.8	99.0
Particulate concentration...			
actual.....(GR/ACF)	0.17013	0.21398	0.21084
dry standard.....(GR/DSCF)	0.28338	0.35916	0.35076
Particle mass rate...(LB/HR)	59.988	73.636	72.366

Test No. 4
Dryer Stack

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

	Run 1 08-17-93	Run 2 08-17-93	Run 3 08-17-93
Date of run			
Time run start/end.....(HRS)	1540/1722	1742/1846	1922/2025
Static pressure.....(IN.WC)	-0.90	-0.90	-0.90
Cross sectional area (SQ.FT)	18.99	18.99	18.99
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	197.0	286.0	295.0
desiccant.....(GRAMS)	26.0	32.0	24.0
total.....(GRAMS)	223.0	318.0	319.0
Total particulate material..collected(grams)	0.0341	0.0400	0.0332
Gas meter coefficient.....	0.9952	0.9952	0.9952
Barometric pressure..(IN.HG)	28.57	28.57	28.57
Avg. orif.pres.drop..(IN.WC)	2.80	2.91	2.90
Avg. gas meter temp..(DEF-F)	94.3	98.3	99.9
Volume through gas meter....			
at meter conditions...(CF)	59.33	60.74	60.76
standard conditions.(DSCF)	54.07	54.97	54.84
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.240	.240	.240
Avg.stack gas temp ..(DEG-F)	138	137	138
Volumetric flow rate.....			
actual.....(ACFM)	79033	79745	80417
dry standard.....(DSCFM)	55614	54227	54425
Isokinetic variation.....(%)	98.0	102.2	101.5
Particulate concentration...			
actual.....(GR/ACF)	0.00685	0.00763	0.00632
dry standard.....(GR/DSCF)	0.00973	0.01123	0.00934
Particle mass rate...(LB/HR)	4.639	5.218	4.358

Test No. 11
Press Vent Stack

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

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93
Time run start/end.....(HRS)	1425/1528	1550/1653	1801/1904
Static pressure.....(IN.WC)	-1.00	-1.00	-1.00
Cross sectional area (SQ.FT)	21.31	21.31	21.31
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	13.0	16.0	17.0
desiccant.....(GRAMS)	22.0	21.0	12.0
total.....(GRAMS)	35.0	37.0	29.0
Total particulate material..			
.....collected(grams)	0.0242	0.0193	0.0157
Gas meter coefficient.....	0.9952	0.9952	0.9952
Barometric pressure..(IN.HG)	28.60	28.60	28.60
Avg. orif.pres.drop..(IN.WC)	2.26	2.35	2.18
Avg. gas meter temp..(DEF-F)	85.0	90.6	88.8
Volume through gas meter....			
at meter conditions...(CF)	52.85	54.12	52.10
standard conditions.(DSCF)	48.97	49.65	47.93
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.190	.190	.190
Avg.stack gas temp ..(DEG-F)	92	95	97
Volumetric flow rate.....			
actual.....(ACFM)	98674	100918	98989
dry standard.....(DSCFM)	87008	88477	86932
Isokinetic variation.....(%)	101.6	101.3	99.5
Particulate concentration...			
actual.....(GR/ACF)	0.00672	0.00526	0.00444
dry standard.....(GR/DSCF)	0.00763	0.00600	0.00505
Particle mass rate...(LB/HR)	5.687	4.548	3.766

Test No. 12
GEKA Stack

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

	Run 1	Run 2	Run 3
Date of run	08-19-93	08-19-93	08-19-93
Time run start/end.....(HRS)	1255/1359	1600/1701	1745/1850
Static pressure.....(IN.WC)	-0.35	-0.35	-0.35
Cross sectional area (SQ.FT)	9.62	9.62	9.62
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	51.0	48.0	47.0
desiccant.....(GRAMS)	13.0	15.0	14.0
total.....(GRAMS)	64.0	63.0	61.0
Total particulate material..			
.....collected(grams)	0.0978	0.0856	0.0823
Gas meter coefficient.....	1.0075	1.0075	1.0075
Barometric pressure..(IN.HG)	28.50	28.50	28.50
Avg. orif.pres.drop..(IN.WC)	1.84	1.59	1.65
Avg. gas meter temp..(DEF-F)	97.9	95.0	95.5
Volume through gas meter....			
at meter conditions...(CF)	46.20	42.80	43.51
standard conditions.(DSCF)	42.14	39.22	39.84
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.250	.250	.250
Avg.stack gas temp ..(DEG-F)	340	337	337
Volumetric flow rate.....			
actual.....(ACFM)	33854	31250	31924
dry standard.....(DSCFM)	19839	18315	18778
Isokinetic variation.....(%)	100.0	100.8	99.9
Particulate concentration...			
actual.....(GR/ACF)	0.02098	0.01973	0.01874
dry standard.....(GR/DSCF)	0.03581	0.03368	0.03187
Particle mass rate...(LB/HR)	6.089	5.287	5.130

3.3 Results of Oxides of Nitrogen Determinations

Test No. 4
Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	08-17-93	08-17-93	08-17-93	08-17-93
Time of run.....(HRS)	905	915	930	940
Flask number.....	17	25	27	29
Volume of flask.....(ML)	2054	2100	2054	2068
Data: time of sampling				
flask temperature..(DEG-F)	70.00	70.00	71.00	71.00
bar. press.....(IN.HG)	28.57	28.57	28.57	28.57
flask vacuum.....(IN.HG)	26.70	26.70	26.70	26.70
flask abs. press...(IN.HG)	1.87	1.87	1.87	1.87
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.14	29.14	29.14	29.14
flask static press.(IN.HG)	-1.60	-1.80	-0.60	-1.80
flask abs. press...(IN.HG)	27.54	27.34	28.54	27.34
Volume gas sampled....(DSML)	1727	1752	1794	1725
Moisture content.....(%V/V)	16.28	16.28	16.28	16.28
Nitrate in gas sample...(JG)	93.0	98.5	94.5	87.0
NO2 in gas sample.....(JG)	69.0	73.1	70.1	64.6
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0175	0.0182	0.0171	0.0164
(MG/DSCM).....	40	42	39	37
(PPM-DRY).....	21	22	20	20
(PPM-WET).....	17	18	17	16
NOX Emission rate....(LB/HR)	8.33	8.69	8.14	7.79

Test No. 4
Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	08-17-93	08-17-93	08-17-93	08-17-93
Time of run.....(HRS)	1150	1210	1220	1240
Flask number.....	30	48	43	44
Volume of flask.....(ML)	2071	2102	2088	2090
Data: time of sampling				
flask temperature..(DEG-F)	72.00	72.00	73.00	73.00
bar. press.....(IN.HG)	28.57	28.57	28.57	28.57
flask vacuum.....(IN.HG)	26.65	26.60	26.70	26.70
flask abs. press...(IN.HG)	1.92	1.97	1.87	1.87
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press...(IN.HG)	29.14	29.14	29.14	29.14
flask static press.(IN.HG)	-3.60	-3.40	-2.30	-1.00
flask abs. press...(IN.HG)	25.54	25.74	26.84	28.14
Volume gas sampled....(DSML)	1602	1637	1708	1799
Moisture content.....(%V/V)	21.43	21.43	21.43	21.43
Nitrate in gas sample...(JG)	130.0	141.0	88.5	67.5
NO2 in gas sample.....(JG)	96.5	104.6	65.7	50.1
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0263	0.0279	0.0168	0.0122
(MG/DSCM).....	60	64	38	28
(PPM-DRY).....	31	33	20	15
(PPM-WET).....	25	26	16	11
NOX Emission rate....(LB/HR)	12.23	12.98	7.81	5.65

Test No. 4
Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	08-17-93	08-17-93	08-17-93	08-17-93
Time of run.....(HRS)	1350	1410	1430	1445
Flask number.....	46	58	73	76
Volume of flask.....(ML)	2090	2085	2065	2093
Data: time of sampling				
flask temperature..(DEG-F)	73.00	73.00	72.00	72.00
bar. press.....(IN.HG)	28.57	28.57	28.57	28.57
flask vacuum.....(IN.HG)	26.75	26.70	26.70	26.70
flask abs. press...(IN.HG)	1.82	1.87	1.87	1.87
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.14	29.14	29.14	29.14
flask static press.(IN.HG)	-2.90	-2.70	-2.60	-1.00
flask abs. press...(IN.HG)	26.24	26.44	26.54	28.14
Volume gas sampled....(DSML)	1672	1678	1669	1801
Moisture content.....(%V/V)	21.52	21.52	21.52	21.52
Nitrate in gas sample...(JG)	87.5	100.0	93.5	91.0
NO2 in gas sample.....(JG)	64.9	74.2	69.4	67.5
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0170	0.0193	0.0182	0.0164
(MG/DSCM).....	39	44	42	37
(PPM-DRY).....	20	23	22	20
(PPM-WET).....	16	18	17	15
NOx Emission rate....(LB/HR)	7.91	9.01	8.48	7.64

Test No. 12
Geka Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	08-19-93	08-19-93	08-19-93	08-19-93
Time of run.....(HRS)	1300	1315	1330	1345
Flask number.....	50	53	54	68
Volume of flask.....(ML)	2084	2083	2064	2101
Data: time of sampling				
flask temperature..(DEG-F)	73.00	73.00	73.00	73.00
bar. press.....(IN.HG)	28.50	28.50	28.50	28.50
flask vacuum.....(IN.HG)	26.20	26.20	26.20	26.30
flask abs. press...(IN.HG)	2.30	2.30	2.30	2.20
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.14	29.14	29.14	29.14
flask static press.(IN.HG)	-3.10	-2.00	-1.20	-2.40
flask abs. press...(IN.HG)	26.04	27.14	27.94	26.74
Volume gas sampled....(DSML)	1621	1695	1734	1690
Moisture content.....(%V/V)	6.68	6.68	6.68	6.68
Nitrate in gas sample...(JG)	150.0	165.0	171.0	148.0
NO2 in gas sample.....(JG)	111.3	122.4	126.9	109.8
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0300	0.0316	0.0320	0.0284
(MG/DSCM).....	69	72	73	65
(PPM-DRY).....	36	38	38	34
(PPM-WET).....	34	35	36	32
NOX Emission rate....(LB/HR)	5.10	5.37	5.44	4.83

Test No. 12
Geka Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	08-19-93	08-19-93	08-19-93	08-19-93
Time of run.....(HRS)	1600	1615	1630	1645
Flask number.....	71	72	18	37
Volume of flask.....(ML)	2038	2092	2045	2054
Data: time of sampling				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
bar. press.....(IN.HG)	28.50	28.50	28.50	28.50
flask vacuum.....(IN.HG)	26.20	26.30	26.15	26.25
flask abs. press...(IN.HG)	2.30	2.20	2.35	2.25
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press...(IN.HG)	29.14	29.14	29.14	29.14
flask static press.(IN.HG)	-2.90	-1.60	-0.70	-0.40
flask abs. press...(IN.HG)	26.24	27.54	28.44	28.74
Volume gas sampled....(DSML)	1598	1737	1747	1782
Moisture content.....(%V/V)	7.04	7.04	7.04	7.04
Nitrate in gas sample...(JG)	141.0	144.0	137.0	141.0
NO2 in gas sample.....(JG)	104.6	106.8	101.7	104.6
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0286	0.0269	0.0254	0.0257
(MG/DSCM).....	65	62	58	59
(PPM-DRY).....	34	32	30	31
(PPM-WET).....	32	30	28	29
NOX Emission rate....(LB/HR)	4.54	4.27	4.03	4.07

Test No. 12
Geka Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	08-19-93	08-19-93	08-19-93	08-19-93
Time of run.....(HRS)	1800	1815	1830	1845
Flask number.....	38	39	40	41
Volume of flask.....(ML)	2056	2062	2093	2076

Data: time of sampling

flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
bar. press.....(IN.HG)	28.50	28.50	28.50	28.50
flask vacuum.....(IN.HG)	26.20	26.20	26.20	26.30
flask abs. press...(IN.HG)	2.30	2.30	2.30	2.20

Data: Time of Flask Opening

flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.14	29.14	29.14	29.14
flask static press.(IN.HG)	-0.90	-0.60	-3.20	-3.30
flask abs. press...(IN.HG)	28.24	28.54	25.94	25.84
Volume gas sampled....(DSML)	1746	1772	1620	1607
Moisture content.....(%V/V)	6.73	6.73	6.73	6.73
Nitrate in gas sample...(JG)	133.0	136.0	136.0	146.0
NO2 in gas sample.....(JG)	98.7	100.9	100.9	108.3

NOx Concentration

(GR/DSCF).....	0.0247	0.0249	0.0272	0.0295
(MG/DSCM).....	57	57	62	67
(PPM-DRY).....	30	30	33	35
(PPM-WET).....	28	28	30	33
NOx Emission rate....(LB/HR)	3.97	4.01	4.38	4.74

3.4 Results of Opacity Determinations

Test No. 4
Dryer Stack

Results of Opacity Observations ----- EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	94.17
5	0.0223	4.58
10	0.0458	1.25
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 0.35	Avg OD 0.0016	Time average

Observer: G. Hove
Cert. Date: 4-6-93
Date of Observation: 8-17-93
Time of Observation: 1808-1908

Test No. 11
Press Vent Stack

Results of Opacity Observations ----- EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	50.00
5	0.0223	40.83
10	0.0458	7.08
15	0.0706	2.08
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 3.06	Avg OD 0.0138	Time average

Observer: J. Bergstrom
Cert. Date: 04-01-93
Date of Observation: 08-18-93
Time of Observation: 1800-1900

Test No. 12
Geka Stack

Results of Opacity Observations ----- EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	100.00
5	0.0223	0.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 0.00	Avg OD 0.0000	Time average

Observer: G. Hove
Cert. Date: 4-6-93
Date of Observation: 8-19-93
Time of Observation: 1600-1700

Test No. 4
Dryer Stack

Results of CO Determinations -----Method 10

	Run 1	Run 2	Run 3
Date of run	08-17-93	08-17-93	08-17-93
Time run start/end.....(HRS)	1540-1722	1742-1846	1922-2025
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	16.28	19.25	19.55
O2 Concentration.....(%V/V)	18.60	18.40	18.30
Volumetric flow rate (DSCFM)	55614	54227	54425
CO concentration.....			
(GR/DSCF).....	0.0534	0.0682	0.0687
(MG/DSCM).....	122.33	156.11	157.28
(PPM-WET).....	87.91	108.21	108.61
(PPM-DRY).....	105.00	134.00	135.00
(PPM-DRY @ 7% O2).....	612.50	721.54	700.00
CO emission rate.....(LB/HR)	25.468	31.691	32.044

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 11
Press Vent Stack

Results of CO Determinations -----Method 10

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93
Time run start/end.....(HRS)	1425-1528	1550-1653	1801-1904
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	3.26	3.39	2.77
O2 Concentration.....(%V/V)	20.90	20.90	20.90
Volumetric flow rate (DSCFM)	87008	88477	86932
CO concentration.....			
(GR/DSCF).....	0.0014	0.0013	0.0012
(MG/DSCM).....	3.15	3.03	2.80
(PPM-WET).....	2.61	2.51	2.33
(PPM-DRY).....	2.70	2.60	2.40
CO emission rate.....(LB/HR)	1.025	1.003	0.910

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value
is less than or equal to the reported value

Test No. 12
Geka Stack

Results of CO Determinations -----Method 10

	Run 1	Run 2	Run 3
Date of run	08-19-93	08-19-93	08-19-93
Time run start/end.....(HRS)	1255-1359	1600-1701	1745-1850
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	6.68	5.78	6.73
O2 Concentration.....(%V/V)	17.80	17.70	17.90
Volumetric flow rate (DSCFM)	19839	18517	18778
CO concentration.....			
(GR/DSCF).....	0.0214	0.0229	0.0204
(MG/DSCM).....	48.93	52.43	46.60
(PPM-WET).....	39.19	42.40	37.31
(PPM-DRY).....	42.00	45.00	40.00
(PPM-DRY @ 7% O2).....	183.75	190.91	180.65
CO emission rate.....(LB/HR)	3.634	3.634	3.276
*CO emission factor (LB/10 ⁶ BTU)...	0.19	0.20	0.19

* Emission factor calculated using the dry O₂ F-factor method
F-factor = 9240 DSCF/10⁶BTU

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value
is less than or equal to the reported value

3.6 Results of Formaldehyde Determinations

Test No. 1
Face Inlet

Results of Formaldehyde Tests ----- EPA Method 0011

	Run 1 08-17-93	Run 2 08-17-93	Run 3 08-17-93
Date of run			
Time run start/end.....(HRS)	900/1003	1103/1207	1345/1448
Static pressure.....(IN.WC)	-6.00	-6.00	-6.00
Cross sectional area (SQ.FT)	9.39	9.39	9.39
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	273.0	280.0	238.0
desiccant.....(GRAMS)	5.0	20.0	7.0
total.....(GRAMS)	278.0	300.0	245.0
Formaldehyde in sample..(uG)	7400	2200	6000
Gas meter coefficient.....	1.0006	1.0006	1.0006
Barometric pressure..(IN.HG)	28.57	28.57	28.57
Avg. orif.pres.drop..(IN.WC)	2.42	2.46	2.46
Avg. gas meter temp..(DEF-F)	81.1	88.2	90.1
Volume through gas meter....			
at meter conditions...(CF)	51.90	52.60	52.70
standard conditions.(DSCF)	48.67	48.69	48.62
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.245	.245	.245
Avg.stack gas temp ..(DEG-F)	233	233	228
Volumetric flow rate.....			
actual.....(ACFM)	41099	41483	41207
dry standard.....(DSCFM)	23205	23011	24015
Isokinetic variation.....(%)	100.4	101.2	96.9
CH2O concentration.....			
(GR/DSCF).....	0.0024	0.0007	0.0019
(MG/DSCM).....	5.40	1.61	4.39
(PPM-DRY).....	4.33	1.29	3.51
(PPM-WET).....	3.41	1.00	2.84
CH2O emission rate...(LB/HR)	0.46935	0.13832	0.39431

Test No. 1
Core Inlet

Results of Formaldehyde Tests ----- EPA Method 0011

	Run 1 08-17-93	Run 2 08-17-93	Run 3 08-17-93
Date of run			
Time run start/end.....(HRS)	900/1008	1105/1207	1345/1448
Static pressure.....(IN.WC)	-7.10	-7.10	-7.10
Cross sectional area (SQ.FT)	9.39	9.39	9.39
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	228.0	247.0	248.0
desiccant.....(GRAMS)	21.0	11.0	22.0
total.....(GRAMS)	249.0	258.0	270.0
Formaldehyde in sample..(uG)	3100	2900	2200
Gas meter coefficient.....	1.0075	1.0075	1.0075
Barometric pressure..(IN.HG)	28.57	28.57	28.57
Avg. orif.pres.drop..(IN.WC)	2.76	2.78	2.80
Avg. gas meter temp..(DEF-F)	79.0	86.4	89.9
Volume through gas meter....			
at meter conditions...(CF)	55.39	55.87	56.41
standard conditions.(DSCF)	52.55	52.29	52.46
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.248	.248	.248
Avg.stack gas temp ..(DEG-F)	205	207	207
Volumetric flow rate.....			
actual.....(ACFM)	40422	40565	41053
dry standard.....(DSCFM)	24603	24414	24502
Isokinetic variation.....(%)	99.7	100.0	100.0
CH2O concentration.....			
(GR/DSCF).....	0.0009	0.0009	0.0007
(MG/DSCM).....	2.10	1.97	1.49
(PPM-DRY).....	1.68	1.58	1.20
(PPM-WET).....	1.37	1.28	0.96
CH2O emission rate...(LB/HR)	0.19324	0.18029	0.13682

Test No. 1
Dryer Stack

Results of Formaldehyde Tests ----- EPA Method 0011

	Run 1 08-17-93	Run 2 08-17-93	Run 3 08-17-93
Date of run			
Time run start/end.....(HRS)	900/1006	1103/1206	1345/1447
Static pressure.....(IN.WC)	-0.90	-0.90	-0.90
Cross sectional area (SQ.FT)	18.99	18.99	18.99
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	265.0	266.0	233.0
desiccant.....(GRAMS)	20.0	27.0	28.0
total.....(GRAMS)	285.0	293.0	261.0
Formaldehyde in sample..(UG)	12000	12400	8200
Gas meter coefficient.....	0.9952	0.9952	0.9952
Barometric pressure..(IN.HG)	28.57	28.57	28.57
Avg. orif.pres.drop..(IN.WC)	2.86	2.88	2.90
Avg. gas meter temp..(DEF-F)	84.6	87.2	89.2
Volume through gas meter....			
at meter conditions...(CF)	59.36	59.80	60.07
standard conditions.(DSCF)	55.07	55.21	55.27
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.240	.240	.240
Avg.stack gas temp ..(DEG-F)	135	135	135
Volumetric flow rate.....			
actual.....(ACFM)	78633	80422	80546
dry standard.....(DSCFM)	54444	55494	55831
Isokinetic variation.....(%)	101.9	100.3	99.8
CH2O concentration.....			
(GR/DSCF).....	0.0034	0.0035	0.0023
(MG/DSCM).....	7.75	7.99	5.28
(PPM-DRY).....	6.21	6.40	4.23
(PPM-WET).....	5.09	5.23	3.47
CH2O emission rate...(LB/HR)	1.57995	1.65974	1.10329

Test No. 8
Press Vent Stack

Results of Formaldehyde Tests ----- EPA Method 0011

	Run 1 08-18-93	Run 2 08-18-93	Run 3 08-18-93
Date of run			
Time run start/end.....(HRS)	940/1045	1115/1220	1245/1348
Static pressure.....(IN.WC)	-1.00	-1.00	-1.00
Cross sectional area (SQ.FT)	21.31	21.31	21.31
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	10.0	12.0	13.0
desiccant.....(GRAMS)	13.0	13.0	12.0
total.....(GRAMS)	23.0	25.0	25.0
Formaldehyde in sample..(uG)	2100	970	2400
Gas meter coefficient.....	0.9952	0.9952	0.9952
Barometric pressure...(IN.HG)	28.60	28.60	28.60
Avg. orif.pres.drop..(IN.WC)	2.27	2.30	2.35
Avg. gas meter temp..(DEF-F)	84.1	88.1	87.3
Volume through gas meter....			
at meter conditions...(CF)	52.95	53.45	53.93
standard conditions.(DSCF)	49.14	49.25	49.77
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.190	.190	.190
Avg.stack gas temp ..(DEG-F)	96	96	96
Volumetric flow rate.....			
actual.....(ACFM)	99920	100272	101625
dry standard.....(DSCFM)	88482	88718	89964
Isokinetic variation.....(%)	100.2	100.2	99.8
CH2O concentration.....			
(GR/DSCF).....	0.0007	0.0003	0.0007
(MG/DSCM).....	1.52	0.70	1.71
(PPM-DRY).....	1.22	0.56	1.37
(PPM-WET).....	1.19	0.55	1.34
CH2O emission rate...(LB/HR)	0.50276	0.23236	0.57696

Test No. 18
Geka Stack

Results of Formaldehyde Tests ----- EPA Method 0011

	Run 1 08-18-93	Run 2 08-18-93	Run 3 08-18-93
Date of run			
Time run start/end.....(HRS)	757/ 905	955/1058	1118/1221
Static pressure.....(IN.WC)	-0.35	-0.35	-0.35
Cross sectional area (SQ.FT)	9.62	9.62	9.62
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	49.0	47.0	54.0
desiccant.....(GRAMS)	10.0	12.0	9.0
total.....(GRAMS)	59.0	59.0	63.0
Formaldehyde in sample..(uG)	71	43	140
Gas meter coefficient.....	1.0075	1.0075	1.0075
Barometric pressure..(IN.HG)	28.50	28.50	28.50
Avg. orif.pres.drop..(IN.WC)	1.70	1.87	1.78
Avg. gas meter temp..(DEF-F)	79.3	86.2	95.8
Volume through gas meter....			
at meter conditions...(CF)	43.58	46.01	45.26
standard conditions.(DSCF)	41.11	42.87	41.44
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.250	.250	.250
Avg.stack gas temp ..(DEG-F)	338	340	340
Volumetric flow rate.....			
actual.....(ACFM)	33011	34520	33352
dry standard.....(DSCFM)	19475	20367	19556
Isokinetic variation.....(%)	99.4	99.1	99.7
CH2O concentration.....			
(GR/DSCF).....	0.0000	0.0000	0.0001
(MG/DSCM).....	0.06	0.04	0.12
(PPM-DRY).....	0.05	0.03	0.10
(PPM-WET).....	0.05	0.03	0.09
CH2O emission rate...(LB/HR)	0.00447	0.00271	0.00878

3.7 Results of Phenol Determinations

Test No. 6
Dryer Stack

Results of Phenol Determinations -----

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93
Time run start/end.....(HRS)	0800-0900	0910-1010	1015-1115
Barometric pressure..(IN.HG)	28.58	28.58	28.58
Meter temperature....(DEG-F)	84.90	91.10	94.40
Meter correction coefficient	1.0006	1.0006	1.0006
Volume through gas meter.... at meter conditions...(CF)	45.300	45.430	45.300
standard conditions (DSCF)	42.162	41.808	41.440
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	20.18	18.71	19.95
Volumetric flow rate (DSCFM)	53000	53000	53000
Phenol in sample.....(uG)	840.00<	840.00<	840.00<
Phenol concentration..... (GR/10 ³ DSCF).....	0.3074<	0.3100<	0.3128<
(uG/DSCM).....	704.08<	710.05<	716.35<
(PPB-DRY).....	179.92<	181.45<	183.06<
(PPB-WET).....	143.61<	147.50<	146.54<
Phenol emis. rate(10 ⁻³ LB/HR)	139.645<	140.830<	142.080<

A trailing '<' symbol indicates that the true value
is less than or equal to the reported value

Analysis performed according to NIOSH Method 3502

Test No. 9
Press Vent Stack

Results of Phenol Determinations -----

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93
Time run start/end.....(HRS)	0945-1045	1105-1205	1210-1310
Barometric pressure...(IN.HG)	28.60	28.60	28.60
Meter temperature....(DEG-F)	78.00	81.71	88.46
Meter correction coefficient	1.0011	1.0011	1.0011
Volume through gas meter.... at meter conditions...(CF)	46.880	37.200	47.100
standard conditions (DSCF)	44.236	34.862	43.596
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	2.60	3.52	2.94
Volumetric flow rate (DSCFM)	88482	88718	89964
Phenol in sample.....(MG)	4	4	4
Phenol concentration..... (GR/DSCF).....	0.001	0.002	0.001
(MG/DSCM).....	3	4	3
(PPM-DRY).....	1	1	1
(PPM-WET).....	1	1	1
Phenol emission rate.(LB/HR)	1.04	1.43	1.14

A trailing '<' symbol indicates that the true value
is less than or equal to the reported value

Analysis performed according to NIOSH Method 3502

Test No. 14
Geka Stack

Results of Phenol Determinations -----

	Run 1	Run 2	Run 3
Date of run	08-18-93	08-18-93	08-18-93
Time run start/end.....(HRS)	0900-1000	1045-1145	1210-1310
Barometric pressure...(IN.HG)	28.65	28.65	28.65
Meter temperature....(DEG-F)	82.00	87.88	88.38
Meter correction coefficient	0.9972	0.9972	0.9972
Volume through gas meter.... at meter conditions...(CF)	47.200	47.070	47.120
standard conditions (DSCF)	44.108	43.515	43.522
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	5.65	6.20	6.11
Volumetric flow rate (DSCFM)	20000	20000	20000
Phenol in sample.....(uG)	840.00<	840.00<	840.00<
Phenol concentration..... (GR/10 ³ DSCF).....	0.2938<	0.2979<	0.2978<
(uG/DSCM).....	673.01<	682.19<	682.09<
(PPB-DRY).....	171.98<	174.33<	174.30<
(PPB-WET).....	162.27<	163.52<	163.65<
Phenol emis. rate(10 ⁻³ LB/HR)	50.371<	51.058<	51.050<

A trailing '<' symbol indicates that the true value
is less than or equal to the reported value

Analysis performed according to NIOSH Method 3502

3.8 PAHs Sampling Data

Test No. 2
Dryer Stack

Sampling Data for PAH Determinations-----SW846 Method 0010

	Run 1 08-17-93	Run 2 08-17-93	Run 3 08-17-93
Date of run			
Time run start/end.....(HRS)	900/1110	1145/1430	1507/1715
Static pressure.....(IN.WC)	-0.90	-0.90	-0.90
Cross sectional area (SQ.FT)	18.99	18.99	18.99
Pitot tube coefficient.....	0.840	0.840	0.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	315.0
impingers.....(GRAMS)	325.0	307.0	0.0
desiccant.....(GRAMS)	21.0	20.0	24.0
total.....(GRAMS)	346.0	327.0	339.0
Gas meter coefficient.....	1.0011	1.0011	1.0011
Barometric pressure..(IN.HG)	28.57	28.57	28.57
Avg. orif.pres.drop..(IN.WC)	1.08	1.00	1.04
Avg. gas meter temp..(DEG-F)	81.4	89.9	91.2
Volume through gas meter....			
at meter conditions...(CF)	70.99	69.25	70.56
standard conditions.(DSCF)	66.33	63.70	64.76
standard conditions..(NM ³)	1.878	1.804	1.834
Total sampling time....(MIN)	120.00	120.00	120.00
Nozzle diameter.....(IN)	.185	.185	.185
Avg.stack gas temp ..(DEG-F)	135	136	136
Volumetric flow rate.....			
actual.....(ACFM)	79798	78169	79717
dry standard.....(DSCFM)	55136	53725	54789
Isokinetic variation.....(%)	102.0	100.6	100.2

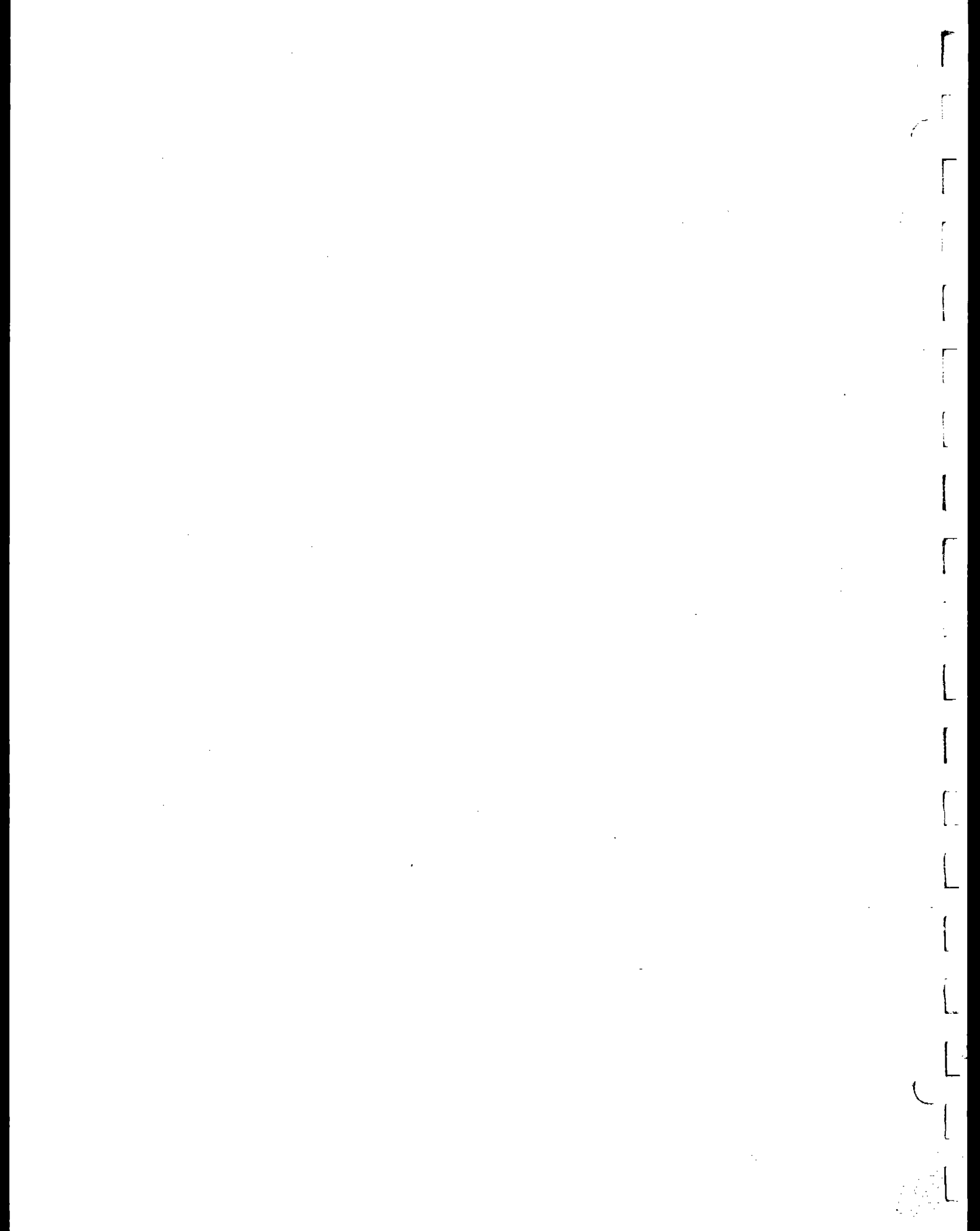
Test No. 13
Geka Stack

Sampling Data for PAH Determinations-----SW846 Method 0010

	Run 1 08-18-93	Run 2 08-18-93	Run 3 08-18-93
Date of run			
Time run start/end.....(HRS)	935/1140	1230/1435	1522/1730
Static pressure.....(IN.WC)	-0.35	-0.35	-0.35
Cross sectional area (SQ.FT)	9.62	9.62	9.62
Pitot tube coefficient.....	0.840	0.840	0.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	85.0
impingers.....(GRAMS)	100.0	100.0	0.0
desiccant.....(GRAMS)	22.0	22.0	37.0
total.....(GRAMS)	122.0	122.0	122.0
Gas meter coefficient.....	1.0075	1.0075	1.0075
Barometric pressure..(IN.HG)	28.65	28.65	28.65
Avg. orif.pres.drop..(IN.WC)	1.49	1.57	1.64
Avg. gas meter temp..(DEF-F)	84.3	84.1	89.0
Volume through gas meter....			
at meter conditions...(CF)	81.70	83.02	86.23
standard conditions.(DSCF)	76.72	78.00	80.31
standard conditions..(NM ³)	2.172	2.209	2.274
Total sampling time....(MIN)	120.00	120.00	120.00
Nozzle diameter.....(IN)	.242	.242	.242
Avg.stack gas temp ..(DEG-F)	344	341	341
Volumetric flow rate.....			
actual.....(ACFM)	34037	33793	33996
dry standard.....(DSCFM)	19888	19844	20018
Isokinetic variation.....(%)	96.9	98.7	100.8

APPENDIX A

RESULTS OF VOLUMETRIC FLOW RATE DETERMINATIONS



Test No. 1
Core Inlet

Results of Volumetric Flow Rate Determination-----Method 2

Date of Determination.....	08-17-93
Time of Determination.....(HRS)	752
Barometric pressure.....(IN.HG)	28.57
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	41.5
Duct area.....(SQ.FT)	9.39
Direction of flow.....	DOWN
Static pressure.....(IN.WC)	-7.1
Avg. gas temp.....(DEG-F)	206
Moisture content.....(% V/V)	18.26
Avg. linear velocity.....(FT/SEC)	69.6
Gas density.....(LB/ACF)	.05233
Molecular weight.....(LB/LBMOLE)	29.14
Mass flow of gas.....(LB/HR)	123255
Volumetric flow rate.....	
actual.....(ACFM)	39253
dry standard.....(DSCFM)	23857

Test No. 1
Face Inlet

Results of Volumetric Flow Rate Determination-----Method 2

Date of Determination.....	08-17-93
Time of Determination.....(HRS)	810
Barometric pressure.....(IN.HG)	28.57
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	41.5
Duct area.....(SQ.FT)	9.39
Direction of flow.....	UP
Static pressure.....(IN.WC)	-6
Avg. gas temp.....(DEG-F)	227
Moisture content.....(% V/V)	21.22
Avg. linear velocity.....(FT/SEC)	72.6
Gas density.....(LB/ACF)	.05039
Molecular weight.....(LB/LBMOLE)	29.24
Mass flow of gas.....(LB/HR)	123675
Volumetric flow rate.....	
actual.....(ACFM)	40906
dry standard.....(DSCFM)	23285

Test No. 6
Dryer Stack

Results of Volumetric Flow Rate Determination-----Method 2

Date of Determination.....	08-18-93
Time of Determination.....(HRS)	745
Barometric pressure.....(IN.HG)	28.58
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	20
Shape of duct.....	Round
Stack diameter.....(IN)	59
Duct area.....(SQ.FT)	18.99
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.9
Avg. gas temp.....(DEG-F)	136
Moisture content.....(% V/V)	20.18
Avg. linear velocity.....(FT/SEC)	69.6
Gas density.....(LB/ACF)	.05894
Molecular weight.....(LB/LBMOLE)	29.13
Mass flow of gas.....(LB/HR)	280283
Volumetric flow rate.....	
actual.....(ACFM)	79258
dry standard.....(DSCFM)	53412

Test No. 12
GEKA Stack

Results of Volumetric Flow Rate Determination-----Method 2

Date of Determination.....	08-19-93
Time of Determination.....(HRS)	1155
Barometric pressure.....(IN.HG)	28.5
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	42
Duct area.....(SQ.FT)	9.62
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.35
Avg. gas temp.....(DEG-F)	338
Moisture content.....(% V/V)	6.68
Avg. linear velocity.....(FT/SEC)	57.9
Gas density.....(LB/ACF)	.04651
Molecular weight.....(LB/LBMOLE)	29.19
Mass flow of gas.....(LB/HR)	93338
Volumetric flow rate.....	
actual.....(ACFM)	33446
dry standard.....(DSCFM)	19653

Test No. 18
GEKA Stack

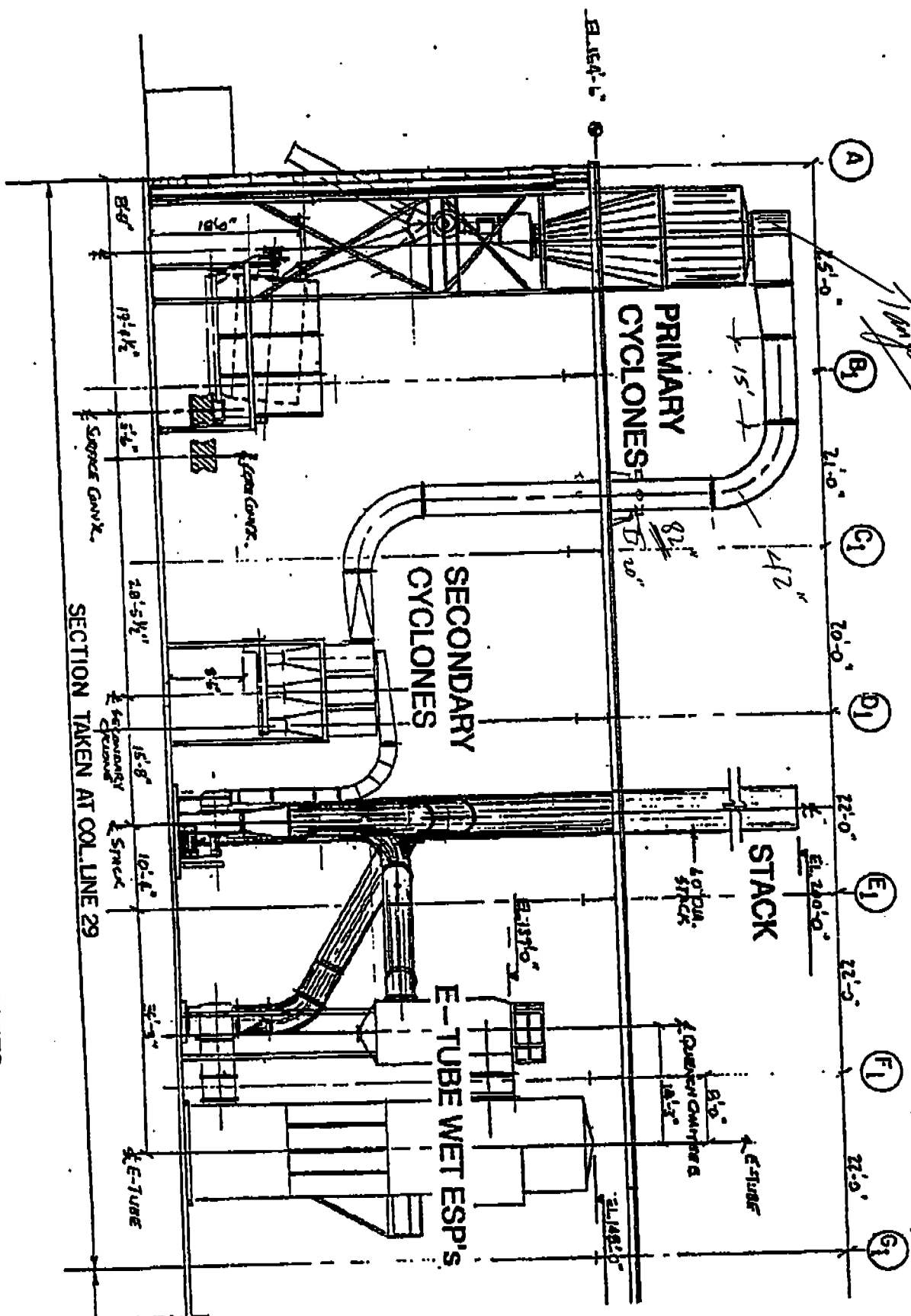
Results of Volumetric Flow Rate Determination-----Method 2

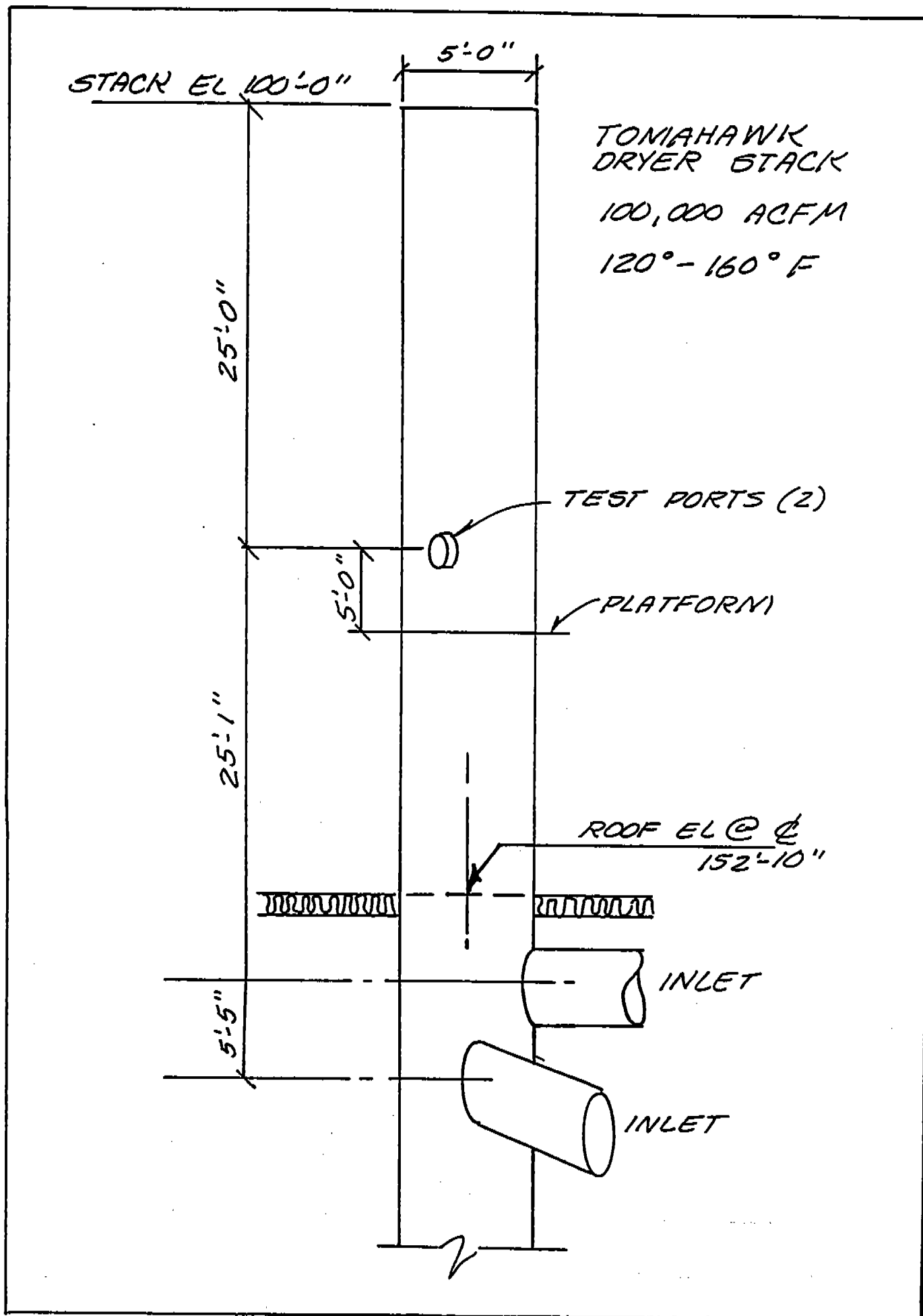
Date of Determination.....	08-18-93
Time of Determination.....(HRS)	730
Barometric pressure.....(IN.HG)	28.5
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	42
Duct area.....(SQ.FT)	9.62
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.35
Avg. gas temp.....(DEG-F)	339
Moisture content.....(% V/V)	6.34
Avg. linear velocity.....(FT/SEC)	57.9
Gas density.....(LB/ACF)	.04655
Molecular weight.....(LB/LBMOLE)	29.21
Mass flow of gas.....(LB/HR)	93328
Volumetric flow rate.....	
actual.....(ACFM)	33417
dry standard.....(DSCFM)	19684

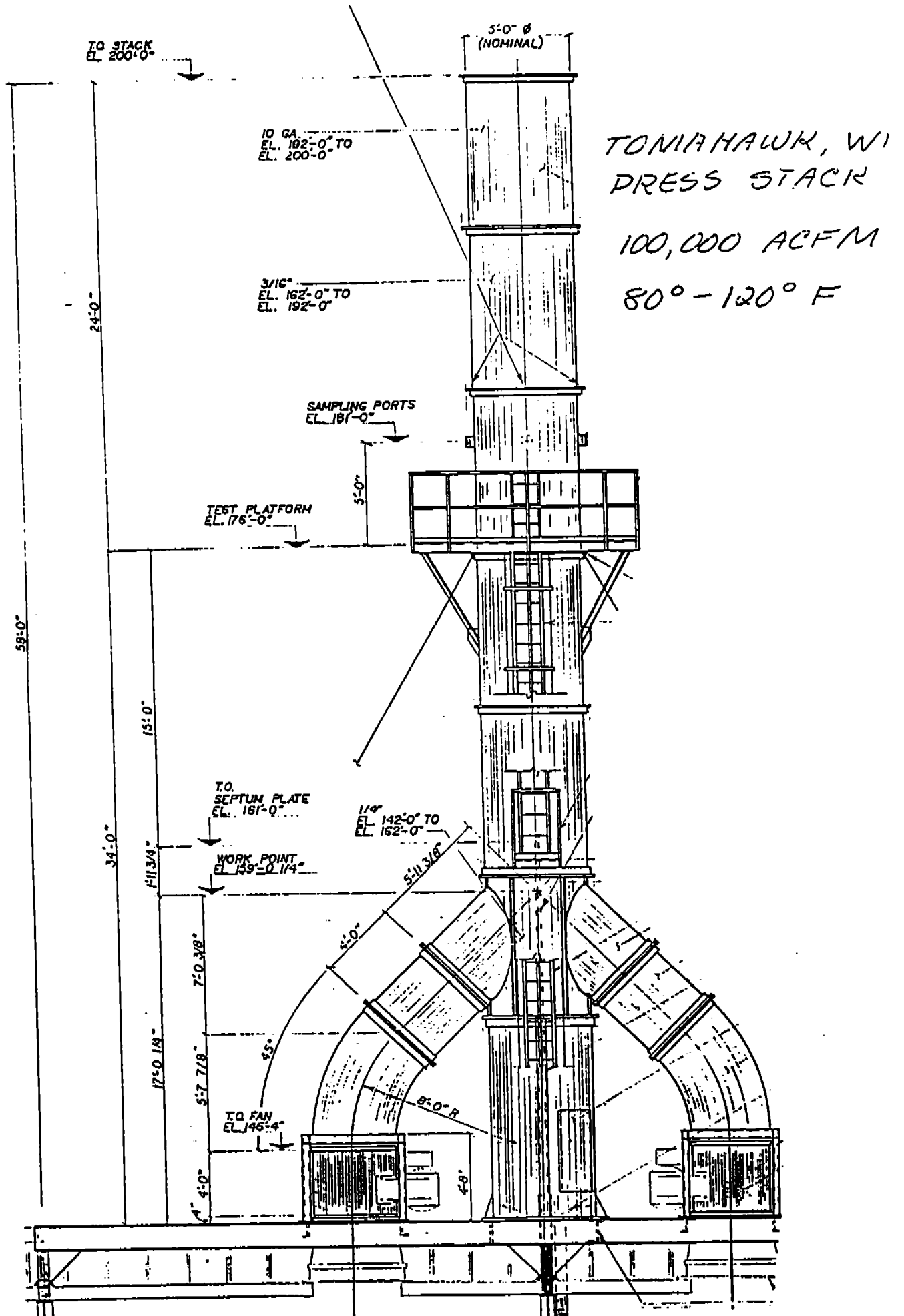
APPENDIX B

LOCATION OF TEST PORTS

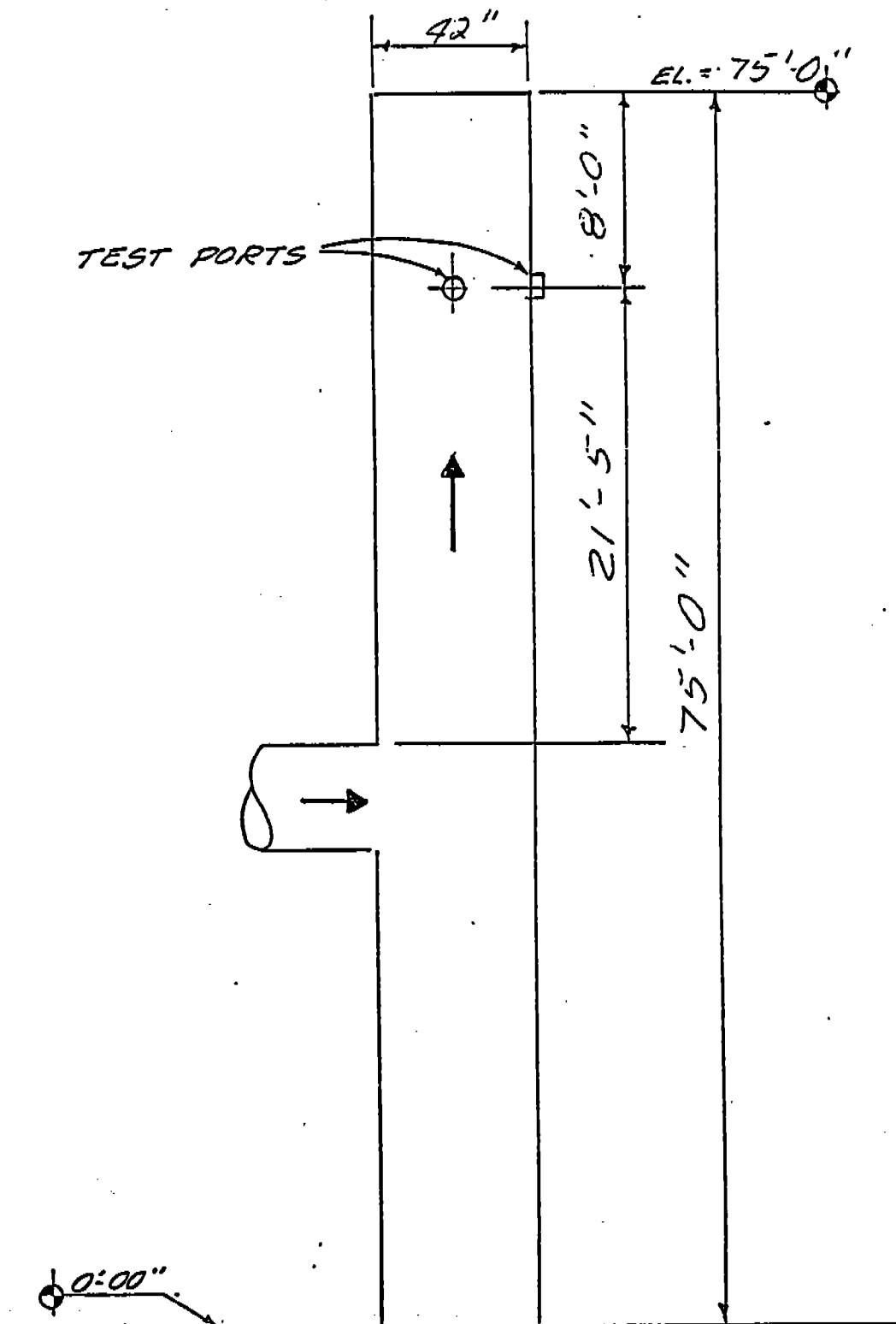








TOMIAHAWK, WI
DRESS STACK
100,000 ACFM
80°-120° F



L-P TOMAHAWK
THERMAL OIL HEATER STACK

20,000 - 32,600 ACFM
250 - 350° F

N.T.S.

APPENDIX C

DRYER FIELD DATA SHEETS

INTERPOL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job LP/TOMAHAWK-TOMAHAWK, WIS

Source FACE INLET

Test 1 Run 1 Date 8-17-93

Stack dimen. 4 1/2 IN.

Dry bulb 227 °F Wet bulb 145 °F

Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 28.57 in Hg

Static pressure -6.0 in WC

Operators E. TRANBLIDGE-K. ROSENTHAL

Pitot No. 23V-4 C_p .840

Cross-section
View

Elevation
View

Drawing
of Test Site

Formaldehyde

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:	8 in.	Time start: 0810 hrs	
A 1	.021	.87	8.87	1.00	
2	.067	2.78	10.78	1.10	
3	.118	4.90	12.90	1.10	
4	.177	7.35	15.35	1.00	
5	.250	10.38	18.38	.95	
6	.356	14.77	22.77	.90	227
7	.644	26.73	34.73	.95	
8	.750	31.13	39.13	1.05	
9	.823	34.15	42.15	1.20	
10	.882	36.60	44.60	1.30	
11	.933	38.72	46.72	1.30	
12	.979	40.63	48.63	1.30	
B 1				.95	
2				1.10	
3				1.30	
4				1.40	
5				1.30	
6				1.20	227
7	.7136			1.00	
8	.40223			1.05	
9	.23532			1.10	
10				1.10	
11				1.20	
12				1.20	
Temp. meas. device & S/N: <u>POT-12</u>				Time end: <u>0825</u> hrs	

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/TONA HAWK Date 8-17-93 Test 1 Run 1
 Source FACE INLET No. of traverse points 24
 Method SO₂ Filter holder: Filter type:

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) ~~X~~
 Posttest: { 0 cfm at 11 in. Hg. (vac) ~~X~~

Particulate Catch Data:

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

 ☐ acetone
 ☒ other(s) MC & DI

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		{ 100 }	
Impinger No. 2	473	{ 200 }	273
Impinger No. 3			
Condenser			
Desiccant	1378	1373	5
Total			278

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 19 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 0 cc/min at 15 in. Hg.
 Time start: 0901 (HRS) Time end: 1002 (HRS)
 Sampling rate: 700 cc/min Operator: ET
 S/N of O₂ Analyzer used to monitor train outlet: 7

CF-023

INTERCOLL LABORATORIES LCA METHOD 5 FIELD DATA SHEET

Job LP/Toma Hawk
 Source FACE Project
 Date 8-17-83 Year 1983 Run 1

Operators E. J. Brown & J. Brown
 Motor Box No. 2
 Gas meter serial 110026

CP 8460
 Pilot No. 23V
 Bar. Press. 28.57 inHg
 Nozzle No. 2-2 Nozzle Dia. 3/32 in.

Traverse Point No.	Sampling Time (min)	Supply Volume (cf)	Velocity Head (inH ₂ O)	Orifice Meter (inH ₂ O)	Dis. Vol. (cf)	VAC. inHg	Temperature (°F)					Dyecon (xv/v)		
							Stack	Probe	Dyecon	Inlet	Gas In		Gas Out	
A 12	2.5	562.20	1.30	2.81	4.53	7.6	227	260	252	46	73	72	16.9	
11	5	564.48	1.20	2.53	6.73	7.8	232				75	74	16.9	
10	7.5	566.66	1.10	2.32	8.84	7.8	234	262	254	46	78	74	17.0	
9	10	568.74	1.10	2.33	0.96	7.6	232				79	74	17.0	
8	12.5	570.94	1.05	2.22	3.03	7.5	234	264	250	48	80	75	17.1	
7	15	572.94	1.00	2.12	5.05	7.2	234				82	75	17.0	
6	17.5	575.00	1.97	2.06	7.05	7.1	234	258	253	50	82	76	17.0	
5	20	577.01	1.95	2.02	9.03	7.1	234				83	76	17.2	
4	22.5	579.00	1.10	2.34	1.16	7.8	235	254	250	50	85	76	17.3	
3	25	581.15	1.30	2.78	5.48	9.0	252				86	77	17.2	
2	27.5	583.42	1.40	2.99	5.89	9.5	254	256	253	51	86	77	17.2	
1	30	585.80	1.40	5.01	8.30	10.0	230				86	78	16.9	
B 12	32.5	588.29	1.40	8.00	0.72	9.8	232	258	251	50	84	78	16.9	
11	35	590.70	1.40	2.99	3.12	9.8	234				85	78	17.1	
10	37.5	593.09	1.30	2.78	5.44	9.2	234	256	252	48	86	79	17.1	
9	40	595.40	1.20	2.58	7.68	9.0	231				87	79	16.9	
8	42.5	597.68	1.05	2.26	9.78	8.0	232	258	250	48	87	79	16.9	
7	45	599.77	1.92	1.98	1.75	7.5	233				88	81	16.7	
6	47.5	601.90	1.85	1.83	3.64	7.0	235	255	253	49	88	81	16.9	
5	50	603.70	1.90	1.93	5.58	7.0	235				89	81	17.0	
4	52.5	605.62	1.05	2.27	7.64	7.5	232	252	255	50	90	81	17.1	
3	55	607.74	1.10	2.38	9.84	7.0	232				90	82	17.1	
2	57.5	609.84	1.10	2.38	2.00	7.0	232	250	255	50	90	82	16.9	
1	60	612.01	1.00	2.16	4.06	7.4	232				91	82	17.0	

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/TIM A HAWK Date 8-17-93 Test 1 Run 2
 Source FACD INLET DUCT No. of traverse points 24
 Method SO11 Filter holder: Filter type:

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) A
 Posttest: { 0 cfm at 11 in. Hg. (vac) X

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)
 ☐ acetone
 ☒ other(s) MCF & DZ
 No. of probe wash bottles: 1
 Sample recovered by: SR

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		{100}	
Impinger No. 2	480	{100}	280
Impinger No. 3			
Condenser			
Desiccant	1303	1283	20
Total			300

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 19 Bag No. 2
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 0 cc/min at 15 in. Hg.
 Time start: 1104 (HRS) Time end: 1205 (HRS)
 Sampling rate: 400 cc/min Operator: ET
 S/N of O₂ Analyzer used to monitor train outlet: 7

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INTERPOL LABORATORIES L'A METHOD 5 FIELD DATA SHEET

KP/Tern Hawk

Operator's Name ET-CP
 Water Box No. 7
 Counter coil. 10006

Pilot No. 23V-11 Cp. 840
 Bar. Press. 28.57 in Hg 120 x
 Nozzle No. 2-77 Nozzle D19, 2.44-11.

[illegible]

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/TOMAHAWK Date 8-17-93 Test 1 Run 3
 Source FACE INLET DUCT No. of traverse points 24
 Method S0011 Filter holder: Filter type:

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) X
 Posttest: 0 cfm at 11 in. Hg. (vac) X

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)
 ☐ acetone
 ☒ other(s) MEQDI
 No. of probe wash bottles: 1
 Sample recovered by: SB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	439	{200}	239
Impinger No. 3			
Condenser			
Desiccant	1376	1369	7
Total			246

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 19 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 0 cc/min at 15 in. Hg.
 Time start: 1346 (HRS) Time end: 1447 (HRS)
 Sampling rate: 400 cc/min Operator: ET
 S/N of O₂ Analyzer used to monitor train outlet: 2

CF-023

Sub LP/ Tomatawix
Source FACE INLET
Date 9-17-83 1001

**Jatani
XnB
Djnt**

7-KR
KHH
1.00%

SECRET

Putt
Bar.
Norz

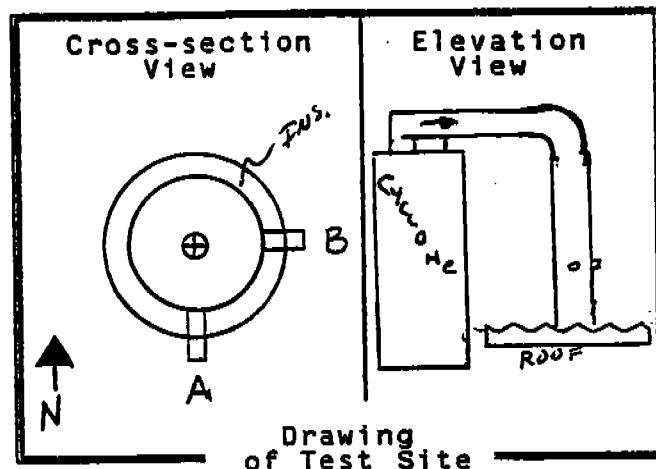
217 D10,
10119 H20
0758

25-11.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Drifts Meter (inWC)	Det. Vol. (cf)	VAC. inHg	Temperature (°F)				Castin	Cast/Det	Oxygen (xv/v)
							Stack	Proby	Dryn	Wapn			
A	1345	667.30	1.20	2.56	4.55	7.8	232	238	249	49	84	83	17.0
12	2.5	669.58	1.20	2.53	1.77	7.8	229				84	83	17.2
11	5	671.70	1.20	2.53	3.99	7.9	228	242	251	49	87	83	17.0
10	7.5	673.92	1.10	2.35	6.13	7.8	222				89	84	16.9
9	10	676.07	1.05	2.23	8.22	7.5	229	248	253	50	91	84	16.9
8	12.5	678.13	1.00	2.13	0.27	7.3	227				92	84	16.5
7	15	680.18	.97	2.07	2.29	7.3	226	250	250	50	93	84	17.2
6	17.5	682.17	1.30	2.77	4.63	9.0	227				94	84	17.5
5	20	684.50	1.40	2.99	7.05	10.0	226	254	252	52	94	84	17.5
4	22.5	686.90	1.40	2.98	9.47	10.2	229				94	84	17.5
3	25	689.30	1.40	2.98	1.89	10.2	229	250	248	52	95	85	17.5
2	27.5	691.78	1.20	2.56	4.14	9.9	228				95	85	17.3
1	30	694.04	1.40	2.98	6.52	10.2	229	248	251	50	93	86	17.3
B	32.5	696.50	1.30	2.78	8.90	10.0	227				94	87	17.3
12	35	698.82	1.30	2.78	1.24	10.0	228	252	254	45	95	87	17.3
11	37.5	701.24	1.10	2.36	3.40	9.0	227				96	88	17.5
10	40	703.40	1.00	2.15	5.47	8.2	227	250	254	46	96	88	17.3
9	42.5	705.48	.92	1.98	7.45	8.0	227				97	89	17.3
8	45	707.55	.90	1.91	9.40	7.5	237	250	251	47	98	89	17.3
7	47.5	709.50	1.00	2.11	1.45	7.6	240				99	89	17.5
6	50	711.52	.96	2.06	5.47	7.6	230	255	250	47	99	90	17.4
5	52.5	713.50	1.05	2.27	5.60	7.7	227				99	90	17.4
4	55	715.55	1.40	3.02	8.05	10.2	227	257	252	48	99	90	17.4
3	57.5	718.00	.90	1.94	7.01	7.6	229				99	91	17.0
2	60	720.00											
1	62												
	(1440)												
	Q = 100	52.70		2.44							Av. = 90.1		

INTERPOL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job L.P. TOMAHAWK
 Source CORE INLET (N)
 Test 1 Run 0 Date 8-17-93
 Stack dimen. 41.5 IN.
 Dry bulb 206 °F Wet bulb 141 °F
 Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
 Barometric pressure 28.57 in Hg
 Static pressure -7.10 in WC
 Operators S. BAINVILLE & K. ROSENTHAL
 Pitot No. V22-4 Cp .840



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: <u>8</u> in.		Time start: <u>0752</u> hrs	
A	1	.021	0.87	8.87	0.41 206
	2	.067	2.78	10.78	1.10 206
	3	.118	4.90	12.90	1.30 206
	4	.177	7.35	15.35	1.22 206
	5	.250	10.38	18.36	1.10 206
	6	.356	14.77	22.77	1.05 206
	7	.644	26.73	34.73	0.98 206
	8	.750	31.13	39.13	0.99 206
	9	.823	34.15	42.15	1.08 206
	10	.882	36.60	44.60	1.10 206
	11	.933	38.72	46.72	1.20 206
	12	.979	40.63	48.63	1.25 206
B	1			0.53	206
	2			1.32	206
	3			1.38	206
	4			1.20	206
	5			1.10	205
	6			1.12	205
	7			1.10	205
	8			1.10	205
	9	ACFM =	38.999	1.13	205
	10	DSCFM =	23.766	1.10	205
	11	FT/SEC =	69.19	1.12	205
	12			1.12	205
Temp. meas. device & S/N: <u>Digimark TC-PDT29</u>				Time end: <u>0805</u> hrs	

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP-TOMAHAWK Date 8-17-93 Test 1 Run 1
 Source CORE INLET No. of traverse points 24
 Method 0011 Filter holder: N/A Filter type: N/A

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: 0.00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: _____ Recovery solvent(s) _____
 _____ MeCl₂
 _____ acetone
 _____ other(s) DI H₂O
 No. of probe wash bottles: 1
 Sample recovered by: S-B

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	<u>695</u>	<u>467</u>	<u>228</u>
Impinger No. 3			
Condenser			
Desiccant	<u>1418</u>	<u>1397</u>	<u>21</u>
Total			<u>249</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 20 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 00 cc/min at 15 in. Hg.
 Time start: 0900 (HRS) Time end: 1008 (HRS)
 Sampling rate: 400 cc/min Operator: S-B
 S/N of O₂ Analyzer used to monitor train outlet: 8

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INTERPOL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Jul LP - TOMAHAWK
EQUIP CORP INCET
Jul 8-17-93 1991

Run 2

Dept. of Justice
Mail Box No. 100
Columbus, Ohio

2
KPI 1.90
2075

Pilot No. V22-4 Cp. 870
 Bor. Press. 28.57 in Hg H2O
 Nozzle No. 10-4 Nozzle Dia. .25

Traverse Point No.	Sampling Time (min)	Supply Volume (cf)	Velocity Head (inWC)	Drifts Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperature (°F)					Oxygen	
							Stack	Probe	Duct	Impg.	Gas In	Gas Out	(xv/v)
(1420)													
A 12	2.5	16.50	1.27	3.00	6.58	6	206	252	255	45	70	70	18.9
11	5	19.00	1.30	3.07	9.00	8	207	252	255	45	72	72	18.9
10	7.5	21.34	1.22	2.89	1.35	8	206	251	255	46	74	71	19.0
9	10	23.60	1.12	2.66	3.61	7	206	251	254	46	74	72	18.8
8	12.5	25.77	1.05	2.50	5.80	6	206	252	254	47	77	72	18.8
7	15	27.92	1.02	2.43	7.96	6	206	254	254	44	78	73	18.9
6	17.5	30.10	1.02	2.46	0.13	6	202	254	256	44	79	74	18.8
5	20	32.30	0.99	2.38	2.27	6	204	254	256	44	81	74	18.9
4	22.5	34.40	1.01	2.43	4.44	6	204	254	256	43	81	74	18.9
3	25	36.80	1.23	2.96	6.83	8	204	254	256	48	82	75	18.8
2	27.5	39.20	1.30	3.13	9.28	8	205	256	256	48	83	76	18.9
1	30	41.80	1.40	3.41	1.85	9	198	256	256	46	84	76	18.9
B 12	32.5	44.10	1.10	2.66	4.12	7	204	256	249	48	82	76	18.9
11	35	46.42	1.10	2.65	6.38	8	206	256	252	46	82	77	18.8
10	37.5	48.77	1.15	2.74	8.70	7	207	256	252	46	85	77	18.5
9	40	50.99	1.08	2.61	0.95	7	205	256	253	48	86	78	18.6
8	42.5	53.20	1.10	2.67	3.23	7	203	254	254	47	86	78	18.7
7	45	55.49	1.08	2.62	5.49	7	205	254	256	49	87	79	19.1
6	47.5	57.76	1.08	2.62	7.75	7	204	242	256	50	88	79	19.1
5	50	60.00	1.12	2.72	0.05	7	205	244	249	52	88	80	18.9
4	52.5	62.46	1.21	2.94	2.45	8	205	244	251	52	88	80	18.8
3	55	64.88	1.25	3.04	4.89	9	205	244	256	52	89	81	18.6
2	57.5	67.20	1.20	2.68	7.18	8	205	245	251	52	88	80	18.6
1	60	69.59	1.23	2.99	9.59	7	205	245	255	52	88	80	18.6
(1008)													
V = 55.39													
0 = 60													
Avg. = 79.0													

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP-TOMAHAWK
 Source CORE INLET
 Method 0011 Filter holder: N/A

Date 8-17-93 Test 1 Run 2
 No. of traverse points 24
 Filter type: MA

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: 0.00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

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

☒ acetone MECL
☒ other(s) DI H₂O

No. of probe wash bottles: _____
 Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	<u>447</u>	<u>200</u>	<u>247</u>
Impinger No. 3			
Condenser			
Desiccant	<u>1420</u>	<u>1409</u>	<u>11</u>
Total			<u>258</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 20 Bag No. 2
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 00 cc/min at 15 in. Hg.
 Time start: 1105 (HRS) Time end: 1207 (HRS)
 Sampling rate: 400 cc/min Operator: SB
 S/N of O₂ Analyzer used to monitor train outlet: 8

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INTERPOL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

 Job LP - TOMAHAWK
 Source CORE FANLET
 Date 8-17-93

 Operator SCS + KC
 Meter Box No. 4
 Counter Count 10035

 Pilot No. V22-4
 Bar. Press. 28.57
 Nozzle No. 10-4

 CP 840
 INHG 120
 IN. 248

Tripping Point No.	Sampling Time (min)	Sample Volume (cl)	Velocity Head (inHg)	Orifice Meter (inHg)	Dis. Vol. (cl)	VAC. inHg	Temperature (°F)				Gas/Dut	Oxygen (Kv/v)
							Stack	Probe	Duct	Inlet		
B 12	2.5	72.30	1.08	2.59	2.33	5	205	250	255	49	78	18.9
11	5	74.56	1.10	2.63	4.59	6	205	250	251	49	81	19.0
10	7.5	76.88	1.12	2.69	6.87	6	205	251	251	49	86	19.0
9	10	79.10	1.09	2.62	9.13	6	208	252	252	49	84	19.0
8	12.5	86.32	1.09	2.61	1.38	6	209	248	255	49	86	19.0
7	15	83.60	1.10	2.64	3.65	6	209	249	256	50	88	19.0
6	17.5	85.90	1.08	2.60	5.91	6	209	249	255	51	88	19.2
5	20	88.20	1.14	2.79	8.24	6	209	251	255	51	89	19.2
4	22.5	90.56	1.12	2.70	0.54	6	209	250	256	49	90	19.1
3	25	92.93	1.20	2.91	2.93	7	205	251	256	48	90	19.3
2	27.5	95.36	1.22	2.96	5.34	7	205	252	256	49	91	19.0
1	30	97.76	1.22	2.97	7.76	7	205	252	256	50	91	18.9
A 12	32.5	100.20	1.22	2.97	0.17	7	205	252	254	50	91	19.2
11	35	102.62	1.20	2.92	2.56	7	205	252	254	50	91	19.2
10	37.5	104.93	1.13	2.76	4.89	7	202	255	256	50	91	19.0
9	40	107.10	1.08	2.62	7.16	7	207	254	254	50	92	19.1
8	42.5	109.30	1.02	2.48	9.37	6	207	254	255	50	92	19.1
7	45	111.58	1.00	2.43	1.56	6	207	255	257	51	93	19.2
6	47.5	113.94	1.18	2.86	3.94	7	209	256	257	50	93	19.1
5	50	116.28	1.12	2.72	6.26	7	209	256	254	50	93	18.8
4	52.5	118.70	1.28	3.11	8.73	7	209	256	254	50	93	18.8
3	55	121.72	1.38	3.34	1.30	8	210	256	255	51	94	19.2
2	57.5	123.86	1.40	3.40	3.88	8	210	255	254	51	95	19.0
1	60	126.07	0.99	2.41	6.07	7	216	255	254	51	96	19.0
	(1207)											
V = 5587											AVG. = 864	
A = 60												

INTERPOL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP - TOMAHAWK Date 8-17-93 Test 1 Run 3
 Source CORR TUNNEL No. of traverse points 24
 Method 0011 Filter holder: N/A Filter type: N/A

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: 0.00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: _____ Recovery solvent(s) _____
 _____ ☒ acetone MCCLE
 _____ ☒ other(s) DI H₂O
 No. of probe wash bottles: 1
 Sample recovered by: SCB

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	<u>743</u>	<u>473</u>	<u>270.0</u>
Impinger No. 2	<u>674</u>	<u>474</u>	<u>200</u>
Impinger No. 3	<u>448</u>	<u>200</u>	<u>248</u>
Condenser			
Desiccant	<u>1488</u>	<u>1466</u>	<u>22.0</u>
			<u>270</u>
Total			<u>192.0</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 20 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 00 cc/min at 15 in. Hg.
 Time start: 1345 (HRS) Time end: 1448 (HRS)
 Sampling rate: 400 cc/min Operator: SCB
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

INTERPOL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Jul LP - Tomahawk

SUBJECT CORE - INLET
DATE 8-17-93 TIME 1051

Dpt. of Justice
 Criminal Division
 Criminal Justice Center
 1000 17th St. N.W.
 Washington, D.C. 20530

STB	\$ 14.2
Y	1.007

IN RE

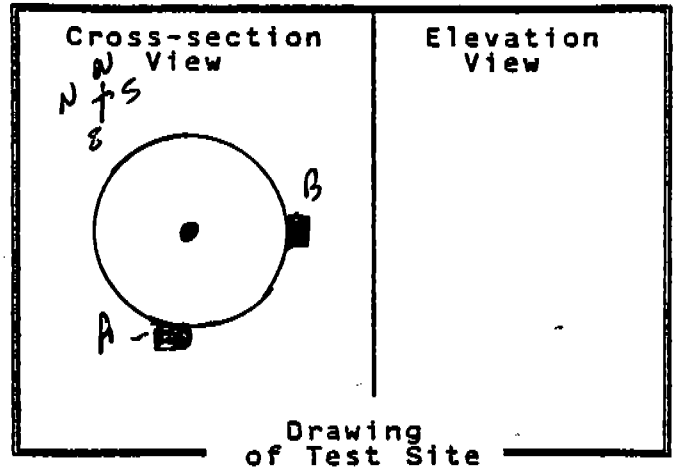
**Pittsburg
Bur. Priz
Moriz**

122-4
23.57
10-7 No

$\frac{100}{100} \times \frac{100}{100} = 100$

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (ft)	Orifice Meter (inches)	Dis. Vol. (cf)	VAC. in Hg	Temperature (°F)					Gas/Dust	Dewpoint (°F)
							Stack	Probe	Oven	Leaky	Gas In		
A-12	(1345) 2.5	126.70	1.18	2.85	9.00	6	202	251	250	58	83	82	18.8
"	5	129.00	1.20	2.84	14.1	6	210	252	253	55	84	82	18.7
"	7.5	131.42	1.23	2.91	3.79	6	210	252	256	54	85	83	17.9
"	10	133.80	1.18	2.80	6.13	6	210	253	256	56	85	83	18.8
"	12.5	136.15	1.08	2.59	8.38	6	204	254	256	56	87	83	12.9
"	15	138.42	1.05	2.52	0.60	6	204	254	255	56	88	83	19.9
"	17.5	140.67	1.00	2.39	2.77	6	208	254	256	56	91	83	19.4
"	20	142.70	1.12	2.68	5.06	6	208	250	251	52	92	85	19.4
"	22.5	145.00	1.28	3.06	7.52	6	210	254	254	51	93	85	19.5
"	25	147.58	1.32	3.17	0.01	6	208	254	254	52	94	86	19.4
"	27.5	150.01	1.35	3.26	2.55	6	205	254	258	54	95	87	19.4
"	30	152.58	1.20	2.91	4.95	6	204	254	257	54	95	88	17.5
"	32.5	154.99	1.12	2.72	7.27	6	204	254	257	55	90	87	19.2
"	35	157.30	1.10	2.66	9.52	6	204	255	257	51	95	88	19.4
"	37.5	159.64	1.10	2.66	18.5	6	207	255	257	57	95	87	19.3
"	40	161.88	1.10	2.66	4.15	6	207	255	256	57	96	87	19.3
"	42.5	164.10	1.08	2.62	6.43	6	207	255	254	53	97	89	17.5
"	45	166.43	1.08	2.61	8.70	6	209	255	256	54	97	90	19.4
"	47.5	168.62	1.10	2.66	1.00	6	209	255	256	49	97	90	19.4
"	50	171.02	1.15	2.78	3.36	6	209	254	254	44	98	90	19.3
"	52.5	173.39	1.18	2.84	5.72	6	213	255	256	48	98	91	19.5
"	55	175.70	1.20	2.91	8.14	7	209	254	256	49	99	91	19.4
"	57.5	178.19	1.28	3.10	0.62	7	209	258	256	45	99	91	19.4
"	60	180.66	1.28	3.11	3.11	7	207	256	254	49	99	91	19.3
"	(1448)	183.11											
Σ = 56.41							Σ = 87.7					Avg. = 87.7	

Job L.P. / Tomo Hawk, WI.
Source Dryer STACK STACK
Test 1 Run 0 Date 8/17/93
Stack dimen. 59 IN.
Dry bulb °F Wet bulb °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.57 in Hg
Static pressure - .90 in WC
Operators D. BRENNEN + J. BERLSTROM
Pitot No. 23-6 (Wass) C_p .84
127400 0011



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:	42.5 in.	Time start:	0830 hrs
A 1	.026	1.53	5.78	1.10	134
2	.082	4.84	9.09	1.10	
3	.146	8.61	12.86	1.20	
4	.226	13.33	17.58	1.30	
5	.342	20.18	24.43	1.35	
6	.658	38.82	43.07	1.35	
7	.774	45.67	49.92	1.30	
8	.854	50.39	54.64	1.25	
9	.918	54.16	58.41	1.20	
10	.974	57.47	61.72	1.15	
Temp. meas. device & S/N: PDT-25				Time end: 0845 hrs	

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / TOMAHAWK Date 8/17/93 Test 1 Run 1
 Source Dryer Stack No. of traverse points 20
 Method 0011 Filter holder: N/A Filter type: 4" 6.P.

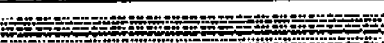
Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) 
 Posttest: .000 cfm at 18 in. Hg. (vac) 

Particulate Catch Data:

No.s of filters used: N/A Recovery solvent(s)
☐ acetone
☒ other(s) D.I. H₂O + M₂Cl₂
 No. of probe wash bottles: 1
 Sample recovered by: D. Brennan

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	739	474	265.0
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1348	1328	26.0
Total			285.0

Integrated Gas Sampling Data:

Bag Pump No. 238 Box No. 3 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 19 in. Hg.
 Time start: 0900 (HRS) Time end: 1006 (HRS)
 Sampling rate: 400 cc/min Operator: D. Brennan
 S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

L.P./TOMANDAK

Job	L.P./Tomahawk
Subjob	DAYEN STICK
Unit	89671/
Date	1981
Run	1

Dept. of
Material
Control

11. 9. 1968. 1.77 IN NE
BESUNN, BEISTON-

Plot No.
Bul. Price
Mozila No.

117 112
114 112
118 112

$$\frac{111}{77} = 1.44$$

Traverse Point No.	Sampling Time (min)	Supply Volume (cf)	Velocity Head (inWC)	Orifices Meter (inWC)	Obs. Vol. (cf)	VAC. inHg	Temperature (°F)				Gas/In	Cal/Dwt	Oxygen (Kv/v)
							Stack	Probe	Duct	Impg.			
A-10	5	545.66	1.20	2.80	8.59	8.8	135	239	250	57	81	76	18.5
	6	548.54	1.20	2.82	1.53	10.5	135	242	246	54	84	77	18.7
	8	571.48	1.20	2.83	4.48	10.5	135	245	249	48	86	78	18.7
	7	577.50	1.25	2.96	7.80	11.0	135	248	251	48	86	79	18.8
	6	580.46	1.25	2.96	0.52	11.0	135	246	250	46	87	79	18.6
	5	583.63	1.30	3.08	3.61	12.5	135	246	253	45	88	80	18.7
	4	586.65	1.30	3.04	6.70	12.5	134	245	255	45	88	80	18.8
	3	589.81	1.30	3.04	9.79	13.0	134	245	258	45	88	81	18.7
	2	592.84	1.15	2.74	2.70	11.0	134	248	254	43	88	81	18.7
	1	595.467	1.03	2.35	5.40	8.0	131	246	256	43	88	81	18.6
B-10	33	598.18	1.08	2.46	8.16	8.0	134	245	255	45	88	82	18.5
	34	600.98	1.10	2.57	6.99	9.0	135	249	253	45	90	82	18.5
	35	603.79	1.10	2.62	3.84	9.0	136	251	254	49	90	83	18.4
	42	606.70	1.15	2.74	6.76	9.5	136	249	254	50	91	83	18.4
	45	609.72	1.15	2.75	9.69	9.5	135	248	253	50	91	83	18.7
	48	612.70	1.25	2.99	2.74	12.0	135	248	256	50	91	84	18.6
	51	615.89	1.30	3.10	5.84	12.5	136	249	252	52	91	84	18.4
	54	618.92	1.30	3.10	8.95	12.5	136	240	254	53	91	84	18.4
	57	621.93	1.25	2.98	2.00	12.0	136	244	255	53	88	83	18.6
	60	625.017	1.30	3.04	5.09	12.5	136	246	257	55	88	83	18.5
(over)													
Total = 59.357												84.4	

0011
INTERPOLL LABORATORIES EPA METHOD ~~201~~ 7 SAMPLE LOG SHEET

Job L.P. / TOMAHAWIC Date 8/17/93 Test 1 Run 2
Source DRYER STACK No. of traverse points 20
Method 0011 Filter holder: N/A Filter type: N/A

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) ~~8~~
Posttest: .01 cfm at 15 in. Hg. (vac) ~~8~~

Particulate Catch Data:

No.s of filters used: N/A Recovery solvent(s)
☐ acetone
☒ other(s) MeOH, 10% H₂O

No. of probe wash bottles: 1
Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	743	477	266.0
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1367	1340	27.0
Total			293

Integrated Gas Sampling Data:

Bag Pump No. 23 B Box No. 3 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: .00 cc/min at 22 in. Hg.
Time start: 1103 (HRS) Time end: 1206 (HRS)
Sampling rate: 400 cc/min Operator: D. BRENNAN
S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

0011
INTERPOLL LABORATORIES EPA METHOD ~~501~~ SAMPLE LOG SHEET

Job C.P. TOMAHAWK Date 8/17/93 Test 1 Run 3
Source DRYER STACK No. of traverse points 20
Method 0011 Filter holder: N/A Filter type: N/A

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ~~5~~
Posttest: -00 cfm at 16 in. Hg. (vac) ~~5~~

Particulate Catch Data:

No.s of filters used: N/A Recovery solvent(s)
☐ acetone
☒ other(s) MECL₂ + D.I. H₂O
No. of probe wash bottles: 1
Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	710	477	233.0
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1376	1348	28.0
Total			261.0

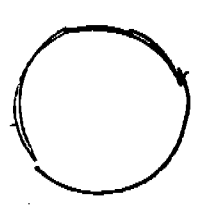
Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 3 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: .00 cc/min at 20 in. Hg.
Time start: 1345 (HRS) Time end: 1447 (HRS)
Sampling rate: 400 cc/min Operator: D. BRENNAN
S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

INTERPOL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job LP TOMAHAWK
 Source DRYER STACK
 Test 2 Run 0 Date 8-17-93
 Stack dimen. 59" IN.
 Dry bulb 138 °F Wet bulb °F
 Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
 Barometric pressure in Hg
 Static pressure -.90 in WC
 Operators G HOUE & J B
 Pitot No. MMS-V4 C_p .84

Cross-section View 	Elevation View
Drawing of Test Site	

PAH

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: 4.25 in.				Time start: 1800 hrs	
1	.026	1.53	5.78		138
2	.082	4.84	9.09		
3	.146	8.61	12.86		
4	.226	13.33	17.58		
5	.342	20.18	24.43		
6	.658	38.82	43.07		
7	.774	45.67	49.92		
8	.854	50.39	54.64		
9	.918	54.16	58.41		
10	.974	57.47	61.72		138
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Temp. meas. device & S/N: POT 24				Time end: 1810 hrs	

INTERPOL LABORATORIES EPA MODIFIED METHOD 5 SAMPLE LOG SHEET

Job LP TOMAHAWK
 Source DRYER
 Cyclone: ☐ Yes ☒ No Filter holder: MMS
 Analytes: _____
 Field recovery spike added: ☒ Yes ☐ No

Date 8-17-93 Test 2 Run 1
 No. of traverse points 24
 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) ☒
 Posttest: 00 cfm at 10 in. Hg. (vac) ☒

Semivolatile Catch Data:

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

☐ MeCl₂ * MeOH 50:50 v/v
☐ other(s) _____

No. of bottles for condensate trap catch: 1
 Samples recovered by: DVA

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate trap			
Condensate trap			
Condensate trap			
Impingers	<u>592</u>	<u>267</u>	<u>325</u>
Desiccant	<u>1415</u>	<u>1394</u>	<u>21</u>
Total			<u>346</u>

Integrated Gas Sampling Data:

Bag Pump No. 22B Box No. 6 Bag No. 1

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

Pretest leak check: 200 cc/min at 20 in. Hg.

Time start: 0900 (HRS) Time end: 1110 (HRS)

Sampling rate: 200 cc/min O₂ Analyzer S/N: 9

INTERPOL LABORATORIES EPA MODIFIED METHOD 3 FIELD DATA SHEET

Job LP-TOMMANY Operator G. HOUK Nozzle No. 2425-3 P1101 NO. M450 4
 SOURCE STACK EXHAUST Water Box No. 8 Nozzle Dia. 1/8" CP 84
 Date 10-17-93 Tester 2 NO. 1 Gas Meter Coeff. 1.0511 Bar. Pres. 28.57 In. Hg 16 %

Transfer Point No.	Sampling Time (min)	Sample Volume (cc)	Velocity Head (in H ₂ O)	Orifice Water (in H ₂ O)	Det. Vol. (cc)	VAC. in Hg	Temperature (°F)					Oxygen	
							Stack	Probe	Oven	XRD2	Imp.	Meter (In/Dut)	(% V/V)
C 10.	0900	953.675	1.25	1.06	5.4	6	135	243	241	41	42	71	18.6
10.	3	955.41	1.15	.97	7.08	6	136					71	18.3
9	6	957.08	1.20	1.03	8.80	6	135	244	243	42	42	71	18.6
9	9	958.80	1.10	.94	0.45	5	135					72	18.6
8	12	960.45	1.1	.94	2.10	4	135	246	265	43	44	72	18.6
8	15	962.10	1.1	.94	3.75	5	135					73	18.6
7	18	963.75	1.2	1.04	5.48	5	135	245	262	44	43	80	18.6
7	21	965.49	1.3	1.04	7.22	5	134					82	18.6
6	24	967.31	1.3	1.13	9.04	6	135	246	259	45	42	82	18.6
6	27	969.04	1.3	1.13	0.85	6	135					83	18.6
5	30	970.84	1.3	1.13	2.67	6	134	249	255	40	42	84	18.5
5	33	972.66	1.3	1.13	4.49	6	134					84	18.6
4	36	974.50	1.25	1.09	6.28	6	135	250	251	41	43	84	18.7
4	39	976.29	1.25	1.09	8.06	6	135					85	18.5
4	42	978.07	1.25	1.09	9.81	6	136	250	252	42	44	85	18.5
3	45	979.81	1.20	1.04	1.60	6	135					85	18.6
3	48	981.62	1.25	1.09	3.39	6	136	250	256	44	41	85	18.6
2	51	983.39	1.25	1.09	5.18	7	136					86	18.5
2	54	985.18	1.1	.96	6.86	7	136	251	257	45	42	84	18.4
1	57	986.87	1.1	.96	8.53	7	136					85	18.6
1	60	988.53	1.1	.96	0.21	7	135	252	253	40	40	82	18.5
A 10	63	990.21	1.1	.96	1.89	7	136					84	18.4
10	66	991.89	1.1	.96	3.56	7	135	255	254	41	46	86	18.6
9	69	993.56	1.2	1.05	5.32	6	135					87	18.5
9	72	995.32	1.25	1.10	7.13	7	135					87	18.4
8	75	997.13	1.25	1.10	7.13	7	135					87	18.4
Total		V _h =	H = 1.08		Avg. = 81.4								

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 SAMPLE LOG SHEET

Job LP TOMAHAWK Date 8-17-93 Test 2 Run 2
 Source DRYER STACK No. of traverse points _____
 Cyclone: ☐ Yes ☒ No Filter holder: MM5 Filter type: 4" Glass fiber
 Analytes: _____ 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) ☒
 Posttest: .00 cfm at _____ in. Hg. (vac) ☒

Semivolatile Catch Data:

No.s of filters used: _____ Recovery solvent(s) _____
☐ MeCl₂ * MeOH (50:50 v/v)
☐ other(s) _____

No. of bottles for condensate trap catch: _____
 Samples recovered by: DLH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate trap			
Condensate trap			
Condensate trap			
Impingers	<u>697</u>	<u>390</u>	<u>307</u>
Desiccant	<u>1364</u>	<u>1344</u>	<u>20</u>
Total			<u>327</u>

Integrated Gas Sampling Data:

Bag Pump No. 220 Box No. 6 Bag No. 2
 Bag Material: 4-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 25 in. Hg.
 Time start: 1145 (HRS) Time end: 1430 (HRS)
 Sampling rate: 200 cc/min O₂ Analyzer S/N: 9

Rev.1 CF-026

INTERPOL LABORATORIES EPA MODIFIED METHOD 3 FIELD DATA SHEET

JOB LP TOMAHAWK
SOURCE DRYER
DATE 1911 2 JUN 2

Operator C HOWE S.B.
Meter Box No. 8
Gasmeter const. 1.0011

NO2114 NO. MM5-3
NO2119 Dia. .185 in.
Bar. Pres. 28.57 in. Hg

P1101 NO. MM5-V 4
CO .84 %
H₂O 1.0 %

[illegible]
$$\begin{array}{r} 96 \\ 5 \overline{) 480} \\ \underline{45} \\ 30 \\ \underline{25} \\ 50 \\ \underline{45} \\ 50 \\ \underline{45} \\ 50 \\ \underline{45} \\ 50 \end{array}$$

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 SAMPLE LOG SHEET

Job L P TOMAHAWK Date 8-17-93 Test 2 Run 3
 Source DRYER STACK No. of traverse points 20
 cyclone: ☐ Yes ☒ No Filter holder: MMS Filter type: 4" Glass fiber
 Analytes: _____ 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) ☒
 Posttest: .00 cfm at 10 in. Hg. (vac) ☒

Semivolatile Catch Data:

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

☒ MeCl₂ * MeOH (50:50 v/v)
☐ other(s) _____

No. of bottles for condensate trap catch: 1
 Samples recovered by: DIA

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate trap			
Condensate trap	<u>315</u>	<u>0</u>	<u>315</u>
Condensate trap			
Impingers			
Desiccant	<u>1453</u>	<u>1429</u>	<u>24</u>
Total			<u>339</u>

Integrated Gas Sampling Data:

Bag Pump No. 228 Box No. 6 Bag No. 3
 Bag Material: 4-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 25 in. Hg.
 Time start: 1507 (HRS) Time end: 1715 (HRS)
 Sampling rate: 200 cc/min O₂ Analyzer S/N: 9

INTERPOLL LABORATORIES EPA MODIFIED METHOD 3 FIELD DATA SHEET

JOB LP TOHAWANK OPERATOR G. HANEY NO. 1115 NO. 1115 NO. 1115
 SOURCE ORXES METER BOX NO. 28 NO. 1115 NO. 1115 NO. 1115
 DATE 8-17-93 RUN 3 GEOMETER CORR. 10011 BAR. PRES. 2857 16. Hg 18 %

Traverse Point No.	Sampling Time (min)	Sample Volume (cc)	Velocity Hood (fpm)	Orifice Meter (fpm)	Des. Vol. (cc)	VAC. inHg	Temperature (°F)						Oxygen	
							Stack	Probe	Oven	XAD2	lap.	Meter (in/out)	(%v/v)	
C-10	1507	94.90	1.2	1.02	6.44	5	134	265	240	39	39	84	18.5	
10	3	96.45	1.2	1.01	8.37	5	135					85	18.4	
9	6	98.37	1.2	1.01	0.10	5	134	263	248	42	43	85	18.3	
9	9	100.10	1.2	1.02	1.13	5	134					87	18.3	
8	12	101.83	1.2	1.01	3.56	5	135	260	252	44	45	91	18.3	
8	15	103.56	1.2	1.02	5.31	5	135					91	18.2	
7	18	105.32	1.2	1.02	7.05	5	135	259	258	44	46	92	18.3	
7	21	107.05	1.2	1.02	8.79	5	135					93	18.2	
7	24	108.79	1.2	1.11	0.61	5	136	260	259	45	47	94	18.3	
6	27	110.61	1.3	1.11	2.42	5	136					94	18.3	
6	30	112.42	1.3	1.11	4.24	5	136	263	254	46	46	95	18.4	
5	33	114.24	1.25	1.07	6.02	5	136					95	18.2	
5	36	116.02	1.25	1.06	7.81	5	137	261	254	47	47	95	18.2	
4	39	117.81	1.25	1.06	9.59	5	137					96	18.3	
4	42	119.59	1.25	1.07	1.30	5	137	262	257	44	43	96	18.3	
3	45	121.30	1.25	1.07	3.17	5	136					96	18.3	
3	48	123.17	1.25	1.03	4.92	5	135	261	254	42	42	95	18.1	
3	51	124.92	1.20	1.03	6.67	5	135					95	18.1	
2	54	126.67	1.15	.99	8.37	5	135	263	259	44	43	99	18.1	
1	57	128.39	1.15	.99	0.11	5	134					95	18.2	
1	60	130.11	1.1	.94	1.79	5	134	261	256	45	42	91	18.5	
A 10	63	131.79	1.1	.94	3.46	5	136					93	18.5	
10	66	133.46	1.1	.94	5.13	5	135	260	257	42	45	95	18.6	
9	69	135.13	1.1	.94	6.81	5	135					96	18.6	
9	72	136.81	1.1	.94		5								
Σ							Σ	Σ	Σ	Σ	Σ	Σ	Σ	
Avg. =							Avg. =							

0100
0006
0000

S-405

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job LP/ TOMAHAWK
Source FACE INLET DUCT
Test 4 Run Date 8-17-93
Stack dimen. 41.5 IN.
Dry bulb °F Wet bulb °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.57 in Hg
Static pressure -6.0 in WC
Operators E. Trowbridge K. Rosenthal
Pitot No. 23V-4 C_p .840

Elevation
View

Drawing of Test Site

[illegible]

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/TOMAHAWK Date 8-17-93 Test 4 Run 1
 Source Face Inlet Street No. of traverse points 2.4
 Method 5 Filter holder: 4" glass Filter type: 4" glass fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: 0 cfm at 7 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5571 Recovery solvent(s)

☒ acetone
☐ other(s) _____

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		(100)	
Impinger No. 2	335	{ 100 }	135
Impinger No. 3		{ 0 }	
Condenser			
Desiccant	1308	1300	8
Total			143

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 19 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 0 cc/min at 15 in. Hg.
 Time start: 1541 (HRS) Time end: 1641 (HRS)
 Sampling rate: 400 cc/min Operator: ET
 S/N of O₂ Analyzer used to monitor train outlet: 7

CF-023

Job LP/TOMAHAWK
 Support FACE INLET DUCT
 Date 8-17-83 1981 2 RUN 1

Operators ETXR
 Motor Box No. 2 111 1.931N UC
 Compressor Code: 1.0006

Pitot No. 238-1 Cp .840
 Bar. Press. 28.57 inHg RED X
 Nozzle No. 1-3 Nozzle Dia. .185 in.

[illegible]

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job A.P. Tomahawk Date 8-17-93 Test 4 Run 2
 Source State Soil Dept No. of traverse points 24
 Method 5 Filter holder: 4" glass Filter type: 4" glass & fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: 0 cfm at 4 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5608 Recovery solvent(s) ☒ acetone ☐ other(s) _____

No. of probe wash bottles: 1

Sample recovered by: ET

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		<u>100</u>	
Impinger No. 2		<u>100</u>	<u>174</u>
Impinger No. 3		<u>0</u>	
Condenser			
Desiccant	<u>1363</u>	<u>1351</u>	<u>12</u>
Total			<u>186</u>

Integrated Gas Sampling Data:

Bag Pump No. 24A Box No. 19 Bag No. 2
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 0 cc/min at 15 in. Hg.
 Time start: 1749 (HRS) Time end: 1849 (HRS)
 Sampling rate: 400 cc/min Operator: ET
 S/N of O₂ Analyzer used to monitor train outlet: 7

CF-023

INTERPOL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP Transbank Operator ET-KR Pilot No. 2314 CP 846
 Source Base Fuel Meter Box No. 2 HP 1.23 IN HG Bar. Press. 28.57 IN HG H₂O
 Date 8-12-83 Tester Y Run 2 Nozzle No. 2-3 Nozzle Dia. 18.5 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Hood (in/min)	Drifts Meter (in/min)	Dis. Vol. (cf)	VAC. inHg	Temperature (°F)					Oxygen (xv/v)
							Stack	Probe	Dye	Leaky	Caslin	Cas/Dye
A	12	750.80	1.50	.95	2.18	4.2	239	230	245	48	90	90
	11	752.22	1.20	.86	3.49	4.0	237				91	90
	10	753.55	1.10	.79	4.75	4.0	236	242	251	48	94	90
	9	754.81	1.10	.77	6.00	4.0	237				95	90
	8	756.10	1.05	.76	7.24	3.9	257	248	254	48	96	90
	7	757.30	1.00	.72	8.44	5.9	238				96	92
	6	758.50	.98	.71	9.63	3.9	238	253	251	49	97	92
	5	759.70	1.10	.90	0.90	4.0	235				98	93
	4	760.94	1.30	.95	7.28	4.5	235	255	252	50	98	93
	3	762.30	1.40	1.02	3.71	5.0	234				100	94
	2	763.71	1.40	1.03	5.15	5.0	234	251	250	50	100	94
	1	765.14	1.30	.96	6.54	5.0	232				100	94
B	12	766.54	1.40	1.02	7.97	5.0	238	245	249	49	100	94
	11	767.96	1.50	.95	9.35	5.0	235				101	94
	10	769.35	1.30	.95	0.75	5.0	236	251	250	50	101	94
	9	770.73	1.20	.88	2.07	5.0	235				102	95
	8	772.10	1.05	.77	3.31	4.9	233	253	254	50	102	95
	7	773.33	.94	.69	4.50	4.5	233				102	95
	6	774.55	.85	.62	5.62	4.3	233	253	253	52	102	95
	5	775.68	.90	.60	6.78	4.5	233				102	95
	4	776.80	1.05	.77	8.03	5.0	233	250	252	52	102	95
	3	778.10	1.10	.81	9.31	5.0	232				103	96
	2	779.33	1.10	.81	0.59	5.0	230	251	247	52	103	96
	1	780.65	1.00	.74	1.81	4.9	230				103	96
	60	781.90										
	C18.50											
Avg. = 83		31.10										
Avg. = 86												

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP Tampa Bay Date 8-17-93 Test Run 3
 Source road salt dust No. of traverse points 24
 Method 5 Filter holder: 4" glass Filter type: 1" glass fiber

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac)
 Posttest: 0 cfm at 6 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 5609 Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1

Sample recovered by: ET

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		{ 1440 }	
Impinger No. 2		{ 1440 }	172
Impinger No. 3		{ 0 }	
Condenser			
Desiccant	1319	1308	11
Total			183

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 19 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 0 cc/min at 15 in. Hg.
 Time start: 1922 (HRS) Time end: 2024 (HRS)
 Sampling rate: 440 cc/min Operator: ET
 S/N of O₂ Analyzer used to monitor train outlet: 2

CF-023

1001 2 P. Vandenbark
 1001 1001 1001 1001 1001 1001
 1001 8-77-83 1001 4 1001 3

Operator
Meter Box No.
Counter cost

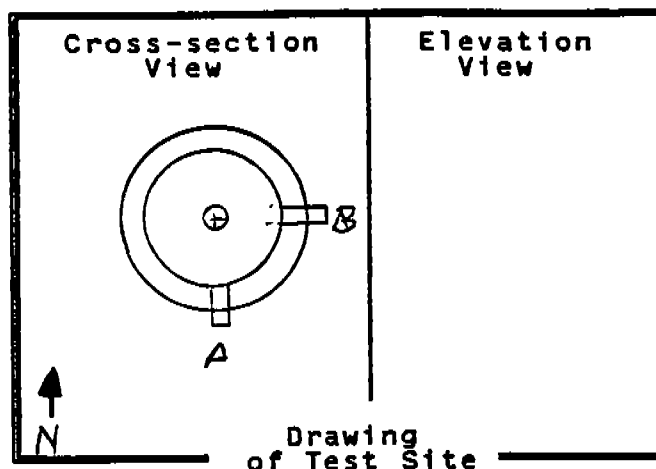
67-XP
- 193 IN NC
- 193 IN NC

Pilot No. 231-4 CP, 84
 Bar. Press. 28.5 in Hg 120 x
 Nozzle No. 2-3 Nozzle Dia. 185 H.

Traverse Point No.	Sampling Time (min)	Sample Volume (cc)	Velocity Head (inWC)	Drifted Meter (inWC)	Obs. Vol. (cc)	VAC. inHg	Temperature (°F)						Oxygen (xv/v)
							Stack	Probe	Dyn	Insp.	Caslin	Cat/Dut	
B	19.22	782.10	1.40	.95	3.48	4.0	235	235	249	48	93	93	16.9
	2.5	783.54	1.40	.95	4.86	4.2	235				94	93	17.1
	5	784.90	1.40	.88	6.18	4.1	235	244	252	48	96	93	17.2
	7.5	786.22	1.30	.81	7.46	4.1	239				97	93	16.9
	10	787.55	1.20	.72	8.66	4.0	232	260	235	48	97	93	16.9
	12.5	788.70	1.05	.64	9.79	4.0	237				97	93	16.9
	15	789.80	.94	.57	ORL	3.8	237	252	251	49	98	94	16.9
	17.5	790.92	.85	.41	1.97	3.8	257				99	94	16.9
	20	791.99	.90	.71	3.17	4.0	237	250	255	50	99	94	17.1
	22.5	793.20	1.05	.75	4.40	4.1	237				100	94	17.1
	25	794.45	1.10	.75	5.63	4.1	236	252	254	50	100	94	17.0
	27.5	795.65	1.10	.68	6.80	4.0	232				100	94	16.9
A	30	796.82	1.00	.95	8.19	5.0	235	250	248	49	100	94	16.9
	32.5	798.22	1.40	.82	9.47	4.8	235				101	94	17.0
	35	799.50	1.20	.75	10.70	4.7	235	248	245	49	101	94	17.0
	37.5	800.73	1.10	.75	11.93	4.7	235				101	94	17.3
	40	801.98	1.05	.72	13.14	4.5	232	247	249	49	101	95	17.3
	42.5	803.18	1.00	.69	14.32	4.5	234				101	95	17.0
	45	804.35	1.00	.68	15.49	4.5	234	249	250	50	101	95	17.0
	47.5	805.51	1.10	.75	16.72	4.7	234				101	95	17.0
	50	806.70	1.30	.89	18.07	5.0	234	246	248	50	101	95	17.5
	52.5	808.04	1.40	.96	19.46	5.2	234				102	95	17.7
	55	809.50	1.40	.90	20.85	5.2	232	244	247	50	102	95	17.7
	57.5	810.85	1.40	.90	22.19	5.2	230				102	95	17.7
	60	812.20	1.30	.90									
	(2024)	V = 30.10		H = .79							Av. = 96		

INTERPOL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job 1 D- TOMAHAWK
 Source CORE INLET
 Test 4 Run 0 Date 8-17-93
 Stack dimen. 41.5 IN.
 Dry bulb 207 °F Wet bulb 138 °F
 Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
 Barometric pressure 28.57 in Hg
 Static pressure -7.10 in WC
 Operators SB + KR
 Pitot No. V22-4 C_p .840



PMI

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: <u>8</u> in.		Time start: _____ hrs	
A 1	.021	0.87	8.87		
2	.067	2.78	10.78		
3	.118	4.90	12.90		
4	.177	7.35	15.35		
5	.250	10.38	18.34		
6	.356	14.77	22.77		
7	.644	26.73	34.73		
8	.750	31.13	39.13		
9	.823	34.15	42.15		
10	.882	36.60	44.60		
11	.753	38.72	46.72		
12	.779	40.63	48.63		
B 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Temp. meas. device & S/N: <u>DIGITAL TE-DDT-29</u>				Time end: _____	

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP-TOMAHAWK Date 8-17-93 Test 4 Run 1
 Source CORR INLET No. of traverse points 2
 Method 1-5 Filter holder: GLASS Filter type: Glass Fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: 0.00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5645 Recovery solvent(s) ☒ acetone
☐ other(s)
 No. of probe wash bottles: 1
 Sample recovered by: SB & WR

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	<u>628</u>	<u>498</u>	<u>130</u>
Impinger No. 3			
Condenser			
Desiccant	<u>1372</u>	<u>1344</u>	<u>28</u>
Total			<u>158</u>

Integrated Gas Sampling Data:

Bag Pump No. 28A Box No. 20 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 00 cc/min at 15 in. Hg.
 Time start: 1540 (HRS) Time end: 1641 (HRS)
 Sampling rate: 400 cc/min Operator: SB
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

LP - TOMA HAWK

LP - TOMA x 14114

Departure

$$\underline{SB + VL}$$
[illegible]

Pitt

6-221

34

$$\frac{840}{1121}$$

15

JAN 1967

Run

144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077 1078 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105 1106 1107 1108 1109 1110 1111 1112 1113 1114 1115 1116 1117 1118 1119 1120 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133

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11-1-2022

$$\begin{array}{r} 18.27 \\ 10-37 \\ \hline \end{array}$$

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7
6
5741
$$\begin{array}{r} 111 \\ 8 \overline{) 888} \\ \underline{888} \\ 0 \end{array}$$

Traverse Point No.	Sampling Time (min)	Sample Volume (cu ft)	Velocity Head (in WC)	Drifted Meter (in WC)	Obs. Vel. (ft)	VAC. in Hg	Temperature (°F)					Dwyer (xv/v)	
							Stack	Probe	Dyn	Ingr	Cas In		Cas Out
	(1540)	(183.70)											
B 12	2.5	185.00	1.10	0.93	5.04	5	205	251	252	51	86	86	19.2
"	5	186.42	1.10	0.92	6.41	5	207	250	253	51	89	87	19.2
"	7.5	187.76	1.10	.93	7.16	5	207	253	254	51	91	88	19.3
"	10	189.14	1.10	.93	9.12	5	206	254	264	50	92	88	19.2
"	12.5	190.56	1.10	.93	0.49	5	206	254	254	50	93	89	19.3
"	15	191.88	1.12	0.94	1.86	5	208	254	256	50	94	90	19.3
"	17.5	193.29	1.20	1.02	3.28	5	207	254	256	50	95	90	19.2
"	20	194.70	1.22	1.10	4.77	5	207	254	256	51	97	90	19.0
"	22.5	196.26	1.22	1.10	6.25	5	207	254	256	51	97	90	19.0
"	25	197.76	1.23	1.11	7.74	6	207	254	256	51	97	91	19.1
"	27.5	199.27	1.28	1.16	9.26	6	207	254	256	52	97	91	19.1
"	30	200.62	0.98	0.89	0.59	5	205	254	254	52	98	92	19.1
"	32.5	202.18	1.22	1.11	2.08	6	204	254	254	52	97	92	19.2
"	35	203.56	1.15	1.05	3.53	6	204	254	254	53	98	92	19.2
"	37.5	205.00	1.20	1.08	5.01	6	209	255	256	55	99	92	19.1
"	40	206.36	1.05	0.94	6.38	6	211	256	256	56	99	93	18.9
"	42.5	207.82	1.10	0.99	7.79	6	211	256	257	56	99	93	19.0
"	45	209.60	1.12	1.01	9.22	6	209	256	255	55	99	93	19.1
"	47.5	210.76	1.20	1.08	0.70	6	211	254	256	55	101	93	19.1
"	50	212.17	1.18	1.07	2.04	6	210	254	256	55	100	93	19.1
"	52.5	213.60	1.19	1.08	3.63	6	210	254	252	54	100	93	19.1
"	55	215.26	1.40	1.28	5.24	7	202	254	254	54	101	94	18.9
"	57.5	216.28	1.30	1.18	6.78	7	207	255	254	54	101	94	19.0
"	60	218.19	1.09	0.99	8.19	6	207	255	254	54	101	94	19.0
							Avg. = 93.7					93.7	

INTERPOL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP-TOMAHAWK
 Source BORE INLET
 Method 1-5 Filter holder: GLASS

Date 8-17-93 Test 4 Run 2
 No. of traverse points 21
 Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: 0.00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5647 Recovery solvent(s)
☒ acetone
☐ other(s)
 No. of probe wash bottles: 1
 Sample recovered by: SB + KR

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	<u>645</u>	<u>498</u>	<u>147</u>
Impinger No. 3			
Condenser			
Desiccant	<u>1491</u>	<u>1483</u>	<u>8</u>
Total			<u>155</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 20 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 00 cc/min at 15 in. Hg.
 Time start: 1745 (HRS) Time end: 1850 (HRS)
 Sampling rate: 400 cc/min Operator: SB
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

INTERROLL LABORATORIES - PA METHOD 5 FIELD DATA SHEET

Job LP - TOMAHAWK Operators SB & KC Pilot No. V22-4 C# 840
 Source CORE INLET Meter Box No. 7 SH# 132 IN NC Bar. Press. 28.57 IN HG H2O 17 K
 Date 8-17-73 1961 4 Hrs 2 Gas meter coeff. 1.0073 Nozzle No. 10-3 Nozzle Dia. 22 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (in WC)	Orifice Meter (in WC)	Des. Vol. (cf)	VAC. in Hg	Temperatures (°F)						Oxygen (xy/v)
							Stack	Probe	Duct	Inlet	Gas In	Gas/Duct	
A-12	17.5	(218.80)	1.20	1.00	0.21	5	207	251	255	52	89	87	19.0
11	5	220.26	1.15	0.95	1.58	5	207	252	255	52	90	90	19.0
10	7.5	221.57	1.00	0.82	2.87	5	210	252	255	52	92	91	19.0
9	10	222.86	1.05	0.87	4.18	5	211	252	256	52	93	90	19.0
8	12.5	224.10	0.98	0.81	5.45	5	211	252	256	52	94	91	19.0
7	15	225.40	0.96	0.79	6.71	5	211	252	256	52	95	91	19.0
6	17.5	226.70	1.08	0.89	8.05	5	211	252	256	51	96	91	18.9
5	20	228.02	1.22	1.01	9.48	5	211	252	256	51	97	92	19.0
4	22.5	229.48	1.30	1.08	0.75	5	210	251	255	50	98	92	18.7
3	25	230.97	1.28	1.07	2.41	5	210	251	254	50	98	92	18.7
2	27.5	232.40	1.25	1.04	3.85	6	210	252	254	50	98	93	18.7
1	30	233.80	1.10	0.92	5.21	6	210	252	254	50	99	93	18.8
B-12	32.5	235.20	1.02	0.87	6.54	6	210	252	254	50	97	93	18.9
14	35	236.56	1.07	0.89	7.88	5	210	252	254	48	99	93	18.9
10	37.5	237.80	1.07	0.89	9.22	5	211	252	253	42	98	93	18.7
9	40	239.24	1.07	0.89	0.57	5	210	252	254	42	100	94	18.5
8	42.5	240.62	1.09	0.91	1.90	5	210	252	254	47	100	94	18.5
7	45	241.92	1.05	0.88	3.21	5	208	252	255	50	100	94	18.5
6	47.5	243.22	1.10	0.92	4.57	5	208	251	254	50	100	95	18.6
5	50	244.59	1.20	1.00	5.99	6	209	257	255	50	100	95	18.8
7	52.5	245.90	1.28	1.07	7.46	6	210	251	254	49	101	95	18.7
3	55	247.48	1.22	1.03	8.90	6	206	251	253	49	101	95	18.8
2	57.5	248.96	1.04	0.87	0.23	6	206	252	253	48	101	95	18.3
1	60	250.87	1.00	0.85	1.54	6	202	251	254	48	101	95	18.5
	(1950)												
	0 = 60	V# = 3305		W = 0.85								Av# = 95.0	

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP - TOMAHAWK Date 8-17-93 Test 4 Run 3
 Source PORT JACKET No. of traverse points 21
 Method 1-5 Filter holder: GLASS Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: 0.02 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

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

5648 ☒ acetone _____
☐ other(s) _____

No. of probe wash bottles: 1
 Sample recovered by: SB + KRL

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	<u>631</u>	<u>491</u>	<u>140</u>
Impinger No. 3			
Condenser			
Desiccant	<u>1415</u>	<u>1408</u>	<u>7</u>
Total			<u>147</u>

Integrated Gas Sampling Data:

Bag Pump No. 224 Box No. 20 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 00 cc/min at 15 in. Hg.
 Time start: 1922 (HRS) Time end: 2030 (HRS)
 Sampling rate: 400 cc/min Operator: SB
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

Job L.P. / Tomahawk
Source Dryer Stack
Test 4 Run Date 8/17/93
Stack dimen. IN.
Dry bulb °F Wet bulb °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.57 in Hg
Static pressure in WC
Operators J. Bergstrom
Pitot No. Cp

Cross-section View	Elevation View
Drawing of Test Site	

[illegible]

INTERPOL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / TOMAHAWK Date 8/17/93 Test 4 Run 2
 Source DRYER STALK No. of traverse points 20
 Method 5 Filter holder: GLASS Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) 
 Posttest: .000 cfm at 14 in. Hg. (vac) 

Particulate Catch Data:

No.s of filters used: 5759 Recovery solvent(s)  acetone ROB + NOZZLE
 other(s) _____
 No. of probe wash bottles: 1
 Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	991	505	286
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	461	1369	32
Total			318

Integrated Gas Sampling Data:

Bag Pump No. 23 B Box No. 30 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 22 in. Hg.
 Time start: 1742 (HRS) Time end: 1846 (HRS)
 Sampling rate: 400 cc/min Operator: D. BRENNAN
 S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

L.P. / Tomahawk

OPERATORS
 WATER BOX NO. 9
 OPERATOR CONT. 1-77 IN NE
 9952
 BRENNAN + BRENNAN

Pitot No.	23.6 (6455)	Ep	.81
Bar. Press.	28.53	in Hg	H2O 18 x
Nozzle No.	8.1	Nozzle Dia	2.26 in.

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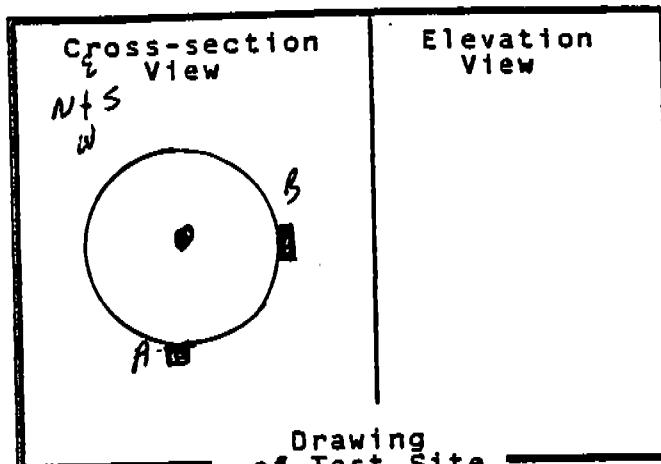
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INTERPOL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job L.P. / TOMAHAWK
 Source DRYER STACK
 Test 4 Runs 1-3 Date 8/17/93
 Stack dimen. 59" IN.
 Dry bulb °F Wet bulb °F
 Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
 Barometric pressure 28.57 in Hg
 Static pressure -.90 in WC
 Operators BRENNAN & BERGSTROM
 Pitot No. 23-6 C_p .84



Drawing of Test Site

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: <u>4.25</u> in.		Time start: hrs	
A	1	.026	1.53	5.78	
	2	.082	4.84	9.09	
	3	.146	8.61	12.86	
	4	.226	13.33	17.58	
	5	.342	20.18	24.43	
	6	.658	38.82	43.07	
	7	.774	45.67	49.92	
	8	.854	56.39	54.64	
	9	.918	54.16	58.41	
	10	.974	57.47	61.72	
	1				
	2				
	3				
	4				
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	8				
	9				
	10				
	11				
	12				
Temp. meas. device & S/N: <u>POT-25</u>				Time end: hrs	

INTERPOL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / TOMAHAWK
 Source DRYER STAGL
 Method 5 Filter holder: 60655

Date 8/17/93 Test 4 Run 1
 No. of traverse points 20
 Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) 4
 Posttest: .005 cfm at 16 in. Hg. (vac) 4

Particulate Catch Data:

No.s of filters used: 1 Recovery solvent(s) acetone
5753 ☒ acetone PROVE + NOZZLE
☐ other(s) _____
 No. of probe wash bottles: 1
 Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	699	502	197
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1393	1367	26
Total			223

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 30 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 100 cc/min at 19 in. Hg.
 Time start: 1540 (HRS) Time end: 1722 (HRS)
 Sampling rate: 400 cc/min Operator: D. BRENNAN
 S/N of O₂ Analyzer used to monitor train outlet: 3

(1 hr 02 min)

CF-023

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / TOMAHAWK Date 8/17/93 Test 4 Run 3
 Source DRYER SUCK No. of traverse points 20
 Method 5 Filter holder: 6 Filter type: 4° C.F.

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: .000 cfm at 16 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 1 Recovery solvent(s) acetone
5735 ☒ other(s) Probe + Nozzle
 No. of probe wash bottles: 1
 Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	802	507	295
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1414	1390	24
Total			319

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 30 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 22 in. Hg.
 Time start: 1922 (HRS) Time end: 2025 (HRS)
 Sampling rate: 400 cc/min Operator: D. BRENNAN
 S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

2.P. TOMAHAWK
DRYER STICK

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2.P. 1 TOMAHAWK					

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Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job L.P./Tomahawk Date 8/17/93 Bar. Pressure 28.57 IN.HG.
Test Location Dryer Fuel Type WOOD Sample Train No. 2
STALK Technician J. BERGSTROM Pump No. 1

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	4-1-1	17	0905	26.70	70	☒ Yes ☐ No
2	4-1-2	25	0915	26.70	70	☒ Yes ☐ No
3	4-1-3	27	0930	26.70	71	☒ Yes ☐ No
4	4-1-1	29	0940	26.70	71	☒ Yes ☐ No
5	4-2-2	30	1150	26.65	72	☒ Yes ☐ No
6	4-2-3	48	1210	26.60	72	☒ Yes ☐ No
7	4-2-1	43	1220	26.70	73	☒ Yes ☐ No
8	4-2-2	44	1240	26.70	73	☒ Yes ☐ No
9	4-3-3	46	1350	26.75	73	☒ Yes ☐ No
10	4-3-1	58	1410	26.70	73	☒ Yes ☐ No
11	4-3-2	73	1430	26.70	72	☒ Yes ☐ No
12	4-3-3	76	1445	26.70	72	☒ Yes ☐ No
13	Blank	51				☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

Test #4 PT

SOURCE NAME L.P. TOMAHAWK			OBSERVATION DATE 8-17-93				START TIME 1808				STOP TIME 1908			
ADDRESS			SEC MIN		0	15	30	45	SEC MIN		0	15	30	45
			1		0	0	0	0	31		0	0	0	0
CITY TOMAHAWK			STATE WI		ZIP		2		32		0	0	0	0
PHONE			SOURCE ID NUMBER		3		0		33		0	0	0	0
PROCESS EQUIPMENT DRYER			OPERATING MODE		4		0		34		0	0	0	0
CONTROL EQUIPMENT			OPERATING MODE		5		0		35		0	0	0	0
			6		0		0		36		5	0	0	0
			7		0		5		37		0	0	0	0
DESCRIBE EMISSION POINT START STACK STOP STACK			8		0		0		38		5	0	0	0
HEIGHT ABOVE GROUND LEVEL START 150 STOP 150			HEIGHT RELATIVE TO OBSERVER START 150 STOP 150		9		0		39		0	0	0	0
DISTANCE FROM OBSERVER START 600 STOP			DIRECTION FROM OBSERVER START EAST STOP EAST		10		0		40		0	0	0	0
DESCRIBE EMISSIONS START LOOPING STOP LOOPING			11		0		0		41		0	0	0	0
EMISSION COLOR YELLOW START WHITE STOP WHITE			PLUME TYPE CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐		12		0		42		0	0	0	0
WATER DROPLETS PRESENT: NO ☐ YES ☒			IF WATER DROPLET PLUME: ATTACHED ☒ DETACHED ☐		13		0		43		0	0	0	0
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 75' NORTH OF STOP 75' N. OF			14		0		0		44		0	0	0	0
DESCRIBE BACKGROUND START SKY STOP SKY			15		0		0		45		0	0	0	0
BACKGROUND COLOR START BLUE STOP BLUE			SKY CONDITIONS START CLOUDY STOP CLOUDY		16		0		46		0	0	0	0
WIND SPEED START 0-5 STOP 0-5			WIND DIRECTION START SOUTH STOP SOUTH		17		0		47		0	0	0	0
AMBIENT TEMP START 83 STOP 79			WET BULB TEMP. 59%		18		0		48		0	0	0	0
Source Layout Sketch Draw North Arrow PLUME Emission Point WIND Observers Position Sun Wind Plume and Stack 140° Sun Location Line			19		0		0		49		0	0	0	0
			20		0		0		50		0	0	0	0
			21		0		0		51		0	0	0	0
			22		0		0		52		0	0	0	0
			23		0		0		53		0	0	0	0
			24		0		0		54		0	0	0	0
			25		0		10		55		0	0	0	0
			26		0		0		56		0	0	0	0
			27		0		0		57		0	0	0	0
			28		0		0		58		0	0	0	0
			29		0		0		59		0	0	0	0
			30		0		0		60		0	0	0	0
AVERAGE OPACITY FOR HIGHEST PERIOD 1.6%			NUMBER OF READINGS ABOVE 1.6% WERE 6											
RANGE OF OPACITY READINGS MINIMUM 0			MAXIMUM 10											
OBSERVER'S NAME (PRINT) GARY HOWE														
OBSERVER'S SIGNATURE <i>Gary Howe</i>			DATE 8-17-93											
ORGANIZATION INTERPOLL														
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE <i>WISCONSIN DNR</i>			CERTIFIED BY WISCONSIN DNR			DATE 4-93								
TITLE			DATE			VERIFIED BY			DATE					

INTERPOLL LABORATORIES

Benzene Field Data Sheet

Job L.P. / Tomahawk
 Source Dryer Stack
 Date 8/17/93 Test 5 Run 1

Operator(s) JEFF BERGSTROM
 Meter Box No. 65 Meter coef. .9972
 Barometric Pressure 28.87 in.Hg

Sample Train Leak Check:

Pretest: 0 cc/min at 1.5 in.Hg

Posttest: 0 cc/min at 15 in.Hg

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	VAC. (inHg)	Temperature (oF)		
					Stack	Probe	Gasmeter
	1540	28.00					
N/A	5	28.198	1000	3	136	—	102
—	10	28.396	1000	3	138	—	102
—	15	28.595	1000	3	138	—	102
—	20	28.793	1000	5	140	—	103
—	25	28.989	1000	6	140	—	103
—	30	29.186	1000	6	140	—	104
—	35	29.382	1000	6	140	—	104
—	40	29.580	1000	7	140	—	106
—	45	29.779	1000	7	139	—	107
—	50	29.893	1000	7	140	—	108
—	55	30.089	1000	7	140	—	108
—	60	30.287	1000	7	139	—	108
$\theta = 60$		$V_m = 2.287$					$t_m = 104.75$

1640

$V_{std} = 2.058$

S-476

INTERPOLL LABORATORIES

Benzene Field Data Sheet

Job L.P.
 Source Dryer Stack
 Date 8/17/93 Test 5 Run 2

Operator(s) JEFF BERGSTROM
 Meter Box No. 65 Meter coef. .9972
 Barometric Pressure 28.87 in.Hg

Sample Train Leak Check:

Pretest: 0 cc/min at 15 in.Hg
 Posttest: 0 cc/min at 15 in.Hg

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	VAC. (inHg)	Temperature (oF)		
					Stack	Probe	Gasmeter
	1742	30.300					
1/A	5	30.476	1000	35	135	—	107
—	10	30.654	1000	4	136	—	107
—	15	30.833	1000	5	136	—	107
—	20	31.008	1000	5	137	—	106
—	25	31.183	1000	6	136	—	106
—	30	31.384	1000	6	137	—	106
—	35	31.573	1000	7	137	—	107
—	40	31.765	1000	7	137	—	107
—	45	31.960	1000	8	137	—	107
—	50	32.154	1000	8	137	—	108
—	55	32.351	1000	8	137	—	109
—	60	32.547	1000	7.5	137	—	110
—	60	Vm= 2.247					tm=107.25

1846

Vstd= 2.013

INTERPOLL LABORATORIES

Benzene Field Data Sheet

Job L.P. Operator(s) JEFF BERGSTROM
 Source Dryer Stack Meter Box No. 65 Meter coef. .9972
 Date 8/17/93 Test S Run 3 Barometric Pressure 28.87 in.Hg

Sample Train Leak Check:

Pretest: 0 cc/min at 15 in.Hg
 Posttest: 0 cc/min at 15 in.Hg

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	VAC. (inHg)	Temperature (oF)		
					Stack	Probe	Gasmeter
	1922	32.700					
MA	5	32.892	1000	3.5	137	—	111
—	10	33.085	1000	4	138	—	110
—	15	33.280	1000	4	137	—	110
—	20	33.475	1000	5	137	—	110
—	25	33.671	1000	5	137	—	110
—	30	33.869	1000	5	137	—	110
—	35	34.042	1000	5	136	—	110
—	40	34.215	1000	6	136	—	110
—	45	34.388	1000	6	137	—	110
—	50	34.561	1000	7	138	—	110
—	55	34.734	1000	9	138	—	110
—	60	34.908	1000	9	138	—	110
	60	Vm=2.208					tm=110

2030

Vstd = 1.968

S-476

Job LPTOMAHAWK
Source DRYER STACK
Test 6 Run 1 Date 8-18-93
Stack dimen. 59 IN.
Dry bulb °F Wet bulb °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.58 in Hg
Static pressure -1.90 in WC
Operators E. TRAUBRIDGE - K. ROSENTHAL
Pitot No. 23-6 Cp 840

Elevation
View

Drawing of Test Site

Pitot No. 23-6
PHENOL

C-59

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/TOMA HAWK Date 8-18-93 Test 6 Run 1
 Source DRYER STALK No. of traverse points 3
 Method PAPNOL Filter holder: _____ Filter type: _____

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) ☐
 Posttest: _____ cfm at _____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: _____ Recovery solvent(s) _____
 _____ ☐ acetone _____
 _____ ☐ other(s) _____
 No. of probe wash bottles: _____
 Sample recovered by: _____

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total	ALL DATA MUST BE RECORDED IN THIS SPACE. IF THE SPACE IS NOT SUFFICIENT, THE DATA MUST BE RECORDED ON A SEPARATE SHEET. THE DATA MUST BE RECORDED IN THE SPACE PROVIDED FOR THIS PURPOSE.		

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 28 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 0 cc/min at 15 in. Hg.
 Time start: 0801 (HRS) Time end: 0859 (HRS)
 Sampling rate: 400 cc/min Operator: ET
 S/N of O₂ Analyzer used to monitor train outlet: 7

CF-023

EPA Method 4 and 6 Field Data Sheet

Job LP/TOMAHAWK
 Source DRYER-STACK
 Date 8-18-93 Test 16 Run 1

Operator(s) ET-KR
 Meter Bq. No. 7 Gasmeter coef. 1.0006
 ΔH 1.93 in.WC Bar. press. 29.58 in.Hg

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. ☒
 Posttest: 0 cfm at 7 in. Hg. ☒

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	0800	813.00								
1	5	816.80	1.93	6.5	240	251	44	77	74	18.0
1	10	820.58	1.93	6.6	240	254	45	82	76	18.3
1	15	824.30	1.93	6.7	246	250	45	83	77	18.2
1	20	828.10	1.93	6.8	248	248	45	87	79	18.1
2	25	831.95	1.93	6.8	251	250	46	84	81	18.1
2	30	835.70	1.93	6.8	252	248	46	90	82	18.0
2	35	839.40	1.93	6.8	250	251	46	91	82	17.9
2	40	843.25	1.93	6.8	247	250	46	94	84	18.0
3	45	846.95	1.93	6.8	250	251	46	93	84	18.1
3	50	850.80	1.93	6.8	252	250	47	93	84	18.2
3	55	854.50	1.93	6.8	250	251	47	94	84	18.1
3	60	858.30	1.93	6.8	252	254	47	94	85	18.1
	(0900)									
	$\theta = 60$	$V_m = 45.30$	$(\Delta H)_{avg} = 1.93$					$(t_m)_{avg} = 84.9$		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	411	200	211
Condenser			
Desiccant	1378	1363	15
	Total		226

Preliminary results of SO ₂ concentration determination	
V _{std}	= DSCF
Moisture	= 20.18 %v/v
SO ₂ , dry	= ppm
SO ₂ , wet	= ppm
LB/MMBtu	=

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LPI TOMA HAWK
 Source DRYER STACK
 Method PHENOL Filter holder: 4" GLASS

Date 8-15-83 Test 6 Run 2
 No. of traverse points 3
 Filter type: 4" GLASS FIBER

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☐
 Posttest: _____ cfm at _____ in. Hg. (vac) ☐

Particulate Catch Data:

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

_____ ☐ acetone _____
 _____ ☐ other(s) _____

No. of probe wash bottles: _____
 Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total	DO NOT WRITE IN THESE SPACES		

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 28 Bag No. 2

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

Pretest leak check: 0 cc/min at 15 in. Hg.

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

Sampling rate: 400 cc/min Operator: ET

S/N of O₂ Analyzer used to monitor train outlet: 7

CF-023

INTERPOLL LABORATORIES
EPA Method 4 and 6 Field Data Sheet

Job LP/TOMAHAWK
Source DRYER STACK
Date 8-18-83 Test 6 Run 2

Operator(s) ET-KR
Meter Box No. 7 Gasmeter coef. 1.0006
 $\bar{H}_e$ 1.93 in.WC Bar. press 28.58 in.Hg

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. ☒
Posttest: 0 cfm at 2 in. Hg. ☒

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Drift Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	0910	858.50								
1	5	862.30	1.93	6.0	247	251	45	92	86	18.3
1	10	866.12	1.93	6.0	251	255	45	93	86	18.3
1	15	869.81	1.93	6.1	250	252	45	94	86	18.3
1	20	873.62	1.93	6.1	251	254	46	95	86	18.3
2	25	877.32	1.93	6.1	252	250	46	95	87	18.4
2	30	881.10	1.93	6.1	249	250	46	96	87	18.4
2	35	884.90	1.93	6.2	247	248	47	96	87	18.4
2	40	888.70	1.93	6.2	250	252	47	96	88	18.4
3	45	892.50	1.93	6.2	250	254	47	96	88	18.4
3	50	896.30	1.93	6.2	248	252	48	96	88	18.3
3	55	900.05	1.93	6.2	247	250	48	96	88	18.3
3	60	903.93	1.93	6.2	248	251	48	96	88	18.3
	(1010)									
	$\theta = 60$	$V_m = 45.43$	$(\bar{H})_{avg} = 1.93$					$(t_m)_{avg} = 91.1$		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	391	200	191
Condenser			
Desiccant	130.7	1294	13
		Total	204

Preliminary results of SO ₂ concentration determination	
V _{std}	= DSCF
Moisture	= 18.7% v/v
SO ₂ , dry	= ppm
SO ₂ , wet	= ppm
LB/MMBtu	=

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/TOMAHAWK Date 8-18-93 Test 6 Run 3
 Source DRYER STACK No. of traverse points 3
 Method Filter holder: Filter type:

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☐
 Posttest: cfm at in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)
 ☐ acetone
 ☐ other(s)
 No. of probe wash bottles:
 Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total	DO NOT WRITE IN THESE SPACES		

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 28 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 0 cc/min at 15 in. Hg.
 Time start: (HRS) Time end: (HRS)
 Sampling rate: 400 cc/min Operator: ET
 S/N of O₂ Analyzer used to monitor train outlet: I

CF-023

EPA Method 4 and 6 Field Data Sheet

Job LP/TOMAHAWK
 Source DRYER STACK
 Date 8-18-93 Test 6 Run 3

Operator(s) ET-KR
 Meter Box No. 7 Gas meter coef. 1.0006
 ^HQ 1.93 in.WC Bar. press 28.58 in.Hg

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. ☒

Posttest: 0 cfm at 7 in. Hg. ☒

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	1015	904.20								
1	5	908.05	1.93	6.6	245	247	45	97	90	18.2
1	10	911.82	1.93	6.7	250	245	45	97	90	18.1
1	15	915.60	1.93	6.7	250	247	45	98	90	18.1
1	20	919.40	1.93	6.8	252	249	46	99	90	18.1
2	25	923.10	1.93	6.8	250	251	46	100	90	18.1
2	30	926.97	1.93	6.8	252	253	46	100	90	18.0
2	35	930.75	1.93	6.8	254	252	46	100	90	18.1
2	40	934.42	1.93	6.8	251	250	47	99	89	18.3
3	45	938.20	1.93	6.8	250	254	47	99	90	18.5
3	50	942.00	1.93	6.8	248	251	47	99	90	18.1
3	55	945.65	1.93	6.8	249	250	47	99	90	18.2
3	60	949.50	1.93	6.8	252	250	47	99	90	18.1
	(1115)									
	$\theta = 60$	$V_m = 45.30$	$(\bar{H})_{avg} = 1.93$					$(t_m)_{avg} = 94.4$		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	406	200	206
Condenser			
Desiccant	1373	1360	13
		Total	219

Preliminary results of SO₂ concentration determination

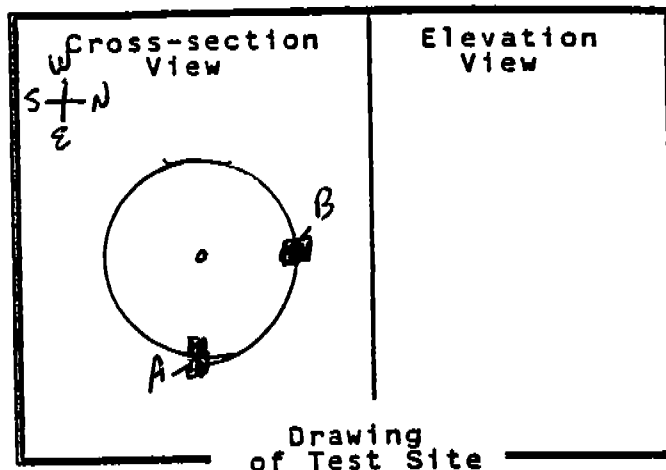
V _{std}	=	DSCF
Moisture	=	19.95 %v/v
SO ₂ , dry	=	ppm
SO ₂ , wet	=	ppm
LB/MMBtu	=	

APPENDIX D

PRESS VENT FIELD DATA SHEETS

INTERPOL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job L.P. / TOMAHAWK
 Source PRESS VENT STACK
 Test 8 Run 0 Date 8/18/93
 Stack dimen. 62.5 IN.
 Dry bulb °F Wet bulb °F
 Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
 Barometric pressure 28.60 in Hg
 Static pressure -1.0 in WC
 Operators BRENNAN + BERLSTROM
 Pitot No. 29-6 (443) C_p .84



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: 3 & in.		Time start: 0856 hrs	
A	1	.021	1.26	7.26	
	2	.067	4.02	10.02	
	3	.118	7.08	13.08	
	4	.177	10.62	16.62	
	5	.250	15.00	21.00	
	6	.356	21.36	27.36	
	7	.644	38.64	44.64	
	8	.750	45.00	51.00	
	9	.823	49.38	55.38	
	10	.882	52.92	58.92	
	11	.933	55.98	61.98	
	12	.979	58.74	64.74	
B	1		1.31	4.31	1.70
	2		4.19	7.19	1.75
	3		7.37	10.37	1.75
	4		11.06	14.06	1.75
	5		15.625	18.625	1.80
	6		22.25	25.25	1.90
	7		46.25	43.25	1.55
	8		46.875	49.875	1.60
	9		51.44	54.44	1.60
	10		58.31	58.31	1.65
	11		58.31	61.31	1.40
	12		61.18	64.1	1.10
Avg.				1.63	
Temp. meas. device & S/N: PDT-25				Time end: hrs	

0011
INTERPOLL LABORATORIES EPA METHOD ~~549~~ SAMPLE LOG SHEET

Job L.P. / TOMAHAWK Date 8/18/93 Test 8 Run 1
Source PRESS VENT STACK No. of traverse points 24
Method 0011 Filter holder: N/A Filter type: N/A

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Posttest: .000 cfm at 12 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: N/A Recovery solvent(s)
☐ acetone
☒ other(s) M2U2 + D.I. H2O
No. of probe wash bottles: 1
Sample recovered by: J. BERGSTROM

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	483	473	10.0
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1390	1377	13.0
Total			23.0

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: 0945 (HRS) Time end: 1045 (HRS)
Sampling rate: cc/min Operator: D. BRENNAN
S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

INTERPOL LABORATORIES L.A. METHOD 5 FIELD DATA SHEET

Job C.P. / TOMAHAWK Operator BRENNAN + BECKSTROM Pitot No. 29-6 (Guss) 84
 Source PAISS VENT STACK Meter Box No. 9 1.22 IN HC Bar. Press. 28.20 IN Hg H2O 2 X
 Date 8/18/83 Calculator 9952 Nozzle No. 3-3 Nozzle Dia. .192 IN.

Traverse Point No.	Sampling Time (min)	Supply Volume (cf)	Velocity Head (in Hg)	Orifice Meter (in Hg)	Dis. Vol. (cf)	VAC. in Hg	Temperature (°F)					Gas/Dust (xv/v)	Oxygen (xv/v)
							Stack	Probe	Duct	Temp.	Gas/In		
A-12	(0940)	937.900					97	239	236	49	79	76	20.9
	2.5	939.75	1.20	1.55	9.72	4.0	95	240	235	48	81	77	1
	5.0	941.67	1.40	1.80	11.7	4.5	98	240	235	46	83	77	A
	7.5	943.70	1.55	1.99	3.73	5.0	95	242	235	46	84	78	M
	10.0	945.82	1.60	2.07	5.84	5.0	95	241	237	46	84	78	B
	12.5	947.91	1.50	1.94	7.88	5.0	95	244	235	46	85	78	1
	15.0	949.92	1.50	1.94	9.92	5.0	96	243	236	46	86	79	E
	17.5	952.15	1.80	2.33	2.15	6.0	95	246	235	45	87	79	N
	20.0	954.41	1.80	2.34	4.39	6.0	99	245	239	45	87	80	T
	22.5	956.64	1.75	2.26	6.59	6.0	96	248	238	46	88	80	A
B-12	25.0	958.81	1.80	2.34	8.83	6.0	95	246	238	46	88	81	1
	27.5	961.07	1.75	2.28	1.05	6.0	95	247	239	48	86	81	R
	30.0	963.231	1.70	2.21	3.23	5.0	99	250	243	48	86	81	
	32.5	965.36	1.55	2.02	5.32	6.0	99	248	237	48	89	82	
	35.0	967.54	1.80	2.33	7.55	6.0	99	248	240	49	89	82	
	37.5	969.83	1.85	2.39	9.82	6.0	95	249	243	51	90	83	
	40.0	972.08	1.80	2.35	2.07	6.0	100	250	242	52	91	83	
	42.5	974.33	1.70	2.21	4.25	6.0	95	246	246	52	91	83	
	45.0	976.52	1.76	2.21	6.44	6.0	96	248	245	52	91	84	
	47.5	978.78	1.85	2.42	8.73	6.5	98	251	245	52	91	84	
	50.0	981.12	1.95	2.55	1.07	7.0	94	250	242	54	92	84	
	52.5	983.55	2.10	2.74	3.50	7.0	94	248	244	55	92	84	
	55.0	986.03	2.20	2.89	6.00	7.0	96	249	243	55	92	85	
	57.5	988.52	2.15	2.82	8.47	6.0							
	60.0	990.847	1.90	2.49	0.79								
	109.5												
		V _s = 52.947	ΔH = 2.25									AVG. = 84.1	
		Q = 60											

0011
INTERPOLL LABORATORIES EPA METHOD ~~507~~ SAMPLE LOG SHEET

Job L.P. / TOMAHAWK Date 8/18/93 Test 8 Run 2
Source RESS VENT No. of traverse points 24
Method 0011 Filter holder: N/A Filter type: N/A

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) ~~8~~
Posttest: .000 cfm at 12 in. Hg. (vac) ~~8~~

Particulate Catch Data:

No.s of filters used: N/A Recovery solvent(s)
☐ acetone
☒ other(s) MeCl₂ + D.I. H₂O
No. of probe wash bottles: 1
Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	487	475	12.0
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1413	1400	13.0
Total			25.0

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: 1115 (HRS) Time end: 1220 (HRS)
Sampling rate: cc/min Operator: D. BRENNAN
S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

Signature: BRENNAN + BELLESTROM

Print No. 29-6 (6455) Cu. 84

1971 11/25 2131 2800 1.1-1.7

11/10/2011

11/25 213/ 2000 9-10-11-12

Highly Rux

11

Box No. 129

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3

Traverse Point No.	Sampling Time (min)	Supply Volume (cf)	Velocity Head (in WC)	Orifice Meter (in WC)	Des. Vol. (cf)	VAC. in Hg	Temperature (°F)					Dwyer (xv/v)	
							Stack	Probe	Duct	Inlet	Cat/Duct		
B-12	(1115) 2.5	991.200	1.80	1.82	3.17	5.0	96	236	240	54	84	82	20.9
11	5.0	993.15	1.80	2.32	5.40	6.0	100	240	244	51	86	82	1
10	7.5	995.35	1.90	2.47	7.71	6.0	95	238	246	50	87	82	A
9	10.0	997.67	1.70	2.21	9.89	5.5	95	240	251	48	89	83	M
8	12.5	999.82	1.60	2.08	2.01	5.0	98	243	250	48	90	84	B
7	15.0	1002.03	1.70	2.22	4.20	5.5	95	246	246	48	90	84	1
6	17.5	1004.17	1.80	2.34	6.45	6.0	98	248	248	46	91	84	E
5	20.0	1006.42	2.00	2.61	8.83	6.5	97	248	248	46	91	85	N
4	22.5	1008.78	2.20	2.88	1.32	7.5	94	250	248	46	92	85	T
3	25.0	1011.27	2.15	2.81	3.79	7.0	95	252	249	46	92	85	A
2	27.5	1013.74	1.80	2.36	6.05	6.0	95	254	251	45	92	85	1
1	30.0	1016.03	1.85	2.43	8.34	6.0	95	254	255	45	92	85	R
A-12	32.5	1018.325	1.80	1.84	6.34	4.5	95	258	254	48	91	85	
11	35.0	1020.40	1.55	2.04	2.44	5.0	94	255	250	48	92	85	
10	37.5	1022.52	1.70	2.23	4.64	5.5	96	255	246	49	92	86	
9	40.0	1024.64	1.75	2.30	6.87	5.5	94	257	248	51	93	86	
8	42.5	1026.85	1.60	2.11	9.61	5.5	94	253	246	51	93	86	
7	45.0	1029.04	1.55	2.03	1.11	5.0	98	255	248	51	93	86	
6	47.5	1031.24	1.90	2.49	3.43	6.5	96	257	245	52	93	86	
5	50.0	1033.52	1.75	2.30	5.67	5.5	95	260	249	52	93	87	
4	52.5	1035.77	1.70	2.23	7.87	5.5	97	263	251	54	93	87	
3	55.0	1037.96	1.70	2.23	10.07	5.5	96	262	250	55	94	87	
2	57.5	1040.10	1.85	2.44	2.38	6.0	94	263	250	55	94	87	
1	60.0	1042.37	1.80	2.37	4.68	6.0	94	262	248	55	94	87	
	(1220)	1044.646											
Avg. = 88.1													
V _s = 53.446													
H = 2.30													
O = 60													

0011
INTERPOLL LABORATORIES EPA METHOD ~~5413~~ SAMPLE LOG SHEET

Job L.P. / TOMAHAWIC Date 8/18/93 Test 8 Run 3
Source DRYER STACK No. of traverse points 24
Method 0011 Filter holder: N/A Filter type: N/A

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac)
Posttest: .000 cfm at 10 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: N/A Recovery solvent(s)
☐ acetone
☒ other(s)
No. of probe wash bottles: 1
Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	490	477	13.0
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1504	1492	12.6
Total			25.6

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: 1245 (HRS) Time end: 1348 (HRS)
Sampling rate: cc/min Operator: D. BRENNAN
S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

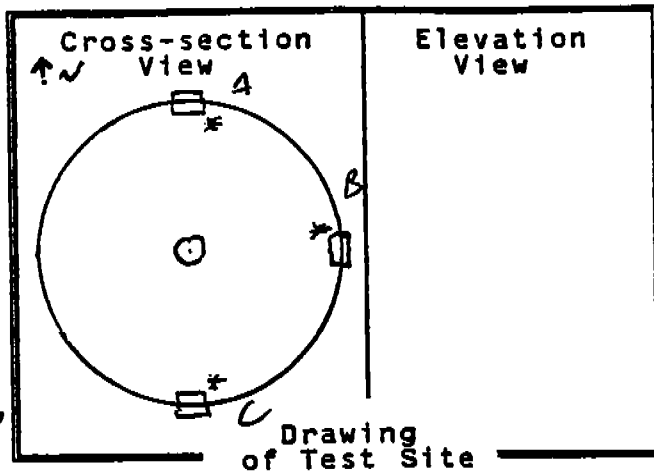
INTERPOL LABORATORIES - A METHOD 5 FIELD DATA SHEET

Job L.P. / TOMAHAWK Operator BOENMAN + BERGSTRON Pitot No. 29-C (Gross) CP .84
 Source Pass Vent Stack Meter Box No. 110 IN HC 1.22 IN HC 2.20 IN HC 2.88
 Date 8/18/93 Run 3 Calibrator Serial No. 9952 Nozzle No. 3-3 Nozzle Dia 1.90 IN.

Transfer Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (in HC)	Drifted Meter (in HC)	Obs. Vol. (cf)	VAC. in Hg	Temperature (°F)					Oxygen (xx/vv)
							Stack	Probe	Duct	Gas/In	Gas/Duct	
A-12	(12.45)	45.00	1.45	1.89	7.02	5.0	95	240	246	86	83	20.9
	2.5	47.03	1.50	1.94	9.07	5.0	94	242	246	86	83	1
	5.0	49.10	1.65	2.14	1.21	5.5	94	245	248	88	84	A
	7.5	51.19	1.90	2.45	3.51	6.5	97	245	247	89	84	m
	10.0	53.49	1.70	2.19	5.69	6.0	98	243	250	90	84	B
	12.5	55.72	1.60	2.08	7.81	5.5	94	243	249	90	84	1
	15.0	57.82	1.90	2.47	0.12	6.5	95	242	253	90	84	2
	17.5	60.14	1.80	2.35	2.37	6.5	93	245	251	90	85	3
	20.0	62.42	1.80	2.34	7.62	6.5	95	249	258	91	85	4
	22.5	64.67	1.85	2.40	6.90	6.5	97	250	254	91	85	5
	25.0	66.93	1.80	2.35	9.16	6.5	94	253	255	91	85	A
	27.5	69.22	1.75	2.28	1.38	6.0	95	252	258	91	85	1
B-12	30.0	71.415	1.55	2.02	3.47	5.5	94	259	260	90	85	2
	32.5	73.55	1.70	2.21	5.66	6.0	95	259	264	91	85	3
	35.0	75.74	1.85	2.41	7.94	6.5	95	260	267	91	85	4
	37.5	77.99	1.75	2.27	0.16	6.0	97	258	266	91	85	5
	40.0	80.18	1.60	2.08	2.29	8.5	95	255	267	91	85	6
	42.5	82.37	1.60	2.08	4.41	8.5	97	255	267	91	85	7
	45.0	84.49	1.85	2.39	6.68	6.5	98	256	266	91	85	8
	47.5	86.74	2.00	2.59	9.05	7.0	97	255	268	91	85	9
	50.0	89.06	2.15	2.79	1.51	7.5	96	255	267	91	85	10
	52.5	91.53	2.40	3.10	7.10	8.0	98	259	265	91	85	11
	55.0	94.04	2.30	2.98	6.43	8.0	97	260	263	91	85	12
	57.5	96.88	1.90	2.48	8.95	7.0	94	263	264	91	85	13
60.0	98.926											
(13.46)												
0 = 60												
V = 53.926												
Avg. = 87.3												

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job L.P. / Tomahawk, WI
Source Press Vent / Stack
Test 9 Run 02 Date 8-18-93
Stack dimen. 62.5 IN.
Dry bulb 92 °F Wet bulb °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 29.60 in Hg
Static pressure -1.0 in WC
Operators Michael + J. Bergstrom
Pitot No. 290-5 Cp .84



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:	3 in.	Time start: 0900 hrs	
	1/6	10.42	13.42		
	3/6	31.25	34.25		92
	5/6	52.08	55.08		
* Port length is actually 6", of which 3" extends inside the stack wall.					
Temp. meas. device & S/N: PDT-1 / TC				Time end: 0900 hrs	

EPA Method 4 and 6 Field Data Sheet

Job L.P. / TOMAHAWK
 Source Press VENT STACK
 Date 8/18/93 Test 9 Run 1

Operator(s) MR. MARK KAEHLER
 Meter Box No. 8 Gas meter coef. 1.0011
 Δ He 1.85 in.WC Bar. press 29.60 in.Hg

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg.Posttest: 0.02 cfm at 10 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Drift Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	(0945)	175.00								
6-3	5	178.89	1.85	7	237	242	45	71	71	20.9
3	10	182.77	1.85	7	240	245	43	74	72	1
3	15	186.65	1.85	7	239	245	42	76	73	A
3	20	190.53	1.85	7	240	248	42	78	73	M
2	25	194.46	1.85	7	237	251	42	80	74	B
2	30	198.37	1.85	7	239	246	42	82	75	1
2	35	202.17	1.85	7	242	250	43	81	75	2
2	40	206.17	1.85	7	240	253	43	84	77	T
1	45	210.10	1.85	7	244	253	43	84	78	A
1	50	214.02	1.85	7	244	251	43	85	78	1
1	55	217.95	1.85	7	241	246	43	85	79	R
1	60	221.88	1.85	7	246	245	43	85	79	
	(1045)									
	$\theta = 60$	$V_m = 46.98$	$(\Delta H)_{avg} = 1.85$					$(t_m)_{avg} = 78$		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers A	273	265	8
Condenser B	270	266	4
Desiccant	1483	1470	13
	Total		25

Preliminary results of SO ₂ concentration determination	
V _{std}	= DSCF
Moisture	= 2.60 %v/v
SO ₂ , dry	= ppm
SO ₂ , wet	= ppm
LB/MMBtu	=

EPA Method 4 and 6 Field Data Sheet

Job L.P. / Omaha, NE
 Source Press Vent / Stack
 Date 8-18-93 Test 9 Run 2

Operator(s) M. Kaehler + J. Bergstrom
 Meter Box No. 8 Gas meter coef. 1.0011
 ΔH 1.85 in.WC Bar. press 28.60 in.Hg

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg.

Posttest: 10.02 cfm at 10 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	(1105)	222.20								
C-3	5	226.16	1.85	7	243	251	43	78	76	20.1
3	10	230.12	1.85	7	240	252	43	82	79	1
3	15	234.00	1.85	7	245	250	43	82	78	A
3	20	237.93	1.85	7	245	255	43	84	78	M
2	25	241.87	1.85	7	242	251	43	85	79	B
2	30	245.80	1.85	7	241	248	44	85	79	1
2	35	249.75	1.85	7	237	245	44	85	79	E
2	40	253.67	1.85	7	240	247	44	85	80	N
1	45	257.60	1.85	7	243	251	44	85	80	T
1	50	261.53	1.85	7	245	251	44	86	80	
1	55	265.47	1.85	7	242	254	44	87	81	A
1	60	269.40	1.85	7	246	253	44	87	81	1
	(1205)									R
	0-60	$V_m = 37.2$	$\Delta H = 1.85$					$(t_m)_{avg} = 81.71$		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers A	276	265	11
Condenser B	272	265	7
Desiccant	1492	1483	9
	Total		

Preliminary results of SO₂ concentration determination

V_{std} = DSCF

Moisture = 3.52 %v/v

SO₂, dry = ppm

SO₂, wet = ppm

LB/MMBtu =

EPA Method 4 and 6 Field Data Sheet

Job 2.P. / Tomahawk, WI
 Source Press Vent / Stack
 Date 9-18-93 Test 9 Run 3

Operator(s) M. Kaehler + J. Bergstrom
 Meter Box No. 8 Gasmeter coef. 1.0011
 ^HQ 1.85 in.WC Bar. press 29.60 in.Hg

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. ☒
 Posttest: 40.02 cfm at 10 in. Hg. ☒

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen
					Probe	Oven	Impg.	Gas/In	Gas/Out	(%v/v)
	(1210)	270.40								
C-3	5	274.35	1.85	7	243	255	44	84	82	20.9
3	10	278.30	1.85	7	241	257	44	87	83	
3	15	282.25	1.85	7	245	256	44	88	83	A
3	20	286.17	1.85	7	242	256	43	90	84	M
2	25	290.08	1.85	7	246	257	43	91	85	B
2	30	294.00	1.85	7	247	255	42	91	85	I
2	35	297.91	1.85	7	245	256	43	92	86	E
2	40	301.82	1.85	7	243	252	42	92	87	N
1	45	305.76	1.85	7	243	252	42	93	88	T
1	50	309.66	1.85	7	240	249	42	94	89	A
1	55	313.56	1.85	7	237	253	42	95	89	I
1	60	317.50	1.85	7	241	250	42	95	90	R
	(1310)									
	θ=60	V _m =47.10	(^H) _{avg} =1.85					(t _m) _{avg} =88.46		

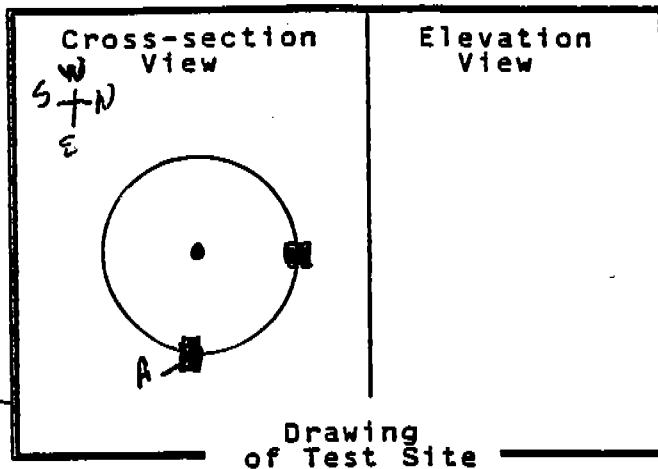
Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers A	276	265	11
Condensate B	271	265	6
Desiccant	1401	1390	11
	Total		28

Preliminary results of SO ₂ concentration determination	
V _{std}	= DSCF
Moisture	= 2.94% v/v
SO ₂ , dry	= ppm
SO ₂ , wet	= ppm
LB/MMBtu	=

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job L.P. / TOMAHAWK
Source PRESS VENT STACK
Test 11 Run 0 Date 8/18/93
Stack dimen. 62.5 IN.
Dry bulb °F Wet bulb °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.60 in Hg
Static pressure -1.0 in WC
Operators D. BRENNAN + J. BERLSTROM
Pitot No. 29-6 (GLASS) C_p 84



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:	3 in.	Time start:	hrs
A	1	.021	1.31	4.31	
	2	.067	4.19	7.19	
	3	.118	7.37	10.37	
	4	.177	11.06	14.06	
	5	.250	15.625	18.625	
	6	.356	22.25	25.25	
	7	.444	40.25	43.25	
	8	.750	46.875	49.875	
	9	.823	51.44	54.44	
	10	.882	55.125	58.12	
	11	.933	58.31	61.31	
	12	.979	61.18	64.18	
Temp. meas. device & S/N: PDT-25				Time end:	hrs

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / TOMAHAWIC Date 8/18/93 Test 11 Run 1
 Source MESS VENT STACK No. of traverse points 24
 Method 5 Filter holder: GLASS Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: .000 cfm at 16 in. Hg. (vac) ☒

Particulate Catch Data:

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

1 ☒ acetone _____
5730 ☐ other(s) _____

No. of probe wash bottles: _____

Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	<u>516</u>	<u>503</u>	<u>13.0</u>
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	<u>1379</u>	<u>1357</u>	<u>22.0</u>
Total			<u>35.0</u>

Integrated Gas Sampling Data:

AMBIENT AIR (NEED BAG ANALYZED)
for CO

Bag Pump No. 23B Box No. 15 Bag No. 1

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

Pretest leak check: .00 cc/min at 22 in. Hg.

Time start: 1425 (HRS) Time end: 1528 (HRS)

Sampling rate: 400 cc/min Operator: D. BRENNAN

S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

L.P. / TOMAHAWK

L.P. / TOMAHAWK
PASS SENT STACK
8/18/93

Department
Water Box
Counter

BENZANN + BENNSTROM

Pitt
Bur.
Hoxl

28-20 10M4 HZ
 1-3 NOX10 DID
 C(455)CP -84

2.38. 11.

Traverse Point No.	Sampling Time (min)	Sample Volume (cc)	Velocity Head (in H ₂ O)	Orifice Meter (in H ₂ O)	Dis. Vol. (cc)	VAC. (in Hg)	Temperature (°F)				Gas In	Gas Out	Oxygen (xv/v)
							Stack	Probe	Duct	Temp.			
B-12	2.5	99.300	1.26	1.57	1.14	6.6	95	245	230	55	80	79	20.9
11	5.0	101.12	1.40	1.80	3.10	7.6	96	248	233	51	81	79	1
10	7.5	105.29	1.80	2.32	5.33	10.0	93	250	232	50	82	80	A
9	10.0	107.43	1.70	2.20	7.50	10.0	92	249	232	50	83	80	M
8	12.5	109.48	1.50	1.93	9.53	8.5	97	251	233	50	84	80	B
7	15.0	111.53	1.50	1.93	1.57	8.5	97	256	235	48	86	81	1
6	17.5	113.90	1.90	2.47	3.87	11.5	93	252	230	47	87	82	2
5	20.0	116.17	1.80	2.35	6.11	10.5	92	252	230	47	87	82	N
4	22.5	118.40	1.75	2.31	8.34	10.0	85	253	232	47	88	82	T
3	25.0	120.65	1.80	2.37	0.60	10.5	87	250	233	47	88	82	
2	27.5	122.85	1.80	2.37	2.86	10.5	88	255	232	47	89	82	A
1	30.0	125.060	1.80	2.37	5.12	10.5	88	252	232	46	89	83	1
A-12	32.5	127.22	1.65	2.18	7.29	9.0	87	249	230	46	88	83	R
11	35.0	129.43	1.75	2.27	9.50	9.5	96	250	233	47	88	83	
10	37.5	131.78	1.85	2.39	1.77	10.5	98	253	231	49	89	83	
9	40.0	133.94	1.70	2.20	3.95	10.0	99	251	231	51	89	83	
8	42.5	136.15	1.60	2.08	6.07	9.0	96	252	230	52	90	83	
7	45.0	138.26	1.60	2.08	8.19	9.0	97	255	231	52	90	84	
6	47.5	140.34	1.55	2.02	0.28	8.0	96	256	233	53	91	84	
5	50.0	142.65	1.90	2.48	2.60	11.0	94	254	235	53	91	84	
4	52.5	145.15	2.15	2.81	5.06	12.5	93	259	231	55	92	85	
3	55.0	147.55	2.20	2.89	7.56	13.0	92	255	234	57	91	85	
2	57.5	149.93	2.00	2.65	9.95	11.5	87	253	233	57	91	85	
1	60.0	152.150	1.65	2.19	2.13	9.0	87	254	231	58	91	85	
(1528)													
V ₀ = 52.850													Av _{g.} = 85.0
Q = 60													

INTERPOL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / TOMAHAWK Date 8/18/93 Test 11 Run 2
 Source PRESS VENT STACK No. of traverse points 24
 Method 5 Filter holder: GLASS Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: .000 cfm at 16 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 1 Recovery solvent(s) acetone
5750 ☒ PROBE + NOZZLE
☐ other(s) _____
 No. of probe wash bottles: 1
 Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	519	503	16
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1411	1390	21
Total			37

Integrated Gas Sampling Data:

Bag Pump No. 23 B Box No. 15 Bag No. 2
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .60 cc/min at 22 in. Hg.
 Time start: 1550 (HRS) Time end: 1652 (HRS)
 Sampling rate: 400 cc/min Operator: D. BRENNAN
 S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

1. Р. Татарский

1. Р. Кутанов

Quercus Rosinoides BELLESTROM

29-62 (55m7)

5

1 2 3
4 5 6
7 8 9

11 1901 36/8112
Press Vert Stock 401103
401105

RVN 2

Jatani

Computer Box No. _____
Computer Cost: \$566.⁻
ET-7
9-11-72

Bar. Press. 28.10
Nozzle No. 3-3 No.

in Hg, Hg, Did

2.5x
196

Traverse Point No.	Sampling Time (min)	Supply Volume (cf)	Velocity Head (inH ₂ O)	Drifted Meter (inH ₂ O)	Des. Vol. (cf)	VAC. inH ₂ O	Temperature (°F)					Oxygen (xy/v)	
							Stack	Probe	Duct	Inpy.	Gas In		Gas Out
A- 12	(1550)	152.600	1.60	2.06	4.70	8.0	98	246	233	51	87	84	20.9
	2.5	154.67	1.70	2.17	6.87	9.0	103	247	233	50	89	84	1
	5.0	156.83	1.80	2.32	9.10	9.5	100	248	235	46	90	85	A
	7.5	159.12	1.80	2.32	1.34	9.5	100	250	231	45	92	85	m
	10.0	161.33	1.60	2.07	3.46	8.5	98	253	232	45	92	86	B
	12.5	163.55	1.60	2.67	5.59	8.5	99	252	235	45	93	86	1
	15.0	165.67	1.80	2.34	7.84	9.5	96	250	236	45	93	86	E
	17.5	167.89	2.00	2.62	0.23	11.5	93	248	235	44	94	87	N
	20.0	170.27	2.10	2.75	2.67	12.5	94	251	235	44	94	87	T
	22.5	172.68	2.00	2.61	5.05	11.5	95	250	232	44	94	87	
B- 12	25.0	175.13	1.75	2.32	7.30	10.0	88	254	236	47	94	87	A
	27.5	177.35	1.65	2.18	9.47	9.0	90	252	234	48	94	88	1
	30.0	179.578	1.65	2.18	1.65	9.0	90	253	237	50	94	88	R
	32.5	181.72	1.70	2.23	3.86	9.0	94	259	235	51	94	88	
	35.0	183.93	2.00	2.62	6.24	11.5	94	261	233	51	95	88	
	37.5	186.28	1.90	2.47	8.57	10.5	98	260	233	51	95	88	
	40.0	188.54	1.80	2.36	0.83	10.0	95	263	231	52	96	89	
	42.5	190.79	1.60	2.10	2.97	8.5	96	262	232	54	96	89	
	45.0	192.98	1.90	2.48	5.30	10.5	97	260	232	55	96	89	
	47.5	195.28	1.85	2.44	7.61	10.0	91	261	235	56	96	89	
	50.0	197.54	1.80	2.38	9.89	10.0	90	261	234	56	96	89	
	52.5	199.87	1.80	2.37	2.17	10.0	92	261	231	56	96	90	
	55.0	202.15	1.80	2.38	4.45	10.0	92	262	235	57	97	90	
	57.5	204.41	1.85	2.45	6.76	10.0	90	259	234	57	97	90	
	60.0	206.723											
(1653)													
		Avg. = 90.6											

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / TOMAHAWK Date 8/18/93 Test 11 Run 3
 Source PISS VENT STACK No. of traverse points 24
 Method 5 Filter holder: 6655 Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: 20.0L cfm at 13 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 1 Recovery solvent(s) acetone
5776 ☒ other(s) PROBE & NOZZLE
 No. of probe wash bottles: 1
 Sample recovered by: D. BRENNAN

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	520	503	17
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1391	1379	12
Total			29

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 15 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 21 in. Hg.
 Time start: 1801 (HRS) Time end: 1904 (HRS)
 Sampling rate: 400 cc/min Operator: D. BRENNAN
 S/N of O₂ Analyzer used to monitor train outlet: 3

CF-023

L.P. / Tom Arank

Deerfield 30410000 + Besenau 20242000

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153

4100 8/18/83
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 4102 PRESS VENT STACK
 4103 L.P. / TOMAHAWK
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Interpoll Laboratories
(612)786-6020

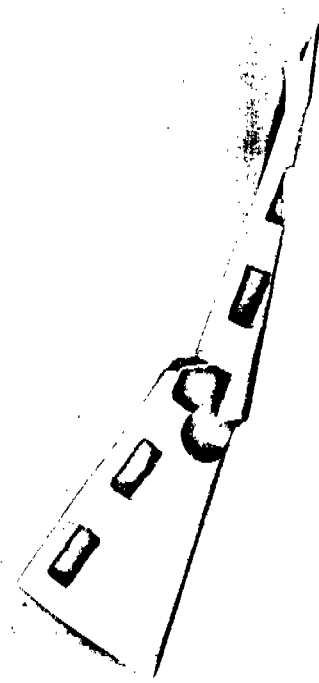
Visible Emissions Form

Twt #1175

SOURCE NAME <u>L.P. / Tomahawk</u>			OBSERVATION DATE <u>8/18/93</u>				START TIME <u>1800</u>		STOP TIME <u>1900</u>			
ADDRESS			SEC	0	15	30	45	SEC	0	15	30	45
			MIN					MIN				
			1	5	5	5	5	31	0	5	0	0
CITY <u>Tomahawk</u>			2	5	5	5	5	32	0	0	0	5
STATE <u>WI</u>			3	5	5	5	5	33	10	10	10	5
ZIP			4	0	5	0	5	34	5	0	0	0
PHONE			5	5	5	5	5	35	0	0	0	0
SOURCE ID NUMBER			6	0	0	5	5	36	0	0	5	10
PROCESS EQUIPMENT <u>Press</u>			7	0	5	5	5	37	10	10	5	5
OPERATING MODE <u>100%</u>			8	5	5	5	5	38	0	0	0	0
CONTROL EQUIPMENT			9	5	5	5	5	39	0	0	0	0
OPERATING MODE			10	15	15	15	10	40	5	5	5	5
DESCRIBE EMISSION POINT START <u>Round metal stack</u> STOP ☒			11	5	5	5	5	41	5	0	0	0
HEIGHT ABOVE GROUND LEVEL START <u>130</u> STOP ☒			12	5	5	5	5	42	0	0	0	0
HEIGHT RELATIVE TO OBSERVER START <u>130</u> STOP ☒			13	5	5	5	5	43	0	0	0	0
DISTANCE FROM OBSERVER START <u>390</u> STOP ☒			14	10	10	10	15	44	0	5	0	5
DIRECTION FROM OBSERVER START <u>E</u> STOP ☒			15	15	10	10	10	45	0	0	0	5
DESCRIBE EMISSIONS START <u>Looping</u> STOP ☒			16	5	5	5	5	46	0	0	0	0
EMISSION COLOR START <u>White</u> STOP ☒			17	0	0	0	0	47	0	0	0	5
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐			18	5	5	5	10	48	5	5	0	0
WATER DROPLETS PRESENT: NO ☒ YES ☐			19	10	10	10	5	49	5	0	0	0
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐			20	0	0	0	0	50	0	0	0	0
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START <u>Exit Point</u> STOP ☒			21	0	0	0	0	51	0	0	5	5
DESCRIBE BACKGROUND START <u>sky</u> STOP ☒			22	5	5	5	0	52	6	5	5	5
BACKGROUND COLOR START <u>Blue</u> STOP ☒			23	0	0	0	0	53	5	5	0	0
SKY CONDITIONS START <u>CL</u> STOP ☒			24	0	0	0	0	54	5	0	5	5
WIND SPEED START <u>0-5</u> STOP ☒			25	0	5	5	5	55	5	5	0	0
WIND DIRECTION START <u>S</u> STOP ☒			26	5	5	0	0	56	5	0	0	0
AMBIENT TEMP. START <u>70</u> STOP ☒			27	0	0	0	0	57	0	0	0	0
WET BULB TEMP. <u>87%</u>			28	0	0	0	0	58	0	0	0	0
RH. percent			29	0	0	0	0	59	5	5	5	0
			30	0	0	5	5	60	0	0	0	0
Source Layout Sketch Draw North Arrow												
AVERAGE OPACITY FOR HIGHEST PERIOD <u>7.7</u>			NUMBER OF READINGS ABOVE <u>7.7</u> % WERE <u>21</u>									
RANGE OF OPACITY READINGS MINIMUM <u>0</u> MAXIMUM <u>15</u>												
OBSERVER'S NAME (PRINT) <u>JEFF BERGSTROM</u>												
OBSERVER'S SIGNATURE <u>Jeff Bergstrom</u>			DATE <u>8/18/93</u>									
ORGANIZATION <u>Interpoll Lab</u>												
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE <u>E.T.A. Minneapolis</u>			DATE <u>Aug 11 1993</u>									
TITLE			DATE									

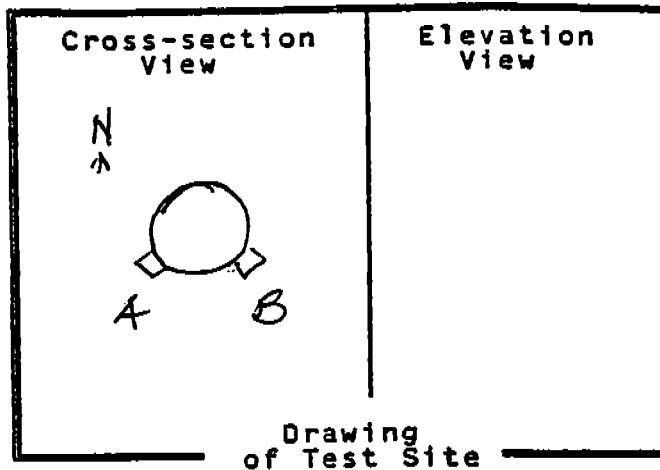
APPENDIX E

GEKA FIELD DATA SHEETS



INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job L.P. TOMAHAWK
Source Geka Stack
Test 12 Run 0 Date 8-19-93
Stack dimen. 42 IN.
Dry bulb 33.8 °F Wet bulb °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.5 in Hg
Static pressure -.35 in WC
Operators G HOVE J B
Pitot No. 254- Cp .84



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:	in.	Time start:	hrs
A	12			.69	338
	11			.68	
	10			.71	
	9			.73	
	8			.74	
	7			.74	
	6			.70	
	5			.70	
	4			.69	
	3			.64	
	2			.61	
	1			.51	
B	12			.60	
	11			.59	
	10			.58	
	9			.61	
	8			.65	
	7			.74	
	6			.74	
	5			.71	
	4			.72	
	3			.80	
	2			.80	
	1			.72	
Temp. meas. device & S/N:				Time ends:	hrs

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. TOMAHAWK Date 8-19-93 Test 12 Run 1
 Source Geka Stack No. of traverse points 24
 Method 5 Filter holder: GLASS Filter type: GF

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: _____ cfm at _____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: 5724 Recovery solvent(s) ☒ acetone _____
☐ other(s) _____
 No. of probe wash bottles: 1
 Sample recovered by: BH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3	<u>595</u>	<u>494</u>	<u>51</u>
Condenser			
Desiccant	<u>1477</u>	<u>1464</u>	<u>13</u>
Total			<u>64</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 20 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 25 in. Hg.
 Time start: 1255 (HRS) Time end: 1359 (HRS)
 Sampling rate: 400 cc/min Operator: BH
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. TOMAHAWK Date 8-19-93 Test 12 Run 2
 Source Geka Stack No. of traverse points 24
 Method 5 Filter holder: GLASS Filter type: C.F.
4"

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: _____ cfm at _____ 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: GA

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3	<u>545</u>	<u>497</u>	<u>48</u>
Condenser			
Desiccant	<u>1448</u>	<u>1333</u>	<u>15</u>
Total			<u>63</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 20 Bag No. 2
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 25 in. Hg.
 Time start: 1600 (HRS) Time end: 1701 (HRS)
 Sampling rate: 400 cc/min Operator: GA
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

INTERPOL LABORATORIES A METHOD 5 FIELD DATA SHEET

Job L.P. TOMAHAWK Date 8-19-93 Time 12:00 Run 2
 Source Geko Street Operator 12 Run 2
 Dye 8-19-93 Meter Box No. 64006 Meter Box No. 192 IN MC
 Gasoline No. 1.0075 Fuel No. 1.0075 Fuel No. 1.0075
 Pitot No. 33V4 CP 84 IN HG 172.0
 Bar. Press. 30.5 IN HG 172.0
 Nozzle No. 4-1 Nozzle Dia. 250 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (in H ₂ O)	Orifice Meter (in H ₂ O)	Dis. Vol. (cf)	VAC. (in Hg)	Temperature (°F)					Oxygen (XV/V)	
							Stack	Pitot	Dye	Imp.	Gas In	Col/Dwl	
4	1600	238.80	53.2	1.43	0.50	6	328	256	253	49	93	93	19.1
11	2.5	740.45	53.2	1.79	2.38	6	335				93	93	17.5
10	5	742.38	53.2	1.65	4.20	6	335	257	254	52	93	93	16.9
9	7.5	744.20	53.2	1.38	5.8	6	337				94	93	17.8
8	10	745.76	53.2	1.65	7.68	6	338	260	257	53	94	93	17.3
7	12.5	747.57	53.2	1.75	9.55	8	339				95	93	17.1
6	15	749.46	53.2	1.65	1.36	8	339	259	254	52	96	94	17.1
5	17.5	751.22	53.2	1.62	3.16	8	339				96	94	17.2
4	20	753.08	53.2	1.65	4.98	8	338	260	257	53	96	94	17.1
3	22.5	754.91	53.2	1.57	6.76	8	338				96	94	17.2
2	25	756.79	53.2	1.43	8.46	8	338	257	257	52	97	94	17.2
1	27.5	758.47	53.2	1.35	0.44	7	338				97	94	17.3
3	30	760.13	53.2	1.65	1.93	7	338	260	258	51	97	93	17.2
11	32.5	761.82	53.2	1.69	3.17	7	337				97	94	17.1
10	35	763.70	53.2	1.74	5.64	8	336	260	259	52	97	94	17.1
9	37.5	765.64	53.2	1.74	7.80	8	337				97	94	17.2
8	40	767.33	53.2	1.68	9.34	8	338	261	258	53	97	95	17.1
7	42.5	769.40	53.2	1.52	1.09	7	336				97	95	17.1
6	45	771.08	53.2	1.66	2.91	7	337	260	257	53	97	95	17.1
5	47.5	772.86	53.2	1.65	4.73	7	338				97	95	17.0
4	50	774.70	53.2	1.41	6.42	7	338	257	256	52	97	95	17.1
3	52.5	776.46	53.2	1.41	8.10		336				97	95	17.0
2	55	778.16	53.2	1.52	9.85		336				98	98	17.0
1	57.5	779.86	53.2	1.50	1.59		336				98	95	17.0
1	60	781.68	53.2	1.50									
Σ = 42.8							Avg. = 75.0						
1701													
0 = 60													

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. TOMAHAWK Date 8-19-93 Test 12 Run 3
 Source GEKA, STICK No. of traverse points 24
 Method 5 Filter holder: CLASS Filter type: G.F
411

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: _____ cfm at _____ in. Hg. (vac) ☐

Particulate Catch Data:

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

5723 ☒ acetone _____
☐ other(s) _____

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3	549	502	47
Condenser			
Desiccant	1405	1391	14
Total			61

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 20 Bag No. 3

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

Pretest leak check: .00 cc/min at 25 in. Hg.

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

Sampling rate: 400 cc/min Operator: GA

S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

INTERPOL LABORATORIES L.A. METHOD 5 FIELD DATA SHEET

Job L.P. TOMAHAWK Operator 64045 5 PERC Pilot No. 22-V-4 CP 84
 Source Geoka Meter Box No. 4 Bar. Press. 28.50 inHg H₂O 7
 Date 8-19-73 Controller Feet: 1.0075 Nozzle No. 4-4 Nozzle Dia. 3.50 in.

Freeze Point No.	Sampling Time (min)	Sample Volume (cc)	Velocity Head (inHg)	Driftless Meter (inHg)	Dis. Vol. (cc)	VAC. inHg	Temperature (°F)				Gas/in	Gas/Dist	Oxygen (xy/v)
							Block	Probe	Dryn	Insp.			
12	1745	781.90	.45	1.22	846	6	336	251	254	39	91	91	18.8
11	25	783.46	.54	1.46	517	6	335				92	91	17.8
10	5	785.18	.49	1.32	679	6	334	255	257	41	92	91	17.5
9	7.5	786.79	.44	1.19	834	6	334				94	92	17.9
8	10	788.35	.48	1.30	995	6	335	256	259	43	94	92	17.6
7	12.5	789.96	.60	1.62	1.75	6	336				96	93	17.8
6	15	791.75	.61	1.65	357	6	338	257	260	44	97	93	17.6
5	17.5	793.57	.60	1.62	537	6	338				97	93	17.8
4	20	795.37	.72	1.95	735	7	339	258	261	45	98	94	18.0
3	22.5	797.31	.65	1.76	923	7	339				98	94	17.8
2	25	799.33	.68	1.68	1.07	8	337	260	263	46	98	93	17.5
1	27.5	801.07	.85	2.31	3	8	336				99	94	16.8
	30	802.20	.85	2.31	5.37	10	335	261	265	44	96	93	17.1
12	32.5	805.37	.65	1.76	7.25	10	335				98	94	17.4
11	35	807.25	.58	1.57	9.03	8	336	263	261	46	99	94	17.1
10	37.5	809.04	.60	1.63	4.84	7	336				99	94	17.1
9	40	810.84	.55	1.49	2.57	6	337	259	254	41	99	95	17.1
8	42.5	812.58	.62	1.68	4.11	6	339				99	95	17.5
7	45	814.41	.62	1.68	6.25	4	338	260	258	43	100	96	17.4
6	47.5	816.25	.63	1.71	8.11	6	339				100	94	17.3
5	50	818.11	.67	1.92	0.23	6	338	260	259	44	100	95	17.3
4	52.5	820.23	.60	1.62	1.84	7	338				100	95	17.4
3	55	821.84	.56	1.53	3.59	7	338	260	259	45	100	94	17.6
2	57.5	823.58	.60	1.63	5.41	7	336				100	94	17.3
1	60	825.41											
	(1850)												
Avg. = 95.5													

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job L.P./Tomahawk Date 8/19/93 Bar. Pressure 28.50 IN.HG.
Test Location Geka Fuel Type Wood Sample Train No. 3
Stack Technician J. BERGSTROM Pump No. 11

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	12-1-1	50	1300	26.20	73	☒ Yes ☐ No
2	12-1-2	53	1315	26.20	73	☒ Yes ☐ No
3	12-1-3	54	1330	26.20	73	☒ Yes ☐ No
4	12-1-1	68	1345	26.30	73	☒ Yes ☐ No
5	12-2-2	71	1600	26.20	72	☒ Yes ☐ No
6	12-2-3	72	1615	26.30	72	☒ Yes ☐ No
7	12-2-1	18	1630	26.15	72	☒ Yes ☐ No
8	12-2-2	37	1645	26.25	72	☒ Yes ☐ No
9	12-3-3	38	1800	26.20	70	☒ Yes ☐ No
10	12-3-1	39	1815	26.20	70	☒ Yes ☐ No
11	12-3-2	40	1830	26.20	70	☒ Yes ☐ No
12	12-3-3	41	1845	26.30	70	☒ Yes ☐ No
13	Blank	82				☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

Interpoll Laboratories
(612)786-6020

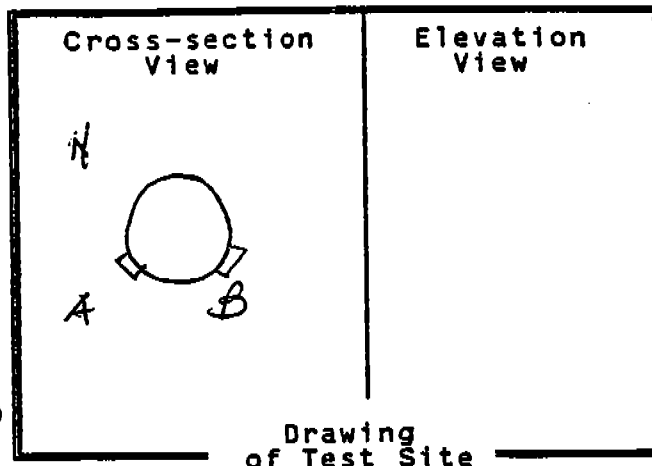
Visible Emissions Form

T102#12

SOURCE NAME L.P. TOMAHAWK			OBSERVATION DATE 8-19-93				START TIME 1600				STOP TIME 1700			
ADDRESS			SEC MIN	0	15	30	45	SEC MIN	0	15	30	45		
CITY TOMAHAWK			STATE WI		ZIP		1		0	0	0	0		
PHONE			SOURCE ID NUMBER		2		0		0	0	0	0		
PROCESS EQUIPMENT Geka			OPERATING MODE FULL		3		0		0	0	0	0		
CONTROL EQUIPMENT DAGHOUSE			OPERATING MODE FULL		4		0		0	0	0	0		
DESCRIBE EMISSION POINT START ROUND STACKTOP			5		0		0		0	0	0	0		
HEIGHT ABOVE GROUND LEVEL START 80 STOP 80			HEIGHT RELATIVE TO OBSERVER START 80 STOP 80		6		0		0	0	0	0		
DISTANCE FROM OBSERVER START 300 STOP 300			DIRECTION FROM OBSERVER START NE STOP NE		7		0		0	0	0	0		
DESCRIBE EMISSIONS START LOOPING STOP LOOPING			8		0		0		0	0	0	0		
EMISSION COLOR START WHITE STOP WHITE			PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐		9		0		0	0	0	0		
WATER DROPLETS PRESENT: NO ☒ YES ☐			IF WATER DROPLET PLUME: ATTACHED ☒ DETACHED ☐		10		0		0	0	0	0		
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 0-1 FT ABOVE STACK EXIT STOP ABOVE STACK EXIT			11		0		0		0	0	0	0		
DESCRIBE BACKGROUND START SKY STOP SKY			12		0		0		0	0	0	0		
BACKGROUND COLOR START BLUE STOP BLUE			SKY CONDITIONS START CLEAR STOP CLEAR		13		0		0	0	0	0		
WIND SPEED START 5-10 MPH STOP 5-10 MPH			WIND DIRECTION START SW STOP SW		14		0		0	0	0	0		
AMBIENT TEMP. START 80 STOP 79			WET BULB TEMP. 62%		15		0		0	0	0	0		
Source Layout Sketch Draw North Arrow Plume X Emission Point WIND Sun - Wind - Plume and Stack Observers Position 40° Location Line			16		0		0		0	0	0	0		
			17		0		0		0	0	0	0		
			18		0		0		0	0	0	0		
			19		0		0		0	0	0	0		
			20		0		0		0	0	0	0		
			21		0		0		0	0	0	0		
			22		0		0		0	0	0	0		
			23		0		0		0	0	0	0		
			24		0		0		0	0	0	0		
			25		0		0		0	0	0	0		
26		0		0		0	0	0	0					
27		0		0		0	0	0	0					
28		0		0		0	0	0	0					
29		0		0		0	0	0	0					
30		0		0		0	0	0	0					
AVERAGE OPACITY FOR HIGHEST PERIOD			0				NUMBER OF READINGS ABOVE 0 % WERE 0							
RANGE OF OPACITY READINGS			MINIMUM 0 MAXIMUM 0											
OBSERVER'S NAME (PRINT)			GARY HOWE											
OBSERVER'S SIGNATURE			GARY HOWE				DATE 8-19-93							
ORGANIZATION			INTERPOLL LABS											
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS			CERTIFIED BY WI DNR				DATE 8-93							
SIGNATURE			VERIFIED BY				DATE							
TITLE			DATE											

INTERPOL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job A.P. TOMAHAWK
 Source Geka Stack
 Test 13 Run 0 Date 8-18-93
 Stack dimen. 42" ID IN.
 Dry bulb 340 °F Wet bulb °F
 Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
 Barometric pressure 28.65 in Hg
 Static pressure - .35 in WC
 Operators B HOVE ONE FIELD
 Pitot No. MM5-V6 C_p .84



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: 1.75 in.		Time start: 0750 hrs	
A 1		0.88	2.63	.75	340
2		2.81	4.56	.80	
3		4.96	6.71	.84	
4		7.43	9.18	.86	
5		10.50	12.25	.89	
6		14.95	16.70	1.1	
7		27.05	28.80	.90	341
8		31.50	33.25	.79	
9		34.57	36.32	.78	
10		37.04	38.79	.78	
11		39.19	40.84	.75	
12		41.12	42.87	.75	
B 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Temp. meas. device & S/N: PPT 24				Time end: 0800 hrs	

INTERPOL LABORATORIES EPA MODIFIED METHOD 5 SAMPLE LOG SHEET

Job LP TOMAHAWK Date 8-18-93 Test 13 Run 1
 Source Geka Stack No. of traverse points 2
 Cyclone: ☐ Yes ☒ No Filter holder: MMS Filter type: 4" Glass fiber
 Analytes: _____ 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) ☒
 Posttest: .00 cfm at 10 in. Hg. (vac) ☒

Semivolatile Catch Data:

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

☐ MeCl₂ * MeOH (50:50 v/v)
☐ other(s) _____

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate trap			
Condensate trap			
Condensate trap			
Impingers	<u>251</u>	<u>151</u>	<u>100</u>
Desiccant	<u>1439</u>	<u>1417</u>	<u>22</u>
Total			<u>122</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 24 Bag No. 1
 Bag Material: 4-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 25 in. Hg.
 Time start: 0935 (HRS) Time end: 1140 (HRS)
 Sampling rate: 200 cc/min O₂ Analyzer S/N: 11

INTERPOL LABORATORIES EPA MODIFIED METHOD 3 FIELD DATA SHEET

Job A P TOMAHAWK Operator C HOVE OF Nozzle No. MM5-4 P1101 No. MM5-6U
 Source GEK-STAR Water Box No. 4 Nozzle Dia. 3/32 In. 84
 Date 8-18-73 Coeff. 1.13 Run 1 Gasometer coeff. 1.0073 Bar. Pres. 28.63 In. Hg 73 %

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (in Hg)	Orifice Meter (in Hg)	Dep. Vol. (cf)	VAC. in Hg	Temperatures (°F)						Oxygen (%/v)
							Stack	Probe	Oven	XRD2	lap.	Water (in/out)	
A	0935	293.90	.72	1.50	291.3	5	340	246	253	39	39	73	18.5
	5	297.31	.74	1.54	0.73	6	340					76	18.2
	10	300.73	.74	1.54	4.17	6	344	247	252	41	42	78	18.1
	15	304.17	.75	1.56	7.63	6	345					81	18.0
	20	307.62	.75	1.57	1.12	6	345	246	255	43	45	83	18.0
	25	311.12	.76	1.59	4.63	6	345					85	17.9
	30	314.63	.78	1.64	8.20	6	345	249	254	44	47	86	18.0
	35	318.21	.80	1.68	1.83	6	345					87	17.9
	40	321.80	.70	1.47	5.22	6	345	250	252	44	43	89	18.2
	45	325.22	.70	1.48	8.63	6	345					89	17.9
	50	328.60	.55	1.16	1.65	6	345	251	253	44	42	90	17.9
	55	331.65	.54	1.14	4.65	6	345					90	17.9
	60	334.65	.65	1.38	7.94	6	345	252	256	46	47	87	17.9
B	65	337.94	.65	1.37	1.23	6	344					89	17.7
	70	341.23	.65	1.37	4.52	6	344	258	259	43	45	89	17.9
	75	344.57	.60	1.27	7.69	6	345					90	17.9
	80	347.69	.65	1.38	0.91	7	345	260	261	44	47	90	17.8
	85	350.98	.69	1.46	4.37	7	345					91	17.8
	90	354.37	.72	1.53	7.85	7	343	261	262	43	44	92	17.8
	95	357.82	.72	1.53	1.33	7	344					92	17.6
	100	361.32	.68	1.72	5.02	7	345	258	260	41	43	92	17.6
	105	365.02	.70	1.78	8.76	7	344					92	18.0
	110	368.76	.65	1.65	2.37	7	344	259	261	42	43	92	17.7
	115	372.32	.52	1.32	5.60	7	344					93	18.0
	120	375.60											
(1140)													
Va = 81.7				W = 1.49								Av. = 84.3	
W = 120													

INTERPOL LABORATORIES EPA MODIFIED METHOD 5 SAMPLE LOG SHEET

Job LP-TOMAHAWK
 Source Geka Stack
 Cyclone: ☐ Yes ☒ No Filter holder: MMS
 Analytes: _____
 Field recovery spike added: ☒ Yes ☐ No

Date 8-18-93 Test 13 Run 2
 No. of traverse points 24
 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) ☒
 Posttest: .00 cfm at 10 in. Hg. (vac) ☒

Semivolatile Catch Data:

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

☐ MeCl₂ * ~~MeOH (50:50 v/v)~~
☐ other(s) _____

No. of bottles for condensate trap catch: 1
 Samples recovered by: DV#

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Condensate trap			
Condensate trap			
Condensate trap			
Impingers	366	266	100
Desiccant	1369	1347	22
Total			122

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 94 Bag No. 2

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

Pretest leak check: .00 cc/min at 25 in. Hg.

Time start: 1230 (HRS) Time end: 1435 (HRS)

Sampling rate: 200 cc/min O₂ Analyzer S/N: 11

INTERPOL LABORATORIES EPA MODIFIED METHOD 3 FIELD DATA SHEET

Job L.P. TOMAHAWK Operator C. HOWE No. 11116 No. MMS-4 P1101 No. MMS-46
 Source STAGE Meter Box No. 0 No. 11116 Dia. 3.62 In. Hg. 1A
 Date 8-18-93 Gas Meter Const. 1.0075 Bar. Pres. 28.65 In. Hg. 1A H₂O 1A %

Transfer Point No.	Sampling Time (min)	Sample Volume (cc)	Velocity Head (10MC)	Orifice Meter (10MC)	Dep. Vol. (cc)	VAC. in Hg	Temperature (°F)					Oxygen (%)						
							Stack	Probe	Oven	XAD2	Leq.		Water (In/Out)					
B	1230	375.80																
	5	379.33	.69	1.60	9.33	7	344	262	254	39	41	80	80	18.2				
	10	382.87	.70	1.60	2.86	7	345					81	80	17.6				
	15	386.43	.71	1.63	6.42	7	344	263	259	41	43	84	81	17.8				
	20	390.07	.74	1.71	0.07	7	343					85	81	17.8				
	25	393.60	.69	1.60	3.60	8	342	263	258	42	45	86	82	17.8				
	30	397.13	.65	1.51	7.13	8	342					87	82	17.9				
	35	400.57	.69	1.60	0.57	9	343	262	259	43	46	87	82	17.6				
	40	404.33	.78	1.81	4.33	9	343					88	82	17.6				
	45	407.92	.70	1.62	7.90	9	343	261	258	44	45	88	83	17.7				
A	50	411.26	.62	1.44	1.26	7	343					88	83	17.7				
	55	414.68	.64	1.49	4.68	7	343	262	259	45	45	89	83	17.6				
	60	417.64	.48	1.11	7.64	6	343					88	83	17.6				
	65	421.21	.71	1.65	1.23	9	343	263	255	46	45	83	81	17.6				
	70	424.89	.74	1.71	4.89	9	339					84	82	17.5				
	75	428.30	.64	1.49	8.30	8	338	259	257	43	45	85	81	17.8				
	80	431.78	.67	1.56	1.78	7	339					86	81	17.9				
	85	435.46	.75	1.74	5.47	9	340	257	254	44	46	86	82	17.5				
	90	438.94	.66	1.54	8.94	9	339					87	82	17.8				
	95	442.63	.75	1.74	2.63	9	340	257	261	43	45	87	82	17.8				
	100	446.33	.75	1.75	6.33	9	338					88	82	17.8				
	105	449.96	.72	1.68	9.96	9	339	258	260	44	45	88	83	17.8				
	110	453.47	.67	1.56	3.46	9	338					89	83	17.8				
	115	456.64	.55	1.29	6.64	9	338	259	261	45		89	83	17.8				
	120	459.82	.55	1.29	9.82	9	338					89	84	17.9				
	(125)																	
	(130)																	
	(135)																	
	Va = 8402							Avg. = 841										

INTERPOLL LABORATORIES EPA MODIFIED METHOD 5 SAMPLE LOG SHEET

Job LP. TOMAHAWK Date 8-18-93 Test 13 Run 3
 Source Geka ~~Stack~~ No. of traverse points _____
 Duplicate: ☐ Yes ☒ No Filter holder: MMS Filter type: 4" Glass fiber
 Analytes: _____ 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) ☒
 Posttest: 100 cfm at 10 in. Hg. (vac) ☒

Semivolatile Catch Data:

No.s of filters used: _____ Recovery solvent(s) _____
☐ MeCl₂ * MeOH (50:50 v/v)
☐ other(s) _____
 No. of bottles for condensate trap catch: 1
 Samples recovered by: DVA

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Condensate trap			
Condensate trap	353	268	85
Condensate trap			
Impingers			
Desiccant	1427	1390	37
Total			122

Integrated Gas Sampling Data:

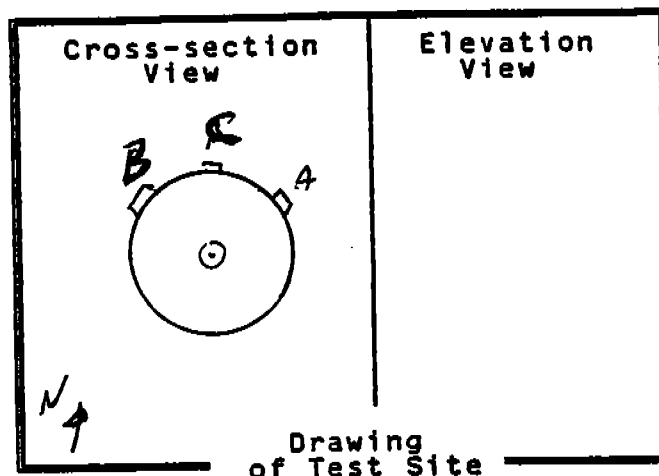
Bag Pump No. 224 Box No. 24 Bag No. 3
 Bag Material: 4-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 100 cc/min at 25 in. Hg.
 Time start: 1522 (HRS) Time end: 1730 (HRS)
 Sampling rate: 200 cc/min O₂ Analyzer S/N: 11

INTERROLL LABORATORIES EPA MODIFIED METHOD 3 FIELD DATA SHEET

Job L.P. TOMAHAWK Operator G. HODE O. FIELD NO. MM5-1 Pilot No. MNS-6
 Source GEKA STATION Meter Box No. 4-342 No. 119 Dia. 1.342 in. Cp. .84
 Date 8-18-93 10:11 13 Hrs. Gas meter coeff. 1.0075 Bar. Pres. 29.85 in. Hg H₂O 7 %

Transfer Point No.	Sampling Time (min)	Sample Volume (cc)	Velocity Head (in H ₂ O)	Orifice Water (in H ₂ O)	Dis. Vol. (cc)	VAC. in Hg	Temperature (°F)						Oxygen (%/v)
							Stack	Probe	Open	XAD2	Tap	Water (in/out)	
A-12	1522	460.20	.75	1.73	388	5	344	260	258	39	40	79	17.7
11	5	463.85	.72	1.66	746	5	340					82	17.3
10	10	467.45	.65	1.50	0.88	5	341	260	259	40	41	85	17.3
9	15	470.88	.63	1.46	4.26	5	341					88	17.9
8	20	474.27	.65	1.57	770	6	340	259	261	42	43	90	17.7
7	25	477.70	.67	1.56	1.21	6	341					90	17.7
6	30	481.31	.75	1.75	491	7	342	260	259	43	44	91	17.8
5	35	484.91	.72	1.68	8.55	7	342					91	17.7
4	40	488.55	.74	1.74	2.14	6	341	261	258	44	46	93	17.9
3	45	492.14	.58	1.36	9.14	6	339	260	256	45	45	94	17.6
2	50	495.38	.63	1.48	2.56	6	339					94	17.4
1	55	499.10	.72	1.69	6.23	6	339	261	259	46	46	91	17.3
B-12	60	502.56	.70	1.64	9.83	7	340					93	17.7
11	65	506.23	.72	1.67	335	7	340	263	258	47	46	95	17.2
10	70	509.82	.71	1.67	0.66	7	340					95	17.4
9	75	513.35	.71	1.67	4.50	7	340	263	258	48	45	95	17.5
8	80	517.02	.79	1.86	8.34	8	341	259	261	43	41	95	17.1
7	85	520.61	.79	1.86	2.08	8	341					95	17.3
6	90	524.50	.70	1.65	5.70	7	341	260	259	44	42	95	17.3
5	95	528.34	.65	1.53	9.19	7	340					95	17.4
4	100	532.08	.70	1.65	2.81	7	340	261	257	43	44	96	17.0
3	105	535.70	.70	1.65	6.43	7	342					96	17.3
2	110	539.19	.70	1.65									
1	115	542.81	.70	1.65									
	120	546.43	.70	1.65									
(1730)													
V _a = 86.23							Avg. = 89.0						
H = 1.64													

Job LP-TOMAHAWK
Source GEKA STACK
Test 14 Run 0 Date 8-18-93
Stack dimen. 42 IN.
Dry bulb 34.0 °F Wet bulb °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.65 in Hg
Static pressure -0.35 in WC
Operators SB & DF
Pitot No. V22-V Cp .840



Phenol

[illegible]

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP-TOMAHAWK Date 8-18-93 Test 14 Run 1
 Source GEKA STACK No. of traverse points 3
 Method PHENOL Filter holder: GLASS Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☐
 Posttest: _____ cfm at _____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: _____ Recovery solvent(s) _____
 _____ ☐ acetone _____
 _____ ☐ other(s) _____
 No. of probe wash bottles: _____
 Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 29A Box No. 13 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 00 cc/min at 15 in. Hg.
 Time start: 0900 (HRS) Time end: 1000 (HRS)
 Sampling rate: 400 cc/min Operator: SB
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

EPA Method 4 and 6 Field Data Sheet

Job LP-TOMAHAWK
 Source BEKA STAG
 Date 8-18-93 Test 14 Run 1

Operator(s) SB & DF
 Meter Box No. 3 Gasmeter coef. .9972
 ΔH 3 in.WC Bar. press 28.65 in.Hg

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. ☒

Posttest: 0.00 cfm at 15 in. Hg. ☒

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Drif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	(0900)	(568.10)								
B3	5	572.80	1.80	8	254	258	47	74	74	18.3
3	10	576.42	1.80	8	254	258	47	81	75	18.3
3	15	580.46	1.80	8	254	258	47	83	76	18.5
3	20	584.51	1.80	8	254	257	47	83	76	18.2
2	25	588.42	1.80	8	254	257	47	84	76	18.2
2	30	592.28	1.80	9	254	257	48	84	77	18.1
2	35	596.47	1.80	9	254	257	49	87	78	18.3
2	40	600.25	1.80	9	254	256	49	88	79	18.2
1	45	605.02	1.80	9	254	257	50	89	81	18.2
1	50	609.61	1.80	9	254	257	50	90	82	18.2
1	55	612.79	1.80	9	254	257	51	92	83	18.2
1	60	615.30	1.80	9	255	257	51	93	84	18.2
	(1000)									
	$\theta = 60$	$V_m = 47.2$	$(\Delta H)_{ave} = 1.80$					$(t_m)_{ave} = 82$		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	240	200	40
Condenser			
Desiccant	1350	1334	16
	Total		56

Preliminary results of SO ₂ concentration determination		
V _{std}	=	DSCF
Moisture	=	5.65 %v/v
SO ₂ , dry	=	ppm
SO ₂ , wet	=	ppm
LB/MMBtu	=	

INTERPOL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP-TDMAHAWIK
 Source GEKA STALK
 Method PHEN Filter holder: CRASS

Date 8-18-93 Test 14 Run 2
 No. of traverse points 3
 Filter type: CRASS FIBER

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) ☐
 Posttest: { _____ cfm at _____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: _____ Recovery solvent(s) _____
 _____ ☐ acetone _____
 _____ ☐ other(s) _____
 No. of probe wash bottles: _____
 Sample recovered by: _____

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 13 Bag No. 2
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 00 cc/min at 15 in. Hg.
 Time start: 1045 (HRS) Time end: 1145 (HRS)
 Sampling rate: 400 cc/min Operator: SB
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

EPA Method 4 and 6 Field Data Sheet

Job LP-TOMAHAWK
 Source GEKA STACK
 Date 8-18-93 Test 14 Run 2

Operator(s) SCB + DK
 Meter Box No. 3 Gasmeter coef. 9972
 ^HG 1.77 in.WC Bar. press 28.6 in.Hg

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. ☒
 Posttest: 0.00 cfm at 15 in. Hg. ☒

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	(1045)	(615.60)								
A3	5	619.55	1.80	9	256	251	50	80	80	18.0
3	10	623.40	1.80	9	256	251	50	84	81	18.0
3	15	627.41	1.80	9	256	252	50	89	83	18.0
3	20	631.56	1.80	9	254	255	50	90	84	17.7
2	25	635.32	1.80	9	254	256	49	91	84	17.7
2	30	639.09	1.80	9	253	256	49	92	85	18.0
2	35	644.15	1.80	9	252	254	49	93	86	17.9
2	40	647.77	1.80	9	251	254	48	94	86	17.9
1	45	651.20	1.80	9	251	254	47	94	87	17.7
1	50	654.63	1.80	9	250	254	47	94	87	17.6
1	55	658.02	1.80	9	250	255	47	95	87	17.6
1	60	662.67	1.80	9	251	253	47	95	88	17.8
	(1145)									
	0=60	V=472.07	(^H)=1.80					(t_m)=87.875		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	246	200	46
Condenser			
Desiccant	1464	1449	15
	Total		61

Preliminary results of SO ₂ concentration determination	
V _{std}	= DSCF
Moisture	= 6.20 %v/v
SO ₂ , dry	= / ppm
SO ₂ , wet	= ppm
LB/MMBtu	=

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP- TOMAHAWK Date 8-18-93 Test 14 Run 3
 Source GEKA STACK No. of traverse points 3
 Method PIENOL Filter holder: CHWACS Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☐
 Posttest: _____ cfm at _____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: _____ Recovery solvent(s) _____
 _____ ☐ acetone _____
 _____ ☐ other(s) _____
 No. of probe wash bottles: _____
 Sample recovered by: _____

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 224 Box No. 13 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: 00 cc/min at 15 in. Hg.
 Time start: 1210 (HRS) Time end: 1310 (HRS)
 Sampling rate: 400 cc/min Operator: SB
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

EPA Method 4 and 6 Field Data Sheet

Job LP TOMAHAWK
 Source GEKA STACIC
 Date 8-18-93 Test 14 Run 3

Operator(s) SB LDK
 Meter Box No. 3 Gasmeter coef. 9972
 Δ He 1.77 in.WC Bar. press 28.65 in.Hg

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. ☒
 Posttest: 0.00 cfm at 15 in. Hg. ☒

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Drift Meter (inWC)	VAC. inHg	Temperatures (°F)					Oxygen (%v/v)
					Probe	Oven	Impg.	Gas/In	Gas/Out	
	(1210)	663.10								
A-3	5	664.26	1.80	9	251	255	48	86	84	18.1
3	10	671.09	1.80	9	251	255	48	90	85	18.1
3	15	674.59	1.80	9	251	255	48	90	85	18.1
3	20	678.53	1.80	9	251	255	47	92	86	17.9
2	25	682.41	1.80	9	251	256	47	93	87	18.0
2	30	686.51	1.80	9	251	256	47	93	87	18.1
2	35	689.96	1.80	9	250	256	46	93	87	17.9
2	40	694.23	1.80	9	250	256	49	93	87	17.9
1	45	699.02	1.80	10	251	255	49	92	86	17.9
1	50	703.45	1.80	10	251	256	48	92	86	17.8
1	55	706.00	1.80	10	252	254	44	92	86	18.0
1	60	710.22	1.80	10	252	254	44	92	87	18.3
	(1310)									
	0-60	$V_m = 47.12$	$(\Delta H)_{avg} = 1.80$					$(t_m)_{avg} = 88.375$		

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impingers	249	200	49
Condenser			
Desiccant	1361	1350	11
		Total	60

Preliminary results of SO ₂ concentration determination	
V _{std}	= DSCF
Moisture	= 6.11 %v/v
SO ₂ , dry	= ppm
SO ₂ , wet	= ppm
LB/MMBtu	=

INTERPOLL LABORATORIES

Benzene Field Data Sheet

Job L.P. (Tomahawk)
 Source GEKA STACK
 Date 8/19/93 Test 17 Run 1

Operator(s) JEFF BERGSTROM
 Meter Box No. 65 Meter coef. 9972
 Barometric Pressure 28.50 in.Hg

Sample Train Leak Check:

Pretest: 0 cc/min at 15 in.HgPosttest: 0 cc/min at 15 in.Hg

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	VAC. (inHg)	Temperature (oF)		
					Stack	Probe	Gasmeter
	0757	35.00					
N/A	5	35.199	1000	3.5	340	N/A	78
—	10	35.397	1000	3.5	338	—	78
—	15	35.596	1000	3.5	340	—	79
—	20	35.798	1000	4	340	—	80
—	25	35.996	1000	4	340	—	81
—	30	36.193	1000	4	340	—	81
—	35	36.390	1000	4	341	—	82
—	40	36.591	1000	4	341	—	82
—	45	36.792	1000	4	339	—	83
—	50	36.993	1000	4	339	—	85
—	55	37.195	1000	5	340	—	87
—	60	37.397	1000	5	340	—	90
	0857	Vm=2.397					tm=82.166

0857 Vsta = 2.218

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INTERPOLL LABORATORIES

Benzene Field Data Sheet

Job L.P. / Tomahawk Operator(s) JEFF BERGSTROM
 Source GEKA / Stack Meter Box No. 65 Meter coef. .9972
 Date 8/14/93 Test 12 Run 2 Barometric Pressure 28.50 in.Hg

Sample Train Leak Check:

Pretest: 0 cc/min at 15 in.HgPosttest: 0 cc/min at 15 in.Hg

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	VAC. (inHg)	Temperature (oF)		
					Stack	Probe	Gasmeter
	0955	37.500					
N/A	5	37.703	1000	4	336	N/A	88
—	10	37.911	1000	4	339	—	89
—	15	38.111	1000	4	341	—	89
—	20	38.309	1000	4	342	—	90
—	25	38.505	1000	4	341	—	90
—	30	38.712	1000	4	338	—	91
—	35	38.918	1000	4	338	—	92
—	40	39.120	1000	4	341	—	94
—	45	39.323	1000	5	341	—	95
—	50	39.529	1000	5	342	—	96
—	55	39.735	1000	5	341	—	97
—	60	39.942	1000	5	338	—	98
0-60		Vm=2.442					tm=92.416

1055 $V_{std} = 2.217$

INTERPOLL LABORATORIES

Benzene Field Data Sheet

Job L.P. / Tomahawk Operator(s) JEFF BERGSTROM
 Source GEKA stack Meter Box No. 65 Meter coef. .9972
 Date 8/19/93 Test 17 Run 3 Barometric Pressure 28.50 in.Hg

Sample Train Leak Check:

Pretest: 0 cc/min at 15 in.HgPosttest: 0 cc/min at 15 in.Hg

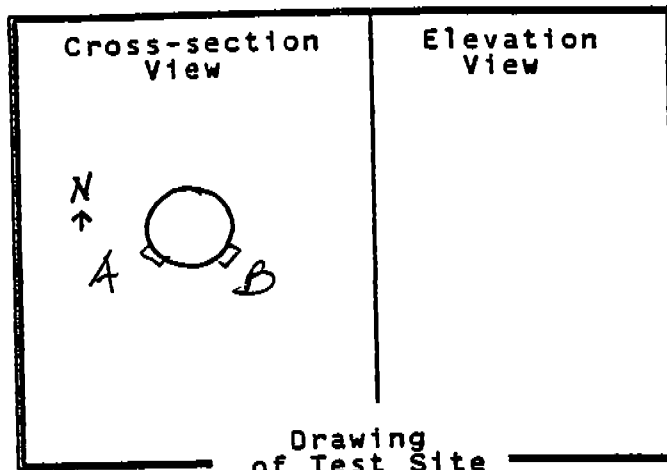
Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	VAC. (inHg)	Temperature (oF)		
					Stack	Probe	Gasmeter
	1/20	40.000					
N/A	5	40.203	1000	4	342	N/A	99
—	10	40.405	1000	4	340	—	99
—	15	40.611	1000	4	341	—	99
—	20	40.818	1000	4	341	—	99
—	25	41.022	1000	4	337	—	99
—	30	41.223	1000	4	338	—	99
—	35	41.425	1000	4	341	—	100
—	40	41.625	1000	4	339	—	100
—	45	41.826	1000	5	340	—	100
—	50	42.035	1000	5	343	—	101
—	55	42.243	1000	5	341	—	102
—	60	42.445	1000	5	341	—	102
$\theta = 60$		$V_m = 2.445$					$t_m = 99.916$

1220 $V_{std} = 2.190$

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INTERPOL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job L.P. TOMAHAWK
 Source GEKA STACK
 Test 18 Run 0 Date 8-19-93
 Stack dimen. 42" IN.
 Dry bulb 33.8 °F Wet bulb °F
 Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
 Barometric pressure 28.50 in Hg
 Static pressure -.35 in WC
 Operators GHOVE - JB
 Pitot No. 22-4 C, .84



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: <u>1.75</u> in.		Time start: <u>0730</u> hrs	
A 12	.88	0.88	2.63	.69	338
11	2.81	2.81	4.56	.71	
10	4.9	4.96	6.71	.69	
9		7.43	9.18	.71	
8		10.50	12.25	.70	
7		14.95	16.70	.69	
6		27.05	28.80	.68	
5		21.50	33.25	.71	
4		38.57	36.32	.70	
3		32.04	38.79	.72	
2		39.19	40.94	.61	
1		41.12	42.87	.58	
B 12				.64	339
11				.63	
10				.66	
9				.56	
8				.61	
7				.69	
6				.65	
5				.69	
4				.67	
3				.66	
2				.59	
1				.60	
Temp. meas. device & S/N: <u>POT NO 24</u>				Time end: <u>0740</u> hrs	

INTERPOL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. TOMAHAWK Date 8-19-93 Test 18 Run 1
 Source GEKA STACK No. of traverse points 24
 Method 0011 Filter holder: NONE Filter type: NONE
CH₂O

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: .00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

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

NONE ☐ acetone
☒ other(s) MECL₂ & DI WATER

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3	<u>527</u>	<u>478</u>	<u>49</u>
Condenser			
Desiccant	<u>1377</u>	<u>1369</u>	<u>10</u>
Total			<u>59</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 19 Bag No. 1
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 25 in. Hg.
 Time start: 0757 (HRS) Time end: 0905 (HRS)
 Sampling rate: 400 cc/min Operator: CA
 S/N of O₂ Analyzer used to monitor train outlet: 8

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INTERFILL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LC TOMAHAWK
 Source BEKA SPRING
 Date 8-19-93

Operator G HOVE
 Meter Box No. 4
 Counter Code 1

Pilot No. 3321
 Bar. Press. 38.50
 Nozzle No. 4-4

CP 84
 INHG 2
 NOZZLE DIA. 250 IN.

Inversion Point No.	Sampling Time (min)	Sample Volume (cc)	Velocity Head (in H ₂ O)	Orifice Meter (in H ₂ O)	Det. Vol. (cc)	VAC. (in Hg)	Temperature (°F)					Oxygen (Kv/v)	
							Blank	Probe	Depth	Temp.	Gas/in		Gas/Out
A	0757	556.470	.68	1.78	832	4	334	261	254	39	71	70	18.1
	25	558.32	.60	1.55	0.04	4	340				73	70	18.1
	5	560.04	.71	1.83	1.92	4	340	262	257	41	74	71	17.9
	7.5	561.92	.68	1.76	3.26	4	341				75	71	17.9
	10	563.76	.70	1.81	5.63	4	342	263	257	42	78	72	18.1
	12.5	565.64	.71	1.84	7.52	4	341				80	73	18.3
	15	567.52	.68	1.77	9.37	4	340	265	257	44	80	74	18.1
	17.5	569.37	.72	1.88	1.28	4	339				82	75	18.1
	20	571.28	.70	1.84	3.17	4	338	264	260	45	82	75	17.9
	22.5	573.17	.60	1.58	4.92	4	338				82	75	18.3
B	25	574.92	.60	1.59	6.68	4	333	264	259	41	83	76	18.3
	27.5	576.68	.55	1.46	8.37	4	330				84	76	18.1
	30	578.40	.45	1.72	0.20	4	332	259	262	43	83	77	18.3
	32.5	580.21	.60	1.59	1.94	4	334				83	77	18.3
	35	581.96	.68	1.79	3.83	4	338	261	260	45	85	78	18.0
	37.5	583.82	.55	1.45	5.52	5	338				86	78	18.0
	40	585.62	.62	1.64	7.31	5	338	263	259	44	86	79	18.3
	42.5	587.30	.69	1.82	9.20	6	338				87	79	18.3
	45	589.20	.64	1.69	10.2	5	340	264	260	45	87	79	18.1
	47.5	591.02	.70	1.85	2.92	6	340				88	80	18.5
	50	592.92	.66	1.74	4.27	6	341	263	262	41	88	80	18.3
	52.5	594.77	.65	1.72	6.61	6	340				88	80	18.4
	55	596.62	.59	1.56	8.37	6	338	259	257	41	89	81	18.6
	57.5	598.37	.55	1.46	0.86	4	339				89	81	18.6
	60	600.05											
V = 43.58										Avg. = 79.3			
(0905)													

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. TOMAHAWK Date 8-19-93 Test 18 Run 2
 Source GEKA STACK No. of traverse points 24
 Method COIL Filter holder: NONE Filter type: NONE
CH₂O

Sample Train Leak Check:

Pretest: { 0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: .00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

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

☐ acetone
☒ other(s) MFCI - 01

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3	<u>483</u>	<u>486</u>	<u>419</u>
Condenser			
Desiccant	<u>1437</u>	<u>1425</u>	<u>72</u>
Total			<u>59</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 19 Bag No. 2
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 25 in. Hg.
 Time start: 0955 (HRS) Time end: 1058 (HRS)
 Sampling rate: 400 cc/min Operator: CH
 S/N of O₂ Analyzer used to monitor train outlet: 8

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INTERPOL LABORATORIES A METHOD 5 FIELD DATA SHEET

Job L.C. TOMAHAWK
 Source GERA 3400K
 Date 8-18-93 1991 18 Run 2

Operators 6 HOUK 5 P
 Motor Box No. 4 190 IN NC
 Combustor Serial 10073

Pilot No. 32 V-Y Cp. 84
 Bur. Press. 28.50 IN Hg 120 Z
 Nozzle No. 4 Nozzle Dia. 350 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (INCH)	Orifice Meter (INCH)	Dis. Vol. (cf)	VAC. IN Hg	Temperature (°F)				Gas In	Gas Out	Oxygen (XV/V)
							Stack	Probe	Duct	Inlet			
B 13	0955	600.30	.65	1.84	1.97	5	339	261	263	39	78	78	18.8
11	2.5	601.97	.60	1.58	3.73	5	334				79	78	18.1
10	5	603.73	.59	1.55	5.46	5	336	263	257	41	80	79	18.4
9	7.5	605.47	.65	1.71	7.29	5	337				82	79	18.2
8	10	607.29	.74	1.95	9.24	5	337	261	262	43	84	80	18.1
7	12.5	609.24	.74	1.95	1.20	5	340				86	81	18.2
6	15	611.20	.71	1.87	3.11	5	341	263	261	44	86	81	18.2
5	17.5	613.11	.73	1.90	5.04	5	341				87	81	18.2
4	20	615.04	.75	1.95	7.02	6	342	262	259	41	88	82	17.9
3	22.5	617.02	.80	2.11	9.05	6	342	262			89	82	17.8
2	25	619.05	.74	1.96	1.02	6	341	260	261	43	90	83	18.1
1	27.5	621.02	.69	1.83	2.92	6	341				90	83	18.1
A 13	30	622.92	.65	1.73	4.77	6	340	260	263	41	88	83	17.9
11	32.5	624.77	.69	1.83	6.67	6	339				89	84	18.0
10	35	626.67	.75	2.00	8.65	6	338	241	258	42	90	84	17.8
9	37.5	628.65	.75	1.99	0.63	6	341				91	85	17.9
8	40	630.63	.74	1.97	2.61	6	342	242	259	41	92	85	18.0
7	42.5	632.60	.65	1.73	4.46	6	341				93	86	17.9
6	45	634.46	.76	2.03	6.44	7	342	259	260	42	94	87	17.8
5	47.5	636.45	.80	2.14	8.52	7	341				94	87	17.8
4	50	638.52	.78	2.09	0.56	7	340	260	259	44	95	88	18.0
3	52.5	640.54	.72	1.93	2.52	7	340				96	89	17.9
2	55	642.62	.69	1.86	4.44	6	338	241	254	42	97	89	17.8
1	57.5	644.44	.65	1.75	6.31	6	339				97	90	18.0
	60	646.31											
(1058)													
0 = 60													
V = 46.01													
1187													
Avg. 86.2													

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP TOMAHAWK Date 8-19-93 Test 18 Run 3
 Source GEKA STACK No. of traverse points 24
 Method 0011 Filter holder: NONE Filter type: NONE
CH₂O

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
 Posttest: .00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: _____ Recovery solvent(s)
 _____ ☐ acetone
☒ other(s) MECL₂ + P1
 No. of probe wash bottles: 1
 Sample recovered by: CH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3	<u>527</u>	<u>473</u>	<u>54</u>
Condenser			
Desiccant	<u>1393</u>	<u>1384</u>	<u>9</u>
Total			<u>63</u>

Integrated Gas Sampling Data:

Bag Pump No. 22A Box No. 19 Bag No. 3
 Bag Material: 5-layer Aluminized Tedlar Size: 44 L
 Pretest leak check: .00 cc/min at 25 in. Hg.
 Time start: 1118 (HRS) Time end: 1221 (HRS)
 Sampling rate: 400 cc/min Operator: CH
 S/N of O₂ Analyzer used to monitor train outlet: 8

CF-023

INTERFILL LABORATORIES METHOD 5 FIELD DATA SHEET

Job LP TOMAHAWK, WI Operator E HOVE Pilot No. 3204 CP 84
 Sample GEKA STAKE Meter Box No. 4 Bar. Press. 25.50 inHg H₂O 7
 Date 8-19-93 Correlator Code 18 Run 3 Nozzle No. 4-4 Nozzle Dia. 380 IN.

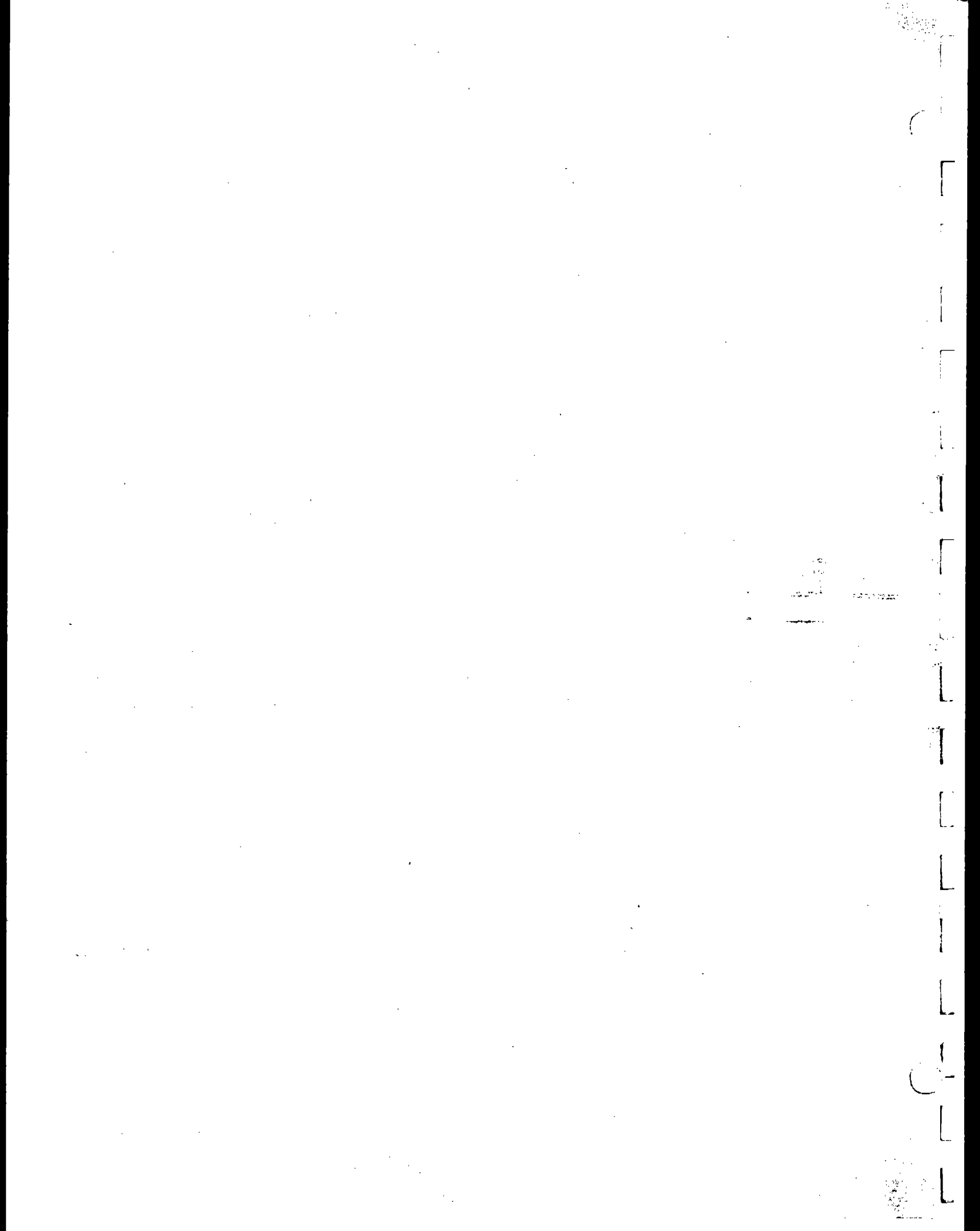
Traverse Point No.	Sampling Time (min)	Supply Volume (ft ³)	Velocity Head (inH ₂ O)	Driftless Meter (inH ₂ O)	Dts. Vol. (ft ³)	VAC. inHg	Temperature (°F)				Gas Out	Oxygen (xx/vv)
							Stack	Probe	Dyn	Logg.	Gas In	
12	11.8	686.60	.70	1.86	8.51	6	338	247	249	39	91	18.3
11	2.5	688.51	.69	1.85	0.43	6	339				93	18.0
10	5	650.43	.65	1.74	2.29	6	341	248	248	41	94	17.6
9	7.5	652.29	.70	1.87	4.22	6	342				94	17.5
8	10	654.22	.64	1.72	6.08	5	341	249	247	43	96	17.5
7	12.5	656.09	.65	1.78	7.95	5	341				97	17.5
6	15	657.95	.68	1.83	9.86	5	340	255	251	44	97	17.6
5	17.5	659.86	.70	1.89	1.81	5	340				99	17.5
4	20	661.81	.70	1.89	3.76	6	340	256	254	43	99	17.4
3	22.5	663.75	.71	1.92	5.72	6	341				100	17.5
2	25	665.71	.62	1.68	7.56	5	338	257	254	44	100	17.6
1	27.5	667.56	.63	1.72	9.42	5	335				100	17.5
12	30	669.42	.56	1.52	1.17	5	336	256	257	45	98	17.4
11	32.5	671.17	.59	1.60	3.96	5	339				99	17.4
10	35	672.97	.65	1.77	4.84	5	337	257	259	46	99	17.4
9	37.5	674.84	.55	1.49	6.58	5	334				100	17.8
8	40	676.54	.60	1.63	8.39	5	339	261	260	41	101	12.5
7	42.5	678.39	.61	1.65	10.21	5	340				101	17.5
6	45	680.21	.60	1.63	12.02	5	340	261	259	43	101	17.8
5	47.5	682.02	.80	2.14	4.11	6	341				101	17.6
4	50	684.10	.79	2.13	6.18	6	343	262	260	44	101	17.4
3	52.5	686.18	.68	1.84	8.11	6	341				102	18.0
2	55	688.11	.69	1.87	10.05	7	341	261	259	41	102	18.0
1	57.5	690.05	.60	1.63	1.84	7	341				101	17.4
	60	691.86										
(1221)												
Avg. 95.8												

APPENDIX F

INTERPOLL LABORATORIES ANALYTICAL DATA

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EPA Method 3 Data Reporting Sheet
Orsat Analysis

Lab L.P. Tomahawk
Team Leader ET
Date Submitted 8/17/93
Test No. 1
Date of Analysis 8/17/93

Source DRYER FACE
Test Site INLET
Date of Test 8/17/93
No. of Runs Completed 3
Technician D. VAN HOEGER

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F ₀
			Zero Pt.	After CO ₂	After O ₂			
1/1	☒ B ☐ F	1	0	3.4	20.8	3.4	17.4	1.03
		2						
		Avg						
1/2	☒ B ☐ F	1	0	3.2	20.4	3.2	17.5	1.06
		2						
		Avg						
1/3	☒ B ☐ F	1	0	3.0	20.6	3.0	17.6	1.1
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F₀ Within EPA M-3 Guidelines
for fuel type.

Where $F_0 = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines	
Fuel Type	F ₀ Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.250
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.936
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.100

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. / Tonahawk Source DRYER CORE INLET
 Team Leader S. Brouville Test Site _____
 Date Submitted 8/17/93 Date of Test _____
 Test No. 1 No. of Runs Completed 3
 Date of Analysis 8/17/93 Technician D. Van Horn

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F _o
			Zero Pt.	After CO ₂	After O ₂			
1/1	☒ B ☐ F	1	0	2.6	20.6	2.6	18.0	1.12
		2						
		Avg						
1/2	☒ B ☐ F	1	0	2.4	20.6	2.4	18.2	1.12
		2						
		Avg						
1/3	☐ B ☐ F	1	0	2.0	20.6	2.0	18.6	1.13
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines
 for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
 B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F _o Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

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EPA Method 3 Data Reporting Sheet
Orsat Analysis

o L.P. Tomahawk
Team Leader DB
Date Submitted 8-20-93
Test No. 1
Date of Analysis 8-20-93
Source Dryer
Test Site Stack
Date of Test 8-17-93
No. of Runs Completed 3
Technician C. Helgeson

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F _o
			Zero Pt.	After CO ₂	After O ₂			
1/1	9772-147 □ B □ F	1	0.00	2.40	20.90	2.40	18.50	1.00
		2	0.00	2.40	20.90	2.40	18.50	1.00
		Avg				2.40	18.50	
1/2	-148 □ B □ F	1	0.00	2.40	20.90	2.40	18.50	1.00
		2	0.00	2.40	20.90	2.40	18.50	1.00
		Avg				2.40	18.50	
1/3	-149 □ B □ F	1	0.00	2.00	20.90	2.00	18.90	1.00
		2	0.00	2.00	20.90	2.00	18.90	1.00
		Avg				2.00	18.90	
	□ B □ F	1						
		2						
		Avg						
	□ B □ F	1						
		2						
		Avg						
	□ B □ F	1						
		2						
		Avg						
	□ B □ F	1						
		2						
		Avg						
	□ B □ F	1						
		2						
		Avg						
	□ B □ F	1						
		2						
		Avg						

☒ Ambient Air QA Check
☒ Orsat Analyzer System Leak Check
☒ F_o Within EPA M-3 Guidelines
for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines	
Fuel Type	F _o Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.555
Wood/Wood Bark	1.000-1.130

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

PAH ORSAT

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. / Tomahawk Source DRYER
Team Leader DVE Test Site STACK
Date Submitted 8/17/93 Date of Test 8/17/93
Test No. 1 No. of Runs Completed 3
Date of Analysis 8/17/93 Technician D. VAN HOOVEN

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F _o
			Zero Pt.	After CO ₂	After O ₂			
2/1	☒ B ☐ F	1	0	2.6	20.6	2.6	18	1.12
		2						
		Avg						
2/2	☒ B ☐ F	1	0	2.2	20.8	2.2	18.6	1.04
		2			20.8			
		Avg						
2/3	☒ B ☐ F	1	0	2.2	20.8	2.2	18.6	1.04
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines
for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines	
Fuel Type	F _o Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

PART

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. / Tomahawk Source DRYER
Team Leader LDH (ET) Test Site DOWN FACE INLET
Date Submitted 8/18 Date of Test 8/18
Test No. 4 No. of Runs Completed 3
Date of Analysis 8/18 Technician D. VAN HOEVER

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F _o
			Zero Pt.	After CO ₂	After O ₂			
4/1	4/1 ☒ B ☐ F	1	0	3.0	20.6	3	17.6	1.1
		2						
		Avg						
4/2	☒ B ☐ F	1	0	3.4	20.5	3.4	17.1	1.12
		2						
		Avg						
4/3	☒ B ☐ F	1	0	3.8	20.8	3.8	16.9	1.05
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines
for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines

Fuel Type	F _o Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.936
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.100

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

Part

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. / Tomahawk Source DRYER CORE
Team Leader S. BAINVILLE Test Site INLET
Date Submitted 8/17/93 Date of Test 8/17/93
Test No. 4 No. of Runs Completed 3
Date of Analysis 8/17/93 Technician D. VAN HEVEN

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F _o
			Zero Pt.	After CO ₂	After O ₂			
4/1	☒ B ☐ F	1	0	2.5	20.5	2.5	18	1.12
		2						
		Avg						
4/2	☒ B ☐ F	1	0	2.8	20.8	2.8	18.0	1.04
		2						
		Avg						
4/3	☒ B ☐ F	1	0	2.6	20.7	2.6	18.1	1.08
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines
for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines
Fuel Type F_o Range

Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
F-6 Wood/Wood Bark	1.000-1.100

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Data Reporting Sheet
Orsat AnalysisLab LIP TOMAHAWK
Team Leader DVA
Date Submitted 8/19/93
Test No. 44
Date of Analysis 8/19/93Source DRYER
Test Site STACK
Date of Test 8/17/93
No. of Runs Completed 3
Technician D. VAN HOFVEN

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F ₀
			Zero Pt.	After CO ₂	After O ₂			
4/1	☒ B ☐ F	1	0	2.2	20.8	2.2	18.6	1.04
		2						
		Avg						
4/2	☒ B ☐ F	1	0	2.2	20.6	2.2	18.4	1.13
		2						
		Avg						
4/3	☒ B ☐ F	1	0	2.5	20.8	2.5	18.3	1.04
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F₀ Within EPA M-3 Guidelines
for fuel type.

Where $F_0 = \frac{20.9 - O_2}{CO_2}$ F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines	
Fuel Type	F ₀ Range
Coal:	Anthracite/Lignite 1.016-1.130
	Bituminous 1.083-1.230
Oil:	Distillate 1.260-1.413
	Residual 1.210-1.370
Gas:	Natural 1.600-1.836
	Propane 1.434-1.586
	Butane 1.405-1.553
	Wood/Wood Bark 1.000-1.100

pheno 1

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. Tomahawk Source DRYER
Team Leader _____ Test Site STACK
Date Submitted _____ Date of Test 8/18/93
Test No. 6 No. of Runs Completed _____
Date of Analysis _____ Technician D. VAN HOEVER

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F ₀
			Zero Pt.	After CO ₂	After O ₂			
6/1	☒ B ☐ F	1	0	2.5	20.7	2.5	18.2	1.08
		2						
		Avg						
6/2	☒ B ☐ F	1	0	2.6	20.8	2.6	18.2	1.04
		2						
		Avg						
6/3	☒ B ☐ F	1	0	2.6	20.8	2.6	18.2	1.04
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F₀ Within EPA M-3 Guidelines
for fuel type.

Where $F_0 = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines	
Fuel Type	F ₀ Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.936
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.100

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

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EPA Method 3 Data Reporting Sheet
Orsat Analysis

Team Leader L.P. Tomahawk Source Press Vents
 Date Submitted 9-20-93 Test Site Stack
 Test No. 11 Date of Test 8-18-93
 Date of Analysis 9-20-93 No. of Runs Completed 3
 Technician C. Helgeson

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F _o
			Zero Pt.	After CO ₂	After O ₂			
11/1	9772-87 B F	1	0.00	0.00	20.90	0.00	20.90	
		2	0.00	0.00	20.90	0.00	20.90	
		Avg				0.00	20.90	
11/2	-91 B F	1	0.00	0.00	20.90	0.00	20.90	
		2	0.00	0.00	20.90	0.00	20.90	
		Avg				0.00	20.90	
11/3	-95 B F	1	0.00	0.00	20.90	0.00	20.90	
		2	0.00	0.00	20.90	0.00	20.90	
		Avg				0.00	20.90	
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						

- ☒ Ambient Air QA Check
☒ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines
 for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines

Fuel Type	F _o Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

F=Flask (250 cc all glass)
 B=Tedlar Bag (5-layer)

E-0

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EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. Tomahawk Source Gesa
Team Leader 64 Test Site Stack
Date Submitted 8-23-93 Date of Test 8-19-93
Test No. 12 No. of Runs Completed 3
Date of Analysis 8-26-93 Technician C. Helgeson

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F _o
			Zero Pt.	After CO ₂	After O ₂			
141	9772-99 B F	1	0.00	3.00	20.80	3.00	17.80	1.03
		2	0.00	3.00	20.80	3.00	17.80	1.03
		Avg				3.00	17.80	
142	-103 B F	1	0.00	3.10	20.80	3.10	17.70	1.03
		2	0.00	3.10	20.80	3.10	17.70	1.03
		Avg				3.10	17.70	
143	-107 B F	1	0.00	3.00	20.90	3.00	17.90	1.00
		2	0.00	3.00	20.90	3.00	17.90	1.00
		Avg				3.00	17.90	
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						
	B F	1						
		2						
		Avg						

- ☒ Ambient Air QA Check
☒ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines
for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines
Fuel Type F_o Range

Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
F-18 Wood/Wood Bark	1.000-1.100

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

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EPA Method 3 Data Reporting Sheet
Orsat Analysis

1. L.P. Tomahawk
 Team Leader Git
 Date Submitted 8-20-93
 Test No. 13
 Date of Analysis 8-20-93
 Source Geka
 Test Site Stack
 Date of Test 8-18-93
 No. of Runs Completed 3
 Technician C. Helgeson

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F _o
			Zero Pt.	After CO ₂	After O ₂			
13/1	4772-125 ☒ B ☐ F	1	0.00	3.00	20.80	3.00	17.80	1.03
		2	0.00	3.00	20.80	3.00	17.80	1.03
		Avg				3.00	17.80	
13/2	-126 ☒ B ☐ F	1	0.00	3.10	20.80	3.10	17.70	1.03
		2	0.00	3.10	20.80	3.10	17.70	1.03
		Avg				3.10	17.70	
13/3	-127 ☒ B ☐ F	1	0.00	3.20	20.80	3.20	17.60	1.03
		2	0.00	3.20	20.80	3.20	17.60	1.03
		Avg				3.20	17.60	
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☒ Ambient Air QA Check
☒ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines
 for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines
Fuel Type F_o Range

Coal:
 Anthracite/Lignite 1.016-1.130
 Bituminous 1.083-1.230
 Oil:
 Distillate 1.260-1.410
 Residual 1.210-1.370
 Gas:
 Natural 1.600-1.836
 Propane 1.434-1.586
 Butane 1.405-1.530
 Wood/Wood Bark 1.000-1.100

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. TOMAHAWK Source Geka
Team Leader DUT Test Site Stack
Date Submitted 8/18/93 Date of Test 8/18/93
Test No. 14 No. of Runs Completed 3
Date of Analysis 8/14/93 Technician D. VAN HOEVER

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F ₀
			Zero Pt.	After CO ₂	After O ₂			
14/1	☒ B ☐ F	1	0	3.4	20.8	3.2	17.6	1.03
		2						
		Avg						
14/2	☒ B ☐ F	1	0	3.2	20.6	3.2	17.4	1.09
		2						
		Avg						
14/3	☒ B ☐ F	1	0	3.2	20.8	3.2	17.6	1.03
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F₀ Within EPA M-3 Guidelines
for fuel type.

Where $F_0 = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines	
Fuel Type	F ₀ Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.100

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EPA Method 3 Data Reporting Sheet
Orsat Analysis

Team Leader L.P. Tomahawk Source Geka
Date Submitted 8-20-43 Test Site Stack
Test No. 18 Date of Test 8-19-43
Date of Analysis 8-20-43 No. of Runs Completed 18
Technician C. Helgeson

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO ₂ %v/v Dry	Conc. O ₂ %v/v Dry	F ₀
			Zero Pt.	After CO ₂	After O ₂			
18/1	9772-144 ☒ B ☐ F	1	0.00	3.20	20.70	3.20	17.5	1.06
		2	0.00	3.20	20.70	3.20	17.50	1.06
		Avg				3.20	17.50	
18/2	~145 ☒ B ☐ F	1	0.00	3.30	20.70	3.30	17.40	1.06
		2	0.00	3.30	20.70	3.30	17.40	1.06
		Avg				3.30	17.40	
18/3	-146 ☒ B ☐ F	1	0.00	3.20	20.80	3.20	17.60	1.03
		2	0.00	3.20	20.80	3.20	17.60	1.03
		Avg				3.20	17.60	
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

- ☒ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F₀ Within EPA M-3 Guidelines
for fuel type.

Where $F_0 = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines	
Fuel Type	F ₀ Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.100

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Wisconsin Protocol

Job L.P. Tomahawk Source Face
Team Leader ET Test Site Inlet Duct
Date Submitted 8-23-93 Date of Test 8-17-93
Test No. 4 No. of Runs Completed 3
Date of Analysis 8-26-93 Technician C. Helgeson

	Solvent Phase	Aqueous Phase
0	Test <u>4</u> Run <u>0</u> Field Blank Log Number <u>9772-24</u> Comments _____ Dish No. <u>206</u> Dish Tare Wt. <u>47.8190</u> g Dish+Sample Wt. <u>47.8192</u> g Sample Wt. <u>0.0002</u> g	Dish No. <u>602</u> Dish Tare Wt. <u>47.2214</u> g Dish+Sample Wt. <u>47.2215</u> g Sample Wt. <u>0.0001</u> g
1	Test <u>4</u> Run <u>1</u> Log Number <u>-27</u> Comments _____ Dish No. <u>208</u> Dish Tare Wt. <u>51.7475</u> g Dish+Sample Wt. <u>52.8078</u> g Sample Wt. <u>0.0103</u> g	Dish No. <u>605</u> Dish Tare Wt. <u>49.6852</u> g Dish+Sample Wt. <u>49.7122</u> g Sample Wt. <u>0.0270</u> g
2	Test <u>4</u> Run <u>2</u> Log Number <u>-31</u> Comments _____ Dish No. <u>401</u> Dish Tare Wt. <u>49.5260</u> g Dish+Sample Wt. <u>49.5408</u> g Sample Wt. <u>0.0148</u> g	Dish No. <u>607</u> Dish Tare Wt. <u>47.3991</u> g Dish+Sample Wt. <u>47.4332</u> g Sample Wt. <u>0.0341</u> g
3	Test <u>4</u> Run <u>3</u> Log Number <u>-35</u> Comments _____ Dish No. <u>508</u> Dish Tare Wt. <u>46.5034</u> g Dish+Sample Wt. <u>46.5214</u> g Sample Wt. <u>0.0180</u> g	Dish No. <u>608</u> Dish Tare Wt. <u>46.2813</u> g Dish+Sample Wt. <u>46.3394</u> g Sample Wt. <u>0.0581</u> g
4	Test _____ Run _____ Log Number _____ Comments _____ Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g	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	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

Results Solvent Phases:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5 Blank Solvent Wt. 0.0002 g

	<u>0.0101</u>	<u>0.0146</u>	<u>0.0183</u>		
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Results Aqueous Phases:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	<u>0.0269</u>	<u>0.0340</u>	<u>0.0580</u>	<u>F 14</u>	
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LSC-03WYP

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job L.P. Tomahawk Source Face
Team Leader CT Test Site Inlet Duct
Date Submitted 8-23-93 Date of Test 8-17-93
Test No. 4 No. of Runs Completed 3
Date of Analysis 8-25-93 Technician C. Helgeson
Transport Leakage ☒ None ☐ ml Solvent Acetone

0	Test <u>4</u> Run <u>0</u> Field Blank Log Number <u>9772-22</u> Vol. of Solvent <u>170</u> ml *Solvent Residue <u>2.94</u> ug/ml	Dish No. <u>7</u> Dish Tare Wt. <u>45.7582</u> g Dish+Sample Wt. <u>45.1887</u> g Sample Wt. <u>0.0005</u> g
1	Test <u>4</u> Run <u>1</u> Vol. of Solvent <u>250</u> ml Log Number <u>-25</u> Comments <u> </u>	Dish No. <u>8</u> Dish Tare Wt. <u>46.9765</u> g Dish+Sample Wt. <u>47.1717</u> g Sample Wt. <u>0.1952</u> g
2	Test <u>4</u> Run <u>2</u> Vol. of Solvent <u>130</u> ml Log Number <u>-29</u> Comments <u> </u>	Dish No. <u>9</u> Dish Tare Wt. <u>47.9751</u> g Dish+Sample Wt. <u>48.1655</u> g Sample Wt. <u>0.1904</u> g
3	Test <u>4</u> Run <u>3</u> Vol. of Solvent <u>155</u> ml Log Number <u>-33</u> Comments <u> </u>	Dish No. <u>14</u> Dish Tare Wt. <u>47.6598</u> g Dish+Sample Wt. <u>47.8512</u> g Sample Wt. <u>0.1914</u> g
4	Test <u> </u> Run <u> </u> Vol. of Solvent <u> </u> ml Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
5	Test <u> </u> Run <u> </u> Vol. of Solvent <u> </u> ml Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g

*Solvent Residue ug/ml = [(Sample Wt. 0.0005g) (1000)] / Vol. of Sol. 170 ml
EPA-M5 Acetone Residue Blank Spec. { 7.8 ug/ml

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	<u>0.1945</u>	<u>0.1900</u>	<u>0.1909</u> F-15		
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LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L.P. Tomaskow Source Face
Team Leader CT Test Site Inlet Duct
Date Submitted 8-23-93 Date of Test 8-17-93
Test No. 4 No. of Runs Completed 3
Date of Analysis 8-25-93 Technician C. Helgeson

0	Test <u>4</u> Run <u>0</u> Field Blank Log Number <u>9772-23</u> Comments _____	Filter No. <u>5611</u> Filter Type <u>4"GF</u> Filter Tare Wt. <u>.9186</u> g Filter+Sample Wt. <u>.9186</u> g Sample Wt. <u>0.0000</u> g
1	Test <u>4</u> Run <u>1</u> Log Number <u>-26</u> Comments _____	Filter No. <u>5571</u> Filter Type <u>4"GF</u> Filter Tare Wt. <u>.9366</u> g Filter+Sample Wt. <u>1.1096</u> g Sample Wt. <u>0.1730</u> g
2	Test <u>4</u> Run <u>2</u> Log Number <u>-30</u> Comments _____	Filter No. <u>5608</u> Filter Type <u>4"GF</u> Filter Tare Wt. <u>.9260</u> g Filter+Sample Wt. <u>1.1457</u> g Sample Wt. <u>0.2197</u> g
3	Test <u>4</u> Run <u>3</u> Log Number <u>-34</u> Comments _____	Filter No. <u>5601</u> Filter Type <u>4"GF</u> Filter Tare Wt. <u>.9255</u> g Filter+Sample Wt. <u>1.1247</u> g Sample Wt. <u>0.1992</u> 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

	0.1730	0.2197	0.1992		
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Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.4045	0.4583	0.4664		
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EPA Method 5 Data Reporting Sheet
Impinger Catch/Wisconsin Protocol

Job L.P. Tomahawk Source Core
Team Leader SB Test Site Inlet
Date Submitted 8-23-93 Date of Test 8-17-93
Test No. 4 No. of Runs Completed 3
Date of Analysis 8-27-93 Technician C. Helgeson

	Solvent Phase	Aqueous Phase
0	Test <u>4</u> Run <u>0</u> Field Blank Log Number <u>9772-164</u> Comments _____ Dish No. <u>115</u> Dish Tare Wt. <u>45.0674</u> g Dish+Sample Wt. <u>45.0676</u> g Sample Wt. <u>0.0002</u> g	Dish No. <u>522</u> Dish Tare Wt. <u>47.0006</u> g Dish+Sample Wt. <u>47.0007</u> g Sample Wt. <u>0.0001</u> g
1	Test <u>4</u> Run <u>1</u> Log Number <u>-150</u> Comments _____ Dish No. <u>158</u> Dish Tare Wt. <u>50.2240</u> g Dish+Sample Wt. <u>50.2269</u> g Sample Wt. <u>0.0029</u> g	Dish No. <u>523</u> Dish Tare Wt. <u>49.8066</u> g Dish+Sample Wt. <u>49.8161</u> g Sample Wt. <u>0.0095</u> g
2	Test <u>4</u> Run <u>2</u> Log Number <u>-156</u> Comments _____ Dish No. <u>209</u> Dish Tare Wt. <u>43.2099</u> g Dish+Sample Wt. <u>43.2169</u> g Sample Wt. <u>0.0070</u> g	Dish No. <u>524</u> Dish Tare Wt. <u>48.0409</u> g Dish+Sample Wt. <u>48.0497</u> g Sample Wt. <u>0.0088</u> g
3	Test <u>4</u> Run <u>3</u> Log Number <u>-160</u> Comments _____ Dish No. <u>407</u> Dish Tare Wt. <u>47.9932</u> g Dish+Sample Wt. <u>48.0020</u> g Sample Wt. <u>0.0088</u> g	Dish No. <u>201</u> Dish Tare Wt. <u>42.2328</u> g Dish+Sample Wt. <u>42.2388</u> g Sample Wt. <u>0.0060</u> g
4	Test _____ Run _____ Log Number _____ Comments _____ Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g	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	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

Results Solvent Phase:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0027	0.0068	0.0086		

Results Aqueous Phase:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0099	0.0087	0.0059		

E-17

LSC-03WYP

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job L.P. Tomaskiw Source Core
Team Leader SB Test Site Inlet
Date Submitted 8-23-93 Date of Test 8-17-93
Test No. 4 No. of Runs Completed 3
Date of Analysis 8-25-93 Technician C. Helgeson
Transport Leakage None ☐ 0 ml Solvent Acetone

0	Test <u>4</u> Run <u>0</u> Field Blank Log Number <u>9772-162</u> Vol. of Solvent <u>170</u> ml *Solvent Residue <u>2.94</u> ug/ml	Dish No. <u>105</u> Dish Tare Wt. <u>47.8630</u> g Dish+Sample Wt. <u>47.8635</u> g Sample Wt. <u>0.0005</u> g
1	Test <u>4</u> Run <u>1</u> Vol. of Solvent <u>185</u> ml Log Number <u>-150</u> Comments _____	Dish No. <u>117</u> Dish Tare Wt. <u>47.3731</u> g Dish+Sample Wt. <u>47.8078</u> g Sample Wt. <u>0.4347</u> g
2	Test <u>4</u> Run <u>2</u> Vol. of Solvent <u>200</u> ml Log Number <u>-154</u> Comments _____	Dish No. <u>119</u> Dish Tare Wt. <u>47.7649</u> g Dish+Sample Wt. <u>48.3003</u> g Sample Wt. <u>0.5354</u> g
3	Test <u>4</u> Run <u>3</u> Vol. of Solvent <u>160</u> ml Log Number <u>-158</u> Comments _____	Dish No. <u>204</u> Dish Tare Wt. <u>47.4649</u> g Dish+Sample Wt. <u>47.9444</u> g Sample Wt. <u>0.4795</u> 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 2.94 ug/ml = [(Sample Wt. 0.0005 g) (10⁶)] / Vol. of Sol. 170 ml

EPA-M5 Acetone Residue Blank Spec. { 7.8 ug/ml

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	<u>0.4342</u>	<u>0.5348</u>	<u>0.4790</u>	<u>F-18</u>	
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LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L.P. Tomahawk Source Core
Team Leader SB Test Site Inlet
Date Submitted 8-23-93 Date of Test 8-17-93
Test No. 4 No. of Runs Completed 3
Date of Analysis 8-25-93 Technician C. Helgeson

0	Test <u>4</u> Run <u>0</u> Field Blank Log Number <u>9772-163</u> Comments _____	Filter No. <u>5649</u> Filter Type <u>4"6FF</u> Filter Tare Wt. <u>.9195</u> g Filter+Sample Wt. <u>.9198</u> g Sample Wt. <u>0.003</u> g
1	Test <u>4</u> Run <u>1</u> Log Number <u>-151</u> Comments _____	Filter No. <u>5645</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9272</u> g Filter+Sample Wt. <u>1.0633</u> g Sample Wt. <u>0.1361</u> g
2	Test <u>4</u> Run <u>2</u> Log Number <u>-155</u> Comments _____	Filter No. <u>5647</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9303</u> g Filter+Sample Wt. <u>1.0855</u> g Sample Wt. <u>0.1552</u> g
3	Test <u>4</u> Run <u>3</u> Log Number <u>-154</u> Comments _____	Filter No. <u>5648</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9258</u> g Filter+Sample Wt. <u>1.1133</u> g Sample Wt. <u>0.1875</u> 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

	0.1361	0.1552	0.1875		
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Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.5824	0.7055	0.6810		
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EPA Method 5 Data Reporting Sheet
Impinger Catch/Wisconsin Protocol

Job L.P. Tomahawk Source Dryer
Team Leader DB Test Site Jack
Date Submitted 8-23-93 Date of Test 8-17-93
Test No. 4 No. of Runs Completed 3
Date of Analysis 8-26-93 Technician C. Helgeson

	Solvent Phase	Aqueous Phase
0	Test <u>Run 0</u> Field Blank Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
1	Test <u>4</u> Run <u>1</u> Log Number <u>9772-42</u> Comments _____	Dish No. <u>509</u> Dish Tare Wt. <u>47.6209</u> g Dish+Sample Wt. <u>47.6251</u> g Sample Wt. <u>0.0042</u> g
2	Test <u>4</u> Run <u>2</u> Log Number <u>-46</u> Comments _____	Dish No. <u>609</u> Dish Tare Wt. <u>45.5605</u> g Dish+Sample Wt. <u>45.5643</u> g Sample Wt. <u>0.0038</u> g
3	Test <u>4</u> Run <u>3</u> Log Number <u>-50</u> Comments _____	Dish No. <u>518</u> Dish Tare Wt. <u>48.1052</u> g Dish+Sample Wt. <u>48.1088</u> g Sample Wt. <u>0.0036</u> g
4	Test <u>Run</u> Log Number _____ Comments _____	Dish No. <u>611</u> Dish Tare Wt. <u>50.0094</u> g Dish+Sample Wt. <u>50.0164</u> g Sample Wt. <u>0.0070</u> g
5	Test <u>Run</u> Log Number _____ Comments _____	Dish No. <u>612</u> Dish Tare Wt. <u>49.6261</u> g Dish+Sample Wt. <u>49.6276</u> g Sample Wt. <u>0.0015</u> g

Results Solvent Phases:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0040	0.0034	0.0037		

Blank Solvent Wt. 0.0002g

Results Aqueous Phases:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0087	0.0069	0.0014		

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LSC-0

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job L.P. Tomahawk Source Dryer
Team Leader DB Test Site Stack
Date Submitted 8-23-93 Date of Test 8-17-93
Test No. 4 No. of Runs Completed 3
Date of Analysis 8-25-93 Technician C. Helgeson
Transport Leakage ☒ None ☐ ml Solvent Acetone

0	Test <u> </u> Run <u>0</u> Field Blank Log Number <u> </u> Vol. of Solvent <u> </u> ml *Solvent Residue <u>2.44</u> ug/ml	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
1	Test <u>4</u> Run <u>1</u> Vol. of Solvent <u>150</u> ml Log Number <u>9772-37</u> Comments <u> </u>	Dish No. <u>3A</u> Dish Tare Wt. <u>57.8081</u> g Dish+Sample Wt. <u>57.8179</u> g Sample Wt. <u>0.0098</u> g
2	Test <u>4</u> Run <u>2</u> Vol. of Solvent <u>70</u> ml Log Number <u>-40</u> Comments <u> </u>	Dish No. <u>5</u> Dish Tare Wt. <u>50.6826</u> g Dish+Sample Wt. <u>50.6898</u> g Sample Wt. <u>0.0072</u> g
3	Test <u>4</u> Run <u>3</u> Vol. of Solvent <u>85</u> ml Log Number <u>-44</u> Comments <u> </u>	Dish No. <u>6</u> Dish Tare Wt. <u>44.5317</u> g Dish+Sample Wt. <u>44.5430</u> g Sample Wt. <u>0.0113</u> g
4	Test <u> </u> Run <u> </u> Vol. of Solvent <u> </u> ml Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
5	Test <u> </u> Run <u> </u> Vol. of Solvent <u> </u> ml Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g

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

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0094	0.0070	0.0111 F-21		LSC-01
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The following information is for the use of the
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and is not to be distributed outside the
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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L.P. Tomahawk Source Dryer
 Team Leader DB Test Site Stack
 Date Submitted 8-23-93 Date of Test 8-17-93
 Test No. 4 No. of Runs Completed 3
 Date of Analysis 8-25-93 Technician C. Helgeson

0	Test <u>4</u> Run <u>0</u> Field Blank Log Number <u>9772-38</u> Comments _____	Filter No. <u>5690</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9203</u> g Filter+Sample Wt. <u>.9205</u> g Sample Wt. <u>0.0002</u> g
1	Test <u>4</u> Run <u>1</u> Log Number <u>-41</u> Comments _____	Filter No. <u>5759</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9262</u> g Filter+Sample Wt. <u>.9382</u> g Sample Wt. <u>0.0120</u> g
2	Test <u>4</u> Run <u>2</u> Log Number <u>-45</u> Comments _____	Filter No. <u>5754</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9314</u> g Filter+Sample Wt. <u>.9541</u> g Sample Wt. <u>0.0227</u> g
3	Test <u>4</u> Run <u>3</u> Log Number <u>-49</u> Comments _____	Filter No. <u>5755</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9277</u> g Filter+Sample Wt. <u>.9447</u> g Sample Wt. <u>0.0170</u> 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

	0.0120	0.0227	0.0170		
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Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0341	0.0400	0.0332		
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EPA Method 5 Data Reporting Sheet
Impinger Catch/Wisconsin Protocol

Job L.P. Tomahawk Source Press Vent
Team Leader DB Test Site Stack
Date Submitted 8-23-93 Date of Test 8-18-93
Test No. 11 No. of Runs Completed 3
Date of Analysis 8-27-93 Technician C. Helgeson

		Solvent Phase	Aqueous Phase
0	Test <u>11</u> Run <u>0</u> Field Blank Log Number <u>4772-167</u> Comments _____	Dish No. <u>37</u> Dish Tare Wt. <u>49.4984</u> g Dish+Sample Wt. <u>49.4986</u> g Sample Wt. <u>0.0002</u> g	Dish No. <u>50</u> Dish Tare Wt. <u>45.4660</u> g Dish+Sample Wt. <u>45.4661</u> g Sample Wt. <u>0.0001</u> g
1	Test <u>11</u> Run <u>1</u> Log Number <u>-86</u> Comments _____	Dish No. <u>434</u> Dish Tare Wt. <u>46.5931</u> g Dish+Sample Wt. <u>46.5970</u> g Sample Wt. <u>0.0039</u> g	Dish No. <u>614</u> Dish Tare Wt. <u>44.4096</u> g Dish+Sample Wt. <u>44.4175</u> g Sample Wt. <u>0.0079</u> g
2	Test <u>11</u> Run <u>2</u> Log Number <u>-90</u> Comments _____	Dish No. <u>409</u> Dish Tare Wt. <u>46.1907</u> g Dish+Sample Wt. <u>46.1956</u> g Sample Wt. <u>0.0049</u> g	Dish No. <u>618</u> Dish Tare Wt. <u>46.5684</u> g Dish+Sample Wt. <u>46.5711</u> g Sample Wt. <u>0.0027</u> g
3	Test <u>11</u> Run <u>3</u> Log Number <u>-94</u> Comments _____	Dish No. <u>410</u> Dish Tare Wt. <u>50.5580</u> g Dish+Sample Wt. <u>50.5625</u> g Sample Wt. <u>0.0045</u> g	Dish No. <u>619</u> Dish Tare Wt. <u>47.5541</u> g Dish+Sample Wt. <u>47.5575</u> g Sample Wt. <u>0.0034</u> g
4	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g	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	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

Results Solvent Phase:

Field Blk.	Run 1	Run 2	Run 3	Blank Solvent Wt. <u>0.0002</u> g	Run 4	Run 5
	<u>0.0037</u>	<u>0.0047</u>	<u>0.0043</u>			

Results Aqueous Phase:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	<u>0.0078</u>	<u>0.0026</u>	<u>0.0033</u>	<u>E-23</u>	

LSC-03WYR

100
100
100

100

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job L.P. Tomahawk Source Dryer
Team Leader DB Test Site Stack
Date Submitted 8-23-93 Date of Test 8-17-93
Test No. 11 No. of Runs Completed 3
Date of Analysis 8-25-93 Technician C. Helgeson
Transport Leakage ☒ None ☐ ml Solvent Acetone

0	Test <u>11</u> Run <u>0</u> Field Blank Log Number <u>9772-165</u> Vol. of Solvent <u>170</u> ml *Solvent Residue <u>2.94</u> ug/ml	Dish No. <u>17</u> Dish Tare Wt. <u>48.3923</u> g Dish+Sample Wt. <u>48.3928</u> g Sample Wt. <u>0.0005</u> g
1	Test <u>11</u> Run <u>1</u> Vol. of Solvent <u>120</u> ml Log Number <u>-84</u> Comments <u> </u>	Dish No. <u>39</u> Dish Tare Wt. <u>49.4376</u> g Dish+Sample Wt. <u>49.4465</u> g Sample Wt. <u>0.0089</u> g
2	Test <u>11</u> Run <u>2</u> Vol. of Solvent <u>80</u> ml Log Number <u>-88</u> Comments <u> </u>	Dish No. <u>46</u> Dish Tare Wt. <u>45.4240</u> g Dish+Sample Wt. <u>45.4319</u> g Sample Wt. <u>0.0079</u> g
3	Test <u>11</u> Run <u>3</u> Vol. of Solvent <u>75</u> ml Log Number <u>-92</u> Comments <u> </u>	Dish No. <u>48</u> Dish Tare Wt. <u>47.8873</u> g Dish+Sample Wt. <u>47.8936</u> g Sample Wt. <u>0.0063</u> g
4	Test <u> </u> Run <u> </u> Vol. of Solvent <u> </u> ml Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
5	Test <u> </u> Run <u> </u> Vol. of Solvent <u> </u> ml Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g

*Solvent Residue 2.94 ug/ml = [(Sample Wt. 0.0005 g) (10⁶)] / Vol. of Sol. 170 ml
EPA-M5 Acetone Residue Blank Spec. { 7.8 ug/ml

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	<u>0.0085</u>	<u>0.0077</u>	<u>0.0061</u>	<u>F-24</u>	
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LSC-01YR

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L.P. Tomchuk Source Press Vent Stack
Team Leader DB Test Site Stack
Date Submitted 8-23-93 Date of Test 8-18-93
Test No. 11 No. of Runs Completed 3
Date of Analysis 8-25-93 Technician C. Helgeson

0	Test <u>Run 0</u> Field Blank Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ g Filter+Sample Wt. _____ g Sample Wt. _____ g
1	Test <u>11</u> Run <u>1</u> Log Number <u>9772-85</u> Comments _____	Filter No. <u>5730</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9316</u> g Filter+Sample Wt. <u>.9358</u> g Sample Wt. <u>0.0042</u> g
2	Test <u>11</u> Run <u>2</u> Log Number <u>-89</u> Comments _____	Filter No. <u>5750</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9320</u> g Filter+Sample Wt. <u>.9363</u> g Sample Wt. <u>0.0043</u> g
3	Test <u>11</u> Run <u>3</u> Log Number <u>-93</u> Comments _____	Filter No. <u>5756</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9308</u> g Filter+Sample Wt. <u>.9328</u> g Sample Wt. <u>0.0020</u> g
4	Test <u>Run</u> Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ g Filter+Sample Wt. _____ g Sample Wt. _____ g
5	Test <u>Run</u> 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

	0.0042	0.0043	0.0020		
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Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0242	0.0193	0.0157		
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13

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Wisconsin Protocol

Job L.P. Tomahawk Source Geka
Team Leader GH Test Site Stalk
Date Submitted 8-23-93 Date of Test 8-19-93
Test No. 12 No. of Runs Completed 3
Date of Analysis 8-30-93 Technician C. Helgeson

		Solvent Phase	Aqueous Phase
0	Test <u>Run 0</u> Field Blank Log Number Comments	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
1	Test <u>12</u> Run <u>1</u> Log Number <u>4772-98</u> Comments	Dish No. <u>1</u> Dish Tare Wt. <u>51.9605</u> g Dish+Sample Wt. <u>51.9704</u> g Sample Wt. <u>0.0099</u> g	Dish No. <u>610</u> Dish Tare Wt. <u>48.4388</u> g Dish+Sample Wt. <u>48.4398</u> g Sample Wt. <u>0.0010</u> g
2	Test <u>12</u> Run <u>2</u> Log Number <u>-102</u> Comments	Dish No. <u>21</u> Dish Tare Wt. <u>47.5180</u> g Dish+Sample Wt. <u>47.5306</u> g Sample Wt. <u>0.0126</u> g	Dish No. <u>615</u> Dish Tare Wt. <u>48.1009</u> g Dish+Sample Wt. <u>48.1071</u> g Sample Wt. <u>0.0062</u> g
3	Test <u>12</u> Run <u>3</u> Log Number <u>-106</u> Comments	Dish No. <u>2</u> Dish Tare Wt. <u>46.2175</u> g Dish+Sample Wt. <u>46.2283</u> g Sample Wt. <u>0.0108</u> g	Dish No. <u>616</u> Dish Tare Wt. <u>50.9227</u> g Dish+Sample Wt. <u>50.9247</u> g Sample Wt. <u>0.0020</u> g
4	Test <u>Run</u> Log Number Comments	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test <u>Run</u> Log Number Comments	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

Results Solvent Phases:

Field Blk.	Run 1	Run 2	Run 3	Blank Solvent Wt. <u>0.0002</u> g	Run 4	Run 5
	<u>0.0097</u>	<u>0.0124</u>	<u>0.0106</u>			

Results Aqueous Phase:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	<u>0.0009</u>	<u>0.0061</u>	<u>0.0019</u>		

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LSC-03WYP

4. The fourth part of the document discusses the limitations of the study and the need for further research. It acknowledges that the sample size was relatively small and that the study was conducted in a specific context, which may limit the generalizability of the findings.

5. The fifth part of the document provides a conclusion and recommendations for future research. It suggests that further studies should be conducted to explore the long-term effects of the proposed strategy and to investigate the role of other factors in the research model.

Interpoll Laboratories
(612) 784-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job L.P. Tomahawk Source Geka
Team Leader GH Test Site Stack
Date Submitted 8-23-93 Date of Test 8-19-93
Test No. 12 No. of Runs Completed 3
Date of Analysis 8-25-93 Technician C. Helgeson
Transport Leakage ☒ None ☐ ml Solvent Acetone

0	Test <u>Run 0</u>	Dish No. <u> </u>	
	Field Blank	Dish Tare Wt. <u> </u>	g
	Log Number <u> </u>	Dish+Sample Wt. <u> </u>	g
	Vol. of Solvent <u> </u> ml	Sample Wt. <u> </u>	g
	*Solvent Residue <u>2.94</u> ug/ml		
1	Test <u>12 Run 1</u>	Dish No. <u>56</u>	
	Vol. of Solvent <u>105</u> ml	Dish Tare Wt. <u>47.7565</u>	g
	Log Number <u>9772-96</u>	Dish+Sample Wt. <u>47.1883</u>	g
	Comments <u> </u>	Sample Wt. <u>0.0318</u>	g
2	Test <u>12 Run 2</u>	Dish No. <u>60</u>	
	Vol. of Solvent <u>130</u> ml	Dish Tare Wt. <u>49.6265</u>	g
	Log Number <u>-100</u>	Dish+Sample Wt. <u>49.6557</u>	g
	Comments <u> </u>	Sample Wt. <u>0.0292</u>	g
3	Test <u>12 Run 3</u>	Dish No. <u>66</u>	
	Vol. of Solvent <u>90</u> ml	Dish Tare Wt. <u>48.3091</u>	g
	Log Number <u>-104</u>	Dish+Sample Wt. <u>48.3378</u>	g
	Comments <u> </u>	Sample Wt. <u>0.0287</u>	g
4	Test <u> </u> Run <u> </u>	Dish No. <u> </u>	
	Vol. of Solvent <u> </u> ml	Dish Tare Wt. <u> </u>	g
	Log Number <u> </u>	Dish+Sample Wt. <u> </u>	g
	Comments <u> </u>	Sample Wt. <u> </u>	g
5	Test <u> </u> Run <u> </u>	Dish No. <u> </u>	
	Vol. of Solvent <u> </u> ml	Dish Tare Wt. <u> </u>	g
	Log Number <u> </u>	Dish+Sample Wt. <u> </u>	g
	Comments <u> </u>	Sample Wt. <u> </u>	g

*Solvent Residue ug/ml = [(Sample Wt. g) (10⁶)] / Vol. of Sol. ml

EPA-M5 Acetone Residue Blank Spec. {7.3 ug/ml

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	<u>0.0315</u>	<u>0.0288</u>	<u>0.0284</u>	<u>F-27</u>	
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LSC-01YR

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L.P. Tomahawk Source Geka
Team Leader GH Test Site Stack
Date Submitted 8-23-93 Date of Test 8-19-93
Test No. 12 No. of Runs Completed 3
Date of Analysis 8-25-93 Technician C. Helgeson

0	Test <u> </u> Run <u>0</u> Field Blank Log Number <u> </u> Comments <u> </u>	Filter No. <u> </u> Filter Type <u> </u> Filter Tare Wt. <u> </u> g Filter+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
1	Test <u>12</u> Run <u>1</u> Log Number <u>9772-97</u> Comments <u> </u>	Filter No. <u>5724</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9122</u> g Filter+Sample Wt. <u>.9679</u> g Sample Wt. <u>0.0557</u> g
2	Test <u>12</u> Run <u>2</u> Log Number <u>-101</u> Comments <u> </u>	Filter No. <u>5722</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9139</u> g Filter+Sample Wt. <u>.9522</u> g Sample Wt. <u>0.0383</u> g
3	Test <u>12</u> Run <u>3</u> Log Number <u>-105</u> Comments <u> </u>	Filter No. <u>5725</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.9168</u> g Filter+Sample Wt. <u>.9582</u> g Sample Wt. <u>0.0414</u> g
4	Test <u> </u> Run <u> </u> Log Number <u> </u> Comments <u> </u>	Filter No. <u> </u> Filter Type <u> </u> Filter Tare Wt. <u> </u> g Filter+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
5	Test <u> </u> Run <u> </u> Log Number <u> </u> Comments <u> </u>	Filter No. <u> </u> Filter Type <u> </u> Filter Tare Wt. <u> </u> g Filter+Sample Wt. <u> </u> g Sample Wt. <u> </u> g

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0557	0.0383	0.0414		
--	--------	--------	--------	--	--

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0978	0.0856	0.0823		
--	--------	--------	--------	--	--

LSC-02PR

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EPA Method 7A Recovery and Analysis Data Sheet (1)

*****SOURCE*****
Job LP / Tomahawk
Source Dryer Stack
Date of Sampling 8-17-93
Test No(s) 4

*****RECOVERY*****
Date of Recovery 8-26-93
Recovered by C. Helgeson
Recovery volume 500 ml
Barometric at time 29.14 IN.HG.

*****ANALYTICAL*****
Date of Analysis 8-28-93
Analyst ONS
Eluent AS4A
Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Integrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \quad M_{NO_3} = (C_{RS} - \bar{C}_B)V_R \quad \bar{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where:

C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

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EPA Method 7A Recovery and Analysis Data Sheet (2)

Sample Log ID No.	Flask No.	Test/Run	Final Flask Conditions			Chrom Run No.	DF	Nitrate Concentration (ug/ml)		Total nitrate in Sample (ug) (MNO ₃)
			t _f (°F)	+	- (IN.HG.)			Uncorr. for blank CRS	Corr. for blank (CRS - C _B)	
1	4772-54	17	72°		✓ 1.6		1	0.1810	0.1810	93.0
2	-53	25			✓ 1.8		1	0.197	0.197	98.5
3	-54	27			✓ 0.6		1	0.189	0.189	94.5
4	-55	29			✓ 1.8		1	0.174	0.174	87.0
5	-56	36			✓ 3.6		1	0.259	0.259	130
6	-57	48			✓ 3.4		1	0.282	0.282	141
7	-58	43			✓ 2.3		1	0.177	0.177	88.5
8	-59	44			✓ 1.0		1	0.135	0.135	107.5
9	-60	46			✓ 2.9		1	0.175	0.175	87.3
10	-61	58			✓ 2.7		1	0.200	0.200	100
11	-62	73			✓ 2.6		1	0.187	0.187	93.5
12	-63	76			✓ 1.0		1	0.182	0.182	91.0
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
Blank 1-64 51			72°		0		1	CB1 <0.025	—	C _B = 512.5
Blank 2							1	CB2		
Blank 3							1	CB3		

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EPA Method 7A Recovery and Analysis Data Sheet (1)

*****SOURCE*****
Job LP/Tomahawk
Source Geka Stack
Date of Sampling 8-19-93
Test No(s) 12
*****RECOVERY*****
Date of Recovery 8-26-93
Recovered by C. Helgeson
Recovery volume 500 ml
Barometric at time 29.14 IN.HG. Chromatograph: Dionex System 4000f
*****ANALYTICAL*****
Date of Analysis 8-28-93
Analyst ONS
Eluent ASHA

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Integrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \quad M_{NO_3} = (C_{RS} - \bar{C}_B)V_R \quad \bar{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where:

C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

$\bar{C}_B$ = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
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EPA Method 7A Recovery and Analysis Data Sheet (2)

Sample Log ID No.	Flask No.	Test/Run	Final Flask Conditions			Chrom Run No.	DF	Nitrate Concentration (ug/ml)		Total nitrate in Sample (ug) (MNO ₃)
			t _f (OF)	+	- (IN.HG.)			Uncorr. for blank CRS	Corr. for blank (CRS - C _B)	
1	9772-108	12-1-1	72		✓		1	0.300	0.300	150
2	-109	12-1-2			✓		1	0.330	0.330	165
3	-110	12-1-3			✓		1	0.341	0.341	171
4	-111	12-1-1			✓		1	0.3910	0.3910	198
5	-112	12-2-2			✓		1	0.382	0.382	191
6	-113	12-2-3			✓		1	0.387	0.387	194
7	-114	12-2-1			✓		1	0.374	0.374	187
8	-115	12-2-2			✓		1	0.381	0.381	191
9	-116	12-3-3			✓		1	0.395	0.395	198
10	-117	12-3-1			✓		1	0.372	0.372	186
11	-118	12-3-2			✓		1	0.371	0.371	185
12	-119	12-3-3			✓		1	0.391	0.391	196
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
Blank 1	-120	52	72		○		1	CB1 0.005	—	
Blank 2							1	CB2		
Blank 3							1	CB3		

C_B = 12.5

EPA Method 10 NDIR Analysis

Job Name L.P. Tomahawk
Source Press vent stack
Date of Analysis 8-20-93
Technician C. Helgeson

NDIR Analyzer: ☐ Fugl ACS Model 3300
☐ Mon. Lab Model 8310
☒ Dasibi Model 3003
Range: 0 - 200 ppm
Flow rate: 1000 cc/min

Pretest Calibration				
Conc.	Reading	Vendor	Cyl. Number	
Zero gas: <u>0</u> ppm	<u>0</u>	<u>T.C.Ox</u>	<u>0293-28</u>	
Upscale gas: <u>40</u> ppm	<u>40</u>	<u>Scott</u>	<u>ALMO30329</u>	
Upscale gas: <u>144</u> ppm	<u>144</u>	<u>National</u>	<u>CC114302</u>	
Upscale gas: <u> </u> ppm	<u> </u>	<u> </u>	<u> </u>	

Post-test Calibration				
Conc.	Reading	Vendor	Cyl. Number	
Zero gas: <u>0</u> ppm	<u>0</u>	<u>T.C.Ox</u>	<u>0293-28</u>	
Upscale gas: <u>40</u> ppm	<u>40</u>	<u>Scott</u>	<u>ALMO30329</u>	
Upscale gas: <u>144</u> ppm	<u>144</u>	<u>National</u>	<u>CC114302</u>	
Upscale gas: <u> </u> ppm	<u> </u>	<u> </u>	<u> </u>	

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry)		
		Dilution Factor	Reading	Actual ppm
<u>1/1</u>	<u>4772-87</u>	<u>—</u>	<u>2.7</u>	<u>2.7</u>
<u>1/2</u>	<u>-91</u>	<u>—</u>	<u>2.6</u>	<u>2.6</u>
<u>1/3</u>	<u>-95</u>	<u>—</u>	<u>2.4</u>	<u>2.4</u>

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry)	
		Dilution Factor	Reading Actual ppm

- Note 1: If sample dilution is required the sample is diluted with CO-free gas prior to analysis.
 Note 2: The Fugl ACS model 3300 has a rejection ratio for CO to CO₂ greater than 100,000; 1 and the Mon. Lab Model 8310 and Dasibi Model 3003 have rejection ratios greater than 200,000:1 and thus CO₂ removal prior to analysis is not required.
 Note 3: The analyzer must be zeroed and spanned immediately before and after sample analysis. Additional checks may be performed between sample analyses if required.

EPA Method 10 NDIR Analysis

Job Name L.P. Tomahawk
 Source Pressurized stack
 Date of Analysis 8-20-93
 Technician C. Halgren

NDIR Analyzer: ☐ Fugl ACS Model 3300
☐ Mon. Lab Model 8310
☒ Dasibi Model 3003
 Range: 0 - 200 ppm
 Flow rate: 1000 cc/min

Pretest Calibration				Post-test Calibration			
Sample Description Test/Run	Conc.	Reading	Vendor	Cyl. Number	Conc.	Reading	Vendor
Zero gas:	0	ppm	0	ppm	0	ppm	I.C.O.
Upscale gas:	40	ppm	40	ppm	40	ppm	Scott
Upscale gas:	144	ppm	144	ppm	144	ppm	National
Upscale gas:		ppm		ppm		ppm	

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry)		
		Dilution Factor	Reading	Actual ppm
111	4772-87	-	2.7	2.1
112	-91	-	2.6	2.6
113	-95	-	2.4	2.4

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry)		
		Dilution Factor	Reading	Actual ppm

Note 1: If sample dilution is required the sample is diluted with CO-free gas prior to analysis.
 Note 2: The Fugl ACS model 3300 has a rejection ratio for CO to CO₂ greater than 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater than 200,000:1 and thus CO₂ removal prior to analysis is not required.
 Note 3: The analyzer must be zeroed and spanned immediately before and after sample analysis. Additional checks may be performed between sample analyses if required.

INTERPOLL LABORATORIES, INC.
(612)786-6020

Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Formaldehyde Analysis¹

Test: 1
Source: Core Inlet
Sample Type: Impinger Catch

Sample Log No.	Sample Description	Formaldehyde
		Total ug
9772-01	Trip Blank	4.7
9772-02	Field Spike	73
9772-03	Field Blank	9.5
9772-04	Run 1	3100
9772-05	Run 2	2900
9772-06	Run 3	2200

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method 0011.

INTERPOLL LABORATORIES, INC.
(612)786-6020

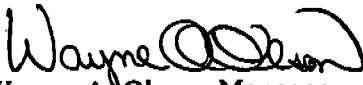
Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Formaldehyde Analysis¹

Test: 1
Source: Dryer Stack
Sample Type: Impinger Catch

		Formaldehyde
<u>Sample Log No.</u>	<u>Sample Description</u>	<u>Total ug</u>
9772-11	Field Blank	4.7
9772-12	Run 1	12000
9772-13	Run 2	12400
9772-14	Run 3	8200

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method 0011.

INTERPOLL LABORATORIES, INC.
(612)786-6020

Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Formaldehyde Analysis¹

Test: 1
Source: Face Inlet Duct
Sample Type: Impinger Catch

Sample Log No.	Sample Description	Formaldehyde
		Total ug
9772-07	Field Blank	5.0
9772-08	Run 1	7400
9772-09	Run 2	2200
9772-10	Run 3	6000

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method 0011.

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Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Formaldehyde Analysis¹

Test: 8
Source: Press Vent Stack
Sample Type: Impinger Catch

Sample Log No.	Sample Description	Formaldehyde
		Total ug
9772-75	Run 1	2100
9772-76	Run 2	970
9772-77	Run 3	2400

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method 0011.

INTERPOLL LABORATORIES, INC.
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Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Formaldehyde Analysis¹

Test: 18
Source: Konus Stack
Sample Type: Impinger Catch

Sample Log No.	Sample Description	Formaldehyde
		Total ug
9772-141	Run 1	71
9772-142	Run 2	43
9772-143	Run 3	140

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method 0011.

INTERPOLL LABORATORIES, INC.
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Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Phenol Analysis¹

Test: 6
Source: Dryer Stack
Sample Type: Impinger Catch

Sample Log No.	Sample Description	Phenol
		Total mg
9772-72	Run 1	< 0.84
9772-73	Run 2	< 0.84
9772-74	Run 3	< 0.84

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method SW-846, 8270.

INTERPOLL LABORATORIES, INC.
(612)786-6020

Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Phenol Analysis¹

Test: 9
Source: Press Vent Stack
Sample Type: Impinger Catch

Sample Log No.	Sample Description	Phenol
		Total mg
9772-81	Run 1	3.94
9772-82	Run 2	4.26
9772-83	Run 3	4.16

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method SW-846, 8270.

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Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Phenol Analysis¹

Test: 14
Source: Konus Stack
Sample Type: Impinger Catch

Sample Log No.	Sample Description	Phenol
		Total mg
9772-128	Field Blank	< 0.84
9772-129	Run 1	< 0.84
9772-130	Run 2	< 0.84
9772-131	Run 3	< 0.84

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method SW-846, 8270.

Interpoll Laboratories, Inc.

(612)786-6020

Report No.3-9772

Louisiana Pacific - Tomahawk

Run	800/200 mg		Total (ug)
	<u>Charcoal Tube</u>		
	(Front)	(Back)	
(Dryer - Benzene)			
0	<2.0	<0.59	-
1	4.2	<0.59	550
2	5.0	<0.59	490
3	9.5	<0.59	150
(Geka - Benzene)			
0	<2.0	<0.59	-
1	<2.0	<0.59	<2.0
2	<2.0	<0.59	<2.0
3	<2.0	<0.59	<2.0

EPA Method 18/NIOSH Sampling
Data Reporting Sheet

Job/Project LP/Tomahawk Date of Sampling 8-17-93
Source Dryer Analyst LSH
Test Site Stack Date of Analysis 9-10-93
Method of Analysis NIOSH 1501

Sample Log Number	Test/Run	Sampling Media	Sample Tube Size	Analytes:	Mass Front Section (Total ug)	Mass Back Section (Total ug)
9772-68	Test <u>5</u>	☒ C/C Coal	☐ 100/50	Benzene	5.0	<.59
	Run <u>2</u>	☐ P/C Coal	☐ 300/150			
		☐ S. Gel	☐ 400/200			
		☐ XAD-2	☐ 800/200			
			☐ 1060/240			
			☐ 1800/200			
				Method	<2.0	<.59
				Blank		
Comments:						

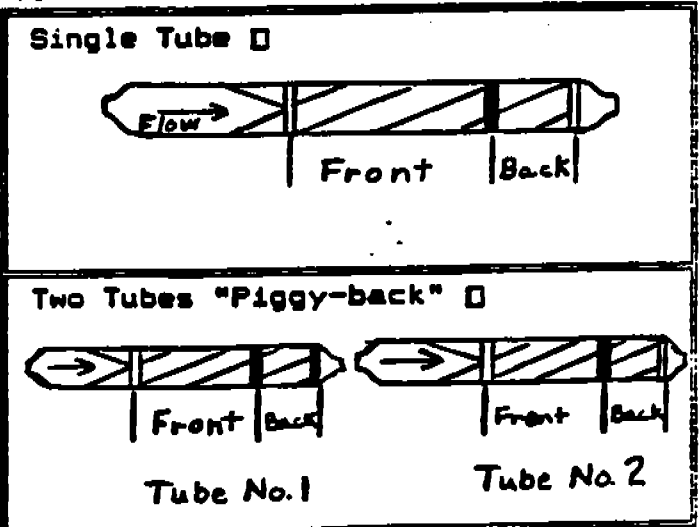
Sample Log Number	Test/Run	Sampling Media	Sample Tube Size	Analytes:	Mass Front Section (Total ug)	Mass Back Section (Total ug)
9772-70	Test <u>5</u>	☒ C/C Coal	☐ 100/50	Benzene	9.5	<.59
	Run <u>3</u>	☐ P/C Coal	☐ 300/150			
		☐ S. Gel	☐ 400/200			
		☐ XAD-2	☐ 800/200			
			☐ 1060/240			
			☐ 1800/200			
				Method	<2.0	<.59
				Blank		
Comments:						

Detection Limits:

Analytes:	Mass Front Section (Total ug)	Mass Back Section (Total ug)
BENZENE	2.0	.59

C/C Coal = Coconut Charcoal
P/C Coal = Petroleum Charcoal
S. Gel = Silica Gel

Tube Schematics:



Due 4-10-93

**EPA Method 18/NIOSH Sampling
Data Reporting Sheet**

Job/Project LP/Tomahawk
Source Geka
Test Site Stack

Date of Sampling 8-19-93
Analyst LSH
Date of Analysis 9-10-93
Method of Analysis NIOSH 1501

Sample Log Number	Test/Run	Sampling Media	Sample Tube Size	Analytes:	Mass Front Section (Total ug)	Mass Back Section (Total ug)
9772-135	Test <u>17</u>	☒ E/C Coal	☐ 100/50	Benzene	<2.0	<.59
	Run <u>1</u>	☐ P/C Coal	☐ 300/150			
		☐ S. Gel	☐ 400/200			
		☐ XAD-2	☐ 800/200			
		☐	☐ 1060/240	Methad	<2.0	<.59
		☐	☐ 1800/200	Blank		
		☐				
Comments: _____						

Sample Log Number	Test/Run	Sampling Media	Sample Tube Size	Analytes:	Mass Front Section (Total ug)	Mass Back Section (Total ug)
9772-137	Test <u>17</u>	☒ C/C Coal	☐ 100/50	Benzene	<2.0	<.59
	Run <u>2</u>	☐ P/C Coal	☐ 300/150			
		☐ S. Gel	☐ 400/200			
		☐ XAD-2	☒ 800/200			
		☐	☐ 1060/240			
		☐	☐ 1800/200	Methad	<2.0	<.59
		☐	☐	Blank		
Comments: _____						

Detection Limits:

Analytes:	Mass Front Section (Total ug)	Mass Back Section (Total ug)
Benzene	2.0	.59

C/C Coal = Coconut Charcoal
P/C Coal = Petroleum Charcoal
S. Gel = Silica Gel

Tube Schematics:

Single Tube □



Two Tubes "Piggy-back" □



Tube No. 1

Tube No. 2

LOA-13

**EPA Method 18/NIOSH Sampling
Data Reporting Sheet**

Job/Project LP/Tomahawk
Source _____
Test Site Stack

Date of Sampling 8-19-93
Analyst LSH
Date of Analysis 9-10-93
Method of Analysis NIOSH 1501

Sample Log Number	Test/Run	Sampling Media	Sample Tube Size	Analytes:	Mass Front Section (Total ug)	Mass Back Section (Total ug)
9772-139	Test <u>17</u> Run <u>3</u>	☐ C/C Coal	☐ 100/50	Benzene	<2.0	<.59
		☐ P/C Coal	☐ 300/150			
		☐ S. Gel	☐ 400/200			
		☐ XAD-2	☐ 800/200			
		☐ _____	☐ 1060/240			
		☐ _____	☐ 1800/200			
		☐ _____	☐ _____			
		☐ _____	☐ _____			
		☐ _____	☐ _____			
		☐ _____	☐ _____			
Method				<2.0	<.59	
Blank						
Comments: _____						

Sample Log Number	Test/Run	Sampling Media	Sample Tube Size	Analytes:	Mass Front Section (Total ug)	Mass Back Section (Total ug)
	Test_____	☐ C/C Coal	☐ 100/50			
	Run_____	☐ P/C Coal	☐ 300/150			
		☐ S. Gel	☐ 400/200			
		☐ XAD-2	☐ 800/200			
		☐ _____	☐ 1060/240			
		☐ _____	☐ 1800/200			
		☐ _____	☐ _____			
Comments: _____						

Detection Limits:

Analytes:	Mass Front Section (Total ug)	Mass Back Section (Total ug)
Benzene	2.0	.59

C/C Coal = Coconut Charcoal
P/C Coal = Petroleum Charcoal
S. Gel = Silica Gel

Tube Schematics:

Single Tube ☐



Two Tubes "Piggy-back" ☐



Tube No. 1

Tube No. 2

INTERPOLL LABORATORIES, INC.
(612)786-6020

Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Polynuclear Aromatic Hydrocarbons Analysis¹

Test: 13
Source: Konus Stack
Sample Type: MM-5 Train Catch

Analyte	Total Mass of PAHs (ug)			
	Field Blank	Run 1	Run 2	Run 3
(Log No.)	(9772-121)	(9772-122)	(9772-123)	(9772-124)
Benzo(a)anthracene	< 0.54	< 0.54	< 0.54	< 0.54
Benzo(b)fluoranthene	< 0.30	< 0.30	< 0.30	< 0.30
Benzo(a)pyrene	< 0.36	< 0.36	< 0.36	< 0.36
Dibenzo(a,h)anthracene	< 0.26	< 0.26	< 0.26	< 0.26
Indeno(1,2,3-cd)pyrene	< 0.27	< 0.27	< 0.27	< 0.27
Dibenz(a,h)acridine	< 4.5	< 4.5	< 4.5	< 4.5
Dibenz(a,j)acridine	< 0.48	< 0.48	< 0.48	< 0.48
7H-Dibenzo(c,g)carbazole	< 0.36	< 0.36	< 0.36	< 0.36
Dibenzo(a,h)pyrene	< 6.0	< 6.0	< 6.0	< 6.0
Dibenzo(a,i)pyrene	< 6.0	< 6.0	< 6.0	< 6.0

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method SW-846, 8270.

INTERPOLL LABORATORIES, INC.
(612)786-6020

Louisiana Pacific/Tomahawk
Laboratory Log No. 9772

Results of Polynuclear Aromatic Hydrocarbons Analysis¹

Test: 2
Source: Dryer Stack
Sample Type: MM-5 Train Catch

Analyte	Total Mass of PAHs (ug)			
	Field Blank	Run 1	Run 2	Run 3
(Log No.)	(9772-15)	(9772-16)	(9772-17)	(9772-18)
Benzo(a)anthracene	< 0.54	< 1.1	< 1.1	< 1.1
Benzo(b)fluoranthene	< 0.30	< 0.60	< 0.60	< 0.60
Benzo(a)pyrene	< 0.36	< 0.72	< 0.72	< 0.72
Dibenzo(a,h)anthracene	< 0.26	< 0.52	< 0.52	< 0.52
Indeno(1,2,3-cd)pyrene	< 0.27	< 0.54	< 0.54	< 0.54
Dibenz(a,h)acridine	< 4.5	< 9.0	< 9.0	< 9.0
Dibenz(a,j)acridine	< 0.48	< 0.96	< 0.96	< 0.96
7H-Dibenzo(c,g)carbazole	< 0.36	< 0.72	< 0.72	< 0.72
Dibenzo(a,h)pyrene	< 6.0	< 12	< 12	< 12
Dibenzo(a,i)pyrene	< 6.0	< 12	< 12	< 12

Respectfully submitted,


Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg

¹Analysis performed by EPA Method SW-846, 8270.

Interpoll Laboratories

(612) 786-6020

Sample Deposition

Job LP/TOMAHAWK Source FACE INLET
 Field Engineer E. J. [Signature] Test Site DUCT
 Date Submitted 8-19-93 Date of Test 8-17-93
 Test No. 1 No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
4	Probe Wash: ☐ Acetone ☐ MeCl ₂ ☐ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	_____
0	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	_____
4	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☒ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☒ Formaldehyde (ou II) ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	_____
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	<u>analyzed in site</u>
	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other _____	_____
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	_____
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	_____
	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	_____

Type of Source: Dryer

Fuel Type:

Coal: ☐ Bituminous
☐ Anthracite
☐ Lignite

Wood: ☒ Wood Waste
☐ Dust
☐ Bark

Oil: ☐ Waste Oil
☐ No. 2
☐ No. 6

☐ Natural Gas
☐ RDF
☐ Other _____

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Interpoll Laboratories
(612) 786-6020
Sample Deposition

Job LP-TOMAHAWK Source CORE
 Field Engineer SS Test Site INLET
 Date Submitted 8-19-93 Date of Test 8-17-93
 Test No. 1 No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
4	Probe Wash: ☒ Acetone ☒ MeCl ₂ ☒ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☒ Other <u>DOU</u>	<u>3 RUNS</u> <u>1 BLANK</u>
0	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
5	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☒ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☒ Formaldehyde (<u>DOU</u>) ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	<u>3 RUNS</u> <u>1 BLANK</u> <u>1 SPIKE</u>
<i>[Signature]</i>	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☒ As per EPA M-10 ☐ Other _____	<i>[Signature]</i> <u>DOUGLAS FIELD</u>
0	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other _____	
0	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
0	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
0	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: WOOD CHIP DRYER
 Fuel Type:
Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☒ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
☐ Natural Gas ☐ RDF ☐ Other _____

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Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job L.P. / TOMAHAWK Source DRYER STACK
Field Engineer DUKE BRENNEN Test Site STACK
Date Submitted 8/20/93 Date of Test 8/17/93
Test No. 1 No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
3	Probe Vent: <u>Impinger</u> ☒ Acetone ☒ MeCl ₂ ☐ DI Water ☐	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☒ Other <u>METHOD 0011</u>	
0	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other	
3 +	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☒ 2,4-DNPH ☐ ☐ <u>Blank</u>	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☒ Other <u>METHOD 0011</u>	
0	Integrated Gas Sample ☐ Tedlar Bag ☐	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other	
12	Oxides of Nitrogen (NO _x)	☒ As per EPA M-7A ☐ Other	
SSS DWH	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
0	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other	
0	Misc Samples ☐ ☐	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other	

Type of Source: DRYER

Fuel Type:

Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☒ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
☐ Natural Gas ☐ RDF ☐ Other

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Interpoll Laboratories

(612) 786-6020

Sample Deposition

Job L.P. Tomahawk
 Field Engineer [Signature]
 Date Submitted 8-19-93
 Test No. 4

Source fall
 Test Site subt. dust
 Date of Test 8-17-93
 No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
4	Probe Wash: ☒ Acetone ☐ MeCl ₂ ☐ DI Water ☐ _____	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	_____
4	Filter: ☒ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	_____
4	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☒ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	_____
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	<u>on site</u>
	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other _____	_____
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	_____
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	_____
	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	_____

Type of Source: DRYER

Fuel Type:

Coal: ☐ Bituminous
☐ Anthracite
☐ Lignite

Wood: ☒ Wood Waste
☐ Dust
☐ Bark

Oil: ☐ Waste Oil
☐ No. 2
☐ No. 6

☐ Natural Gas
☐ RDF
☐ Other _____

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GASTACKWPF09M95-278LAS

Interpoll Laboratories
(612) 786-6020
Sample Deposition

Job L P-TOMAHAWK Source CORE
Field Engineer SLB Test Site INLET
Date Submitted 8-19-93 Date of Test 8-17-93
Test No. 4 No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
4	Probe Wash: ☒ Acetone ☐ MeCl ₂ ☐ DI Water ☐	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other	
4	Filter: ☒ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other	
4	Impingers: ☒ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☐ 2,4-DNPH ☐	☐ MN Protocol ☒ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other	
③	Integrated Gas Sample ☒ Tedlar Bag ☐	☒ As per EPA M-3 ☒ As per EPA M-10 ☐ Other	<i>Power in Field</i>
0	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other	
0	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
0	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other	
0	Misc Samples ☐ ☐	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other	

Type of Source: DRYER
Fuel Type:
Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☒ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
☐ Natural Gas ☐ RDF ☐ Other

GASTACKWPF

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job L.P. / TOMAHAWK

Field Engineer DUEE BRENNAN

Date Submitted 8/20/93

Test No. 4

Source DRYER STACK

Test Site STACK

Date of Test 8/17/93

No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
4	Probe Wash: ☒ Acetone ☐ MeCl ₂ ☐ DI Water ☐	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other	
4	Filter: ☒ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other	
4	Impingers: ☒ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☐ 2,4-DNPH ☐	☐ MN Protocol ☒ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other	
3	Integrated Gas Sample ☒ Tedlar Bag ☐	☒ As per EPA M-3 ☒ As per EPA M-10 ☐ Other	<u>1220 CO DOWE</u>
0	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other	
SSS DVH	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
ND	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other	
ND	Misc Samples ☐ ☐	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other	

Type of Source: DRYER

Fuel Type:

Coal: ☐ Bituminous
☐ Anthracite
☐ Lignite

Wood: ☒ Wood Waste
☐ Dust
☐ Bark

Oil: ☐ Waste Oil
☐ No. 2
☐ No. 6

☐ Natural Gas
☐ RDF
☐ Other

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Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job L.P. Source Dryer
Field Engineer D.V.H. Test Site Stack
Date Submitted _____ Date of Test 8/17/93
Test No. 5 No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
	Probe Wash: ☐ Acetone ☐ MeCl ₂ ☐ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	_____
	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	_____
	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	_____
	Integrated Gas Sample ☐ Tedlar Bag ☐ _____	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	_____
	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other _____	_____
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	_____
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	_____
<u>3</u> <u>1 Blank</u>	Misc Samples ☒ Benzene ☐ Charcoal tubes	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	_____

Type of Source: _____

Fuel Type:

Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☒ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
☐ Natural Gas ☐ RDF ☐ Other _____

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Interpoll Laboratories

(612) 786-6020

Sample Deposition

Job 2P/TOMAHAWK
 Field Engineer E. T. [Signature]
 Date Submitted 8-19-93
 Test No. 6

Source Dupon
 Test Site Stach
 Date of Test 8-18-93
 No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
	Probe Wash: ☐ Acetone ☐ MeCl ₂ ☐ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	
	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
9	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☐ 2,4-DNPH ☒ <u>PHENOL</u> ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other _____	
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: _____

Fuel Type:

Coal: ☐ Bituminous
☐ Anthracite
☐ Lignite

Wood: ☒ Wood Waste
☐ Dust
☐ Bark

Oil: ☐ Waste Oil
☐ No. 2
☐ No. 6

☐ Natural Gas
☐ RDF
☐ Other _____

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Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job L.P. / TOOTHAWK

Field Engineer DUKE BRENDAN

Date Submitted 8/20/93

Test No. 8

Source PRESS VENT

Test Site STACK

Date of Test 8/18/93

No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
5	Probe Wash: <u>+ Impinger Wash</u> ☐ Acetone ☒ MeCl ₂ ☒ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☒ Other <u>METHOD 0011</u>	<u>NO RISE BOTTOMS FOR 3RD RUN.</u>
N/A	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
3	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☒ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☒ Other <u>METHOD 0011</u>	
NO (6)	Integrated Gas Sample ☐ Tedlar Bag ☐ _____	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
0	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other _____	
0	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
0	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
0	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: PRESS VENT

Fuel Type:

Coal: ☐ Bituminous
☐ Anthracite
☐ Lignite

Wood: ☐ Wood Waste
☐ Dust
☐ Bark

Oil: ☐ Waste Oil
☐ No. 2
☐ No. 6

☐ Natural Gas
☐ RDF
☐ Other _____

AMBIENT AIR
NO FUEL

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GASTACKWPF00M55-278LAS

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job R.P. / Tomahawk, WI
Field Engineer M. Mueller
Date Submitted 8-20-93
Test No. 9

Source Press Vent
Test Site Stack
Date of Test 8-18-93
No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
-	Probe Wash: ☐ Acetone ☐ MeCl ₂ ☐ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	_____
-	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	_____
3	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☒ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☒ Other <u>Phenols</u>	_____
-	Integrated Gas Sample ☐ Tedlar Bag ☐ _____	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	<u>Ambient Air</u>
-	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other _____	_____
-	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	_____
-	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	_____
-	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	_____

Type of Source: Wood Press

Fuel Type: NA

Coal: ☐ Bituminous
☐ Anthracite
☐ Lignite

Wood: ☐ Wood Waste
☐ Dust
☐ Bark

Oil: ☐ Waste Oil
☐ No. 2
☐ No. 6

☐ Natural Gas
☐ RDF
☐ Other _____

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Interpoll Laboratories
(612) 786-6020
Sample Deposition

Job LP. TOMAHAWK Source Geka
Field Engineer E. HOVE Test Site STACK
Date Submitted 8-19-93 Date of Test 8-19-93
Test No. 18 No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
3	Probe Wash: ☐ Acetone ☒ MeCl ₂ ☒ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	
0	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
3	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☒ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☒ Other <u>DO 11</u>	
3	Integrated Gas Sample ☐ Tedlar Bag ☐ _____	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
0	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other _____	
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
0	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: BOF FURNACE - THERMAL OIL HEATER
Fuel Type:
Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☐ Wood Waste ☐ Dust ☒ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
☐ Natural Gas ☐ RDF ☐ Other _____

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Interpoll Laboratories
(612) 786-6020
Sample Deposition

Job L.P. TOMAHAWK Source Geka
 Field Engineer C. HOUE Test Site STACK
 Date Submitted 8-20-93 Date of Test 8-19-93
 Test No. 12 No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
<u>3</u>	Probe Wash: ☒ Acetone ☒ HCl ☒ DI Water ☐ _____	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	
<u>3</u>	Filter: ☒ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
<u>3</u>	Impingers: ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H_2SO_4 (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☒ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	
<u>3</u>	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☒ As per EPA M-10 ☐ Other _____	<u>BAG 19</u>
	Oxides of Nitrogen (NO_2)	☐ As per EPA M-7A ☐ Other _____	
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: D

Fuel Type:

Coal: ☐ Bituminous Wood: ☐ Wood Waste Oil: ☐ Waste Oil ☐ Natural Gas
☐ Anthracite ☐ Dust ☐ No. 2 ☐ RDF
☐ Lignite ☒ Bark ☐ No. 6 ☐ Other _____

S-278

GASTACKWPFORMS-278.LAS

Interpoll Laboratories
(612) 786-6020
Sample Deposition

Job LP - TOMAHAWK
Field Engineer SD
Date Submitted 8-19-93
Test No. 14

Source Geka
Test Site STACK
Date of Test 8-18-93
No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
✓	Probe Wash: ☐ Acetone ☐ MeCl ₂ ☐ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	_____
✓	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	_____
8	Impingers: ☐ DI Water ☐ 3% H ₂ O ₂ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H ₂ SO ₄ (HCl) ☐ 2,4-DNPH ☒ <u>PHENOL</u> ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☒ Other <u>PHENOL</u>	_____
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☒ As per EPA M-10 ☐ Other _____	<u>CO</u>
✓	Oxides of Nitrogen (NO _x)	☐ As per EPA M-7A ☐ Other _____	_____
✓	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	_____
✓	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	_____
✓	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	_____

Type of Source: ROWUS STACK (OIL HEATER)

Fuel Type:

Coal: ☐ Bituminous
☐ Anthracite
☐ Lignite

Wood: ☒ Wood Waste
☐ Dust
☐ Bark

Oil: ☐ Waste Oil
☐ No. 2
☐ No. 6

☐ Natural Gas
☐ RDF
☐ Other _____

S-278

GASTACKWPFORMSIS-278LAS

Interpoll Laboratories
(612) 786-6020

XAD-2 & VOST Trap Preparation Work
Order Form

Project Name: LP/Tom. Order Date: 8/11/93
Date Required: 8/16/93 Delivery Date: 8/16/93

Number of XAD-2 Traps Required: 9

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

XAD-2 TRAP HISTORY

XAD-2 Lot Number: _____ Date of Spiking: 8/15/93
XAD-2 Lot Date: Turn 93 Technician: TM
XAD-2 Lot Technician: Alltech

Nature of Spiking Material	Spike Concentration	Spike Volume	Total Mass of Spike
D ₁₀ -Fluorathene	4.0 ug / ul	50 ul	20.0 ug

VOST TUBE HISTORY

Date of Thermal Disorption: _____ Technician: _____

Total Hydrocarbon Analysis: _____ ppm

SPECIAL REQUIREMENTS

**Please return this form with the samples.

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L.P. / Tomahawk
Date of Sampling 8/16/93 Site Dryer Stack
Test 2 Run 0 Team Leader D. Van Hoever

Type of Sample Train: P.A.H

Sample Collection/Recovery

Person performing sample recovery:

Signature D. Van Hoever

Title Supervisor

Location at which recovery was done _____

Special transport/storage requirements? _____

	Sample Description	No. of Items	Assigned Log Number
1.	Solvent Rinse	1 of 4	9772-15
2.	Filter 315	2 of 4	↓
3.	Resin Trap	3 of 4	↓
4.	Condensate Trap	4 of 4	↓
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck # 22

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 8-23-93 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
1.	<u>9772-15</u>	<u>8/31-9/2/93</u>	<u>8270</u>	<u>Raw</u>
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____
11.	_____	_____	_____	_____
12.	_____	_____	_____	_____
13.	_____	_____	_____	_____
14.	_____	_____	_____	_____
15.	_____	_____	_____	_____
16.	_____	_____	_____	_____
17.	_____	_____	_____	_____
18.	_____	_____	_____	_____

Signature of each analyst:

Initials

Raw

Signature

Robert E. W. W. W.

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L.P. / Tomahawk
Date of Sampling 8/17/93 Site Dryer Stack
Test 2 Run 1 Team Leader J. Van Hoever

Type of Sample Train: P.A.H.

Sample Collection/Recovery

Person performing sample recovery:

Signature J. Van Hoever

Title Supervisor

Location at which recovery was done _____

Special transport/storage requirements? _____

	Sample Description	No. of Items	Assigned Log Number
1.	<u>Solvent Rinse</u>	<u>1 of 4</u>	<u>9772-16</u>
2.	<u>Filter 316</u>	<u>2 of 4</u>	<u>1</u>
3.	<u>PPSIN Trap</u>	<u>3 of 4</u>	<u>1</u>
4.	<u>Condensate Trap</u>	<u>4 of 4</u>	<u>1</u>
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck #22

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 8-23-93 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
1.	<u>9772-16</u>	<u>8/31-9/2/93</u>	<u>8270</u>	<u>RWA</u>
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____
11.	_____	_____	_____	_____
12.	_____	_____	_____	_____
13.	_____	_____	_____	_____
14.	_____	_____	_____	_____
15.	_____	_____	_____	_____
16.	_____	_____	_____	_____
17.	_____	_____	_____	_____
18.	_____	_____	_____	_____

Signature of each analyst:

Initials	Signature
<u>RWA</u>	<u>Robert W. Wyne</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L.P. / Tomahawk
Date of Sampling 8/17/93 Site Dryer Stack
Test 2 Run 2 Team Leader DWT

Type of Sample Train: PIAH

Sample Collection/Recovery

Person performing sample recovery:

Signature Diana Van Hoever Title Supervisor

Location at which recovery was done _____

Special transport/storage requirements? _____

	Sample Description	No. of Items	Assigned Log Number
1.	<u>Solvent Rinse</u>	<u>1 of 4</u>	<u>9772-17</u>
2.	<u>Filter 317</u>	<u>2 of 4</u>	<u>↓</u>
3.	<u>Resin trap</u>	<u>3 of 4</u>	<u>↓</u>
4.	<u>Condensate Trap</u>	<u>4 of 4</u>	<u>↓</u>
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck #22

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 8-23-93 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
1.	<u>9772-17</u>	<u>8/31-9/2/93</u>	<u>8270</u>	<u>Raw</u>
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____
11.	_____	_____	_____	_____
12.	_____	_____	_____	_____
13.	_____	_____	_____	_____
14.	_____	_____	_____	_____
15.	_____	_____	_____	_____
16.	_____	_____	_____	_____
17.	_____	_____	_____	_____
18.	_____	_____	_____	_____

Signature of each analyst:

Initials <u>Raw</u>	Signature <u>Robert D. Wyane</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L. P. / Tomahawk
Date of Sampling 8/17/93 Site Dryer Stack
Test 2 Run 3 Team Leader DWT

Type of Sample Train: P.A.H

Sample Collection/Recovery

Person performing sample recovery:

Signature Quanchen Jones

Title Supervisor

Location at which recovery was done _____

Special transport/storage requirements? _____

	Sample Description	No. of Items	Assigned Log Number
1.	<u>Solvent Rinse</u>	<u>1 of 4</u>	<u>9772-18</u>
2.	<u>Filter 318</u>	<u>2 of 4</u>	<u>1</u>
3.	<u>Resin Trap</u>	<u>3 of 4</u>	<u>1</u>
4.	<u>Condensate Trap</u>	<u>4 of 4</u>	<u>1</u>
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck #122

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 Dunhe Title Lab Analyst
 Date of receipt 8-23-93 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
1.	<u>9772-18</u>	<u>8/31-9/2/93</u>	<u>8270</u>	<u>RAW</u>
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

Signature of each analyst:

Initials	Signature
<u>RAW</u>	<u>Robert T. Wilson</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L. P. Tomahawk
Date of Sampling 8/17/93 Site Geka, Hack
Test 13 Run 0 Team Leader D. Van Hever

Type of Sample Train: P.A. 4

Sample Collection/Recovery

Person performing sample recovery:

Signature D. Van Hever

Title Supervisor

Location at which recovery was done _____

Special transport/storage requirements? _____

	Sample Description	No. of Items	Assigned Log Number
1.	<u>Solvent Rinse</u>	<u>1 of 4</u>	<u>9772-121</u>
2.	<u>Filter 319</u>	<u>2 of 4</u>	
3.	<u>Resin Trap</u>	<u>3 of 4</u>	
4.	<u>Condensate Trap</u>	<u>4 of 4</u>	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck #22

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 8-23-93 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
1.	<u>9772-121</u>	<u>8/31-9/2/93</u>	<u>8270</u>	<u>RWD</u>
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____
11.	_____	_____	_____	_____
12.	_____	_____	_____	_____
13.	_____	_____	_____	_____
14.	_____	_____	_____	_____
15.	_____	_____	_____	_____
16.	_____	_____	_____	_____
17.	_____	_____	_____	_____
18.	_____	_____	_____	_____

Signature of each analyst:

Initials	Signature
<u>RWD</u>	<u>Robert E. Ogden</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L.P. / Tomahawk
Date of Sampling 8/18/93 Site Geka Stack
Test 13 Run 1 Team Leader D. Van Hoever

Type of Sample Train: P.A.H

Sample Collection/Recovery

Person performing sample recovery:

Signature D. Van Hoever

Title Supervisor

Location at which recovery was done _____

Special transport/storage requirements? _____

	Sample Description	No. of Items	Assigned Log Number
1.	<u>Solvent Rinse</u>	<u>1 of 4</u>	<u>9712-122</u>
2.	<u>filter 320</u>	<u>2 of 4</u>	
3.	<u>Resin trap</u>	<u>3 of 4</u>	
4.	<u>Condensate trap</u>	<u>4 of 4</u>	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck #22

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 DeLo Title Lab Analyst
 Date of receipt 8-23-93 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
1.	9772-122	8/31-9/2/93	8270	RAW
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

Signature of each analyst:

Initials	Signature
<u>RAW</u>	<u>Robert W. Tylgare</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L.P. / Tomahawk
Date of Sampling 8/18/93 Site Geka Stack
Test 13 Run 2 Team Leader _____

Type of Sample Train: PAH

Sample Collection/Recovery

Person performing sample recovery:

Signature James Van Hoene

Title Supervisor

Location at which recovery was done _____

Special transport/storage requirements? _____

	Sample Description	No. of Items	Assigned Log Number
1.	<u>Solvent Rinse</u>	<u>1 of 4</u>	<u>9772-123</u>
2.	<u>Filter 321</u>	<u>2 of 4</u>	<u>↓</u>
3.	<u>Resin Trap</u>	<u>3 of 4</u>	<u>↓</u>
4.	<u>Condensate trap</u>	<u>4 of 4</u>	<u>↓</u>
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____
9.	_____	_____	_____
10.	_____	_____	_____
11.	_____	_____	_____
12.	_____	_____	_____
13.	_____	_____	_____
14.	_____	_____	_____
15.	_____	_____	_____
16.	_____	_____	_____
17.	_____	_____	_____
18.	_____	_____	_____

Sample Transport

Method of transport Truck #22

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 Duke Title Lab Analyst
 Date of receipt 8-23-93 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
1.	9172-123	8/31-9/2/93	8270	RWA
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

Signature of each analyst:

Initials	Signature
<u>RWA</u>	<u>Robert W. Wayne</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L.P. / Tomahawk
Date of Sampling 8/18/93 Site Geka Stack
Test 13 Run 3 Team Leader D. Van Hoven

Type of Sample Train: P.A.H

Sample Collection/Recovery

Person performing sample recovery:

Signature Duane Van Hoven

Title Supervisor

Location at which recovery was done _____

Special transport/storage requirements? _____

	Sample Description	No. of Items	Assigned Log Number
1.	<u>Solvent Rinse</u>	<u>1 of 4</u>	<u>9772-124</u>
2.	<u>Filter 322</u>	<u>2 of 4</u>	<u>↓</u>
3.	<u>Resin Trap</u>	<u>3 of 4</u>	
4.	<u>Condensate Trap</u>	<u>4 of 4</u>	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck #22

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 8-23-93 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
1.	<u>9772-124</u>	<u>8/21-9/2/93</u>	<u>8270</u>	<u>R. W. W.</u>
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____
11.	_____	_____	_____	_____
12.	_____	_____	_____	_____
13.	_____	_____	_____	_____
14.	_____	_____	_____	_____
15.	_____	_____	_____	_____
16.	_____	_____	_____	_____
17.	_____	_____	_____	_____
18.	_____	_____	_____	_____

Signature of each analyst:

Initials <u>R. W. W.</u>	Signature <u>Robert W. Thorne</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

APPENDIX G

CARBON MONOXIDE AND TOTAL HYDROCARBONS STRIPCHARTS

[illegible]

Dryer Co - Test #4 Run #1
105 ppm CO

Chart paper feed problem

0 10 20 30 40 50 60 70 80 90 100

100 90 80 70 60 50 40 30 20 10 0

0 10 20 30 40 50 60 70 80 90 100

144 ppm gas

zero gas

144 ppm gas

zero gas

BUFFALO, N.Y.

GRAPHIC CONTROL & CORPORATION

RECORDING CHART

Dryer
Run 1
0 - 1000 ppm

Integrated
Bag Sample
Analysis

carbon
monoxide
calibration
data

No. 54-100

GEKA CO Test #14 Run #3
40 ppm CO

No. 54

GEKA Run 3

GEKA CO Test #14 Run #2
45 ppm CO

PRINTED IN U.S.A.

GEKA Run 2

GEKA CO Test #14 Run #1
42 ppm CO

GEKA Run 1

DRYER CO Test #4 Run #3
135 ppm CO

Dryer Run 3

DRYER CO Test #4 Run #2
134 ppm

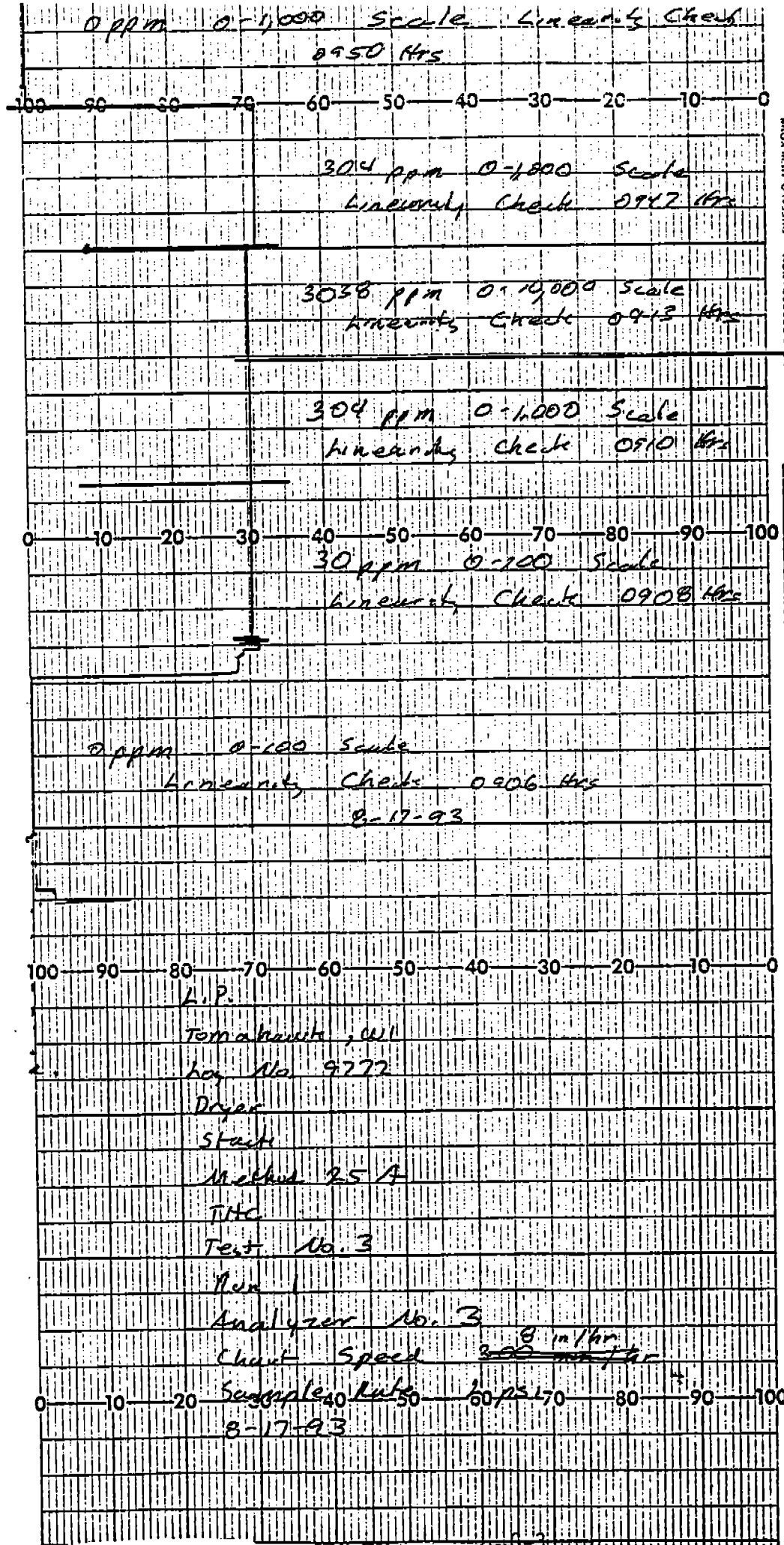
Dryer Run 2

DRYER CO Test #4 Run #1
105 ppm CO

BUFFALO, NEW YORK

GRAPHIC CONTROLS CORPORATION

Chart paper feed problem



GRAPHIC CONTROLS CORPORATION BUFFALO, N.Y. 14203

Calibration
DATA

THE
Dryer Stack
8-17-93
Run 1 only
Runs 2 & 3
on next
stripchart

0 10 20 30 40 50 60 70 80 90 100

No. 54-100

100 90 80 70 60 50 40 30 20 10 0

PRINTED IN U.S.A.

0 10 20 30 40 50 60 70 80 90 100

TS/K1 Stack 0-100 Scale
1030 Hrs

Start Run 1
1030 HRS

0-100 ppm

Ambient Therm Probe 0956 Hrs

0 ppm 0-1,000 Scale Linearity Check
0950 Hrs

100 90 80 70 60 50 40 30 20 10 0

324 ppm 0-1,000 Scale
Linearity Check 0942 Hrs

G-2

UTION BUFFALO, NEW YORK

100 90 80 70 60 50 40 30 20 10 0

0 ppm 0-100 Scale System Brass
1146 Hrs

30 ppm 0-100 Scale
System Brass 1143 Hrs

End Run 1

1130

END T3/K1 0-100 Scale
1130 Hrs

0 10 20 30 40 50 60 70 80 90 100

No. 54-100

100 90 80 70 60 50 40 30 20 10 0

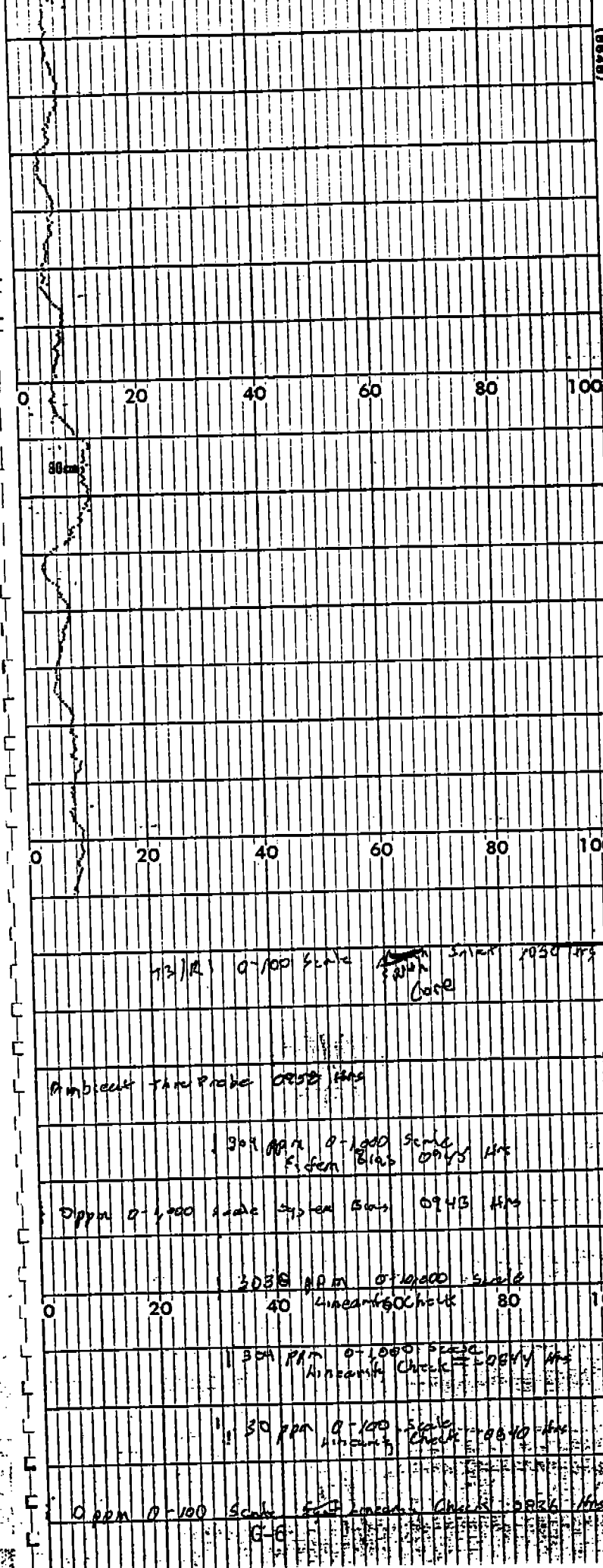
PRINTED IN U.S.A.

0 10 20 30 40 50 60 70 80 90 100

T3/K1 Stack 0-100 Scale
1030 Hrs

Ambient Thru Probe 0956 Hrs 3-5

THE
8-17-93
Core
E-Tube
Inlet



scale
0-100 ppm
as propane



Start Run 1
1030 HRS

calibration
data

73122 1130 HRS 0-100 Scale

30 ppm 0-100 Scale System Bias
Stack

0 ppm 0-100 Scale System Bias Stack 1135 HRS

30 ppm 0-100 Scale System Bias
1138 HRS Core 1138

0 ppm 20-100 Scale System Bias 80 N35 HRS 100

End Run 1 1130 HRS

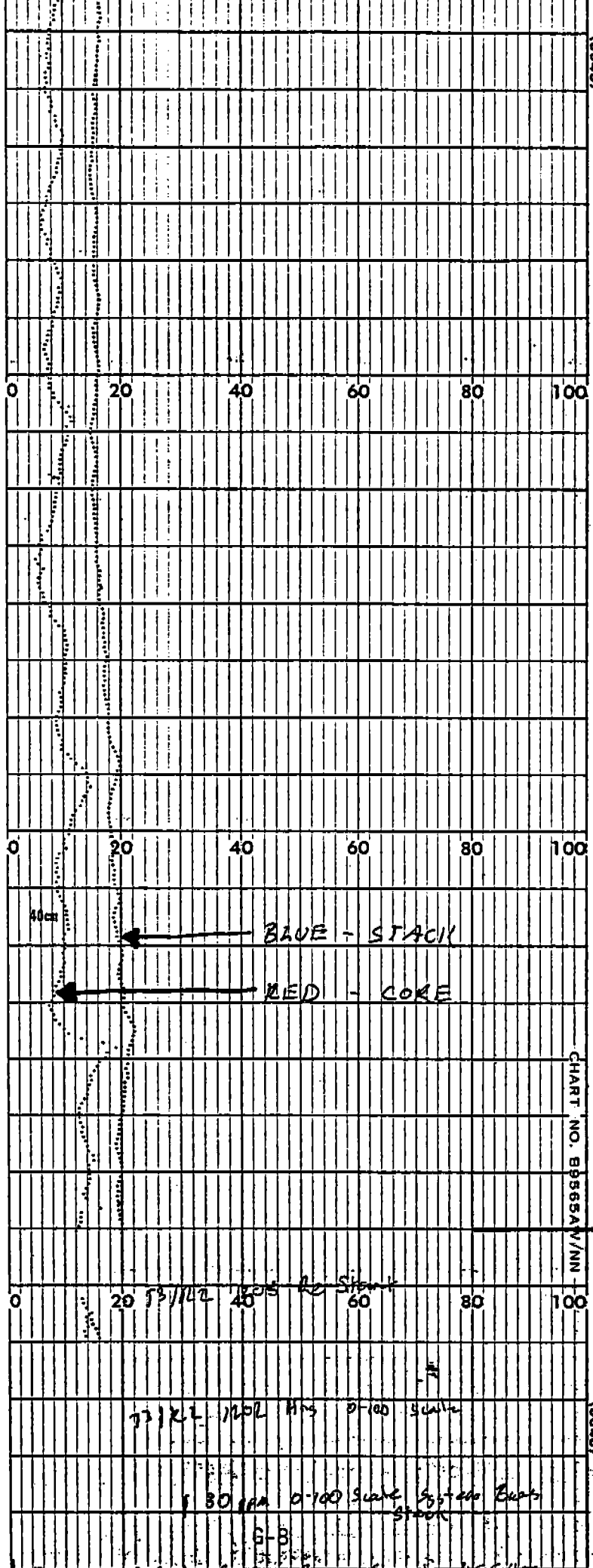
System
Bias
check

End Run 1
1130 HRS

0 20 40 60 80 100

CHART NO. B9565AW/NN

0 20 40 60 80 100

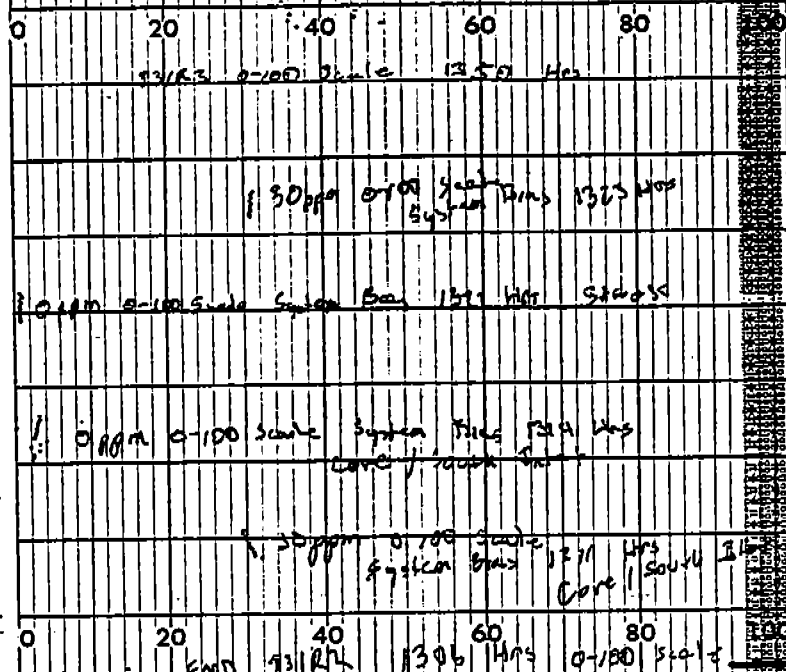


E-TILBE
Inlet
(CORE)
and Dryer
Stack
0-100 ppm
Scale

Start Run 2
1205 HRS

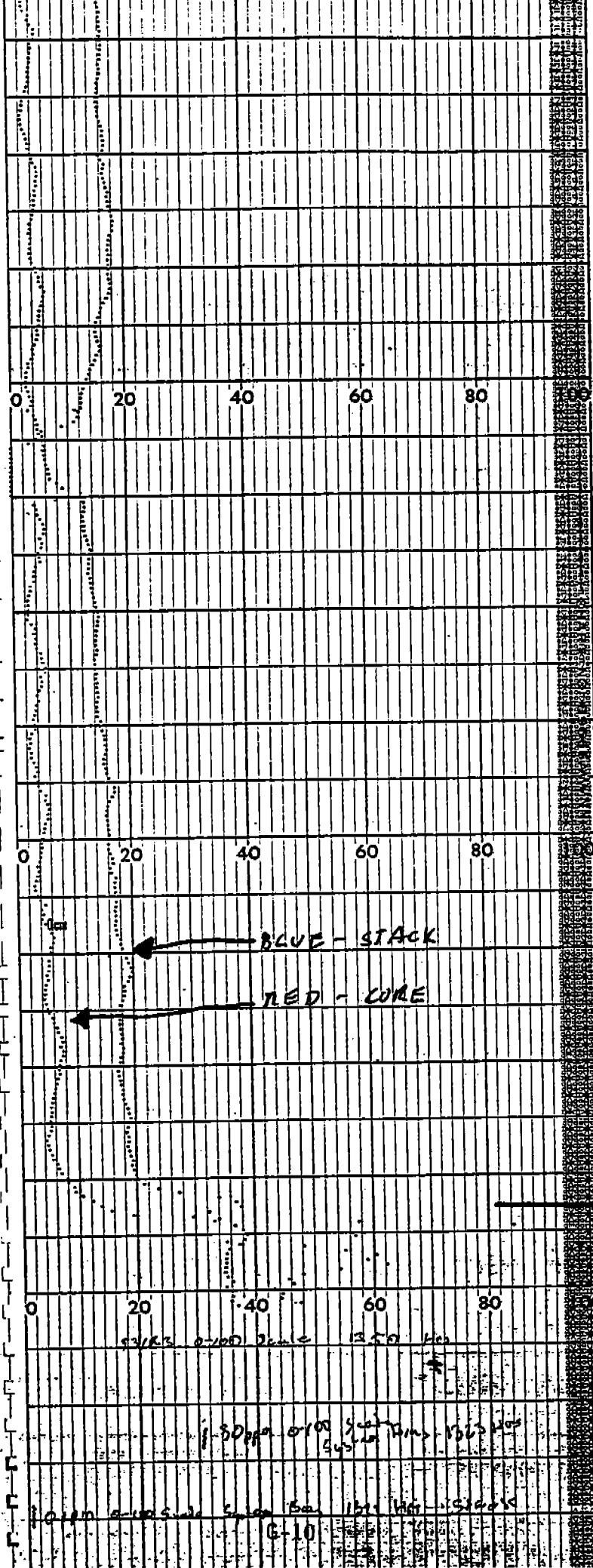
30 1/2 1205 HRS 0-100 Scale

30 1/2 1205 HRS 0-100 Scale



System bias check

End Run 2
1306 HRS



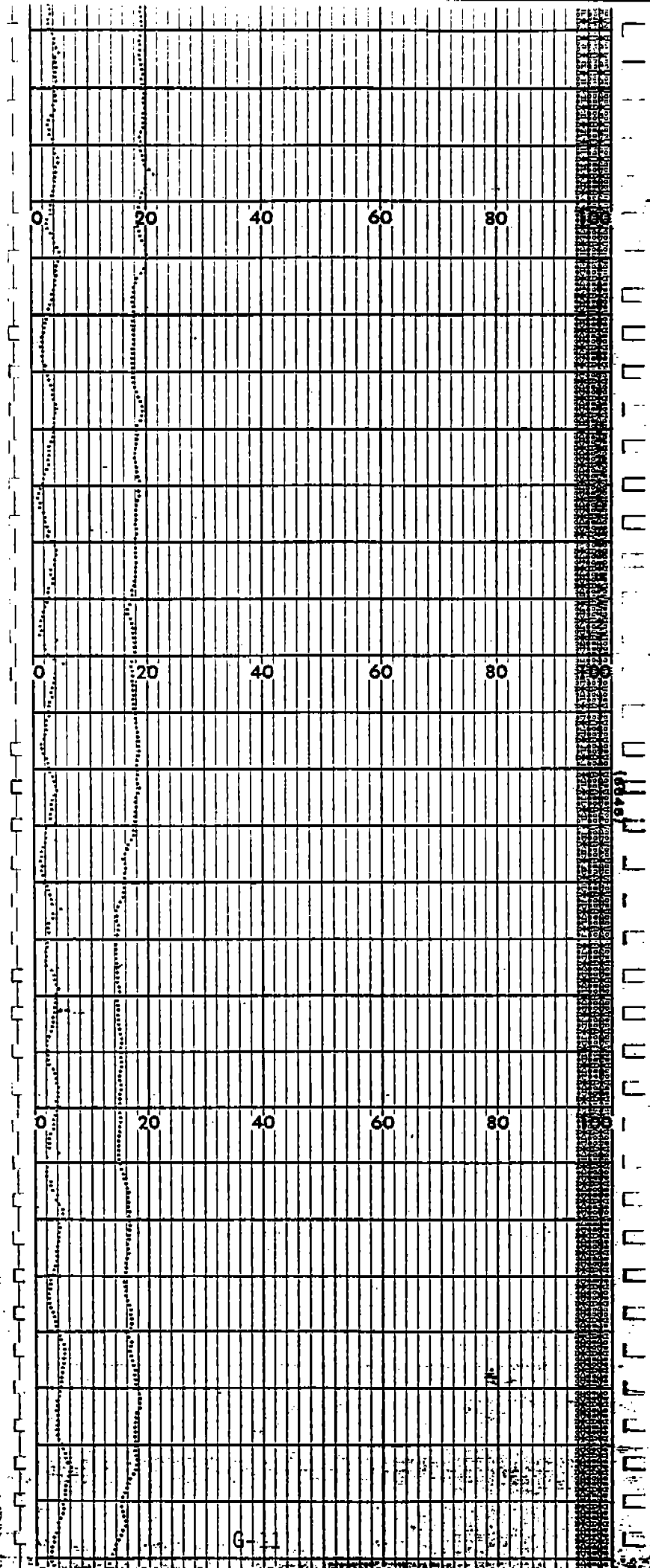
start Run 3
1350 HRS

93/123 0-100 2km 1350 Hrs

1-30ppm 0-100 5km 1350 Hrs

10-100 0-100 5km 1350 Hrs

G-10



8-17-93

A.P.

Fornahawk, WI

Log No. 9772

Core South Inlet } RED CHART

Test No. 3

Runs 2, 3

Dryer Stack } BLUE CHART

Test No. 3

Runs 2, 3

0 20 40 60 80
Method 254
TMC

Analyzer No. 1 (Core)

Sample Rate 100 mbars (Core)

Analyzer No. 3 (Stack)

Sample Rate 2 ms

Chart Speed 300 mm/hr

30 ppm 0-100 scale
System Bias 1540
Dryer / Stack

0 ppm 0-100 scale System Bias 1538
Dryer / Stack

0 ppm 0-100 scale
System Bias 1532
Core / Stack

0 ppm 0-100 scale System Bias 1521
Core / South Inlet

END 1523 0-100 scale
1523 hrs

End Run 3

1523 HRS

0-100 ppm
scale

CORE

Stack

0 20 40 60 80 100

G-12

15/K7 South Inlet
0-100 scale 0950 hrs
Ambient Thru Probe 0957 hrs

30 ppm 0-1000 Scale
System Bias 0953 hrs

0 ppm 0-100 Scale
System Bias 0952 hrs

3030 ppm 0-10,000 Scale
Linearity Check 0930 hrs

304 ppm 0-1,000 Scale
Linearity Check 0928 hrs

30 ppm 0-100 Scale
Linearity Check 0926 hrs

0 ppm 0-100 Scale Linearity Check 0925 hrs

8-17-93

L.P.
Tornahawk, WI
Log No. 9772
Face
North Inlet
Method ISA
THC

Test No. 3

Runs 1, 2, 3

Analyzer No. 2

Chart Speed 8 in/hr

Sample Rate 100 mbar

8-17-93

6-13

Calibration
DATA

THC
Surface
DRYER
E-Tube Inlet
8-17-93

0 ppm 0-100 Scale System Bias 1142 Hrs

30 ppm 0-100 Scale
System Bias 1140 Hrs

END TB/R1 0-100 Scale
1130 Hrs

End Run 1
1130 HRS

0 10 20 30 40 50 60 70 80 90 100

100 90 80 70 60 50 40 30 20 10 0

0 10 20 30 40 50 60 70 80 90 100

Ambient Thru Probe 0957 Hrs

15/R1 South Inlet
0-100 Scale 1030 Hrs

Start Run 1
1030 HRS

0-100 ppm
Scale

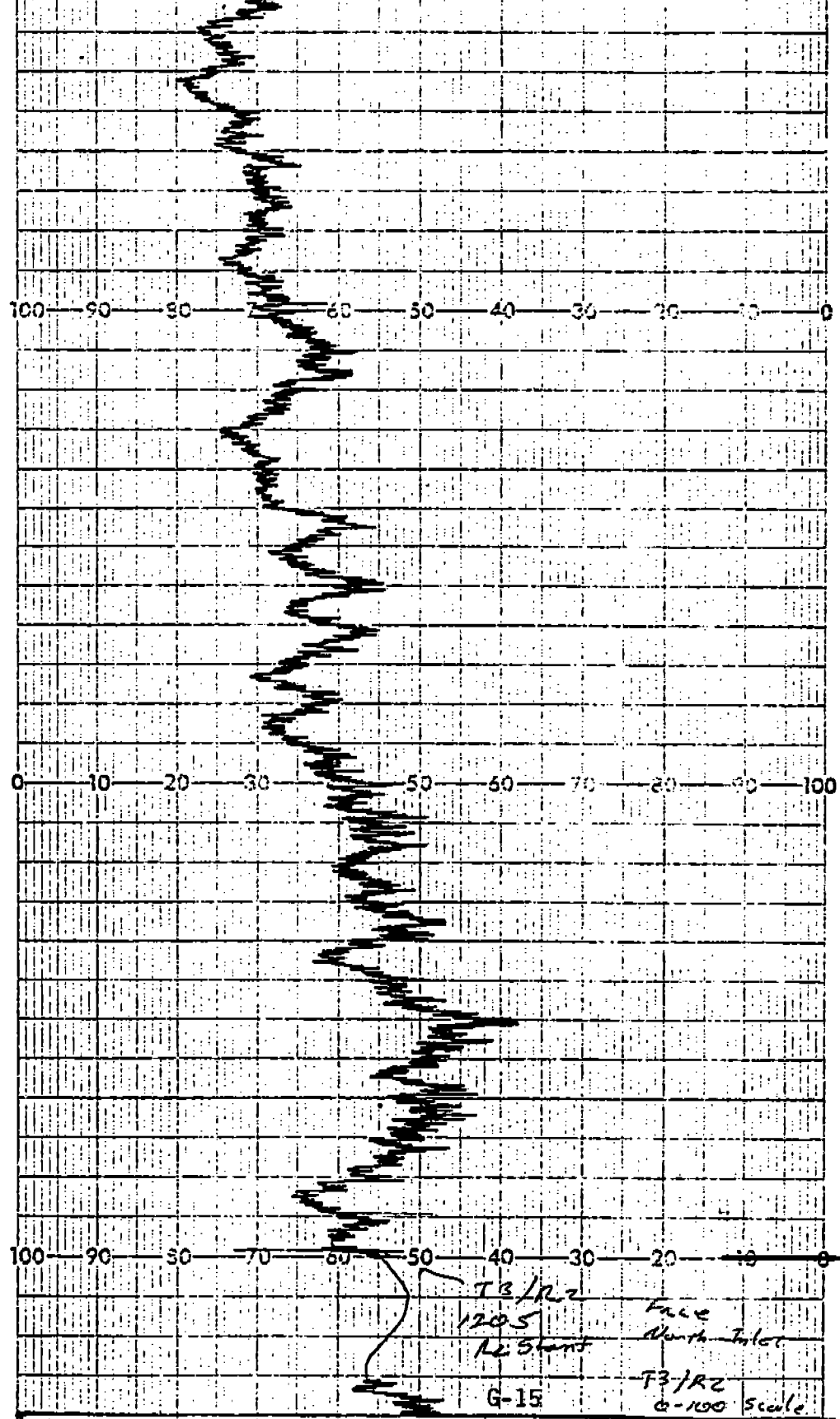
100 90 80 70 60 50 40 30 20 10 0

0 ppm 0-100 Scale System Bias
1319 Hrs
30 ppm 0-100 Scale
System Bias

} system bias

Face 1 North Inlet 1318 Hrs
END T3/R2 0-100 scale
1306 Hrs

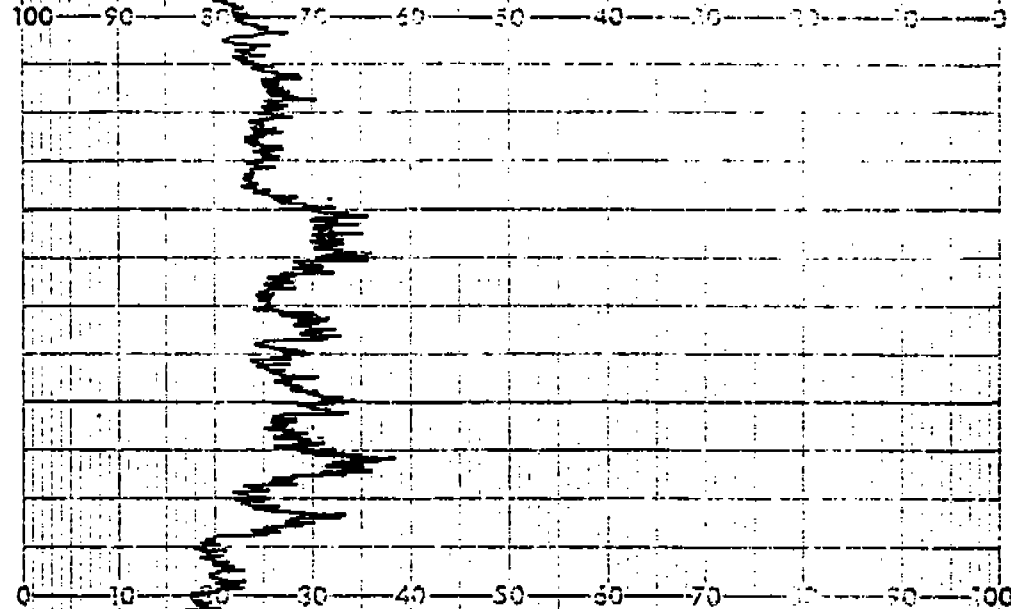
end Run 2
1306 HRS



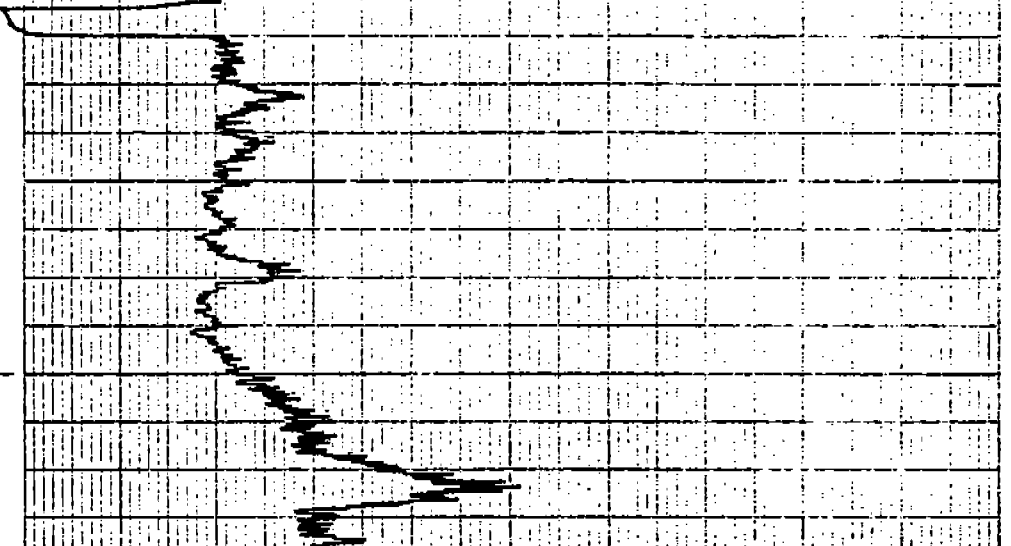
RECORDING CHART GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK

1205
T3/R2
Face North Inlet
RE Start
G-15
T3/R2
0-100 Scale

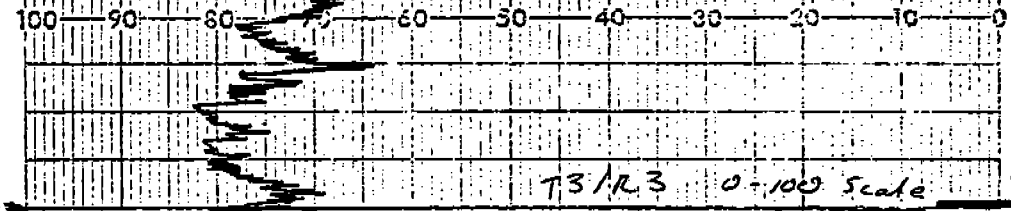
start Run 2
1205



No. 54-100



PRINTED IN U.S.A.

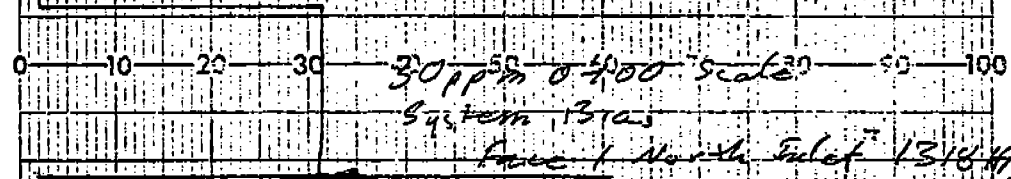


T3/R.3 0-100 scale
1350 Hrs
Face / North inlet

start Run 3
1350 HRS

Run 3 0 Base

Oppm 0-100 Scale System Bias
1319 Hrs



30ppm 0-100 scale
System Bias
Face / North Inlet 1318 Hrs

END T3/R.3 0-100 scale
1306 Hrs

0 ppm 0-100 scale
System Bias 1535 Hrs

System
bias

30 ppm 0-100 scale
34.5 ppm 1535 Hrs

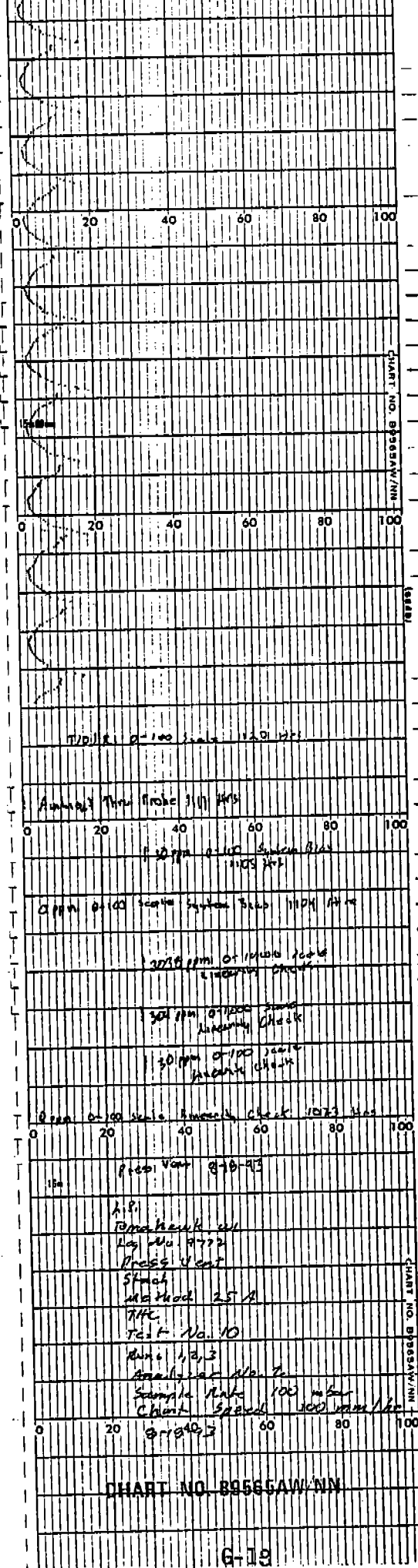
End Run 3
1523

END TS 103 1523 Hrs
0-100 scale

Face 1 North Inlet

0 10 20 30 40 50 60 70 80 90 100

100 90 80 70 60 50 40 30 20 10 0



Press Vent

THC

8-18-93

Scale 0-100 ppm

Calibration DATA

5101 K2 0-100 5-10 122.6 mm

130 AM 0-100 Surin
System Day 1224 Hrs

~~Open circle Smale Open Circle 1239/11~~

240 101 21 1220 444 04.100 5-10

End Run 1
1220 HRS

15260

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1548

11

1114

7/20/81 07:00 3.4 12.0 H-5

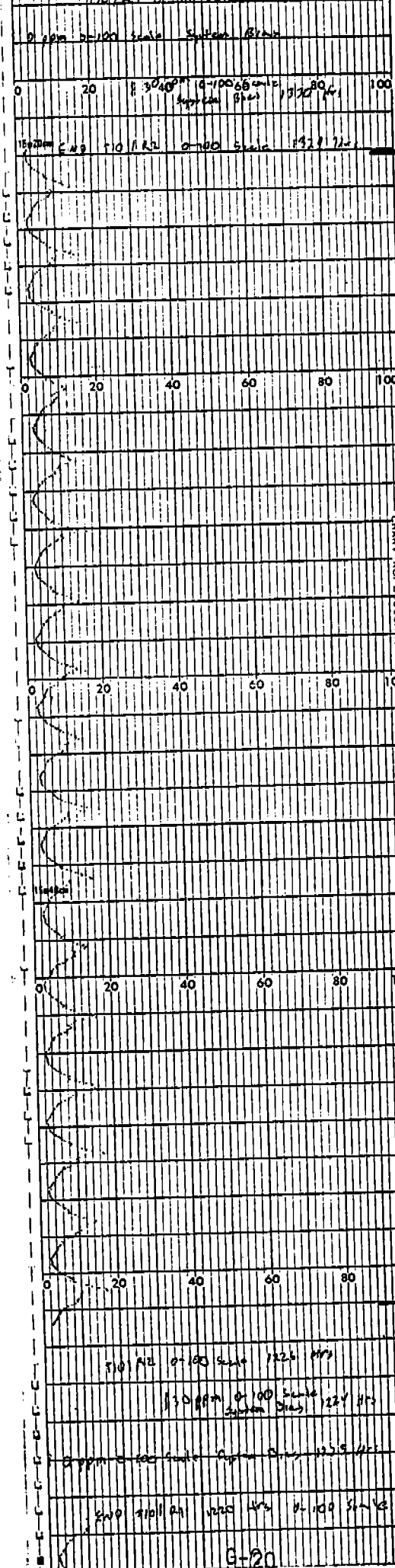
Amberly Thru Grobe 11/2/2013

1. 20 ppm 0.100 g/L solution of
1.5% 20%

Open 0-100 Sampling Station Bldg 1104 14

Life

start Run 1
1120 HRS



End Run 2
1329 HRS

Start Run 2
1226 HRS

System
bias

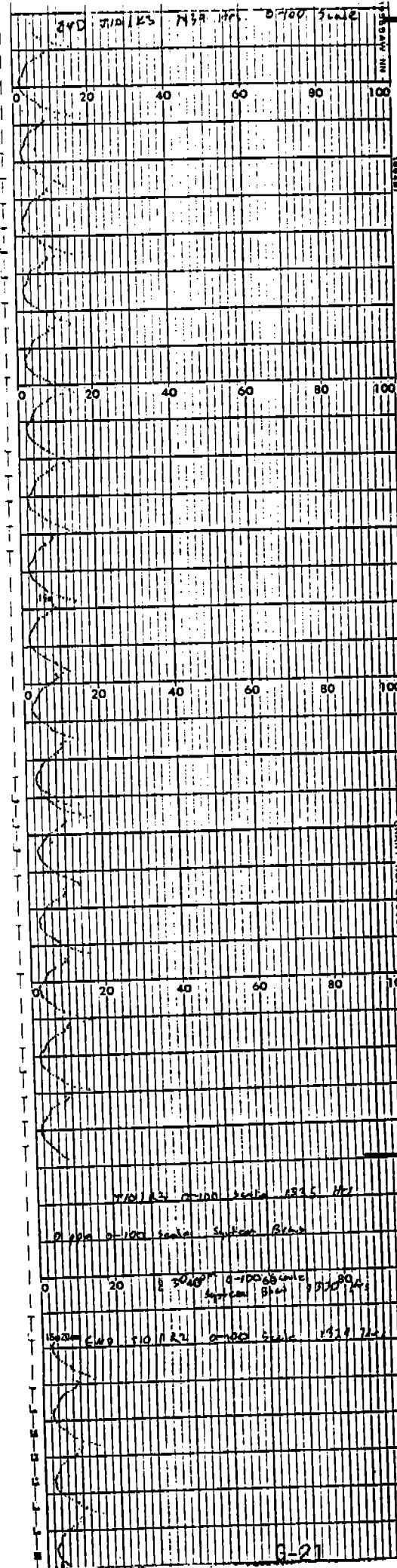
1101 Hz 0-100 Scale 1226 HRS

1300 Hz 0-100 Scale 1226 HRS

1300 Hz 0-100 Scale 1226 HRS

1200 Hz 0-100 Scale 1226 HRS

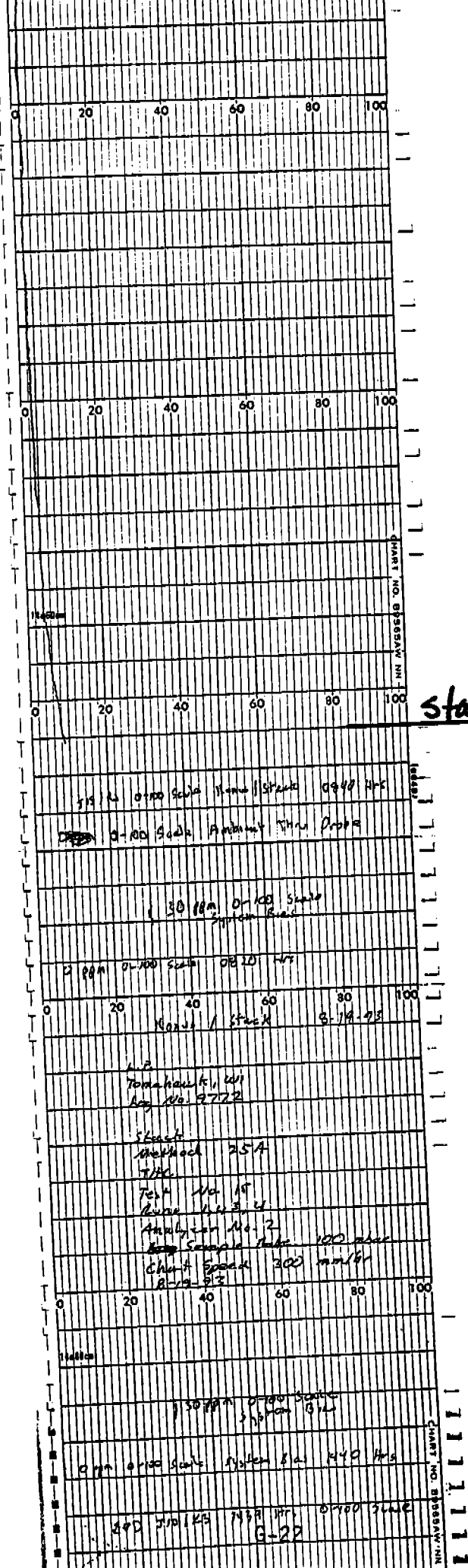
G-20



End Run 3
1439 HRS

Start Run 3
1335 HRS

System bias



Thermal Oil Heater
8-19-93
THC
0-100 ppm, w
as propane

G-23

WPM 0-100 Scale 1055 HRS

30 WPM 0-100 Scale 1055 HRS

END T15 R1 0-100 Scale 1055 HRS

end Run2
1055 HRS

WPM 0-100 Scale 1055 HRS

30 WPM 0-100 Scale 1055 HRS

END T15 R1 0-100 Scale 1055 HRS

WPM 0-100 Scale 1055 HRS

30 WPM 0-100 Scale 1055 HRS

END T15 R1 0-100 Scale 1055 HRS

WPM 0-100 Scale 1055 HRS

30 WPM 0-100 Scale 1055 HRS

END T15 R1 0-100 Scale 1055 HRS

WPM 0-100 Scale 1055 HRS

30 WPM 0-100 Scale 1055 HRS

END T15 R1 0-100 Scale 1055 HRS

WPM 0-100 Scale 1055 HRS

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END T15 R1 0-100 Scale 1055 HRS

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WPM 0-100 Scale 1055 HRS

30 WPM 0-100 Scale 1055 HRS

END T15 R1 0-100 Scale 1055 HRS

WPM 0-100 Scale 1055 HRS

30 WPM 0-100 Scale 1055 HRS

END T15 R1 0-100 Scale 1055 HRS

WPM 0-100 Scale 1055 HRS

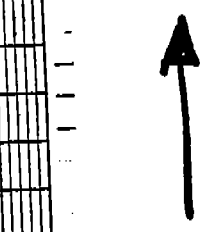
30 WPM 0-100 Scale 1055 HRS

END T15 R1 0-100 Scale 1055 HRS

WPM 0-100 Scale 1055 HRS

30 WPM 0-100 Scale 1055 HRS

END T15 R1 0-100 Scale 1055 HRS



start Run2
0955 HRS

WPM 0-100 Scale 0955 HRS

30 WPM 0-100 Scale 0955 HRS

END T15 R1 0-100 Scale 0955 HRS

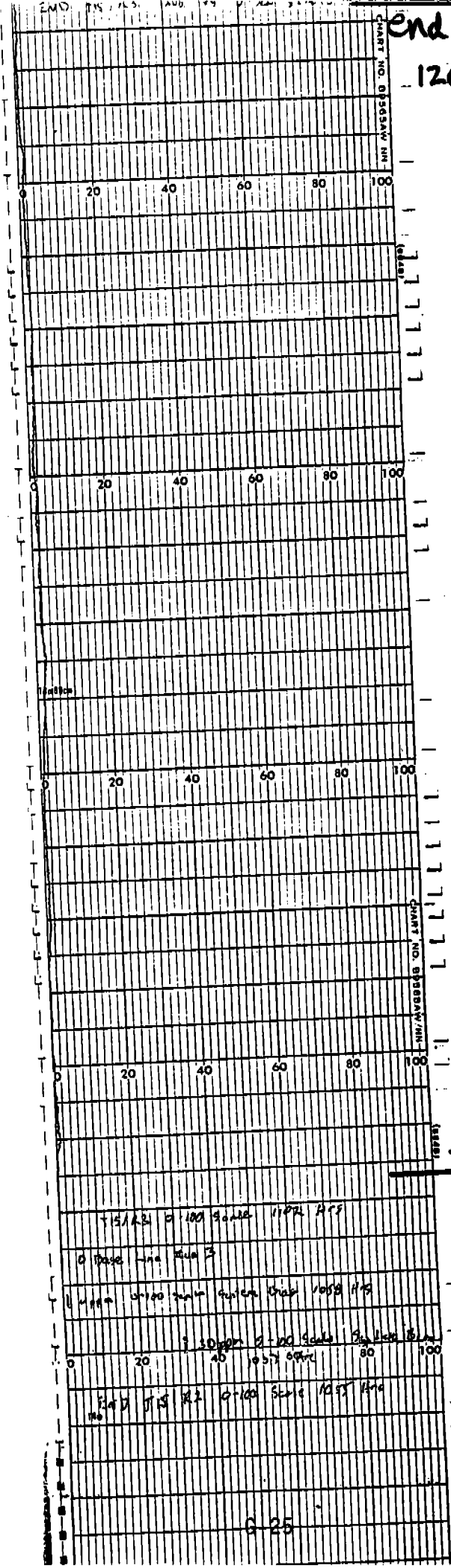
WPM 0-100 Scale 0955 HRS

30 WPM 0-100 Scale 0955 HRS

END T15 R1 0-100 Scale 0955 HRS

WPM 0-100 Scale 0955 HRS

End Run 3
1206 HRS



↑
Start Run 3
1102 HRS

0-100 Scale 94.24 Hrs 1312 HRS
 30 gpm 0-100 Scale 94.24 Hrs
 0-100 Scale 94.24 Hrs
 0-100 Scale 94.24 Hrs

- end Run 4
 1312 HRS

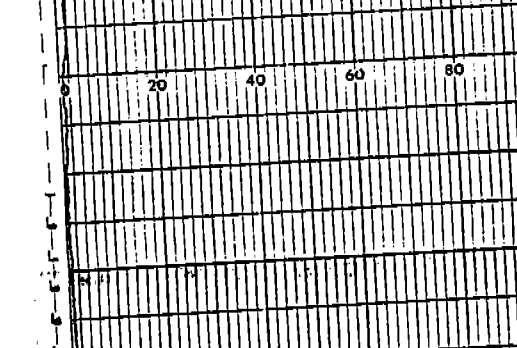
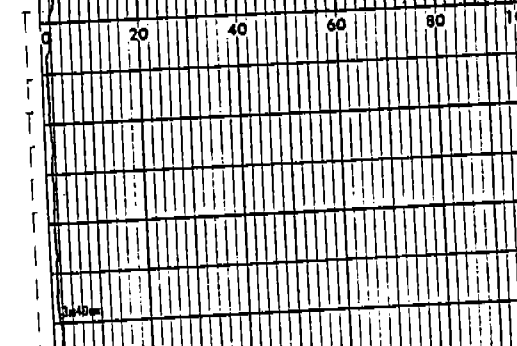


CHART NO. 8588A/VIN

CHART NO. 8588A/VIN

CHART NO. 8588A/VIN

CHART NO. 8588A/VIN

CHART NO. 8588A/VIN

Start Run 4
 1212 HRS

0-100 Scale 94.24 Hrs
 30 gpm 0-100 Scale 94.24 Hrs
 0-100 Scale 94.24 Hrs
 0-100 Scale 94.24 Hrs

APPENDIX H

ANALYZER SPECIFICATIONS

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SPECIFICATIONS FOR ACS MODEL 3300 CO NDIR

Measuring principle	NDIR single beam method
Operating ranges	0 - 500 ppm 0 - 1000 ppm
Reproducibility	±0.5% of full scale
Stability	Zero drift; ±% of full scale/24H Span drift; ±% of full scale/24H
Noise	0.5% of full scale
Ambient temperature	-5 to 45°C
Ambient humidity	Less than 90% RH
Response time (90% of final reading)	Electrical system; 2 sec, 3 sec, 5 sec (selectable with connector) Response of actual gas; Within 15 sec (depending on cell length)
Indicator	100 linear division
Output signal	OUTPUT 1; DC 0 - 1 V OUTPUT 2; DC 0 - 10 mV or DC 0 - 100 mV or DC 0 - 1 V or DC 4 - 20 mA (Allowable load resistance 500Ω max.)
Linearity	Better than ±2% of full scale (when linearizer is used)
Power supply	AC 115 V ± 10%, 60 Hz

Power consumption	Approx. 30 VA
Materials of gas- contacting parts	Measuring cell; SUS304 Window; CaF ₂ Piping; Polyethylene
Sample gas flow rate	1ℓ/min ± 0.5ℓ/min
Sample gas temperature	0 to 55°C
Purging gas flow rate	1ℓ/min (to be flowed as occasion demands)
Warmup time	Approx. 2 hours
External dimensions	200 x 250 x 541 (H x W x D) mm
Weight	Approx. 11 kg
Finish Color	MUNSELL N1.5
Remarks:	For combinations of measuring ranges for the dualcomponent analyzer, inquiry should be made to the manufacturer.



TOTAL HYDROCARBON ANALYZER (FLAME IONIZATION)
Model RS 55

TECHNICAL DATA

MAINS : 115V/60H

RECORDER OUTPUT : 0 - 5 V / 4-20mA

MODEL: ☒ Manual switching
 ☐ Solenoid valves

HOUSING: ☐ Case, ☐ 19"- Rack

MEASURING RANGES: 1 = 0 - 10 C₁-
 2 = 0 - 100 C₁
 3 = 0 - 1,000 C₁
 4 = 0 - 10,000 C₁

SPECIAL OPTIONS:

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

ANALYZER CONDITIONS:

Temperature : 160.°C

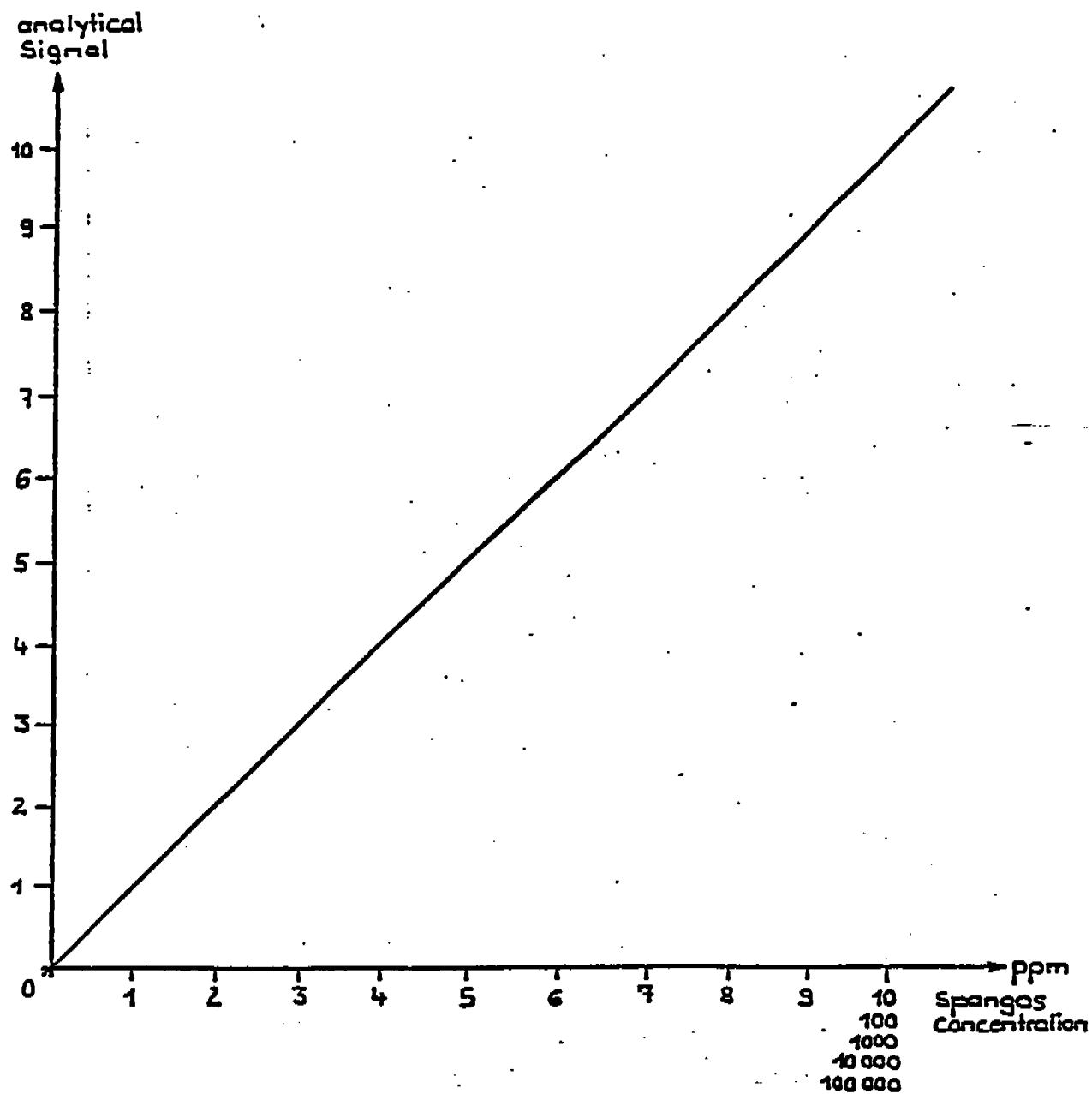
Zero Point : 3,90....

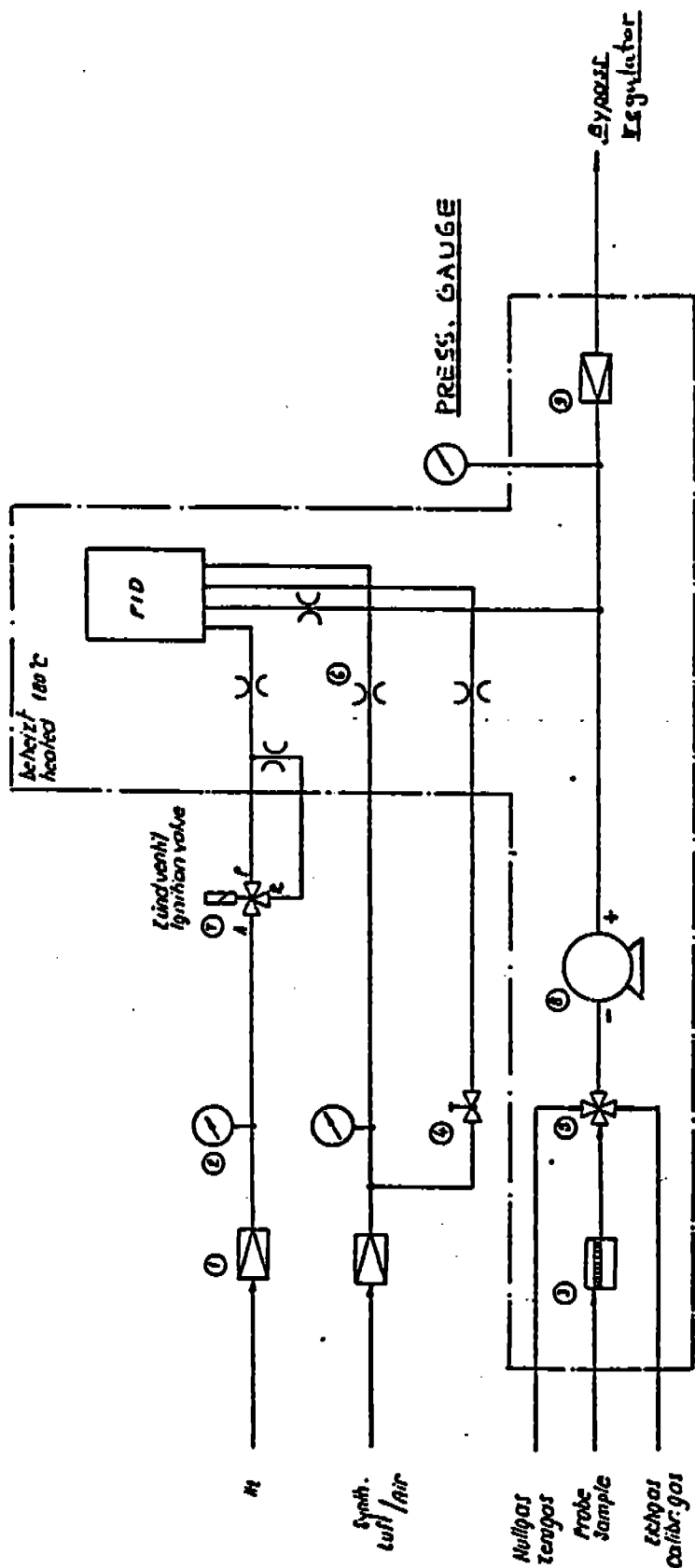
Gain : 7,70....

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

Span Gases : 300. ppm C₁
 24.000. ppm C₁

CALIBRATION DIAGRAMM

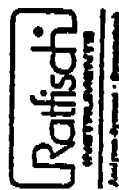




zündventil
ignition valve

P-A angezogen
energized
R-A abgezogen
at rest

- 1 Druckregler
pressure regulator
- 2 Manometer
Gauge
- 3 Nadelventil
Needle valve
- 4 3 Wege Ventil
3 way valve
- 5 5 way valve
capillary
- 6 Magnetventil
solenoid valve
- 7 Pumpe
pump
- 8 Druckregler
pressure regulator



FLAMMEN IONISATIONS DETEKTOR
Flame Ionization Detector

FlieAp/lon RS 55

Flow/detector 13.04.88

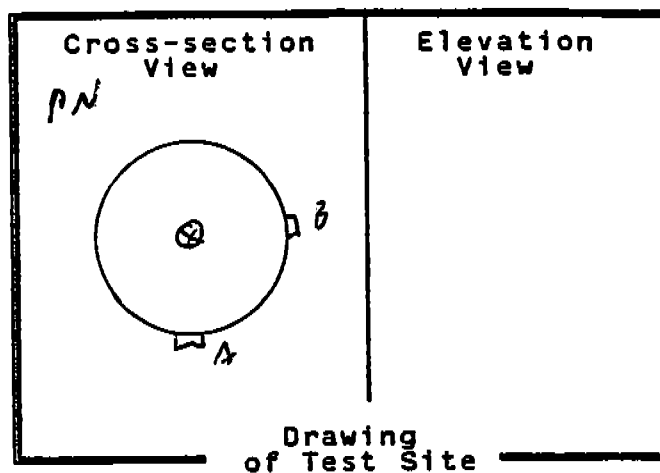
Handumschaltung
Manual switching

APPENDIX I

MEASUREMENT SYSTEMS PERFORMANCE SPECIFICATIONS

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Job L. P. / Tomahawk, WI
Source Face / North Inlet
Test 3 Run 0 Date 8-17-93
Stack dimen. 41 1/2 IN.
Dry bulb 22.7 °F Wet bulb °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 26.57 in Hg
Static pressure -6.0 in WC
Operators M. Kuchler + K. Rasmussen
Pitot No. INST Cp NA

[illegible]

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

Site L.P. / Tomahawk, WI
 Test 3 For 1,3,3 Date 8-17-93
 Operator M. Kuchler

THC Calibration (Low Range):

Lab # 0925

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	100	0
Low level	30.07	30	.07	100	.07
Mid level	304.3	304	.3	1,000	.03
High level	3038	3100	62	10,000	.62

THC Calibration (High Range):

Time (HRS) _____

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

O₂ Calibration:

Time (HRS) _____

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

CO₂ 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

8-420-1A

INTERPOLL LABORATORIES
(612) 755-6020

System Bias Check

Job L.P. / Tomahawk, WI
Test 3 Run 1, 2, 3 Date 8-17-93
Operator m. Koshalev

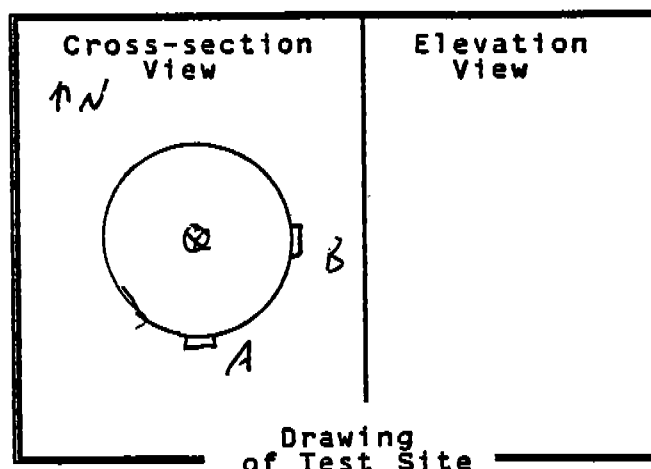
Source Face
Site North Inlet

Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Cal	Resp (ppm) Err	Sys Bias	Diff. CE-SB (ppm)	Span Val (PPM)	% of span
1	0943	Zero gas	0	0	3	3	3	1,000	.3
		Upscale	304.3	303	312	9	9	1,000	.9
2	1140	Zero gas	0	0	.5	.5	.5	100	.5
		Upscale	30.07	30	31	1	1	100	1
3	1318	Zero gas	0	0	2	2	2	100	2
		Upscale	30.07	30	31.5	1.5	1.5	100	1.5
4	1534	Zero gas	0	0	1	1	1	100	1
		Upscale	30.17	30	32	2	2	100	2
5		Zero gas	0						
		Upscale							
6		Zero gas	0						
		Upscale							
7		Zero gas	0						
		Upscale							
8		Zero gas	0						
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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

Job L.P. / Tomahawk, WI
Source Cove / South Inlet
Test 3 Run 0 Date 8-17-93
Stack dimen. 4 1/2 IN.
Dry bulb 22.7 °F Wet bulb °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.57 in Hg
Static pressure -6.0 in WC
Operators M. Kaehler + D. Field
Pitot No. INST Cp NA

[illegible]

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

L.P. / Tomahawk, WI

3 Pin 1,2,3 Date 8-17-93

M. Kuchler

THC Calibration (Low Range):

Time (HRS) 0836

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	100	0
Low level	30.07	31	.93	100	.93
Mid level	304.3	310	5.7	1,000	.57
High level	3038	2990	48	10000	.48

THC Calibration (High Range):

Time (HRS) _____

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

O₂ Calibration:

Time (HRS) _____

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

CO₂ 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

8-420-12

INTERPOL LABORATORIES
(612) 786-6020

System Bias Check

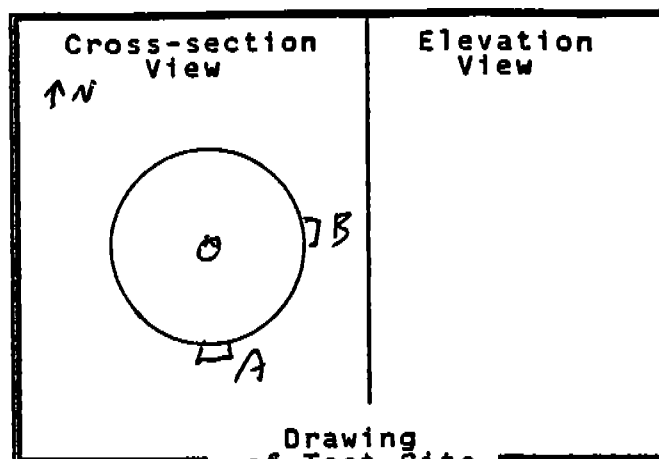
Job L.P. / Tomahawk, WI Source Cone
Test 3 Run 1,2,3 Date 8-17-93 Site South Inlet
Operator M. Koshler

Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Resp (ppm) Cal Err Sys Bias	Diff. CE-SB (ppm)	Span Val (PPM)	% of span
1	0942	Zero gas	0	0	1	1000	.1
		Upscale	304.3	310	299	1000	1.1
2	1135	Zero gas	0	0	2	100	.2
		Upscale	30.07	31	30	100	.1
3	1311	Zero gas	0	0	0	100	0
		Upscale	30.07	31	30	100	.1
4	1531	Zero gas	0	0	0	100	0
		Upscale	30.07	31	28	100	.3
5		Zero gas	0				
		Upscale					
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

Job L.P. / Tomahawk W1
Source Dryer / Stack
Test 3 Run 12 Date 8-17-93
Stack dimen. 59 IN.
Dry bulb 134 °F Wet bulb °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.75 in Hg
Static pressure -.90 in WC
Operators M. Koehler + J. Bergstrom
Pitot No. INST Cp NA

[illegible]

INTERPOL LABORATORIES

EPA Method 25A

Calibration Error Check & Drift Determination

Lab L.P. / Tomahawk, WIPage 3 Run 1,2,3 Date 8-17-93Operator M. Koehler

THC Calibration (Low Range)

Serial # 0906

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	100	0
Low level	20.07	30	107	100	107
Mid level	304.3	303	1.3	1000	113
High level	3038	3005	33	10,000	133

THC Calibration (High Range):

Time (HRS) _____

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

O₂ Calibration:

Time (HRS) _____

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

CO₂ 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-420-1A

INTERPOLL LABORATORIES
(612) 795-6000

System Bias Check

Job L.P. / Tomahawk WI Source Dryer
Test 1 Run 423 Date 4-17-93 Site Stank
Operator M. K. Kehler

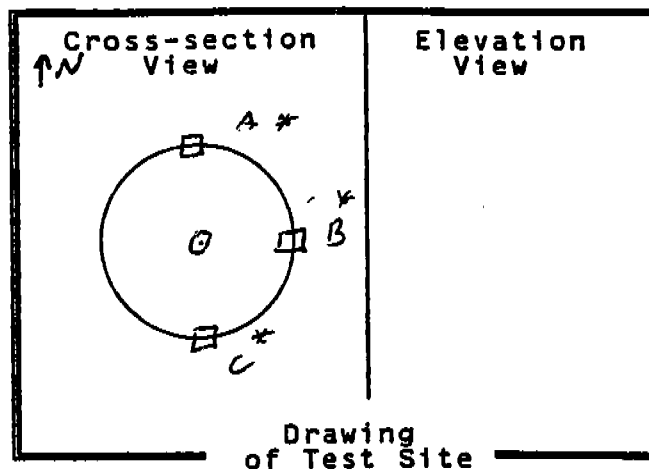
Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Resp (ppm) Cal Err	Sys Bias	Diff. CE-SB (ppm)	Span Val (PPM)	% of span
1	0952	Zero gas	0	0	0	0	100	0
		Upscale	30.07	30	30	0	100	0
2	1143	Zero gas	0	0	0	0	100	0
		Upscale	30.07	30	30	0	100	0
3	1150	Zero gas	0	0	.3	.3	100	.3
		Upscale	30.07	30	30.6	.5	100	.5
4	1320	Zero gas	0	0	.7	.7	100	.7
		Upscale	30.07	30	31	1	100	1
5	1537	Zero gas	0	0	.6	.6	100	.6
		Upscale	30.07	30	31.3	1.3	100	1.3
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.

* Change Strip Chart Recorders

S420-11R

Job L.P. / Tomahawk, WI
Source Press Vent / Stack
Test 10 Run 0 Date 8-18-93
Stack dimen. 62.5 IN.
Dry bulb 92 °F Wet bulb °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.60 in Hg
Static pressure -1.0 in WC
Operators M. Kuehler & T. Bergstrom
Pitot No. INST C_p

[illegible]

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

Loc L.P. / Tomahawk, WI

Gas 10 For 1,2,3 Date 8-18-93

Operator McKeebler

Gas # 1023

THC Calibration (Low Range):

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	100	0
Low level	30.07	30	.07	100	.07
Mid level	304.3	298	6	1,000	.6
High level	3038	3035	3	10,000	.03

Time (HRS) _____

THC Calibration (High Range):

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

Time (HRS) _____

O₂ Calibration:

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

Time (HRS) _____

CO₂ Calibration:

***	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

G-420-1A

INTERPOL LABORATORIES
(612) 786-6020

System Bias Check

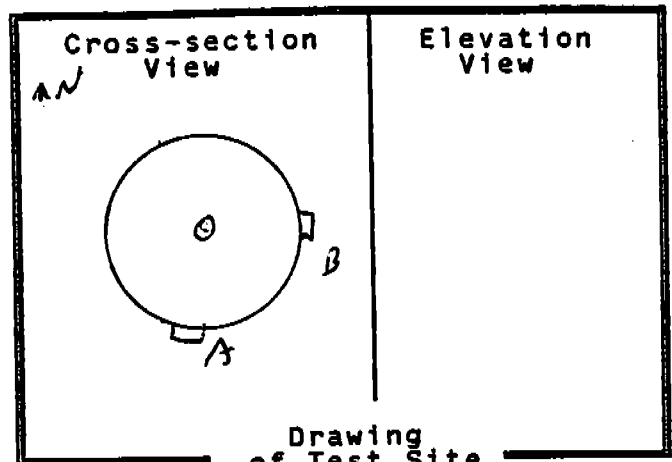
Job L.P. / Tomahawk, WI Source Press Vent
 Test 10 Run 12, 3 Date 8-18-93 Site Stack
 Operator M. Kachler

Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Resp (ppm)		Diff. CE-SB (ppm)	Span Val (PPM)	% of span
				Cal	Err	Sys Bias		
1	1104	Zero gas	0	0		0	100	0
		Upscale	30.07	30		31	100	1
2	1221	Zero gas	0	0		0	100	0
		Upscale	30.07	30		31	100	1
3	1330	Zero gas	0	0		0	100	0
		Upscale	30.07	30		31	100	1
4	1440	Zero gas	0	0		0	100	0
		Upscale	30.07	30		31	100	1
5		Zero gas	0					
		Upscale						
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

Job L.P. / Tomahawk, WI
Source GEKA / Stack
Test 15 Run 0 Date B-19-43
Stack dimen. 42 IN.
Dry bulb 340 °F Wet bulb °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.50 in Hg
Static pressure -35 in WC
Operators Milwaukee + J. Bengstrom
Pitot No. ERTS Cp NA

[illegible]

Calibration Error Check & Drift Determination

Loc A.P. / Tomahawk, WITest 15 Run 123 Date 8-19-93Operator M. Kneblev

TMC Calibration (Low Range):

Time (HRS): _____

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0				
Low level	Refer to Test No. 10 for initial linear calibration				
Mid level					
High level					

TMC Calibration (High Range):

Time (HRS): _____

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

O₂ Calibration:

Time (HRS): _____

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

CO₂ 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-16

INTERPOLL LABORATORIES
(612) 786-5020

System Bias Check

Job L.P. / Tomahawk WI Source Geka
 Test 15 Run 1,2,3 Date 9-19-93 Site Stack
 Operator M. Kuehler

Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Resp (ppm)		Diff. CE-SB (ppm)	Span Val (PPM)	% of span
				Cal	Err			
1	0820	Zero gas	0	0	0	0	100	0
		Upscale	30.07	30	30	0	100	0
2	0941	Zero gas	0	0	0	0	100	0
		Upscale	30.07	30	30	0	100	0
3	1056	Zero gas	0	0	1	1	100	1
		Upscale	30.07	30	32	2	100	2
4	1207	Zero gas	0	0	0	0	100	0
		Upscale	30.07	30	31	1	100	1
5	1314	Zero gas	0	0	0	0	100	0
		Upscale	30.07	30	32	2	100	2
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 J

CALIBRATION GAS CERTIFICATION SHEETS

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NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-25248 CYLINDER #:CC114302 CYL. PRESSURE: 200PSG

EXPIRATION DATE: 7-7-96 LAST ANALYSIS DATE:7-7-93

CUSTOMER:TWIN CITY OXYGEN

P.O.# 5337

METHOD: EPA PROTOCOL # 13.0.4.G-1

STANDARD:

SRM #:2636A

CYL #:CLM4436

CONC.:241.9PPM

INSTRUMENT:

BECKMAN

COMPONENT: NDIR

MODEL #: 865

SERIAL #: 0103409

LAST CAL.: 4-2-93

COMPONENT: CO

MEAN CONC: 144PPM

REPLICATE CONC.

DATE: 6-30-93	DATE: 7-7-93
144PPM	144PPM
145PPM	145PPM
143PPM	144PPM

COMPONENT:

MEAN CONC:

REPLICATE CONC.

DATE: DATE:

COMPONENT:

MEAN CONC:

REPLICATE CONC.

DATE: DATE:

BALANCE GAS:N2

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, N.C. 27713
(919) 544-3772

TO: TWIN CITY OXYGEN

CERTIFICATE OF ANALYSIS

DATE REPORTED: 4-20-93

REFERENCE #: 88-23715

MATERIAL SUBMITTED: CARBON MONOXIDE IN NITROGEN, CERTIFIED
CYLINDER#CC109767

INFORMATION REQUESTED: RATIO ANALYSIS

METHOD OF ANALYSIS: INFRARED

RESULT OF INVESTIGATION:

<u>COMPONENT</u>	<u>SPECIFICATION</u>	<u>CONCENTRATION</u>
CARBON MONOXIDE	300 PPM	312 PPM
NITROGEN		BALANCE

Richard Sykes
AUTHORIZED SIGNATURE

"THIS REPORT STATED ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO DETERMINE OBJECTIVELY, THE INFORMATION REQUESTED; HOWEVER, IN CONNECTION WITH ITS RENDERING OF THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE. ANY USE OF THIS REPORT OR THE INFORMATION CONTAINED HEREIN SHALL BE AT THE SOLE RISK OF THE USER."

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-25249 CYLINDER #:CC44391 CYL. PRESSURE: 200PSIG

EXPIRATION DATE: 7-7-96 LAST ANALYSIS DATE:7-7-93

CUSTOMER:TWIN CITY OXYGEN

P.O.# 5337

METHOD: EPA PROTOCOL # 13.0.4.G-1

STANDARD:

SRM #:1681B

CYL #:CLM4470

CONC.:975PPM

INSTRUMENT:

BECKMAN

COMPONENT: NDIR

MODEL #: 865

SERIAL #: 0103409

LAST CAL: 4-2-93

COMPONENT: CO

MEAN CONC: 620PPM

REPLICATE CONC.

DATE: 6-30-93	DATE: 7-7-93
623PPM	618PPM
620PPM	616PPM
621PPM	619PPM

COMPONENT:

MEAN CONC:

REPLICATE CONC.

DATE: DATE:

COMPONENT:

MEAN CONC:

REPLICATE CONC.

DATE: DATE:

BALANCE GAS:N2



Scott Specialty Gases

a division of
Scott Environmental Technology, Inc.

1280 COMBERMERE STREET, TROY, MICHIGAN 48064 (313) 589-2850

Customer :

GENEX
2435 CLEVELAND AVENUE N.
ROBEVILLE, MN. 55113

Shipped From : Scott Michigan

Our Project # : 533359

Your P.O. # : 6033MW

Expiration Date : 8-18-93

Cylinder Number : BLN-001040

Cylinder Pressure : 1900 psig

1 OF 1 COMPONENT(S)

1111 CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES 1111

PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Procedure # 81

Protocol # 1

File # PQ-2217

Certified Accuracy 1 ± NBS Traceable

ANALYZED CYLINDER

COMPONENT
PROANE

30.07 PPM

BALANCE GAS : AIR

REFERENCE STD

SRM # CYLINDER
(CRM #) NUMBER

16678 FF-26980 47.80-PPM
8H18 ALM-008846 31.20 PPM

INSTRUMENTATION

INSTR/MODEL/SERIAL # LAST CALIBRA-
TION DATE

BECKMAN 2-18-92
400

ANALYTICAL PRINCIPLE

FLAME IONIZATION DETECTOR

ANALYSIS

DATE : 2-18-92

ZERO : TEST

GAS : 30.20

(mV) : 30.07

0.00 : 30.20

0.00 : 30.20

0.00 : 30.20

CALCULATED

RESULTS

30.07

AVERAGE : 30.07 PPM

REFERENCE

GAS

CONC.

47.80 PPM

47.80

47.80

RESULTS

PPM

47.80

47.80

47.80

CALIBRATION CURVE 3 rd DEGREE

SRM # CONC. SPLIT DIVM FITTED PERCENT
(CRM #) PPM PT (X) (mV) VALUE ERROR

16678 47.80 100 47.80 47.80 0.00

31.20 65 31.40 31.26 0.20

22.61 47 22.60 22.53 -0.35

8.17 17 8.20 8.23 0.70

0.00 0 0.00 0.00 0.00

0 0 0.0000 0.00

0 0 0.00 0.00

8H18 8.17 LOW 8.20 8.23 0.70

16678 47.80 HIGH 47.80 47.80 0.00

8H18 - GAS

FACTORY'S INTERNAL STANDARDITY of this Company shall be replaced with the company without further notice.

15328 KE

DATE

TIME

ANALYST

LABORATORY

INSTRUMENT

ANALYSIS

RESULTS

COMMENTS

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RESULTS

COMMENTS



Scott Specialty Gases

a division of
Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48064 (313) 589-2950

Shipped From : Scott Michigan

Our Project # : 533359

Your P.O. # : 6033MN

Customer :

BENEX

2455 CLEVELAND AVENUE N.
ROBEVILLE, MN. 55113

1111 CERTIFICATE OF ANALYSIS - EPA PROTOCOL BASES 1111

PERFORMED ACCORDING TO SECTION 2.0.7.

Certified Per Traceability

Protocol # 2

File # PO-2184

Certified Accuracy 2% ANALYTICAL UNCERTAINTY

Expiration Date : 8-6-93

Cylinder Number : BLN-001645

Cylinder Pressure : 1665 psig

1 OF 1 COMPONENTS

INSTRUMENTATION

REFERENCE STD

ANALYZED CYLINDER

COMPONENT	CERTIFIED CONC.	SRM # (CRM #)	CYLINDER NUMBER	CONC.	INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE
PROPANE	3038 PPM	1669B	CLM-000702	466.0 PPM	BECKMAN 400	1-23-92
		1668B	CLM-000694	95.00 PPM	1002059	

BALANCE GAS : AIR

ANALYSIS

DATE : 2-6-92

ZERO : BAS (mV)	TEST GAS (mV)	REFERENCE GAS CONC.	RESULTS PPM
0.00	65.60	466.0 PPM	100.00
0.00	65.60	100.00	100.00
0.00	65.60	100.00	100.00

CALCULATED RESULTS : 303.8
SAMPLE GAS SPLIT @ 10% OF FULL CONC.
303.8 PPM DIVIDED BY 10% = 3038 PPM.

AVERAGE : 303.8 PPM

ANALYTICAL PRINCIPLE

FLAME IONIZATION DETECTOR

CALIBRATION CURVE 2 nd DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT (%)	DVM PT (mV)	FITTED VALUE	PERCENT ERROR
1669B	466.0	100	100.00	466.0	0.00
	315.8	68	68.10	315.6	-0.08
	199.9	43	43.30	199.7	-0.10
1668B	95.00	20	20.80	95.45	0.47
	0.0000	0	0.00	0.0000	0.00
		0		0.0000	0.00
		0		0.00	0.00
1668B	95.00	LOW	20.80	95.45	0.47
1669B	466.0	HIGH	100.00	466.0	0.00

Approved By :

Yours that is replacement thereof by the Company without extra cost.

APPENDIX K

PROCESS RATE INFORMATION

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**TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93
PROCESS DATA**

PAGE

2	TEST SCHEDULE / PROCESS DATA SUMMARY
3-7	DATA SPECIFIED IN TEST PLAN

DRYER TESTING 8-17-93³

8-15	BOARD WEIGHTS / PRODUCTION / BTU INPUT
16-19	DRYER DATA SHEETS
20-21	DRYER CHARTS
22-24	PRESS CHARTS
25-26	PRESS REPORTS
27-31	E-TUBE READINGS
32-35	E-TUBE CHARTS (8-17 & 8-18)

**DRYER, PRESS VENT AND THERMAL OIL
HEATER TESTING 8-18-93**

36-39	BOARD WEIGHTS / PRODUCTION / BTU INPUT
40-41	DRYER DATA SHEETS
42-43	DRYER CHARTS
44-46	PRESS CHARTS
47-48	PRESS REPORTS
49	RESIN READINGS
50-52	THERMAL OIL HEATER LOG

THERMAL OIL HEATER TESTING 8-19-93

53-54	BOARD WEIGHTS / PRODUCTION / BTU INPUT
55-56	PRESS CHARTS
57	PRESS REPORTS
58-59	THERMAL OIL HEATER LOG

TEST SCHEDULE / PROCESS DATA SUMMARY

DATE	TONS FINISHED PRODUCT/HR.	TONS OF DRY FUEL/HR.	POLLUTANT	RUN #1	TESTING TIMES RUN #2	RUN #3
<u>DRYER OUTLET TESTING (WOOD)</u>						
8-17	11.25	2.11	PAH'S	0900-1100	1145-1430	1507-1715
8-17	11.62	2.22	HCHO ,NOX	0900-1006	1103-1206	1345-1450
8-17	12.10	2.18	VOC	1030-1130	1205-1306	1350-1523
8-17	11.93	2.36	PM,CO,BENZENE	1540-1632, 1714-1722	1742-1846	1922-2025
8-18	12.00	2.32	PHENOL	0802-0907	0910-1020	1015-1120

E-TUBE INLET TESTING (WOOD)

8-17	6.39	1.21	HCHO (SUR)	0900-1003	1103-1203	1345-1443
8-17	6.66	1.20	VOC(SUR)	1030-1130	1205-1306	1350-1523
8-17	5.23	1.01	HCHO (CORE)	0900-1008	1103-1208	1345-1450
8-17	5.45	0.98	VOC(CORE)	1030-1130	1205-1306	1350-1523
8-17	6.56	1.26	PM(SUR)	1540-1641	1745-1850	1922-2025
8-17	5.37	1.10	PM(COR)	1540-1641	1745-1850	1922-2025

PRESS

8-18	11.70	-	HCHO	0940-1045	1115-1220	1245-1350
8-18	11.70	-	PHENOL	0940-1045	1105-1205	1210-1310
8-18	11.70	-	VOC	1120-1220	1226-1330	1335-1435
8-18	11.70	-	PM,CO	1425-1528	1540-1645	1801-1906

TO HEATER (BTU INPUT TO BE VERIFIED BY F FACTOR)

8-18	11.70	0.72	PAH'S	0935-1140	1230-1435	1522-1730
8-18	11.70	0.72	PHENOL,CO	0900-1005	1045-1150	1210-1315
8-19	11.63	0.77	VOC	0941-1041	1056-1156	1205-1305
8-19	11.63	0.77	PM,NOX	1255-1400	1600-1702	1745-1850
8-19	11.63	0.77	HCHO,BENZENE	0757-0905	0955-1058	1118-1221

PRETEST INFORMATION FOR TOMAHAWK, WISCONSIN

1. Description of the air pollution control equipment associated with the process:

THERMAL OIL HEATER

- a) Particulate emissions from the GEKA thermal oil heater are controlled by a cyclone installed in series with a baghouse.
- b) The baghouse is designed to operate at a pressure drop of 2 to 6 inches of water column.
- c) The maximum design airflow through the stack is 32,600 acfm. The rated heat input capacity of the heater is 30mm BTUs. Control efficiencies of the cyclone and baghouse are estimated to be 50% and 99% respectively.
- d) Collected material is presently stored temporarily on site. In the future this material will be either landfilled or spread as a soil amendment.

DRYER

- a) Particulate emissions from each MEC dryer are controlled by a set of multicyclones installed in series with a E-TUBE wet electrostatic precipitator.
- b) Specific multicyclone operating parameters are not monitored. The wet electrostatic precipitator operates within the following ranges:
 - voltage - 45 to 65 kv
 - amperage - 50 to 600 ma
 - spark rate - up to 300 sparks per minute
- c) The maximum design airflow through the stack is 100,000 acfm. The rated heat

input capacity of each burner is 32mm BTUs. Control efficiencies of the multicyclones and wet electrostatic precipitators are estimated to be 60% and 90% respectively.

d) Collected material is mixed with bark and sold or burned in the thermal oil heater.

2. Diagrams of the sampling trains are enclosed in the attachments.
3. Descriptions of the sampling and analysis procedures are enclosed in the attachments.
4. Sketches indicating the flow of the exhaust gases through the equipment are enclosed in the attachments.

5. a) Elevation views of each stack are shown in the attachments.
b) Cross-sectional views of each stack are provided in the attachments.

6. Estimated flue gas conditions are indicated on the attached stack drawings.

7. PROCESS AND CONTROL EQUIPMENT OPERATING DATA

a) THERMAL OIL HEATER OPERATING DATA:

- 1) Design heat input is 30mm BTU's per hour. Operating heat input will be determined by f factor. Heat output will be estimated based on an efficiency of 66%.
- 2) Type of fuel to be burned is green wood bark and fines.
- 3) Acfm of exhaust gas through the thermal oil heater will be determined.
- 4) Tons of fuel burned in the thermal oil heater on a dry basis during testing will be determined based on the number of ram infeed counts and moisture content of the fuel during testing.

- 5) Plant production rate during testing will be determined from board weights and press charts.
- 6) Thermal oil heater operating parameters to be recorded during testing include the following:
 - refractory temperature
 - incoming oil temperature
 - outgoing oil temperature
 - Fuel feed setting (n/a)
 - thermal oil temperature setpoint
- 7) Thermal oil heater control equipment operating parameters to be recorded during testing include the following:
 - baghouse pressure drop

b. . DRYER OPERATING DATA

- 1) The moisture content of wet and dry wafers will be recorded during testing.
- 2) It is anticipated that the plant will process a minimum of 99% green wood and a maximum of 1% dry dead wood.
- 3) It is anticipated that the plant will process approximately 90% hardwood and 10% softwood as required by the air emission permit during testing.
- 4) The dryer inlet and outlet temperatures during testing will be recorded.
- 5) Design airflow rate is 80,000 acfm. Actual airflow rate will be determined during testing.

- 6) The fuels to be burned during testing are dry fines and natural gas as described in Table 1. Waste oil is not used as a fuel for this process. Liquid resin waste is not used as a fuel for this process.
- 7) The heat content of the dry fines fuel will be determined by analysis.
- 8) The dryer drums are 12' in diameter and 60' long.
- 9) Dryer production rate (lbs of dry material produced per hour) will be determined as follows:

$$\frac{\text{pounds of dryer production}}{\text{HR}} = \frac{\text{tons of finished product} \times 2000 \text{ lbs}}{1 - (\text{board trim \%} + \text{fines \%})}$$

The maximum permitted production rate is 7,674 tons of finished product per month. This is equivalent to 10.3 tons per hour for a 31 day month. The maximum permitted hourly production rate is 12.6 tons of finished product per hour. At an estimated 7% board trim and 8% fines, each dryer is required to produce 14,800 lbs. per hour of material to reach the maximum hourly permitted plant production rate.

The design rate of each dryer is estimated to be 29,105 lbs per hour of dry material.

The test rate is anticipated to be greater than or equal to 90% of the maximum hourly permit rate.

- 10) The level of the dry bins will be recorded before and after testing.
- 11) Additional dryer operating parameters to be recorded during testing include:

•Wet bin feed rate

- 12) Additional electrostatic precipitator operating parameters to be recorded during testing include:

•Voltage

•Amperage

•Quench chamber inlet temperature

•Quench chamber outlet temperature

c) PRESS OPERATING DATA

- 1) Nominal board thickness will be recorded
- 2) The number of sheet produced per hour will be determined by multiplying the number of press loads (as recorded on the press chart).
- 3) Pounds of resin used per hour will be recorded.
- 4) Pounds of wax used per hour will be recorded.
- 5) Type of resin used will be recorded.
- 6) Press temperature will be recorded. *403°F*
- 7) There are two exhaust fans with a design airflow of 100,000 acfm. Actual acfm will be determined during sampling.

d) PAINT DRYING OVEN OPERATING DATA: *(NOT OPERATING)*

- 1) The amount of paint applied per hour will be monitored and recorded.
8. Copies of the field data forms to be used are included in the attachments.
9. The names and titles of testing personal are not available at this time. Testing will be preformed by Interpoll Laboratories, Inc.

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

DRYER TESTING 8-17-93

PAH'S

DATA START TIME=

09:00 END TIME=

17:21 DATA TIME (HOURS)=

8.35

TOTAL DATA TIME

8.35

BOARD WEIGHTS - LBS

WEIGHTS OF APPROXIMATELY EVERY 25TH
UNTRIMMED BOARD FROM TAPES

201	203	202	200
205	198	203	198
204	194	201	197
205	191	203	203
205	199	199	
209	198	202	
209	202	204	
205	200	205	
205	201	209	
205	204	206	
203	191	206	
203	197	197	
198	196	207	

201.70 LB = AVERAGE
UNTRIMMED
MAT WEIGHT

183.55 LB = AVERAGE
FINISHED BOARD
WEIGHT
(UNTRIMMED MAT
WEIGHT - TRIM
WEIGHT)

9.0% = TRIM

PLANT PRODUCTION RATE

39.33 , (lb per cubic foot)

8.35 = HOURS DURING TESTING

128.00 = PRESSLOADS (90+38)

1024.00 = NO. OF (8' X 16') BOARDS PRODUCED (PRESSLOADS x 8 BOARDS/LOAD)

187955 = LBS FINISHED PRODUCT (BOARDS x WEIGHT OF FINISHED BOARD)

22510 = LBS FINISHED PRODUCT PRODUCED PER HOUR (LBS FINISHED
PROD./TESTING HOURS)

11.25 = TONS FINISHED PRODUCT PRODUCED PER HOUR (LB FINISHED PROD
PROD/HR / 2000 LB)

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

DRYER TESTING 8-17-93	PAH'S		
DATA START TIME=	09:00	END TIME=	17:21 DATA TIME (HOURS)= 8.35
		TOTAL DATA TIME	8.35

TOTAL DRYER PRODUCTION RATE:

27120 =LB OF DRYER PRODUCTION / HR (LB OF FINISHED PROD./
(1-(% TRIM + % FINES)

8.0% =%FINES

9.0% =%TRIM

47.4% = MOISTURE CONTENT OF INCOMING WOOD

5.5% = MOISTURE CONTENT OF WOOD AFTER DRYING

CORE DRYER PRODUCTION RATE (45%)

12204 =LB OF DRYER PRODUCTION / HR

SURFACE DRYER PRODUCTION RATE (55%)

14916 =LB OF DRYER PRODUCTION / HR

CORE DRYER FUEL BURNING RATE

5.00 =FUEL CALIBRATION IN LB/COUNT

3201 = TOTAL COUNTS DURING TESTING HOURS

8.35 =HOURS DURING TESTING

16005 =TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

1917 =LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS

0.96 =TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

16.48 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

830 = AVERAGE INLET TEMPERATURE

227 = AVERAGE OUTLET TEMPERATURE

SURFACE DRYER FUEL BURNING RATE

4.50 =FUEL CALIBRATION IN LB/COUNT

4278 = TOTAL COUNTS DURING TESTING HOURS

8.35 =HOURS DURING TESTING

19251 =TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

2306 =LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS

1.15 =TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

19.83 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

759 = AVERAGE INLET TEMPERATURE

247 = AVERAGE OUTLET TEMPERATURE

TOTAL DRYER FUEL BURNING RATE

36.31 = ESTIMATED MMBTU INPUT PER HOUR (CORE MMBTU + SURFACE MMBTU)

TOMAHAWK TESTING 8-17-93 THROUGH 8-20-93

DRYER TESTING 8-17-93

HCHO ,NOX

DATA START TIME=	09:00	END TIME=	13:10	DATA TIME (HOURS)=	4.17
DATA START TIME=	13:50	END TIME=	14:50	DATA TIME (HOURS)=	1.00
				TOTAL DATA TIME	5.17

BOARD WEIGHTS - LBS

**WEIGHTS OF APPROXIMATELY EVERY 25TH
UNTRIMMED BOARD FROM TAPES**

201	203	202
205	198	
204	194	
205	191	
205	199	
209	198	
209	202	
205	200	
205	201	
205	204	
203	191	
203	197	
198	196	

**201.22 LB = AVERAGE
UNTRIMMED
MAT WEIGHT**

**183.11 LB = AVERAGE
FINISHED BOARD
WEIGHT
(UNTRIMMED MAT
WEIGHT - TRIM
WEIGHT)**

9.0% = TRIM

PLANT PRODUCTION RATE

39.24 , (lb per cubic foot)

5.17 =HOURS DURING TESTING

82.00 =PRESSLOADS (64+18)

656.00 =NO. OF (8' X 16") BOARDS PRODUCED (PRESSLOADS x 8 BOARDS/LOAD)

120120 =LBS FINISHED PRODUCT (BOARDS x WEIGHT OF FINISHED BOARD)

**23249 =LBS FINISHED PRODUCT PRODUCED PER HOUR (LBS FINISHED
PROD./TESTING HOURS)**

**11.62 =TONS FINISHED PRODUCT PRODUCED PER HOUR (LB FINISHED PROD
PROD/HR / 2000 LB)**

**6.39 =SURFACE DRYER PRODUCTION RATE (55%) IN TONS OF FINISHED PRODUCT
PER HOUR**

**5.23 =CORE DRYER PRODUCTION RATE (45%) IN TONS OF FINISHED PRODUCT
PER HOUR**

TOMAHAWK TESTING 8-17-93 THROUGH 8-20-93

DRYER TESTING 8-17-93

HCHO ,NOX

DATA START TIME=	09:00	END TIME=	13:10	DATA TIME (HOURS)=	4.17
DATA START TIME=	13:50		14:50	DATA TIME (HOURS)=	1.00
				TOTAL DATA TIME	5.17

DRYER PRODUCTION RATE:

**28011 =LB OF DRYER PRODUCTION / HR (LB OF FINISHED PROD / ,
(1-(% TRIM + % FINES)**

8.0% =%FINES

9.0% =%TRIM

47.5% = MOISTURE CONTENT OF INCOMING WOOD

5.7% = MOISTURE CONTENT OF WOOD AFTER DRYING

CORE DRYER PRODUCTION RATE (45%)

12605 =LB OF DRYER PRODUCTION / HR

SURFACE DRYER PRODUCTION RATE (55%)

15406 =LB OF DRYER PRODUCTION / HR

CORE DRYER FUEL BURNING RATE

5.00 =FUEL CALIBRATION IN LB/COUNT

2083 = TOTAL COUNTS DURING TESTING HOURS

5.17 =HOURS DURING TESTING

10415 =TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

**2016 =LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS**

**1.01 =TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)**

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

17.34 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

834 = AVERAGE INLET TEMPERATURE

225 = AVERAGE OUTLET TEMPERATURE

SURFACE DRYER FUEL BURNING RATE

4.50 =FUEL CALIBRATION IN LB/COUNT

2772 = TOTAL COUNTS DURING TESTING HOURS

5.17 =HOURS DURING TESTING

12474 =TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

**2414 =LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS**

**1.21 =TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)**

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

20.76 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

794 = AVERAGE INLET TEMPERATURE

246 = AVERAGE OUTLET TEMPERATURE

TOTAL DRYER FUEL BURNING RATE

38.10 = ESTIMATED MMBTU INPUT PER HOUR (CORE MMBTU + SURFACE MMBTU)

TOMAHAWK TESTING 8-17-93 THROUGH 8-20-93

DRYER TESTING 8-17-93

VOC

DATA START TIME=	10:30	END TIME=	13:10	DATA TIME (HOURS)=	2.67
DATA START TIME=	13:50	END TIME=	15:30	DATA TIME (HOURS)=	1.67
				TOTAL DATA TIME	4.33

BOARD WEIGHTS - LBS

**WEIGHTS OF APPROXIMATELY EVERY 25TH
UNTRIMMED BOARD FROM TAPES**

205	204
205	191
205	197
203	196
203	202
198	203
203	201
198	203
194	199
191	
199	
198	
202	

200.00 LB = AVERAGE
UNTRIMMED
MAT WEIGHT

182.00 LB = AVERAGE
FINISHED BOARD
WEIGHT
(UNTRIMMED MAT
WEIGHT - TRIM
WEIGHT)

9.0% = TRIM

PLANT PRODUCTION RATE

39.00 , (lb per cubic foot)

4.33 = HOURS DURING TESTING

72 = PRESSLOADS (44+19+9)

576.00 = NO. OF (8' X 16') BOARDS PRODUCED (PRESSLOADS x 8 BOARDS/LOAD)

104832 = LBS FINISHED PRODUCT (BOARDS x WEIGHT OF FINISHED BOARD)

24192 = LBS FINISHED PRODUCT PRODUCED PER HOUR (LBS FINISHED
PROD./TESTING HOURS)

12.10 = TONS FINISHED PRODUCT PRODUCED PER HOUR (LB FINISHED PROD
PROD/HR / 2000 LB)

6.66 = SURFACE DRYER PRODUCTION RATE (55%) IN TONS OF FINISHED PRODUCT
PER HOUR

5.45 = CORE DRYER PRODUCTION RATE (45%) IN TONS OF FINISHED PRODUCT
PER HOUR

TOMAHAWK TESTING 8-17-93 THROUGH 8-20-93

DRYER TESTING 8-17-93	VOC		
DATA START TIME=	10:30	END TIME=	13:10 DATA TIME (HOURS)= 2.67
DATA START TIME=	13:50		15:30 DATA TIME (HOURS)= 1.67
			TOTAL DATA TIME 4.33

DRYER PRODUCTION RATE:

**29147 =LB OF DRYER PRODUCTION / HR (LB OF FINISHED PROD /
(1-(% TRIM + % FINES)**

8.0% =%FINES

9.0% =%TRIM

48.0% = MOISTURE CONTENT OF INCOMING WOOD

5.8% = MOISTURE CONTENT OF WOOD AFTER DRYING

CORE DRYER PRODUCTION RATE (45%)

13116 =LB OF DRYER PRODUCTION / HR

SURFACE DRYER PRODUCTION RATE (55%)

16031 =LB OF DRYER PRODUCTION / HR

CORE DRYER FUEL BURNING RATE

5.00 =FUEL CALIBRATION IN LB/COUNT

1707 = TOTAL COUNTS DURING TESTING HOURS

4.33 =HOURS DURING TESTING

8535 =TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

**1970 =LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS**

**0.98 =TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)**

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

16.94 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

817 = AVERAGE INLET TEMPERATURE

227 = AVERAGE OUTLET TEMPERATURE

SURFACE DRYER FUEL BURNING RATE

4.50 =FUEL CALIBRATION IN LB/COUNT

2315 = TOTAL COUNTS DURING TESTING HOURS

4.33 =HOURS DURING TESTING

10418 =TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

**2404 =LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS**

**1.20 =TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)**

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

20.67 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

777 = AVERAGE INLET TEMPERATURE

246 = AVERAGE OUTLET TEMPERATURE

TOTAL DRYER FUEL BURNING RATE

37.61 = ESTIMATED MMBTU INPUT PER HOUR (CORE MMBTU + SURFACE MMBTU)

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

DRYER TESTING 8-17-93

PM, CO, BENZENE

DATA START TIME=	15:40	END TIME=	16:30	DATA TIME (HOURS)=	0.83
DATA START TIME=	17:41	END TIME=	18:50	DATA TIME (HOURS)=	1.15
DATA START TIME=	19:20	END TIME=	20:30	DATA TIME (HOURS)=	1.17

BOARD WEIGHTS - LBS

TOTAL= 3.15

**WEIGHTS OF APPROXIMATELY EVERY 25TH
UNTRIMMED BOARD FROM TAPES**

199	207
202	201
204	195
205	
209	
206	
198	
197	
203	
206	
207	
204	
195	

**202.38 LB = AVERAGE
UNTRIMMED
MAT WEIGHT**

**184.17 LB = AVERAGE
FINISHED BOARD
WEIGHT
(UNTRIMMED MAT
WEIGHT - TRIM
WEIGHT)**

9.0% = TRIM

PLANT PRODUCTION RATE

39.46 , (lb per cubic foot)

3.15 = HOURS DURING TESTING

51 = PRESSLOADS (14+19+18)

408.00 = NO. OF (8' X 16') BOARDS PRODUCED (PRESSLOADS x 8 BOARDS/LOAD)

75141 = LBS FINISHED PRODUCT (BOARDS x WEIGHT OF FINISHED BOARD)

**23854 = LBS FINISHED PRODUCT PRODUCED PER HOUR (LBS FINISHED
PROD / TESTING HOURS)**

**11.93 = TONS FINISHED PRODUCT PRODUCED PER HOUR (LB FINISHED PROD
PROD / HR / 2000 LB)**

**6.56 = SURFACE DRYER PRODUCTION RATE (55%) IN TONS OF FINISHED PRODUCT
PER HOUR**

**5.37 = CORE DRYER PRODUCTION RATE (45%) IN TONS OF FINISHED PRODUCT
PER HOUR**

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

DRYER TESTING 8-17-93

PM, CO, BENZENE

DATA START TIME=	15:40	END TIME=	16:30	DATA TIME (HOURS)=	0.83
DATA START TIME=	17:41	END TIME=	18:50	DATA TIME (HOURS)=	1.15
DATA START TIME=	19:20	END TIME=	20:30	DATA TIME (HOURS)=	1.17
				TOTAL DATA TIME	3.15

DRYER PRODUCTION RATE:

28740 = LB OF DRYER PRODUCTION / HR (LB OF FINISHED PROD /

(1-(% TRIM + % FINES)

8.0% = %FINES

9.0% = %TRIM

45.8% = MOISTURE CONTENT OF INCOMING WOOD

5.3% = MOISTURE CONTENT OF WOOD AFTER DRYING

CORE DRYER PRODUCTION RATE (45%)

12933 = LB OF DRYER PRODUCTION / HR

SURFACE DRYER PRODUCTION RATE (55%)

15807 = LB OF DRYER PRODUCTION / HR

CORE DRYER FUEL BURNING RATE

5.00 = FUEL CALIBRATION IN LB/COUNT

1381 = TOTAL COUNTS DURING TESTING HOURS

3.15 = HOURS DURING TESTING

6905 = TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

2192 = LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS

1.10 = TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

18.85 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

884 = AVERAGE INLET TEMPERATURE

229 = AVERAGE OUTLET TEMPERATURE

SURFACE DRYER FUEL BURNING RATE

4.50 = FUEL CALIBRATION IN LB/COUNT

1771 = TOTAL COUNTS DURING TESTING HOURS

3.15 = HOURS DURING TESTING

7970 = TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

2530 = LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS

1.26 = TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

21.76 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

832 = AVERAGE INLET TEMPERATURE

247 = AVERAGE OUTLET TEMPERATURE

TOTAL DRYER FUEL BURNING RATE

40.61 = ESTIMATED MMBTU INPUT PER HOUR (CORE MMBTU + SURFACE MMBTU)

PLANT TOMAHAWK D4+E 8-17-93

Tien Weber

FUEL CALIBRATION:

[illegible]

DRYER DATA SHEET

PLANT TOMAHAWK 08-17-93

TIMOTHY POWER

EUI CALIBRATION:		CORE	SURFACE
1	100	100	100
2	100	100	100
3	100	100	100
4	100	100	100
5	100	100	100
6	100	100	100
7	100	100	100
8	100	100	100
9	100	100	100
10	100	100	100
11	100	100	100
12	100	100	100
13	100	100	100
14	100	100	100
15	100	100	100
16	100	100	100
17	100	100	100
18	100	100	100
19	100	100	100
20	100	100	100
21	100	100	100
22	100	100	100
23	100	100	100
24	100	100	100
25	100	100	100
26	100	100	100
27	100	100	100
28	100	100	100
29	100	100	100
30	100	100	100
31	100	100	100
32	100	100	100
33	100	100	100
34	100	100	100
35	100	100	100
36	100	100	100
37	100	100	100
38	100	100	100
39	100	100	100
40	100	100	100
41	100	100	100
42	100	100	100
43	100	100	100
44	100	100	100
45	100	100	100
46	100	100	100
47	100	100	100
48	100	100	100
49	100	100	100
50	100	100	100
51	100	100	100
52	100	100	100
53	100	100	100
54	100	100	100
55	100	100	100
56	100	100	100
57	100	100	100
58	100	100	100
59	100	100	100
60	100	100	100
61	100	100	100
62	100	100	100
63	100	100	100
64	100	100	100
65	100	100	100
66	100	100	100
67	100	100	100
68	100	100	100
69	100	100	100
70	100	100	100
71	100	100	100
72	100	100	100
73	100	100	100
74	100	100	100
75	100	100	100
76	100	100	100
77	100	100	100
78	100	100	100
79	100	100	100
80	100	100	100
81	100	100	100
82	100	100	100
83	100	100	100
84	100	100	100
85	100	100	100
86	100	100	100
87	100	100	100
88	100	100	100
89	100	100	100
90	100	100	100
91	100	100	100
92	100	100	100
93	100	100	100
94	100	100	100
95	100	100	100
96	100	100	100
97	100		

[illegible]

DRYER DATA SHEET

PLANT TOMAHAWK 08-17-93

TIMOTHY DWEEBER

FUEL CALIBRATION:		CORE	SURFACE
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100

TIME	CORE				CORE				CORE				SURFACE				SURFACE				SURFACE				INLET FLAKE MOISTURE									
	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	DRY BI LEVEL	WET BIN LEVEL	OUTLET FLAKE MOISTURE	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	DRY BI LEVEL	WET BIN LEVEL	OUTLET FLAKE MOISTURE	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	DRY BI LEVEL	WET BIN LEVEL	OUTLET FLAKE MOISTURE	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	DRY BI LEVEL	WET BIN LEVEL	OUTLET FLAKE MOISTURE		
3:00	230	34	792	229	3200			6.0	247	44	776	247	4341				4.4	44	776	247	4341				4.4	44	776	247	4341				49.0	
3:10	230	35	797	228	3267				247	44	786	248	4435					44	786	248	4435						44	786	248	4435				
3:20	230	36	816	228	3341	55%	90%		247	45	757	245	4529	60%	90%			45	757	245	4529	60%	90%				45	757	245	4529	60%	90%		
3:30	230	36	830	230	3408				247	45	816	249	4616					45	816	249	4616						45	816	249	4616				
3:40	230	36	819	231	3457				247	45	775	249	4653					45	775	249	4653						45	775	249	4653				
3:50	230	36	821	231	3550	55%	65%		247	45	739	247	4791	60%	70%			45	739	247	4791	60%	70%				45	739	247	4791	60%	70%		
4:01	230	38	848	228	3626			6.4	247	47	802	244	4886					47	802	244	4886						47	802	244	4886				45.2
4:10	230	38	843	231	3691				247	47	774	248	4968					47	774	248	4968						47	774	248	4968				
4:20	230	39	835	228	3758	55%	70%		247	47	824	245	5054	60%	70%			47	824	245	5054	60%	70%				47	824	245	5054	60%	70%		
4:30	230	39	845	230	2835				247	47	811	247	5155					47	811	247	5155						47	811	247	5155				
4:40	230	39	863	230	3906				247	47	361	295	5267					47	361	295	5267						47	361	295	5267				
4:50	230	40	850	231	3978	50%	90%		247	35	101	228	5207	65%	90%			35	101	228	5207	65%	90%				35	101	228	5207	65%	90%		
5:00	230	41	869	230	4071			6.2	247	40	548	238	5253					40	548	238	5253						40	548	238	5253				47.4
5:10	230	41	868	230	4128				247	43	704	260	5329					43	704	260	5329						43	704	260	5329				
5:21	230	41	870	229	4202	50%	90%		247	47	762	249	5416	50%	90%			47	762	249	5416	50%	90%				47	762	249	5416	50%	90%		
5:30	230	41	853	230	4271				247	47	786	245	5501					47	786	245	5501						47	786	245	5501				
5:41	230	41	862	230	4350				247	47	814	250	5604					47	814	250	5604						47	814	250	5604				
5:50	230	41	879	230	4430				247	47	799	247	5701					47	799	247	5701						47	799	247	5701				
6:00	230	43	886	231	4488	50%	90%	5.8	247	49	801	247	5775	50%	90%			49	801	247	5775	50%	90%				49	801	247	5775	50%	90%		46.4
6:10	230	43	921	228	4564				247	49	858	247	5871					49	858	247	5871						49	858	247	5871				
6:20	230	45	907	229	4636	50%	95%		247	51	835	246	5961	50%	95%			51	835	246	5961	50%	95%				51	835	246	5961	50%	95%		
6:30	230	45	956	228	4714				247	51	869	243	6054					51	869	243	6054						51	869	243	6054				
6:40	227	46	941	228	4794				247	51	896	247	6157					51	896	247	6157						51	896	247	6157				
6:50	227	42	972	231	4878	60%	90%		247	51	919	247	6261	60%	90%			51	919	247	6261	60%	90%				51	919	247	6261	60%	90%		

QA/1-~~2~~

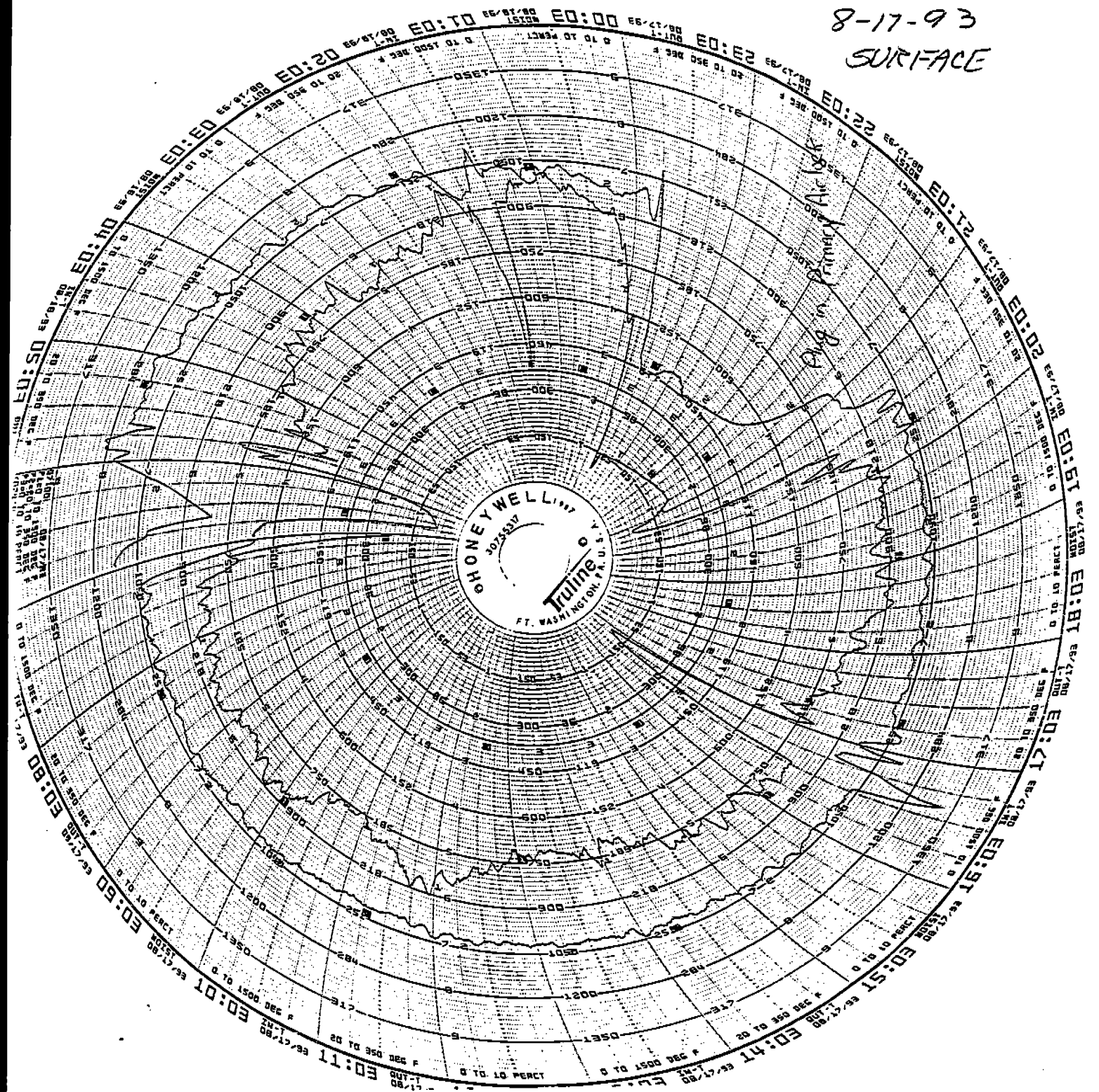
SURFACE

19 K-19

DRYER CHART

8-17-93

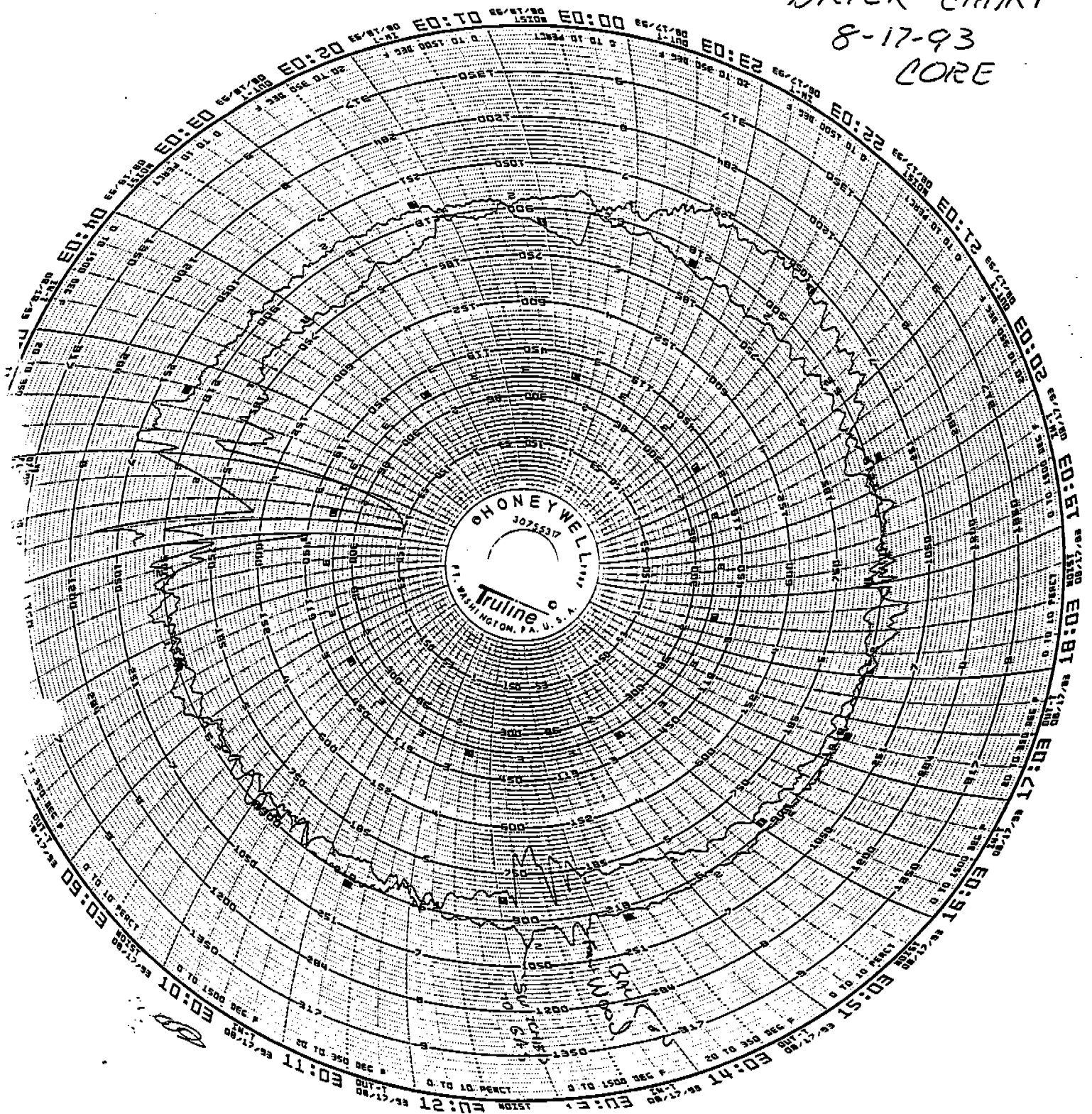
SURFACE



DRYER CHART

8-17-93

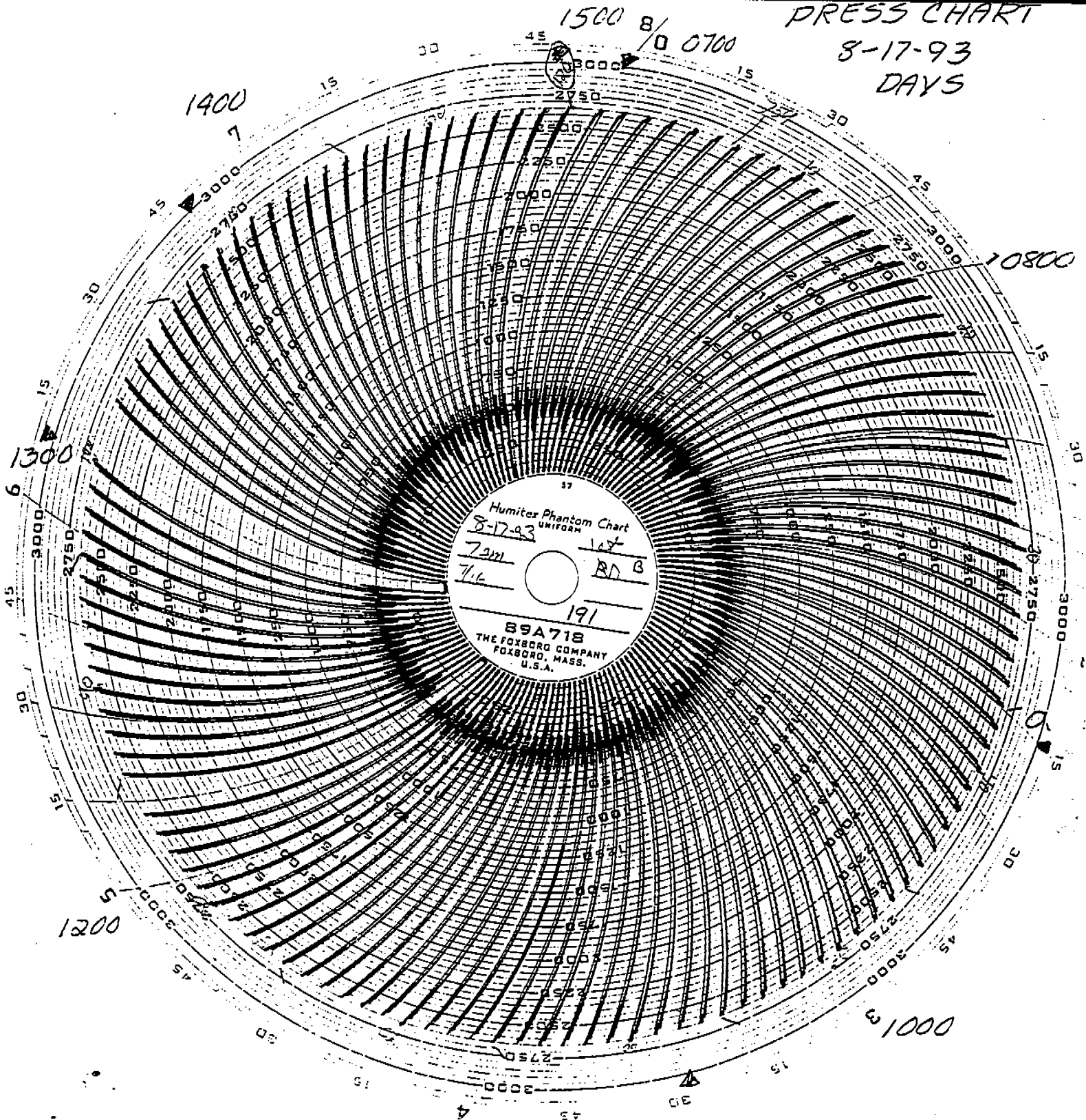
CORE



PRESS CHART

8-17-93

DAYS



1100 PRESSLOADS

0900-1500 = 90

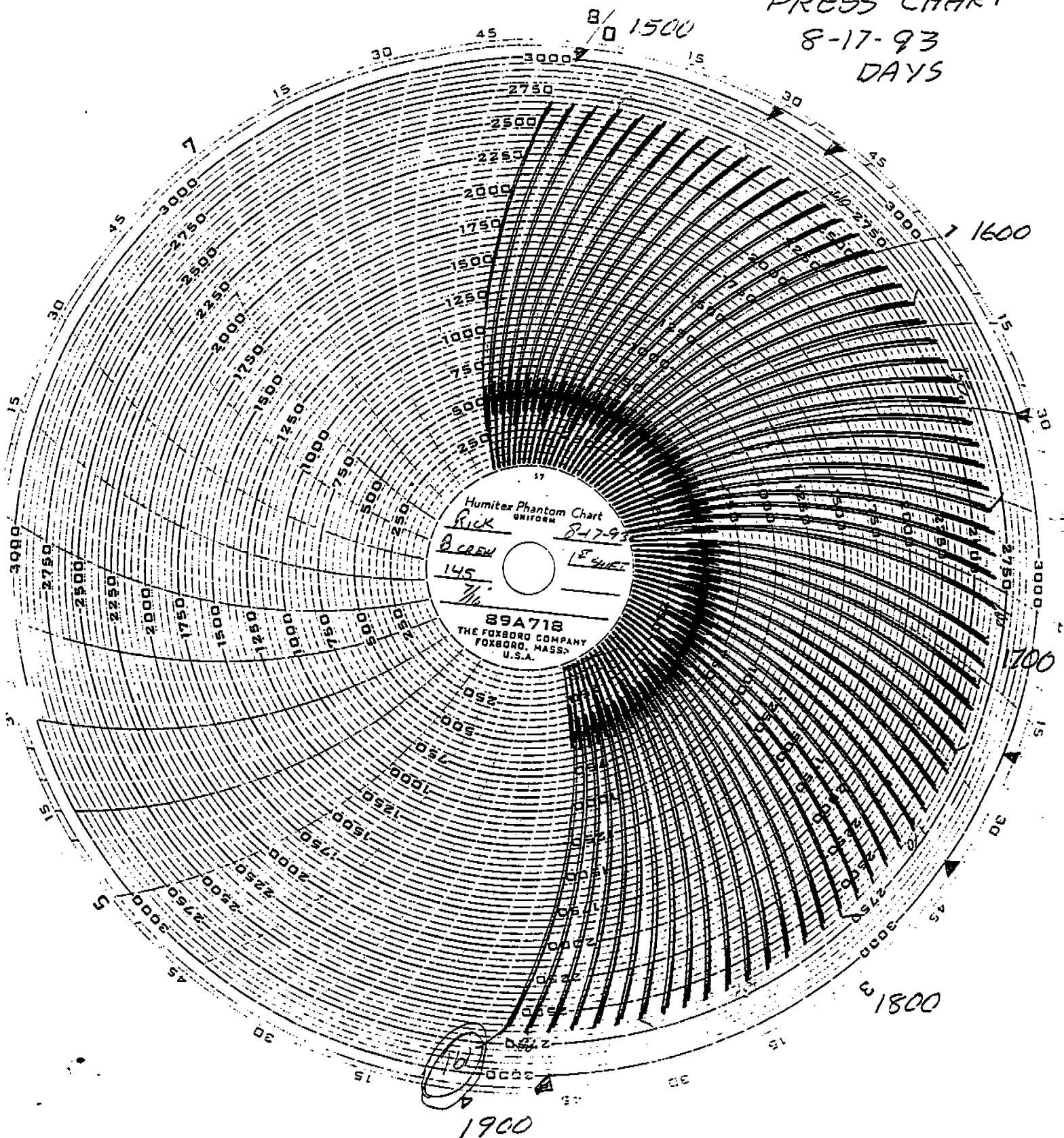
0900-1310 = 64

1350-1450 = 18

1030-1310 = 44

1350-1500 = 19

PRESS CHART
8-17-93
DAYS



PRESSLOADS

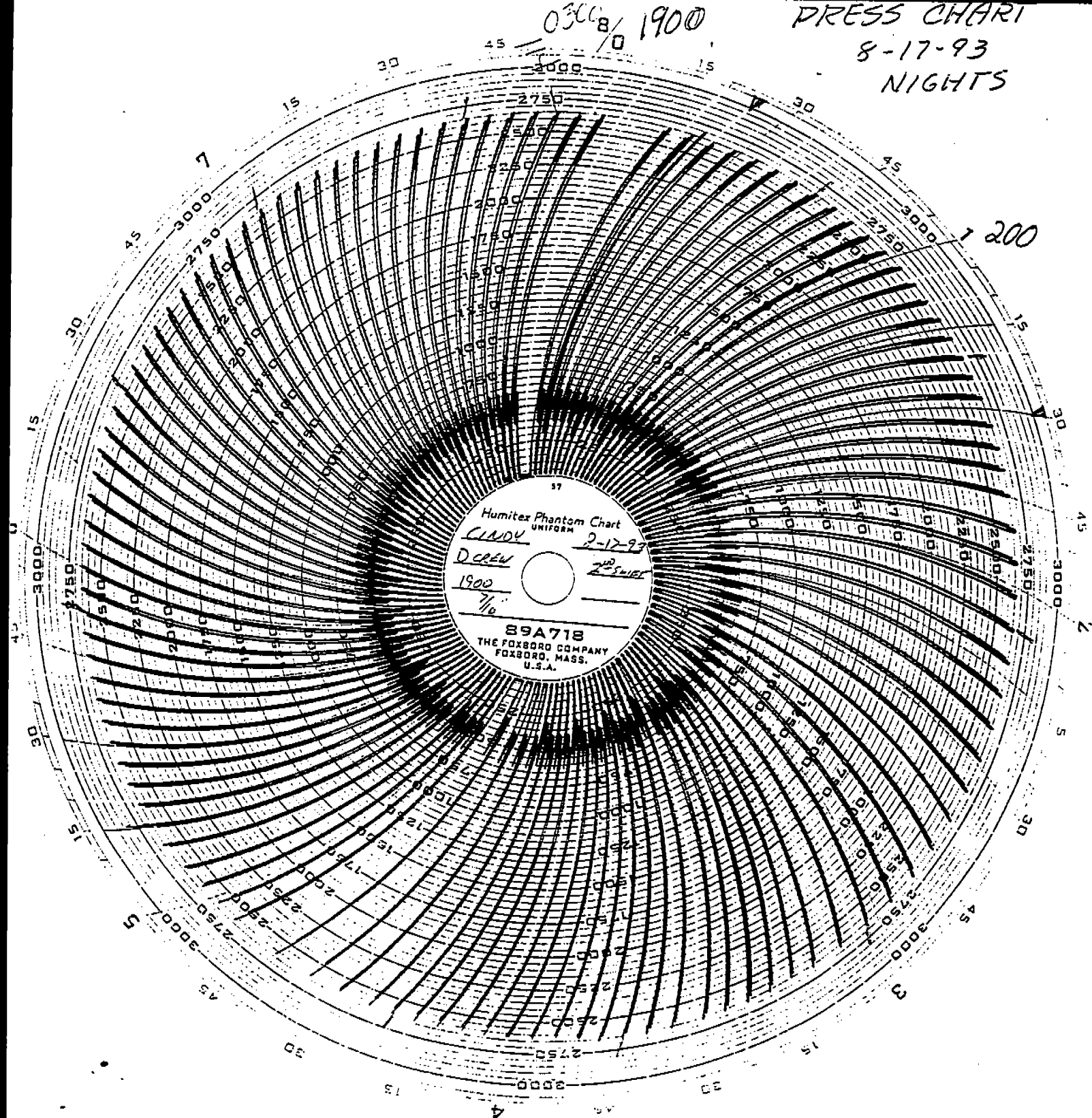
$$1500 - 1721 = 38$$

$$1500 - 1530 = 9$$

$$1540 - 1630 = 14$$

$$1741 - 1850 = 19$$

PRESS CHART
8-17-93
NIGHTS



PRESS LOADS
1920-2030 = 18

PRESS REPORT

LOUISIANA PACIFIC
TOMAHAWK WI

Line Sp.	From	To
730	07:00	07:20
759	07:20	:
	:	:
	:	:
	:	:
	:	:

Press Temp.	448° F
Press Blown Down	—
	Time
Former Hyd. Radiator	—
FCOS Hyd. Radiator	—
Spinnerheads flushed	—

Date:	8-17-93
Operator:	R.D.
Crew:	B.
Shift:	1st
Thickness:	7/16
No. of P/L's	191
Footage:	228,188
Downtime:	11 Min

	From	To	M	E	O	Explanation of Downtime
D	12:16	12:18	2			ADJUST RECLAIM CONVEYOR
O	13:12	13:19	7			ADJUST RECLAIM CONVEYOR PULLEY
W	17:02	17:03	2			LOADER BOOM OVER TRAVEL
N	:	:				
T	:	:				
I	:	:				
M	:	:				
E	:	:				

M-Mechanical

E-Electrical

O-Operator

58 MIN.
TOTAL

Press	Loads				
	10	20	30	40	50
	111	111	111	111	111
	60	70	80	90	100
	111	111	111	111	111
	110	120	130	140	150
	111	111	111	111	111
	160	170	180	190	
	111	111	111	111	

Core ETube	Shutdown	Face ETube	Shutdown	Hammermill	to dump
From	To	From	To	From	To
				0714	0717 3 MIN.
				0820	0822 2 MIN.
				0826	0828 2 MIN.
				0830	0833 3 MIN.
				1131	1132 1 MIN.
				1151	1153 2 MIN.
				1219	1220 1 MIN.
				1239	1242 3 MIN.
				1300	1302 2 MIN.

1322 1324 2 MIN.
1332 1347 15 MIN.
1352 1353 1 MIN.
1401 1402 1 MIN.
1408 1420 12 MIN.

K-2525

PRESS REPORT

LOUISIANA PACIFIC
TOMAHAWK WI

Line Sp.	From	To
759	7:00	8:45
720505	8:45	10:15
5730	10:15	11:30
505	11:30	11:55
780	11:55	12:34
789	12:24	7:00

Press Temp.	456°+
Press Blown Down	
Former Hyd. Radiator	Time
FCOS Hyd. Radiator	:
Spinnerheads flushed	:

Date:	8-17-93
Operator:	CINDY
Crew:	D
Shift:	2nd
Thickness:	1/16
No. of P/L's:	165
Footage:	17,126
Downtime:	56 min

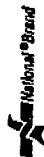
	From	To	M	E	O	Explanation of Downtime
D	7:08	7:15			7	Dry Bin Low (stack test)
O	8:32	8:33		1		Loader Boom overtravel
W	11:50	11:58	3			Loader didn't load #3 then overtraveled #8
N	12:12	12:13		1		Load Boom overtravel
T	5:48	5:49		1		" "
I	6:02	6:45			43	Fill Bins + K.C.
M	:	:				
E	:	:				

M-Mechanical E-Electrical O-Operator

Press	Loads
THIN THIN THIN THIN THIN THIN	70
THIN THIN THIN THIN THIN THIN	80
THIN THIN THIN THIN THIN THIN	100
THIN THIN THIN THIN THIN THIN	120
THIN	

Core ETube	Shutdown	Face ETube	Shutdown	Hammermill	to dump
From	To	From	To	From	To
5:55	5:42	8:50	11:45	10:30	10:42
		5:55	5:42	11:20	11:33
				12:00	12:18
				12:39	12:48
				3:30	3:40
				4:12	4:24
				5:36	5:53
				6:09	6:52

42-381 50 SHEETS EYE EASE® 5 SQUARE
 42-382 100 SHEETS EYE EASE® 5 SQUARE
 42-383 200 SHEETS EYE EASE® 5 SQUARE
 42-384 100 SHEETS EYE EASE® 6 SQUARE
 42-385 200 SHEETS EYE EASE® 6 SQUARE
 42-386 100 RECYCLED WHITE 5 SQUARE
 42-387 200 RECYCLED WHITE 5 SQUARE
 Made in U.S.A.



LP-TOMAHAWK

EMISSIONS TESTING

17 AUG 93

2/

E-TUBE READINGS

TIME	SURFACE		CORE		mA
	QC IN	QC OUT	QC IN	QC OUT	
12:15	226	146	200	146	10
12:20	227				120
12:22					130
12:25					150
12:31	228	145	204	138	160
12:39					150
1:18	228	143	212	137	220
1:30	228	144	209	135	260
1:50	227	144	211	137	220
2:00	227	144	208	135	140
2:13	229	142	207	134	170
2:16	- FLUSH -				
2:19		BOTH UNITS			
2:20		44			50
2:24		48			110
2:40		52			150
3:00	228	143	208	135	180
3:20	226	146	209	136	150
	228	145	207	137	150

*

VC TESTING

**

200

fixed
12:40
1:40

* BOTH UNITS FLUSHING WITH HOT CRUSTIC SOLUTION FOR 60 SEC.



LD-TOMAHAWK

EMISSIONS TEST

17 AUGUST 93

5/

E-TUBE READING S

TIME	SURFACE		CURE		mA	m.A
	QC IN	QC OUT	QC IN	QC OUT		
5:45	228	145	207	137	180	140
5:50	230	144	208	137	190	160
3:55	229	145	208	137	200	150
4:00	228	145	207	139	190	140
4:05	228	146	207	138	180	150
4:10	228	146	207	138	170	160
4:15	229	146	207	138	190	180
4:16	FLUSH BOTH UNITS				3	50
4:17	FOR 1 MIN				3	20
4:18	WATER ONLY				70	90
4:19	227	147	207	138	90	70
4:20					120	100
4:21					130	120
4:22					150	150
4:25	228	146	206	139	170	130
4:30	229	146	207	138	180	130
4:35	229	146	207	139	170	110
4:40	238	122	207	139	180	180
4:43	246	115	207	139	250	200
4:45	247	114	207	139	250	170
4:47	246	113	207	138	270	170
4:50	241	114	207	138	250	
4:52	233	117	207	139	280	170
5:05	218	139	207	139	180	140
5:10	223	141	207	139	120	160
5:15	230	141	207	139	170	180
5:23	230	145	207	139	140	
5:30	229	144	207	139	140	

INTELLIGENT
TEST
START
3:40

DOE
FACE + 11 SEC

K-29

29

TEST
END
HEAD

42-381 50 SHEETS EYE CASE 5 SQUARE
 42-382 100 SHEETS EYE CASE 5 SQUARE
 42-383 100 SHEETS EYE CASE 5 SQUARE
 42-384 100 SHEETS EYE CASE 5 SQUARE
 42-385 100 RECYCLED WHITE 5 SQUARE
 42-386 200 RECYCLED WHITE 5 SQUARE
 Made in U.S.A.



LD - TOWNAWK

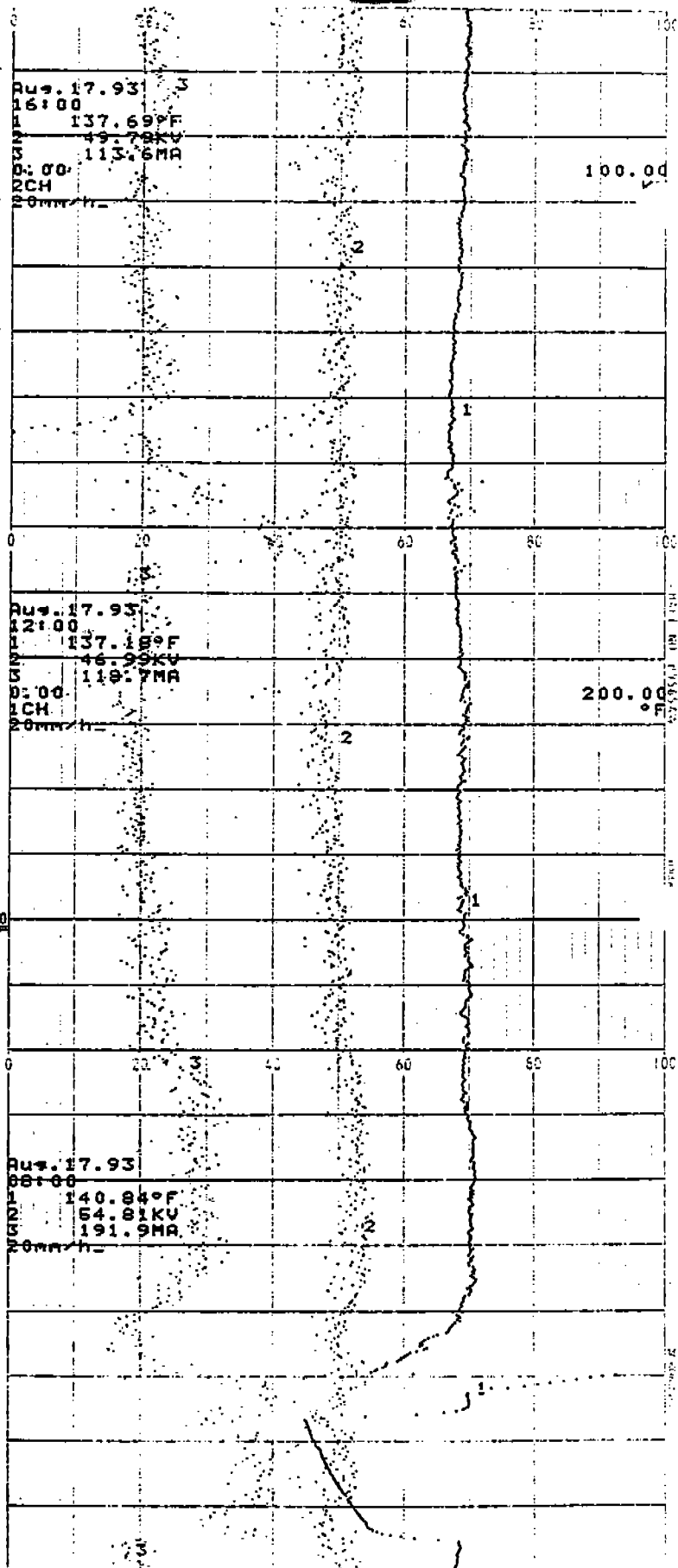
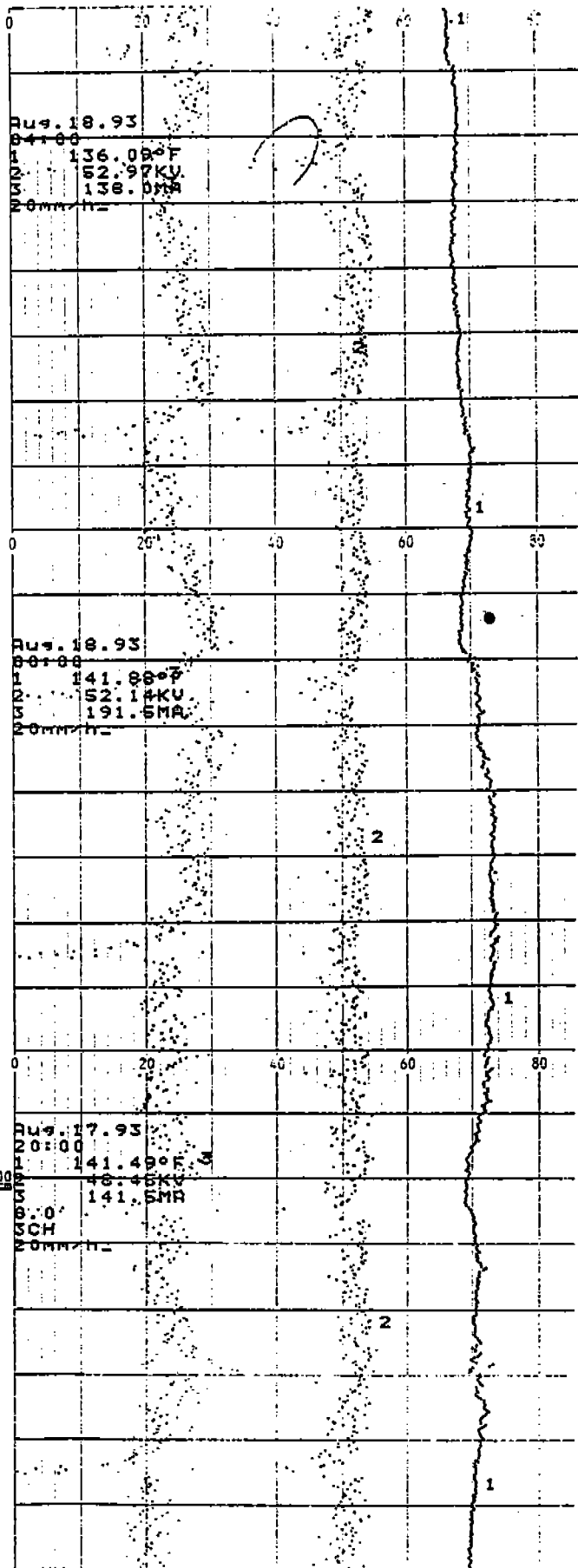
EMISSIONS TEST

17 AUG '93

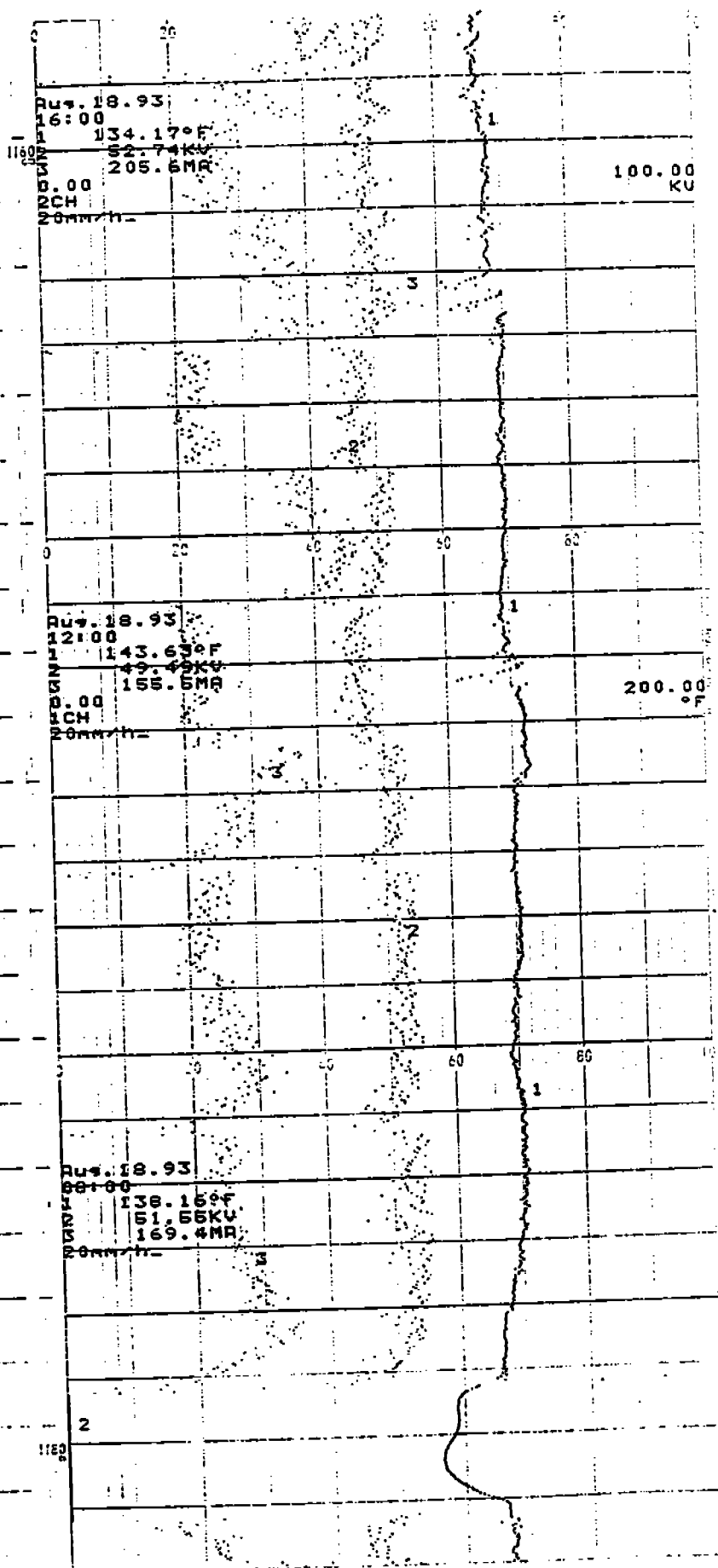
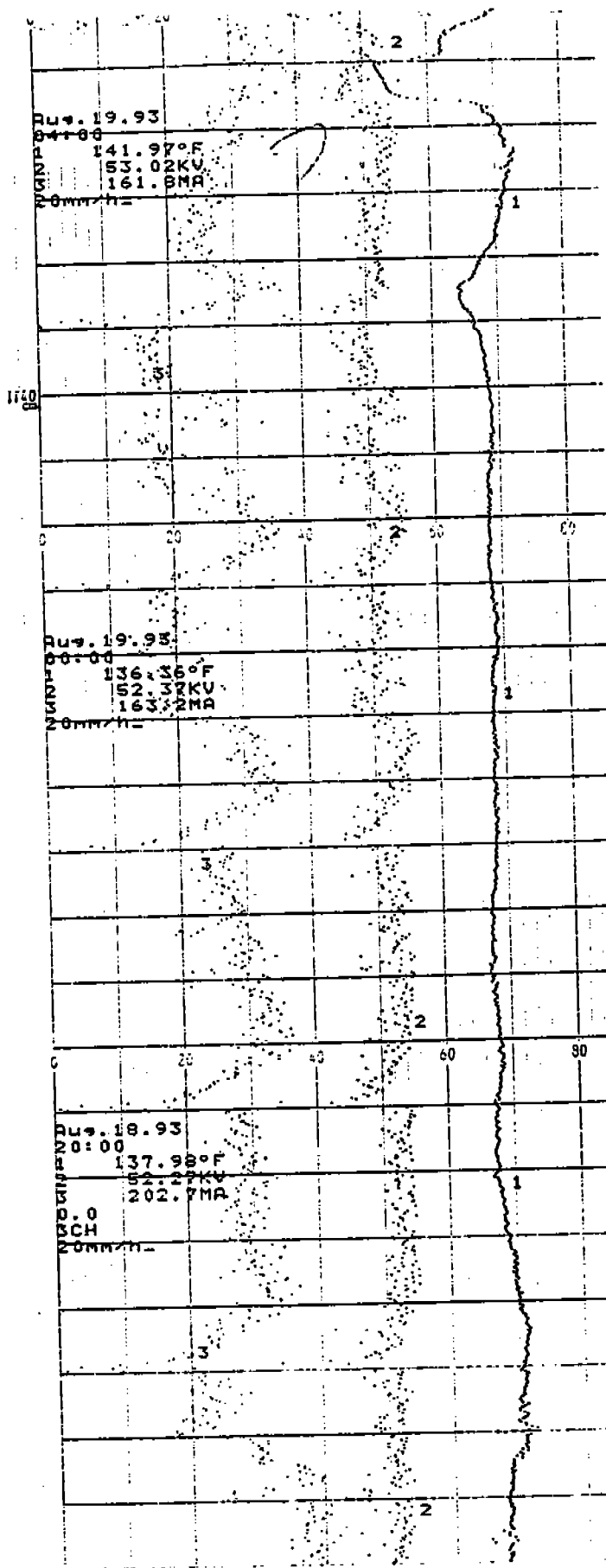
4/

E-TUBE READINGS

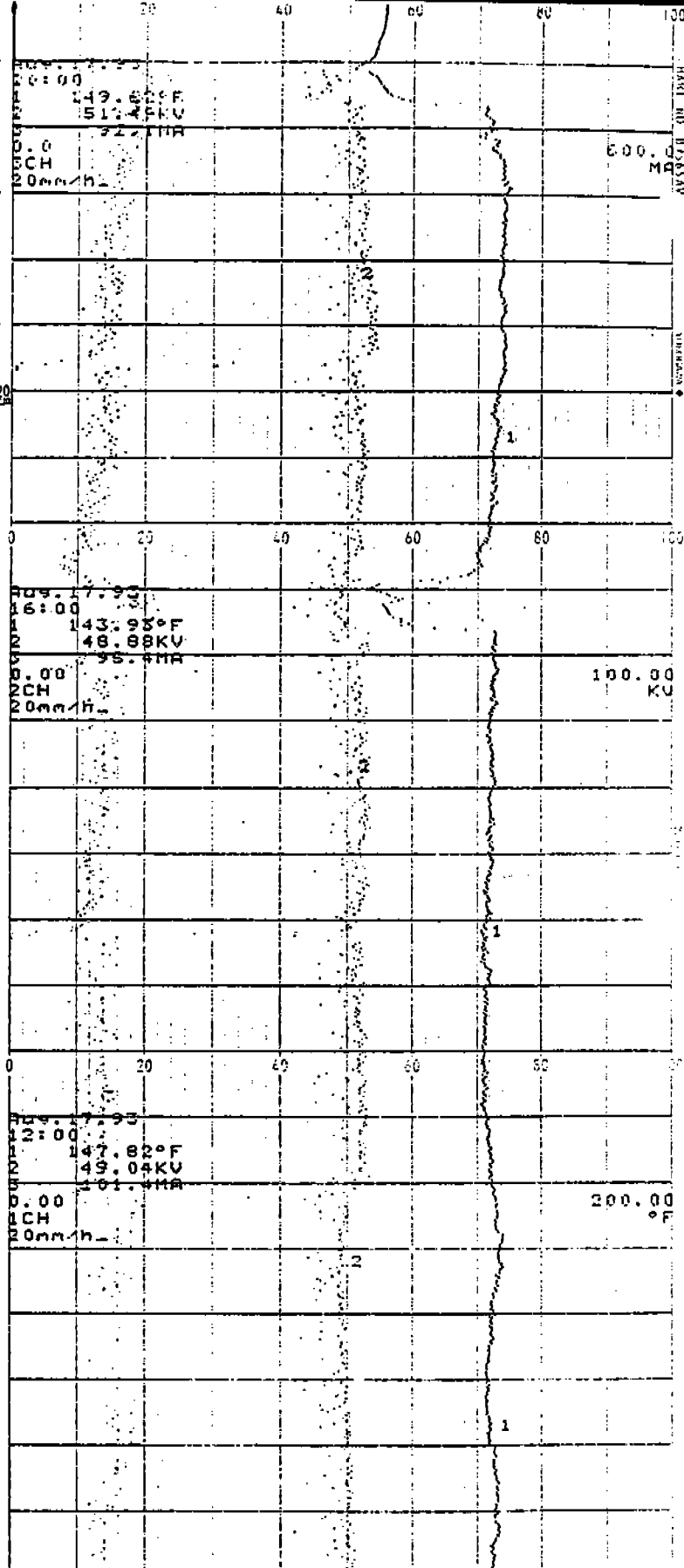
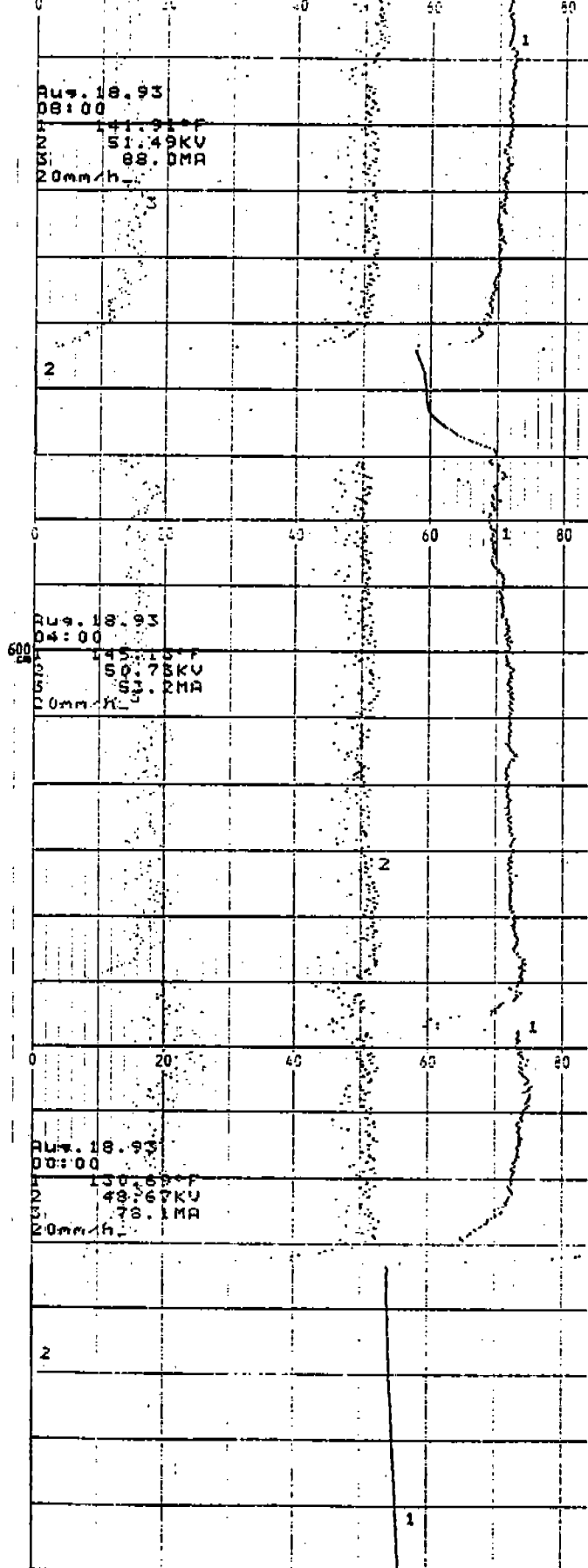
TIME	SURFACE		CORE		mV
	QC IN	QC OUT	QC IN	QC OUT	
START					
5:50	229	146	207	140	160
5:55	228	146	207	141	160
6:00	228	140	207	141	180
6:05	227	140	207	141	150
6:10	227	147	208	142	190
6:15	229	146	206	142	170
6:16	NO	FLUSH	FLUSH - WATER ONLY	FLUSH - 60 SEC	20
17					10
18					70
6:20	228	147	206	141	150
6:25	228	147	206	143	120
6:30	227	148	206	143	180
6:35	226	149	206	143	180
6:36	FLUSH - 60 SEC	FLUSH	NO FLUSH	NO FLUSH	
37	WATER ONLY				
38					
39					
6:40	227	149	206	145	170
6:45	229	149	204	146	180
6:50	228	149	204	144	170



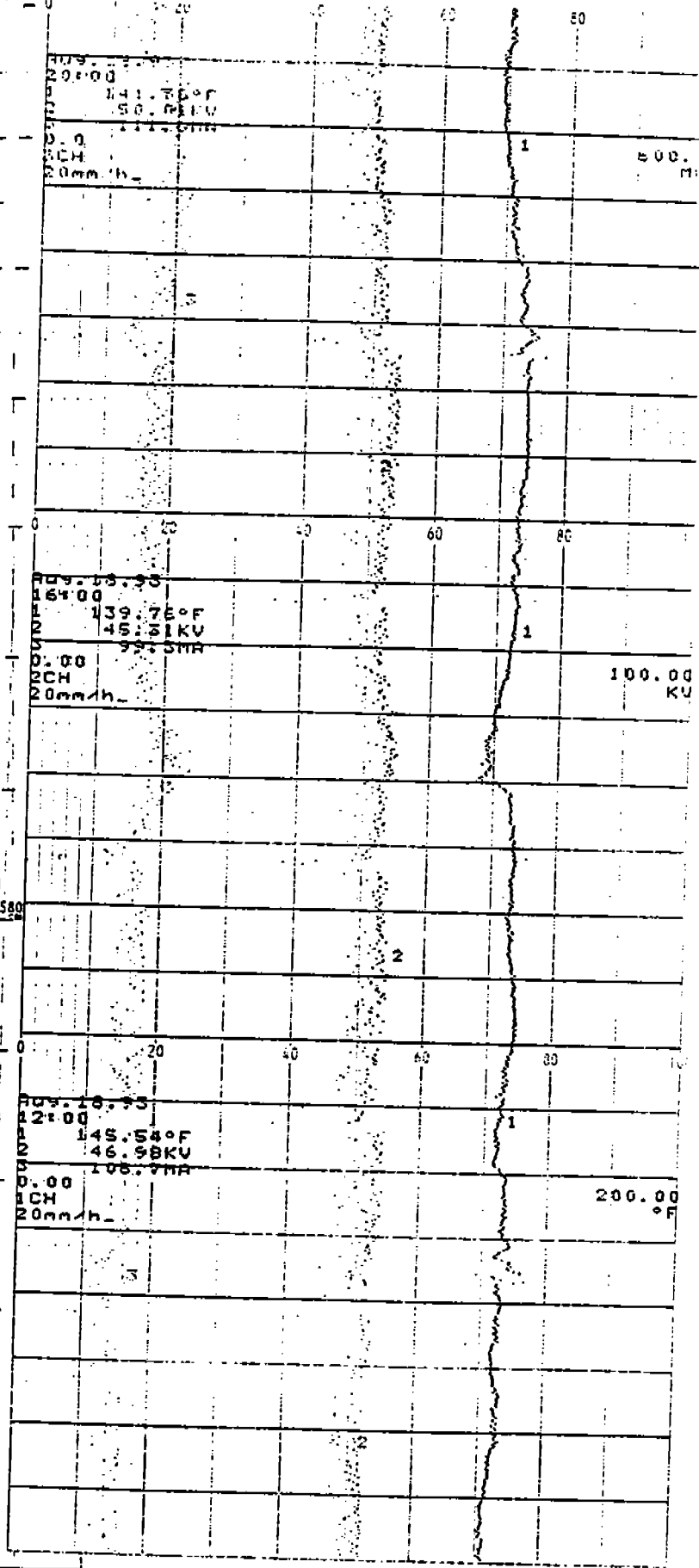
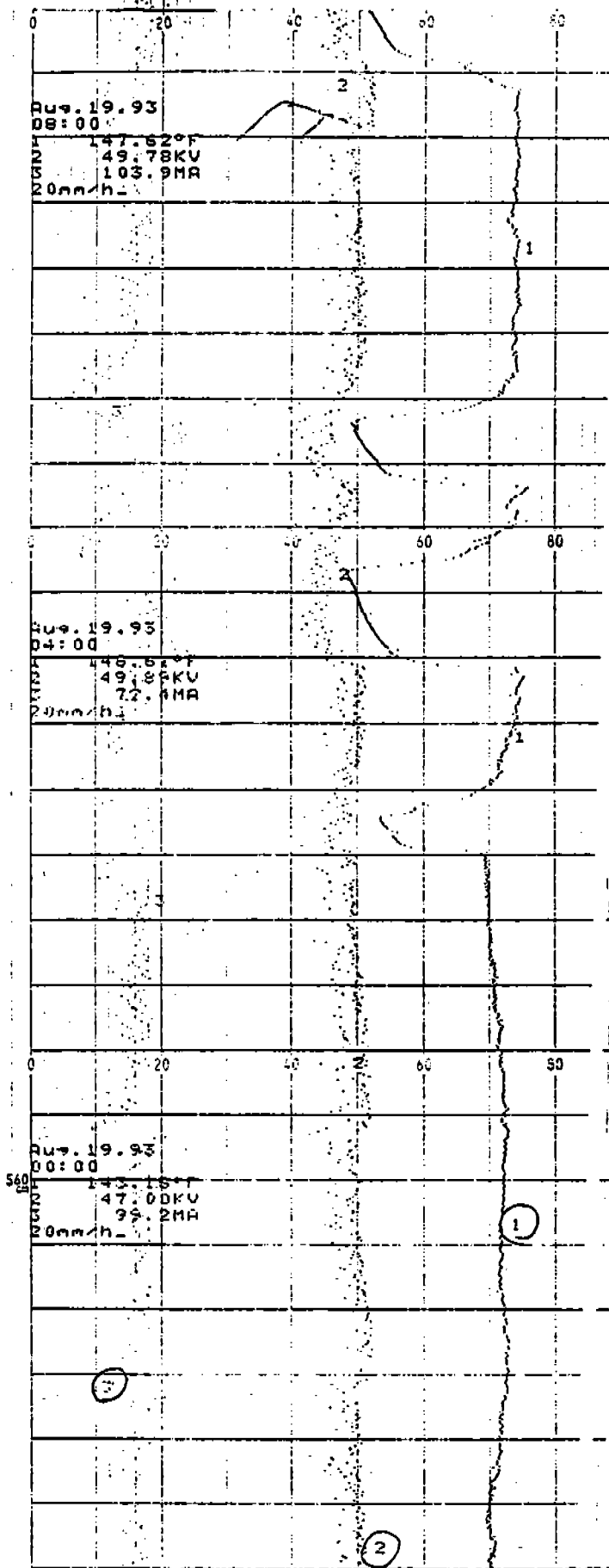
CORE E-TUBE
F 8-17 STRIP CHART
T 8-18 32 K-32



CORE
F 8-18
T 833 19 33
E-TUBE
STRIP CHART



Face E-TUBE
STRIP CHART
F 8-17
T 8-18 34 K-34



Face
F 8-18
T 8-19

E-TUBE
STRIP CHART

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

DRYER TESTING 8-18-93

PHENOL

DATA START TIME=

08:01 END TIME=

11:30 DATA TIME (HOURS)=

3.48

TOTAL=

3.48

BOARD WEIGHTS - LBS

WEIGHTS OF APPROXIMATELY EVERY 25TH
UNTRIMMED BOARD FROM TAPES

200	195
201	195
204	197
204	200
207	203
205	
197	
204	
204	
206	
201	
200	
202	

201.39 LB = AVERAGE
UNTRIMMED
MAT WEIGHT

183.26 LB = AVERAGE
FINISHED BOARD
WEIGHT
(UNTRIMMED MAT
WEIGHT - TRIM
WEIGHT)

9.0% = TRIM

39.27 , (lb per cubic foot)

PLANT PRODUCTION RATE

3.48 =HOURS DURING TESTING

57.00 =PRESSLOADS

456.00 =NO. OF (8' X 16') BOARDS PRODUCED (PRESSLOADS x 8 BOARDS/LOAD)

83567 =LBS FINISHED PRODUCT (BOARDS x WEIGHT OF FINISHED BOARD)

23990 =LBS FINISHED PRODUCT PRODUCED PER HOUR (LBS FINISHED
PROD/TESTING HOURS)

12.00 =TONS FINISHED PRODUCT PRODUCED PER HOUR (LB FINISHED PROD
PROD/HR / 2000 LB)

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

DRYER TESTING 8-18-93

PHENOL

DATA START TIME=

08:01 END TIME=

11:30 DATA TIME (HOURS)=

3.48

TOTAL=

3.48

DRYER PRODUCTION RATE:

28904 =LB OF DRYER PRODUCTION / HR (LB OF FINISHED PROD/
(1-(% TRIM + % FINES)

8.0% =%FINES

9.0% =%TRIM

44.1% = MOISTURE CONTENT OF INCOMING WOOD

4.9% = MOISTURE CONTENT OF WOOD AFTER DRYING

CORE DRYER PRODUCTION RATE (45%)

13007 =LB OF DRYER PRODUCTION / HR

SURFACE DRYER PRODUCTION RATE (55%)

15897 =LB OF DRYER PRODUCTION / HR

CORE DRYER FUEL BURNING RATE

5.00 =FUEL CALIBRATION IN LB/COUNT

1580 = TOTAL COUNTS DURING TESTING HOURS

3.48 =HOURS DURING TESTING

7900 =TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

2268 =LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS

1.13 =TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

19.50 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

887 = AVERAGE INLET TEMPERATURE

232 = AVERAGE OUTLET TEMPERATURE

SURFACE DRYER FUEL BURNING RATE

4.50 =FUEL CALIBRATION IN LB/COUNT

1848 = TOTAL COUNTS DURING TESTING HOURS

3.48 =HOURS DURING TESTING

8316 =TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

2387 =LB. OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS

1.19 =TONS OF FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED PER
HOUR / 2000 LB)

8600 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

20.53 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

799 = AVERAGE INLET TEMPERATURE

260 = AVERAGE OUTLET TEMPERATURE

TOTAL DRYER FUEL BURNING RATE

40.04 = ESTIMATED MMBTU INPUT PER HOUR (CORE MMBTU + SURFACE MMBTU)

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

PRESS TESTING 8-18-93 - HCHO, PHENOL, VOC, PM, CO

T.O. HEATER TESTING 8-18-93 - PAH's, PHENOL, CO

DATA START TIME= 09:00 END TIME= 17:30 DATA TIME (HOURS)= 8.50
DATA START TIME= 18:00 END TIME= 19:10 DATA TIME (HOURS)= 1.17

BOARD WEIGHTS - LBS

TOTAL= 9.67

WEIGHTS OF APPROXIMATELY EVERY 25TH
UNTRIMMED BOARD FROM TAPES

205	205	207	197
197	198	207	202
204	198	201	202
204	196	204	203
206	203	206	204
201	199	198	197
200	201	196	
202	197	197	
195	198	196	
195	199	204	
197	193	201	
200	200	199	
203	205	200	

200.49 LB = AVERAGE
UNTRIMMED
MAT WEIGHT

182.45 LB = AVERAGE
FINISHED BOARD
WEIGHT
(UNTRIMMED MAT
WEIGHT - TRIM
WEIGHT)

9.0% = TRIM

PLANT PRODUCTION RATE

39.10 , (lb per cubic foot)

9.67 = HOURS DURING TESTING

155 = PRESSLOADS (98+39+15)

1240.00 = NO. OF (8' X 16') BOARDS PRODUCED (PRESSLOADS x 8 BOARDS/LOAD)

226238 = LBS FINISHED PRODUCT (BOARDS x WEIGHT OF FINISHED BOARD)

23404 = LBS FINISHED PRODUCT PRODUCED PER HOUR (LBS FINISHED
PROD./TESTING HOURS)

11.70 = TONS FINISHED PRODUCT PRODUCED PER HOUR (LB FINISHED PROD
PROD/HR / 2000 LB)

RESIN AND WAX USAGE

234
438
182

2267 = LBS OF MDI RESIN USED DURING TESTING

4232 = LBS OF LIQUID PHENOLIC RESIN USED DURING TESTING (100% SOLIDS)

1763 = LBS OF WAX USED DURING TESTING

RESIN AND WAX USAGE AS PERCENTAGE OF FINISHED PRODUCT

1.00% = % OF MDI RESIN USED DURING TESTING

1.87% = % OF LIQUID PHENOLIC RESIN USED DURING TESTING (100% SOLIDS)

0.78% = % OF WAX USED DURING TESTING

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

PRESS TESTING 8-18-93 - HCHO, PHENOL, VOC, PM, CO

T.O. HEATER TESTING 8-18-93 - PAH's, PHENOL, CO

DATA START TIME=	09:00	END TIME=	17:30	DATA TIME (HOURS)=	8.50
DATA START TIME=	18:00	END TIME=	19:10	DATA TIME (HOURS)=	1.17
				TOTAL=	9.67

GEKA FUEL BURNING RATE

70.29 = FUEL CALIBRATION IN LB/COUNT

329 = TOTAL COUNTS DURING TESTING HOURS

9.67 = HOURS DURING TESTING

23124 = TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

2392 = LB. OF WET FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS)

40.08% = AVERAGE MOISTURE CONTENT DURING TESTING

1433 = LBS OF DRY FUEL BURNED PER HOUR (LBS OF WET FUEL BURNED PER
HOUR * (1-MOISTURE CONTENT))

9000 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

12.90 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

0.72 = TONS OF DRY FUEL BURNED PER HOUR (LBS / 2000)

08-18-93

TIMOTHY PWEBER

CORE

SURFACE

40

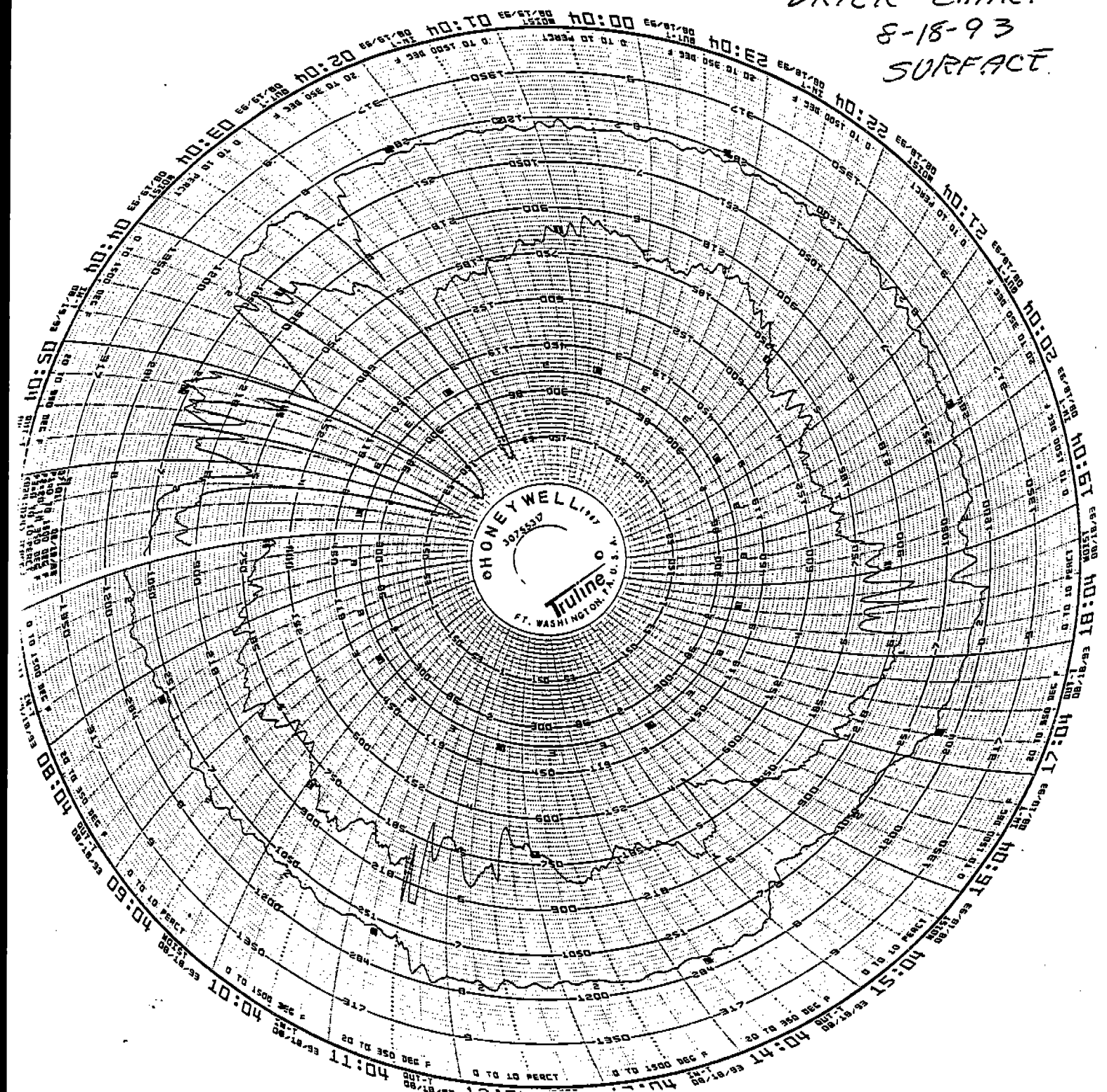
John F. Kennedy

TIMOTHY PUEBER

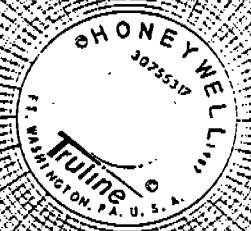
SURFACE

TIME	CORE				CORE				CORE				SURFACE				SURFACE				INLET FLAKE	
	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	DRY BI LEVEL	WET BIN LEVEL	CORE FLAKE MOISTURE	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	DRY BI LEVEL	WET BIN LEVEL	OUTLET FLAKE MOISTURE	FLAKE MOISTURE					
11:00	231	45	874	230	1815	65%	75%	6.6	259	48	781	261	2147	65%	75%	4.8	46.8					
11:10	231	45	886	231	1886				259	48	836	259	2231									
11:20	231	45	900	230	1960				259	48	841	256	2330									
11:30	231	45	912	232	2034	65%			259	48	833	260	2412	65%								
-	5K 1 PPEO				5K 1 PPEO																	
11:50	240	45	876	241	867635				270	48	860	263	727327									
12:00	240	46	880	239	867644	70%	60%	6.2	270	48	710	271	127362	65%	70%	3.0	36.2					
12:10	240	45	870	241	867691				270	48	136	270	727371	12:12								
12:20	240	45	965	251	867702				270	48	846	267	727410	12:22								
12:30	236	40	954	232	867717	12:31		4.6	276	45	780	270	727427	12:31		3.2						
12:40	234	39	867	234					270	45	713	271										
12:50	229	39	844	229	867746	12:52			270	45	677	267	727464	12:52			50.2					
1:00	229	39	854	229		70%	70%		266	45	681	267		65%	70%							
1:10	229	39	879	228	867778	1:13			266	45	722	266	727506	1:13								
1:20	229	39	904	230					266	46	751	264										
1:30	229	39	911	228	867806	1:31	65%		266	46	804	265	727543	1:31	65%							
1:40	229	39	901	230					266	46	800	268										
1:50	229	39	867	229	867817	1:51			266	46	782	266	727605	1:51								
2:00	229	39	878	230		60%	70%	8.6	266	46	749	267		60%	70%	5.0	45.2					
2:10	229	34	902	229					266	46	711	265										
2:20	229	34	893	228					266	46	737	267										
2:30	229	39	862	229	867899	60%			266	46	756	266	727668	60%								
2:40	229	39	879	229					266	46	734	267										
-	229	39	868	228					266	46	765	267										

DRYER CHART
8-18-93
SURFACE.



8-18-93
CORE

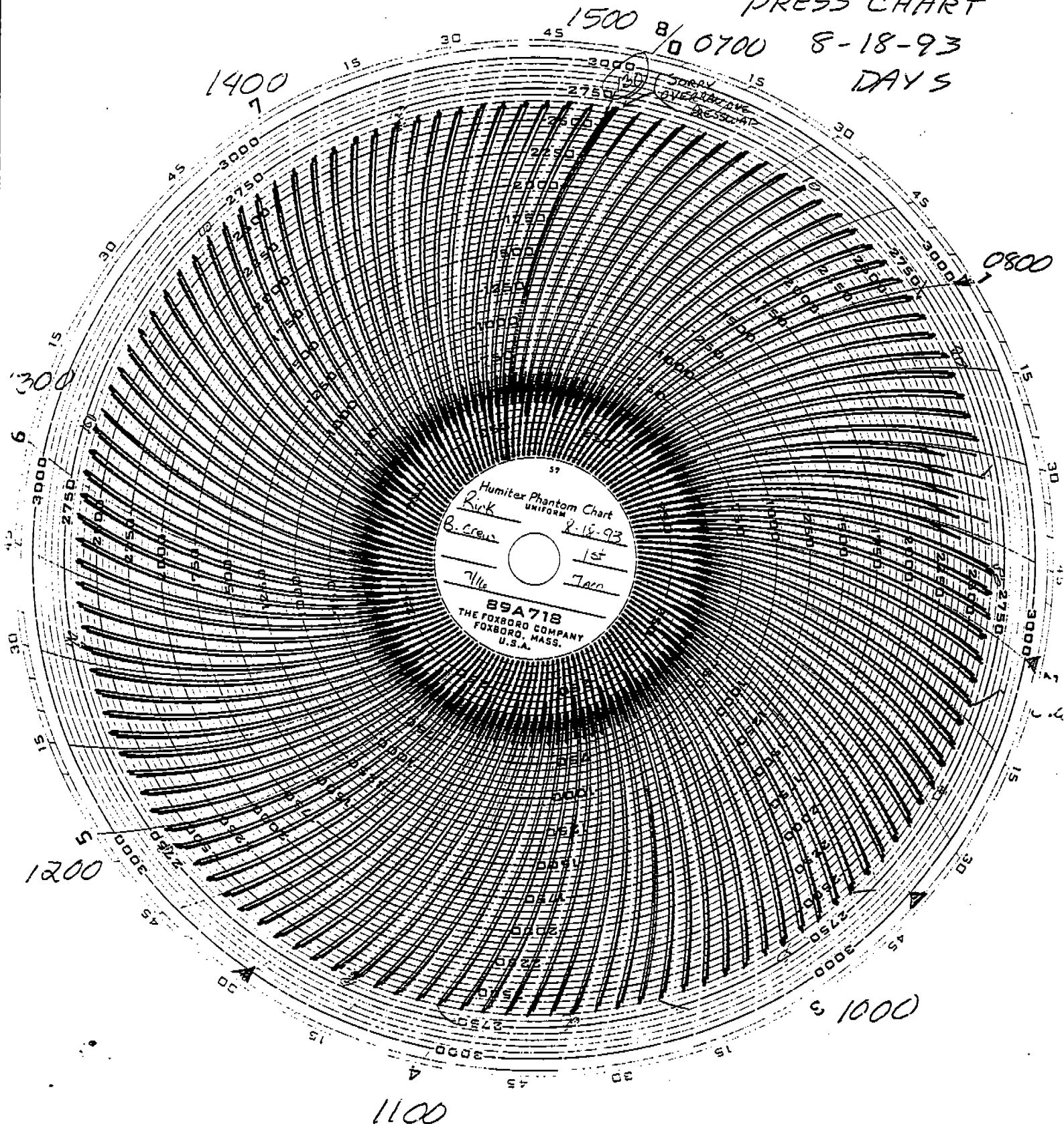


PRESS CHART

1500 8/0700 8-18-93

DAYS

1400

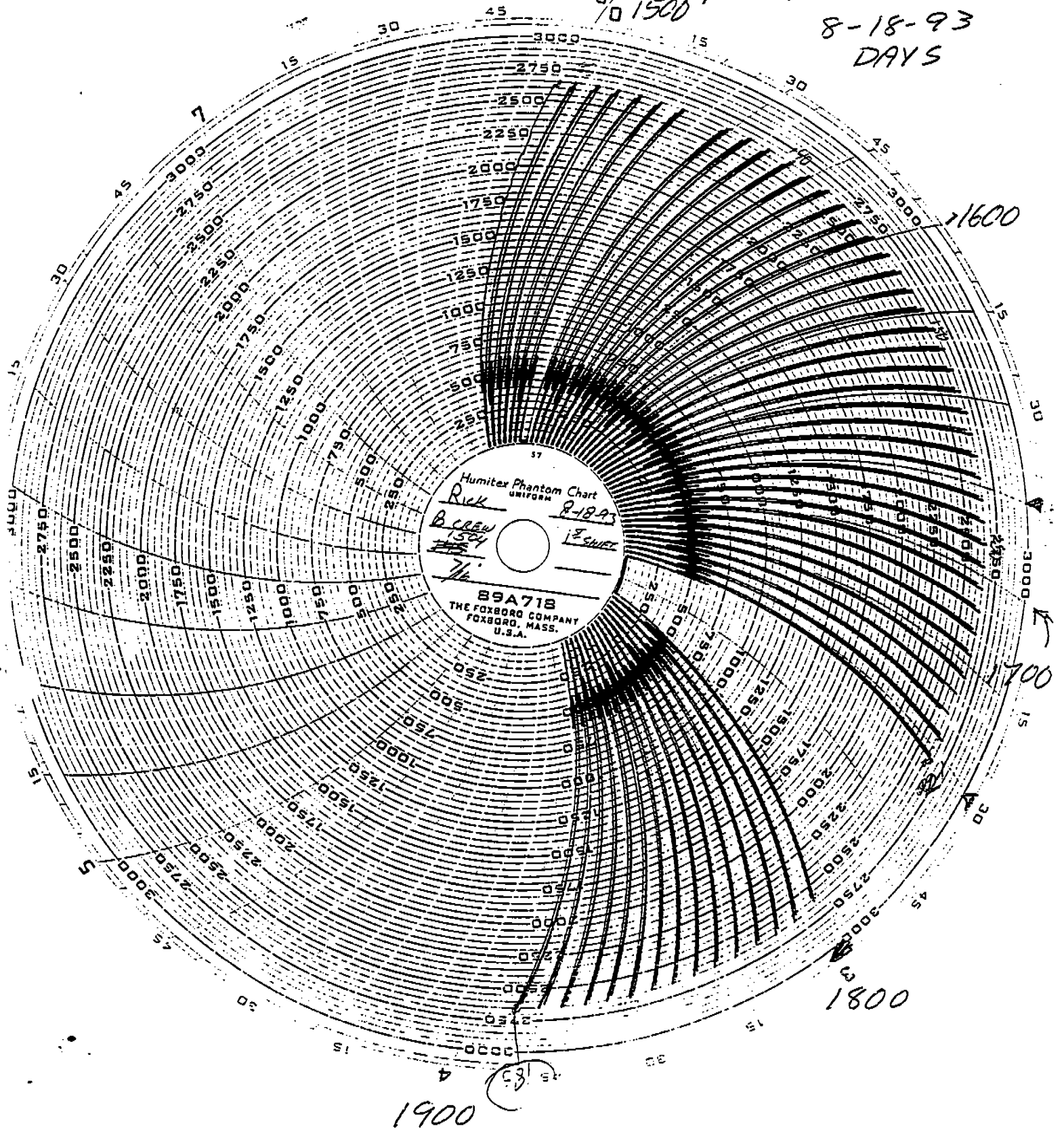


PRESS LOADS

$$0801 - 1130 = 57$$

$$0900 - 1500 = 98$$

8/1500 PRESS CHART
8-18-93
DAYS

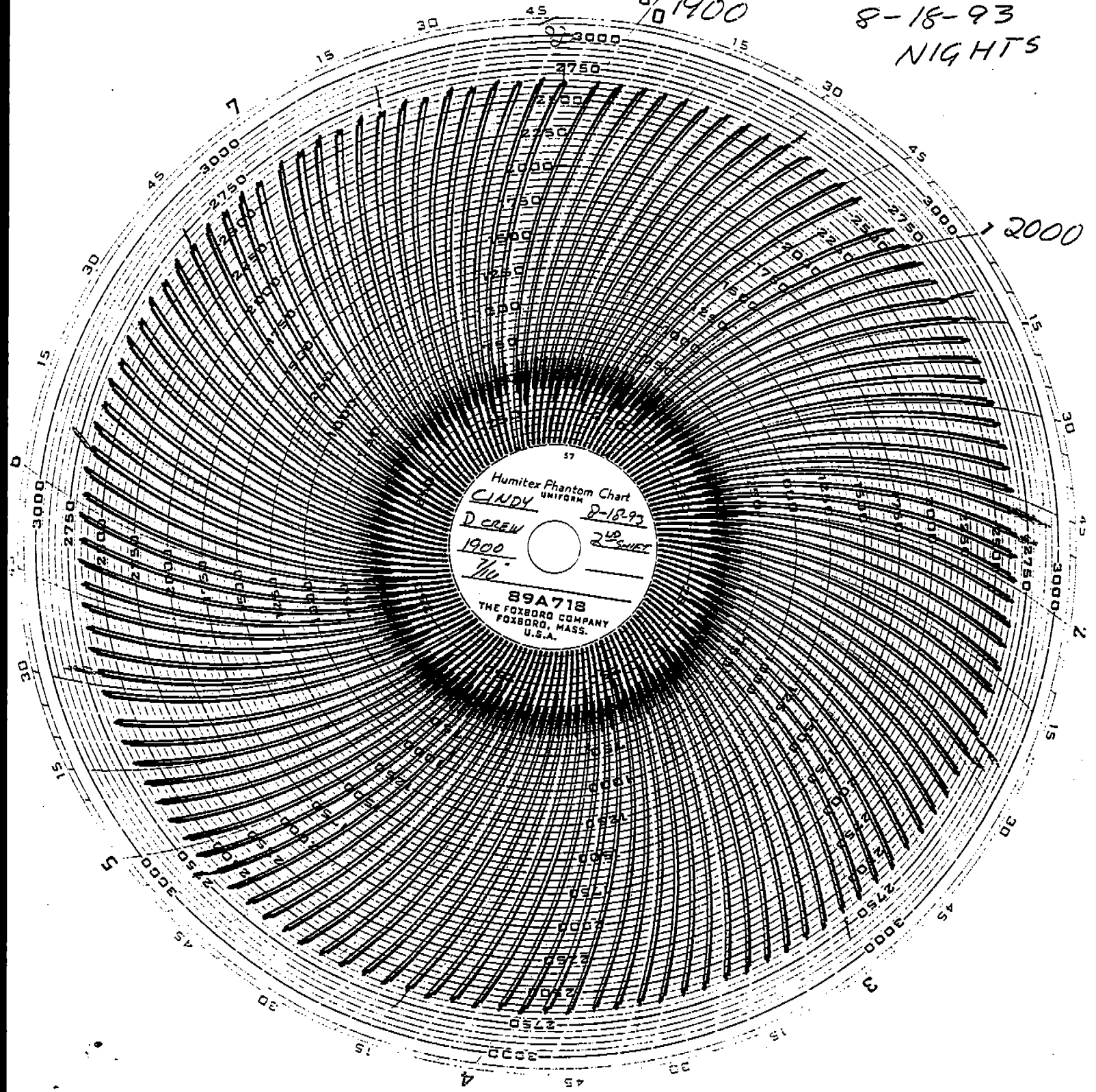


PRESSLOADS
1500 - 1730 = 39
1800 - 1900 = 15

DRESS CHART
8-18-93
NIGHTS

8/1900

2000



PRESS REPORT

LOUISIANA PACIFIC
TOMAHAWK WI

Line Sp.	From	To
739	700	700
	:	:
	:	:
	:	:
	:	:
	:	:

Press Temp.	448 °f
Press Blown Down	
	Time
Former Hyd. Radiator	:
FCOS Hyd. Radiator	:
Spinnerheads flushed	:

Date:	8-18-93
Operator:	CINDY
Crew:	D
Shift:	2 nd
Thickness:	3/16
No. of P/L's	175
Footage:	209,073
Downtime:	65 min

	From	To	M	E	O	Explanation of Downtime
D	12:25	12:26			1	Low core former
O	2:02	2:03			1	" "
W	4:44	5:20			36	Unloader Boom trip - No flakes
N	6:10	6:30			20	No flakes
T	6:46	6:53		7		MDI Pump
I	:	:				
M	:	:				
E	:	:				

M-Mechanical E-Electrical O-Operator

Press	Loads
	175 P/L

Core ETube	Shutdown	Face ETube	Shutdown	Hammermill	to dump
From	To	From	To	From	To
				7:49	7:52
				2:09	2:16
				2:30	2:40
				3:05	3:23

PRESS REPORT

LOUISIANA PACIFIC
TOMAHAWK WI

Line Sp.	From	To
759	0700	1900
	:	:
	:	:
	:	:
	:	:
	:	:

Press Temp.	455
Press Blown Down	---
	Time
Former Hyd. Radiator	---
FCOS Hyd. Radiator	---
Spinnerhead flushed	---

Date:	8-18-93
Operator:	Rick
Crew:	3
Shift:	1st
Thickness:	7/16
No. of P/L's:	185
Footage:	221,020
Downtime:	32 MIN.

	From	To	M	E	O	Explanation of Downtime
D	13:34	13:35	1			STICKER FLT #4
O	15:23	15:27	4			MISSED SCREEN - #6 RETURN -> F.L. TRANSFER
W	17:33	18:00	27			CHARGE DRY BIN'S & ADJUST TAIL ROLLER ON RECLAIM CONVEY.
N	:	:				
T	:	:				
I	:	:				
M	:	:				
E	:	:				

M-Mechanical E-Electrical O-Operator

Press Loads				
10	20	30	40	50
THH	THH	THH	THH	THH
60	70	80	90	100
THH	THH	THH	THH	THH
110	120	130	140	150
THH	THH	THH	THH	THH
160	170	180		
THH	THH	THH		

Core Elube Shutdown		Face Elube Shutdown		Hammermill to dump	
From	To	From	To	From	To
				1138	1831

413 M

TIMOTHY PWEER
TOMAHAWK 8-18-93RESIN USE
EVERY 30 MIN - LBS

TIME	MDI TOTAL	CORE WAX (58.5%)	SURFACE WAX (58.5%)	PHENOLIC TOTAL (60%)
7:06	23	12	20	74
7:31	120	65	98	388
8:03	247	128	197	782
8:31	360	185	285	1130
9:01	- 477	- 245	- 379	- 1563
9:30	600	306	474	1882
10:01	715	365	574	2249
10:34	849	429	683	2665
11:02	958	490	766	3081
11:31	1072	556	856	3364
12:01	1189	625	950	3742
12:30	1363	690	1039	4100
1:02	1431	762	1135	4497
1:29	1538	822	1214	4832
2:03	1677	899	1324	5263
2:32	1787	959	1414	5612
3:03	1910	1027	1514	6002
3:31	2005	1082	1594	6291
4:01	2113	1143	1683	6644
4:31	2235	1208	1780	7027
5:02	2358	1274	1878	7407
5:32	- 2480	- 1334	- 1965	- 7782
6:01	- 2491	- 1344	- 1982	- 7829
6:30	2604	1377	2072	8187
7:00	2717	1457	2160	8545

projected
for 07:10 - 2755 - 1477 - 2189 - 8664

LBS				
0901-1532	2003	1089	1586	6219
601-710	264	133	207	835
	2267	1222	1793	7054
		714@	1049@	4232@
		100%	100%	100%
			49	SOLIDS

T-O HEATER LOG

DATE: 08-18-93

TIMOTHY DWEBER

PLANT: TOMAHAWK

BY:

OIL SETPOINT = 490°

1. READINGS EVERY 10 MINUTES.
2. BARK MOISTURE ONCE PER HOUR.
3. NOTE IF SET-POINTS ARE CHANGED.

TIME	OIL TEMP IN	OIL TEMP OUT	AIR FLOW (mb)	FUEL COUNT	FURNACE TEMP	BARK MOISTURE %	BAGHOUS PRES.	DRO
7:04	489.3°	489.1°	FROM	3	1392°			
7:11	462.2°	490.0°	GEKA	8	1411°			
7:21	463.3°	493.1°	ROOM	12	1454°			
7:31	459.4°	491.1°		18	1515°			
7:50	456.9°	492.1°		29	1584			
8:02	457.6	492.0		34	1612			
8:11	455.8	491.5		43	1576			
8:21	454.7	485.5		49	1557			
8:31	456.5	489.1		59	1612			
8:41	457.7	489.6		60	1610			
8:51	459.0	489.2		65	1572			
9:01	457.9	491.7		76	1512			
9:10	488.0	490.1		80	1518			
9:20	458.5	490.7		84	1535			
9:31	456.3	492.0		92	1537			
9:41	459.6	492.0		96	1541			
9:51	459.8	491.5		102	1539			
10:01	458.0	489.3		109	1533			
10:11	458.3	490.0		115	1524			
10:21	458.3	489.3		123	1502			
10:34	458.3	490.6		126	1543			
10:41	457.0	490.9		132	1543			
10:51	459.6	489.9		137	1533			
11:01	459.5	491.7		141	1548			
11:11	459.1	490.4		147	1556			
11:21	457.5	489.0		154	1543			
11:30	459.4	492.0		157	1542			
11:30	458.8	488.8		161	1552			
12:01	456.3	490.6		176	1547			
12:11	457.0	490.7		184	1541			
12:21	458.3	489.2		189	1538			
12:30	459.3	490.6		193	1534			
12:41	456.0	490.4		202	1548			
12:50	458.0	490.1		209	1523			
13:01	457.2	492.0		217	1538			
1:11	460.9	491.7		221	1529			
1:20	460.0	490.0		225	1533			
1:28	459.4	493.1		230	1543			
1:42	456.9	490.3		240	1527			
1:50	460.9	489.3		243	1492			
2:03	460.4	492.6		251	1529			

2062

TIME	OIL IN	TEMP OUT	FUEL	FURNACE
1:11	459.1	491.5	254	1524
2:21	457.5	492.1	258	1518
2:31	458.5	491.5	263	1529
2:41	458.0	489.9	269	1525
2:51	457.2	489.2	272	1546
3:03	459.1	491.4	279	1527
3:10	458.9	490.9	283	1524
3:22	454.7	488.3	290	1505
3:30	456.6	490.6	293	1532
3:41	458.8	490.4	303	1536
3:52	460.8	490.9	306	1528
4:00	460.0	492.1	312	1517
4:12	458.3	492.4	321	1505
4:21	458.3	491.0	326	1509
4:30	459.1	489.6	333	1521
4:40	456.5	491.4	339	1537
4:51	458.0	490.1	345	1548
5:01	457.9	491.5	351	1572
5:11	455.9	490.4	358	1542
5:21	457.5	490.9	364	1561
5:30	457.0	490.7	367	1577
5:50	462.4	491.2	379	1565
6:00	461.2	491.2	382	1502
6:10	466.1	490.4	384	1456
6:21	465.1	491.4	391	1424
6:30	462.8	490.0	394	1422
6:41	456.5	491.2	398	1438
6:51	459.3	490.6	407	1493
7:00	456.1	491.6	414	1519
7:10*			420	

proportioned

TIMOTHY PWEBER

08-18-93

$$\text{FUEL } (367 - 76) + (420 - 382)$$

$$291 + 38 = 329$$

TOMAHAWK
GERA READINGS

8-18-93
ONCE PER HOUR

TIME	AIRFLOW (m.b)	BARK MOISTURE	BAGHOUSE PRESSURE DROP
8:00	.4	42.6	2.5
9:00	.5	42.8	2.1
10:00	.4	39.4	2.2
10:00			
11:00	.4	40.8	6.5
12:00	.4	41.4	6.5
1:00	.4	41.2	3
2:00	.4	36.6	2.5
3:00	.4	39.6	2.4
4:00	.5	41.6	2
5:00	.4	39.8	2
6:00	.5	37.6	1.5

40.08%

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

T.O. HEATER TESTING 8-19-93 - VOC,PM,NOX,HCHO,BENZENE

DATA START TIME=	09:30	END TIME=	15:00	DATA TIME (HOURS)=	5.50
DATA START TIME=	16:00	END TIME=	17:02	DATA TIME (HOURS)=	1.03
DATA START TIME=	17:45	END TIME=	19:00	DATA TIME (HOURS)=	1.25

TOTAL= 7.78

BOARD WEIGHTS - LBS

**WEIGHTS OF APPROXIMATELY EVERY 25TH
UNTRIMMED BOARD FROM TAPES**

208	203	196
200	198	198
200	207	201
202	206	196
196	206	197
202	205	202
195	198	199
195	204	198
192	197	196
195	194	197
194	200	
199	194	
198	195	

**198.97 LB = AVERAGE
UNTRIMMED
MAT WEIGHT**

**181.06 LB = AVERAGE
FINISHED BOARD
WEIGHT
(UNTRIMMED MAT
WEIGHT - TRIM
WEIGHT)**

9.0% = TRIM

PLANT PRODUCTION RATE

38.80 , (lb per cubic foot)

7.78 =HOURS DURING TESTING

125 =PRESSLOADS (88+17+20)

1000 =NO. OF (8' X 16') BOARDS PRODUCED (PRESSLOADS x 8 BOARDS/LOAD)

181060 =LBS FINISHED PRODUCT (BOARDS x WEIGHT OF FINISHED BOARD)

**23263 =LBS FINISHED PRODUCT PRODUCED PER HOUR (LBS FINISHED
PROD./TESTING HOURS)**

**11.63 =TONS FINISHED PRODUCT PRODUCED PER HOUR (LB FINISHED PROD
PROD/HR / 2000 LB)**

TOMAHAWK TESTING 8-17-93 THROUGH 8-19-93

T.O. HEATER TESTING 8-19-93 - VOC,PM,NOX,HCHO,BENZENE

DATA START TIME=	09:30	END TIME=	15:00	DATA TIME (HOURS)=	5.50
DATA START TIME=	16:00	END TIME=	17:02	DATA TIME (HOURS)=	1.03
DATA START TIME=	17:45	END TIME=	19:00	DATA TIME (HOURS)=	1.25
				TOTAL=	7.78

GEKA FUEL BURNING RATE

70.29 =FUEL CALIBRATION IN LB/COUNT

294 = TOTAL COUNTS DURING TESTING HOURS

7.78 =HOURS DURING TESTING

20664 =TOTAL LB. OF FUEL BURNED DURING TESTING (TOTAL COUNTS x CAL.)

2655 =LB. OF WET FUEL BURNED PER HOUR (TOTAL LB OF FUEL BURNED /
TESTING HOURS

41.80% =AVERAGE MOISTURE CONTENT DURING TESTING

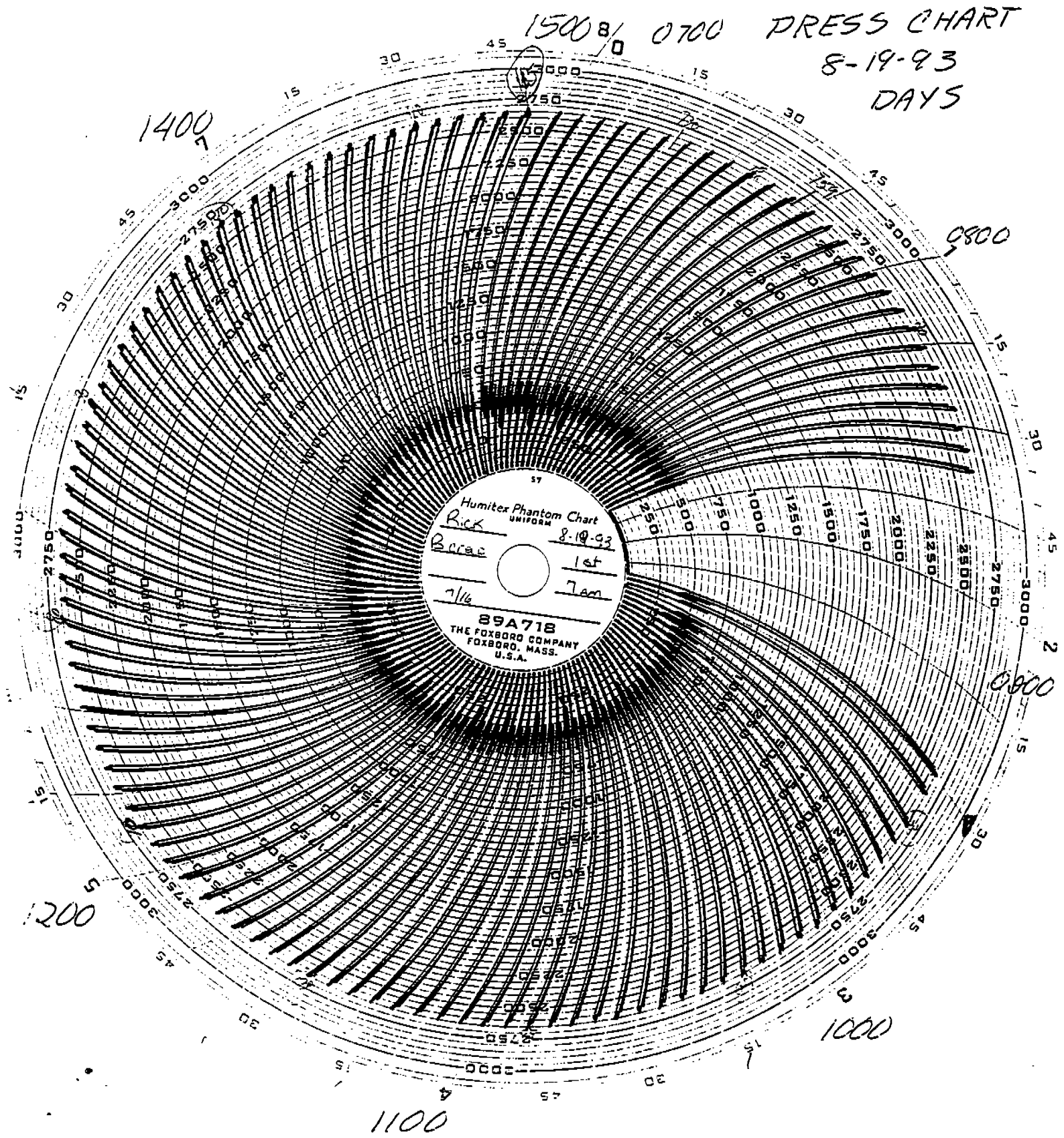
1545 =LBS OF DRY FUEL BURNED PER HOUR (LBS OF WET FUEL BURNED PER
HOUR * (1-MOISTURE CONTENT))

9000 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)

13.91 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

0.77 =TONS OF DRY FUEL BURNED PER HOUR (LBS / 2000)

1500 8/0 0700 PRESS CHART
8-19-93
DAYS



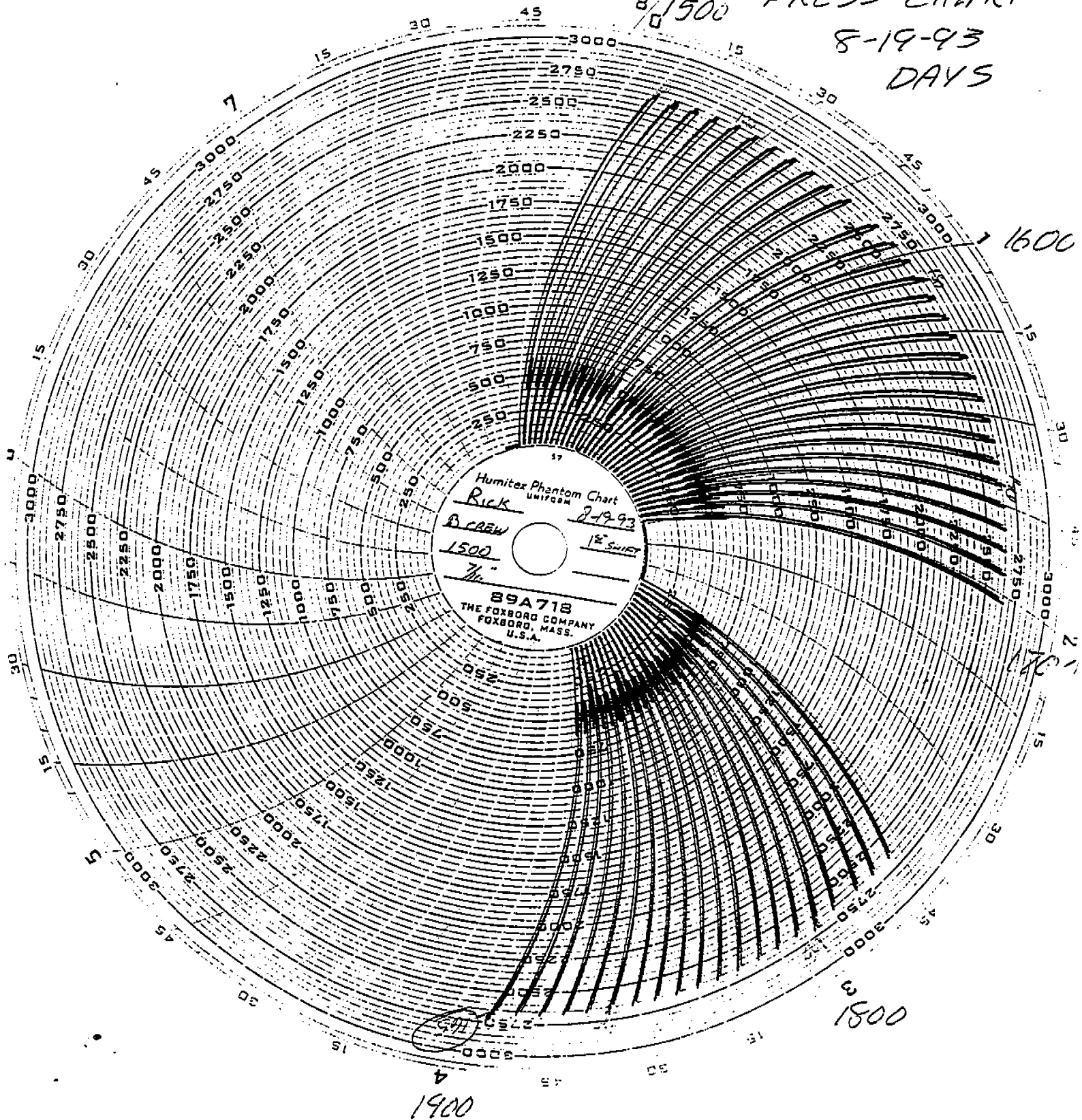
PRESSLOADS
0930-1500 = 88

8/1500

PRESS CHART

8-19-93

DAYS



PRESS LOADS

$$1500 - 1702 = 17$$

$$1745 - 1900 = 20$$

PRESS REPORT

LOUISIANA PACIFIC
TOMAHAWK WI

Line Sp.	From	To
759	07:00	07:22
730	07:22	07:45
769	07:45	19:00
	:	:
	:	:
	:	:

Press Temp.	448°F
Press Blown Down	Time
Former Hyd. Radiator	+
FCOS Hyd. Radiator	+
Spinnerheads flushed	12:22

Date:	8-19-93
Operator:	Rick
Crew:	8
Shift:	1st
Thickness:	7/16
No. of P/L's:	165
Footage:	197,126
Downtime:	106 MIN.

	From	To	M	E	O	Explanation of Downtime
D	08:39	08:41	2			LOW FLOW MDI
O	08:42	09:29	47			STILL LOW FLOW MDI
W	09:34	09:35	1			CHARGE TSL FORMER
N	11:55	11:56	1			CHARGE CORE FORMER
T	14:58	15:07	9			ID. FAN TURNED OFF, COULDN'T GIEKA - RESTART - SMALL FIRE IN FEED HOPPER
I	15:51	15:54	3			CHARGE CORE FORMER
M	17:00	17:01	1			LOADER BOOM OVERTRAVEL
E	17:02	17:43	41			LOW DRY BIN'S
	17:54	17:55	1			CHARGE CORE FORMER

M-Mechanical E-Electrical O-Operator

Press	Loads
10	20
30	40
50	60
70	80
90	100
110	120
130	140
150	160

Core Elube	Shutdown	Face Elube	Shutdown	Hammermill to dump
From	To	From	To	From To
				1103 1105 2 MIN
				1123 1135 12 MIN
				1140 1142 2 MIN
				1147 1158 11 MIN
				1226 1233 7 MIN
				1239 1242 4 MIN
				1251 1255 4 MIN
				1310 1311 1 MIN
				1335 1410 35 MIN
				1440 1505 25 MIN
				103 MIN

COUNTS

FUEL 0930-1500 = 213
 1600-1702 = 134
 1745-1800 = 47

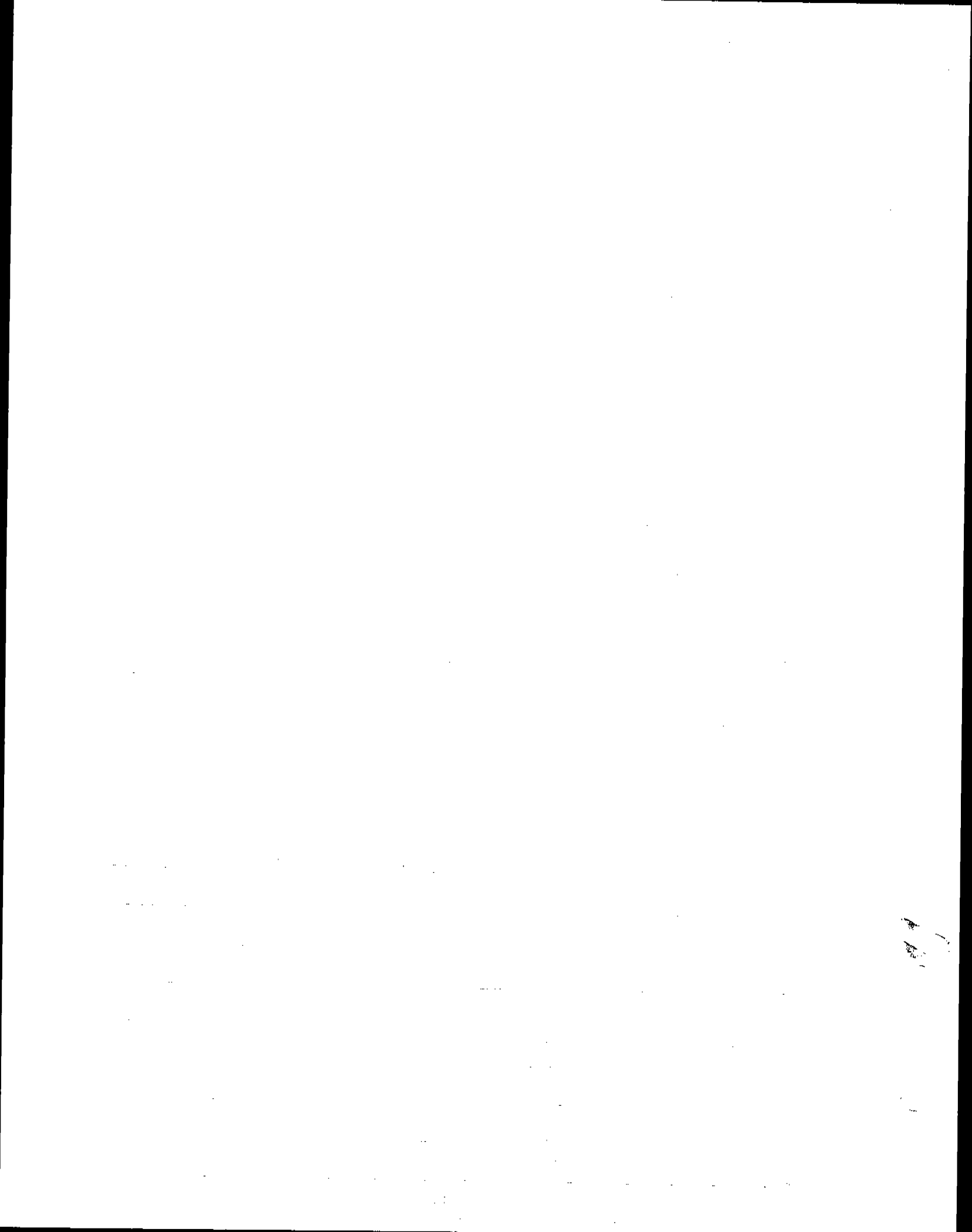
GEKA READINGS 8-19-93

Time	OUT	IN	FURNACE	FUEL	TIME	OUT	IN	FURNACE	FUEL	TIME	OUT	IN	FURNACE	FUEL
7:00	490.1	463.0	1364	6	11:00	490.6	456.9	1528	135	13:00	435.2	427.1	1663	268
7:10	490.6	464.3	1370	7	11:10	490.6	454.0	1532	140	3:10	498.6	447.6	1623	297
7:20	490.4	460.0	1397	12	11:20	490.1	457.6	1537	144	3:20	486.1	459.1	1624	305
7:31	490.6	452.4	1449	20	11:30	491.1	458.0	1546	151	3:30	480.8	457.6	1647	306
7:40	490.9	455.9	1477	30	11:40	491.0	455.2	1545	155	3:40	490.3	460.1	1620	309
7:50	492.3	457.5	1495	36	11:50	491.0	459.8	1534	160	3:50	489.9	458.4	1587	314
8:00	490.9	456.2	1524	41	12:00	489.1	456.3	1521	164	4:00	490.9	459.6	1562	320
8:10	491.1	458.5	1524	44	12:10	491.0	457.1	1499	169	4:10	487.0	459.6	1517	324
8:20	490.9	455.8	1517	49	12:20	492.2	459.4	1491	174	4:20	490.4	456.9	1494	328
8:30	493.2	458.2	1513	58	12:30	491.2	458.6	1517	183	4:30	490.0	457.2	1489	333
8:40	—	—	—	—	12:40	491.2	455.1	1490	190	4:40	490.4	461.1	1488	339
8:50	491.4	461.5	1495	62	12:50	490.1	458.1	1491	194	4:50	491.2	460.2	1514	344
9:00	490.9	465.7	1461	67	1:00	490.9	459.9	1506	202	5:00	489.2	458.5	1527	354
9:10	490.6	464.5	149	70	1:10	490.6	458.9	1494	206	5:10	490.6	457.4	1529	359
9:20	491.1	461.9	1377	74	1:20	490.6	458.3	1495	212	5:20	490.6	463.1	1535	363
9:30	492.2	466.6	1345	75	1:30	491.0	459.3	1487	218	5:30	493.2	465.8	1490	365
9:40	490.6	467.4	1304	84	1:40	489.6	458.2	1487	223	5:40	491.7	464.4	1443	368
9:50	491.7	467.9	1297	90	1:50	492.6	457.1	1498	226	5:50	489.6	468.8	1401	373
10:00	489.9	460.1	1324	97	2:00	491.7	459.8	1513	230	6:00	487.7	467.0	1372	377
10:10	491.2	461.2	1372	104	2:10	491.9	458.3	1489	238	6:10	491.0	462.2	1349	384
10:20	492.6	459.1	1418	112	2:20	490.6	456.8	1482	246	6:20	496.1	455.5	1467	398
10:30	491.3	455.7	1482	117	2:30	490.7	460.0	1476	252	6:30	488.8	460.0	1507	402
10:40	491.0	456.3	1519	121	2:40	486.6	457.6	1543	265	6:40	490.4	458.3	1530	406
10:50	490.9	456.1	1537	128	2:50	462.4	445.3	1654	279	6:50	490.4	455.8	1539	412
														418 = 700

TOMAHAWK
GEKA READINGS

8-19-93
ONCE PER HOUR

TIME	AIR FLOW (mm)	BARK MOISTURE	BAGHOUSE PRESSURE DROP
8:00 am	0.3	45.2	6
9:00	0.5	33.6	6
10:00	0.5	44.2	6
11:00	0.5	39.0	8
12:00	0.5	49.4	8
1:00 pm	0.5	43.8	9
2:00	0.5	38.6	9
3:00	NO TESTING. GEKA DOWN.		
4:00	0.5	41.6	4
5:00	0.5	41.8	5
6:00	0.5	44.0	5
7:00	0.5	42.0	7
		41.8	



APPENDIX L

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.

After sampling is complete, the filter is removed and placed in a clean container. The nozzle 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 then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 OF. This temperature is used to prevent condensation of atmospheric moisture due to the cooling effect induced by the evaporation of acetone. The acetone-free sample is then transferred to an oven and dried at 105 OC for 30 minutes, cooled in a desiccator over Drierite, and then weighed to the nearest .01 mg. The filter sample is quantitatively transferred to a 6-inch watch glass and dried in an oven at 105 OC for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest .01 mg. All weighings are performed in a balance room where the relative humidity is hydrostatted to less than 50% relative humidity. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse is corrected for the acetone blank. The Drierite column is weighed on-site and the water collected by Drierite is added to the condensate so that the total amount of absorbed water may be ascertained.

Integrated flue gas samples for Orsat analysis were collected simultaneously from the stack and from the breeching at the inlet to the wet scrubber. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

Interpoll Laboratories
(612)786-6020

Condensible Organic Compounds Analysis
(State of Wisconsin - EPA Method 5)
Method II-8672-WI

Equipment: Separatory funnel - 500 cc with Teflon stopcock
 Powder funnel - 75 mm ID with a glass wood plug
 Evaporating dish(es) - 200 cc or 250 cc beaker

Reagents: Methylene chloride
 Sodium sulfate - (ACS) granular anhydrous (purified by
 heating for four hours in a shallow tray)

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 °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 °C if the analysis is not conducted within 48 hours.

ANALYSIS:

1. Sample bottles are removed from storage and the contents quantitatively transferred to a clean 500 cc separatory funnel equipped with a Teflon stopcock.
2. Rinse the sample container with distilled water and add to separatory funnel.
3. Then rinse the sample container with acetone and pour through sodium sulfate into a tare beaker marked A.
4. The sample is then extracted consecutively with three 50 cc aliquots of methylene chloride. The extraction is performed according to normal laboratory practice observing the customary safety precaution of releasing excess pressure after each shaking.
5. After each of the three extractions are completed, the organic solvent should be dried by passing it through a funnel containing anhydrous sodium sulfate and collecting it and two 50 cc rinses in the tared beaker marked A (the same one used to catch the acetone container rinse).
6. Evaporate to dryness in a hood at 70 °F or less. Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point otherwise water will be condensed in the container.

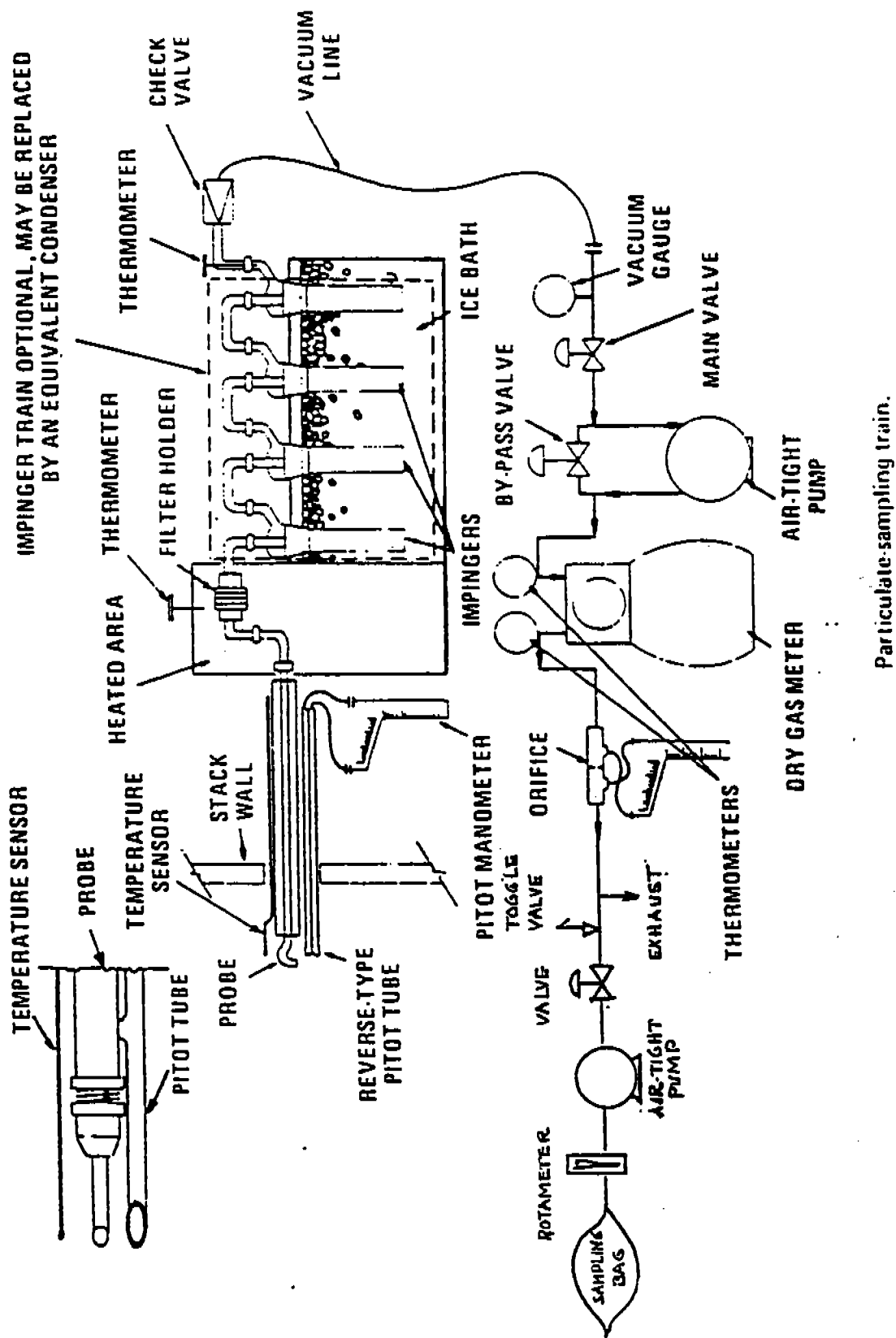
7. Desiccate for two hours in a sealed desiccator and final weigh. Report all results in grams. All weighings should be made to nearest 0.1 mg (four places).
8. The remaining liquid in the separatory funnel is then transferred to a tared beaker marked B and is evaporated to dryness at $220^{\circ}\text{F} \pm 10^{\circ}\text{F}$. The analyst may take an aliquot of the sample, transferring it to a tared beaker and evaporate to dryness at $220^{\circ}\text{F} \pm 10^{\circ}\text{F}$. If an aliquot is used, the weight of the sample and aliquot will have to be taken to correct for the total sample weight.
9. After the drying step, the sample is cooled in a desiccator and weighted to a constant weight to the nearest 0.1 mg.

Calculation (if aliquot is taken):

$$\text{grams} = \frac{(\text{grams recovered from aliquot}) \times (\text{total volume (ml) or grams of sample})}{(\text{aliquot volume (ml) or grams used})}$$

If volume is used, it must be used for both the aliquot and sample. The same goes for using weight.

10. A field blank should be analyzed in an identical manner. If a field blank is not submitted, take an aliquot of Class I water equal in volume to the samples and analyze in a similar manner.
11. The results for container A are to be marked in the organic section of Interpoll Form #LSC-036.
12. The results for container B are to be marked in the inorganic section of Interpoll Form #LSC-036.



DETERMINATION OF CARBON MONOXIDE EMISSIONS
FROM STATIONARY SOURCES

Carbon monoxide concentrations were determined in accordance with CFR Title 40, Part 60, Appendix A (revised July 1, 1990), EPA Method 10 using the integrated sampling technique. An integrated gas sample is extracted from a three-point sampling traverse and analyzed for carbon monoxide content using a ACS Model 3300 nondispersive infrared analyzer (NDIR). This analyzer has a measuring range of 0-500 and 0-1000 ppm. The measuring method is single beam. Linearity is better than $\pm 2\%$ full scale and the noise is less than 0.5 fs. The minimum detectable concentration is 5 ppm. Zero drift is rated at $\pm 1\%$ fs per 24 hours and the span drift is less than 1% in a 24-hour period. Response time is less than 15 seconds to 90% of final reading. Precision is rated at better than $\pm 0.5\%$ fs on low range and $\pm 1\%$ fs on high range. The flow rate through the analyzer is 1.0 ± 0.5 LPM..

Integrated flue gas samples are collected over a 21-minute period using a three or more point traverse. The flue gas samples are collected at a flow rate of 400-1000 cc per minute. The flue gas is dried using a desiccant column filled with silica gel or Drierite. Integrated gas samples are collected in 44-liter Tedlar bags. The bags are leak-checked immediately before initiation of sampling. The integrated bags are housed in aluminum housings to eliminate any contact with sharp objects which might cause puncture and leakage.

After sampling is complete, the bags are transported to the laboratory for analysis. The bags are analyzed using a flow system whereby any residual moisture and carbon dioxide are quantitatively removed prior to introduction into the NDIR. This is accomplished using two cartridges in series immersed in an ice bath. The first cartridge contains silica gel or Drierite and the second cartridge Ascarite as prescribed in EPA Method 10. The analyzer is then zeroed and calibrated

using NBS traceable standard gases (Scott Specialty Gases). These gases are introduced directly into the system and passed through the two adsorbent cartridges. A high purity nitrogen zero gas is used to zero the analyzer. Several concentrations of carbon monoxide in air standards are used to calibrate the analyzer and to quality assure intermittently the analysis of the individual flue gas samples.

The integrated bag samples are also analyzed for carbon dioxide and oxygen by means of a standard Orsat analyzer equipped with a 100 cc buret using standard commercially available absorption reagents in accordance with EPA Method 3. The moisture content of the flue gas is determined independently in accordance with EPA Method 4 (large impinger version) to allow mathematical conversion of the dry, CO₂-free concentrations to actual flue gas conditions.

The reported carbon monoxide concentrations, unless otherwise noted, have been mathematically corrected for both carbon dioxide and moisture content in accordance with the equations given in EPA Method 10.

7.4 Adsorption Tube Procedure (Alternative Procedure). It is suggested that the tester refer to the National Institute of Occupational Safety and Health (NIOSH) method for the particular organics to be sampled. The principal interferent will be water vapor. If water vapor is present at concentrations above 3 percent, silica gel should be used in front of the charcoal. Where more than one compound is present in the emissions, then develop relative adsorptive capacity information.

7.4.1 Additional Apparatus. In addition to the equipment listed in the NIOSH method for the particular organic(s) to be sampled, the following items (or equivalent) are suggested.

7.4.1.1 Probe (Optional). Borosilicate glass or stainless steel, approximately 6-mm ID, with a heating system if water condensation is a problem, and a filter (either in-stack or out-stack heated to stack temperature) to remove particulate matter. In most instances, a plug of glass wool is a satisfactory filter.

7.4.1.2 Flexible Tubing. To connect probe to adsorption tubes. Use a material that exhibits minimal sample adsorption.

7.4.1.3 Leakless Sample Pump. Flow controlled, constant rate pump, with a set of limiting (sonic) orifices to provide pumping rates from approximately 10 to 100 cc/min.

7.4.1.4 Bubble-Tube Flowmeter. Volume accuracy within ± 1 percent, to calibrate pump.

7.4.1.5 Stopwatch. To time sampling and pump rate calibration.

7.4.1.6 Adsorption Tubes. Similar to ones specified by NIOSH, except the amounts of adsorbent per primary/backup sections are 800/200 mg for charcoal tubes and 1040/260 mg for silica gel tubes. As an alternative, the tubes may contain a porous polymer adsorbent such as Tenax GC or XAD-2.

7.4.1.7 Barometer. Accurate to 5 mm Hg, to measure atmospheric pressure during sampling and pump calibration.

7.4.1.8 Rotameter. 0 to 100 cc/min, to detect changes in flow rate during sampling.

7.4.2 Sampling and Analysis. It is suggested that the tester follow the sampling and analysis portion of the respective NIOSH method section entitled "Procedure." Calibrate the pump and limiting orifice flow rate through adsorption tubes with the bubble tube flowmeter before sampling. The sample system can be operated as a "recirculating loop" for this operation. Record the ambient temperature and barometric pressure. Then, during sampling, use the ro-

tameter to verify that the pump and orifice sampling rate remains constant.

Use a sample probe, if required, to obtain the sample at the centroid of the duct, or at a point no closer to the walls than 1 m. Minimize the length of flexible tubing between the probe and adsorption tubes. Several adsorption tubes can be connected in series, if the extra adsorptive capacity is needed. Provide the gas sample to the sample system at a pressure sufficient for the limiting orifice to function as a sonic orifice. Record the total time and sample flow rate (or the number of pump strokes), the barometric pressure, and ambient temperature. Obtain a total sample volume commensurate with the expected concentration(s) of the volatile organic(s) present, and recommended sample loading factors (weight sample per weight adsorption media). Laboratory tests prior to actual sampling may be necessary to predetermine this volume. When more than one organic is present in the emissions, then develop relative adsorptive capacity information. If water vapor is present in the sample at concentrations above 2 to 3 percent, the adsorptive capacity may be severely reduced. Operate the gas chromatograph according to the manufacturer's instructions. After establishing optimum conditions, verify and document these conditions during all operations. Analyze the audit samples (see Section 7.4.4.3), then the emission samples. Repeat the analysis of each sample until the relative deviation of two consecutive injections does not exceed 5 percent.

7.4.3 Standards and Calibration. The standards can be prepared according to the respective NIOSH method. Use a minimum of three different standards; select the concentrations to bracket the expected average sample concentration. Perform the calibration before and after each day's sample analyses. Prepare the calibration curve by using the least squares method.

7.4.4 Quality Assurance.

7.4.4.1 Determination of Desorption Efficiency. During the testing program, determine the desorption efficiency in the expected sample concentration range for each batch of adsorption media to be used. Use an internal standard. A minimum desorption efficiency of 50 percent shall be obtained. Repeat the desorption determination until the relative deviation of two consecutive determinations does not exceed 5 percent. Use the average desorption efficiency of these two consecutive determinations for the correction specified in Section 7.4.4.5. If the desorption efficiency of the compound(s) of interest is questionable under actual sampling conditions, use of the Method of Standard Additions may be helpful to determine this value.

7.4.4.2 Determination of Sample Collection Efficiency. For the source samples, ana-

lyze the primary and backup portions of the adsorption tubes separately. If the backup portion exceeds 10 percent of the total amount (primary and backup), repeat the sampling with a larger sampling portion.

7.4.4.3 Analysis Audit. Immediately before the sample analyses, analyze the two audits in accordance with Section 7.4.2. The analysis audit shall agree with the audit concentration within 10 percent.

7.4.4.4 Pump Leak Checks and Volume Flow Rate Checks. Perform both of these checks immediately after sampling with all sampling train components in place. Perform all leak checks according to the manufacturer's instructions, and record the results. Use the bubble-tube flowmeter to measure the pump volume flow rate with the orifice used in the test sampling, and the result. If it has changed by more than 5 but less than 20 percent, calculate an average flow rate for the test. If the flow rate has changed by more than 20 percent, recalibrate the pump and repeat the sampling.

7.4.4.5 Calculations. All calculations can be performed according to the respective NIOSH method. Correct all sample volumes to standard conditions. If a sample dilution system has been used, multiply the results by the appropriate dilution ratio. Correct all results by dividing by the desorption efficiency (decimal value). Report results as ppm by volume, dry basis.

7.5 Reporting of Results. At the completion of the field analysis portion of the study, ensure that the data sheets shown in Figure 18-11 have been completed. Summarize this data on the data sheets shown in Figure 18-15.

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METHOD 18—MEASUREMENT OF GASEOUS ORGANIC COMPOUND EMISSIONS BY GAS CHROMATOGRAPHY

Introduction

This method should not be attempted by persons unfamiliar with the performance characteristics of gas chromatography, nor by those persons who are unfamiliar with source sampling. Particular care should be exercised in the area of safety concerning choice of equipment and operation in potentially explosive atmospheres.

1. Applicability and Principle

1.1 Applicability. This method applies to the analysis of approximately 90 percent of the total gaseous organics emitted from an industrial source. It does not include techniques to identify and measure trace amounts of organic compounds, such as those found in building air and fugitive emission sources.

This method will not determine compounds that (1) are polymeric (high molecular weight), (2) can polymerize before analysis, or (3) have very low vapor pressures at stack or instrument conditions.

1.2 Principle.

The major organic components of a gas mixture are separated by gas chromatography (GC) and individually quantified by flame ionization, photoionization, electron capture, or other appropriate detection principles.

The retention times of each separated component are compared with those of known compounds under identical conditions. Therefore, the analyst confirms the identity and approximate concentrations of the organic emission components beforehand. With this information, the analyst then prepares or purchases commercially available standard mixtures to calibrate the GC under conditions identical to those of the samples. The analyst also determines the need for sample dilution to avoid detector saturation, gas stream filtration to eliminate particulate matter, and prevention of moisture condensation.

2. Range and Sensitivity

2.1 Range. The range of this method is from about 1 part per million (ppm) to the upper limit governed by GC detector saturation or column overloading. The upper limit can be extended by diluting the stack gases with an inert gas or by using smaller gas sampling loops.

2.2 Sensitivity. The sensitivity limit for a compound is defined as the minimum detectable concentration of that compound, or the concentration that produces a signal-to-noise ratio of three to one. The minimum detectable concentration is determined during the presurvey calibration for each compound.

3. Precision and Accuracy

Gas chromatographic techniques typically provide a precision of 5 to 10 percent relative standard deviation (RSD), but an experienced GC operator with a reliable instrument can readily achieve 5 percent RSD. For this method, the following combined GC/operator values are required.

(a) Precision. Duplicate analyses are within 5 percent of their mean value.

(b) Accuracy. Analysis results of prepared audit samples are within 10 percent of preparation values.

4. Interferences

Resolution interferences that may occur can be eliminated by appropriate GC column and detector choice or by shifting the retention times through changes in the column flow rate and the use of temperature programming.

The analytical system is demonstrated to be essentially free from contaminants by periodically analyzing blanks that consist of hydrocarbon-free air or nitrogen.

Sample cross-contamination that occurs when high-level and low-level samples or standards are analyzed alternately, is best

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.

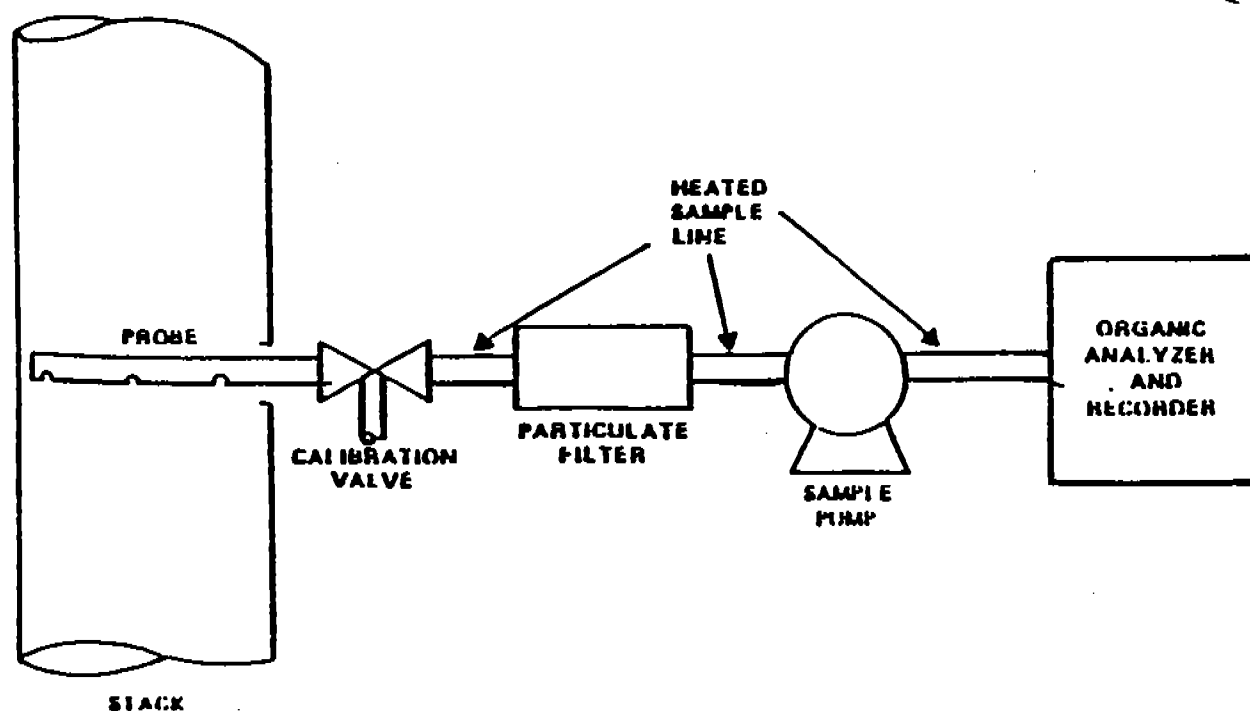


Figure 25A-1. Organic Concentration Measurement System.

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.

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

4.1 Fuel. A 40 percent H₂/60 percent He or 40 percent H₂/60 percent N₂ 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

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.

$$C_c = K C_m \quad \text{Eq. 25A-1}$$

Where:

C_c = Organic concentration as carbon, ppmv.

C_m = 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.

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METHOD 0011

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SAMPLING FOR FORMALDEHYDE EMISSIONS FROM STATIONARY SOURCES JUL 16 1990

INTERPOLL LABORATORIES

1.0 SCOPE AND APPLICATION

1.1 This method is applicable to the determination of Destruction and Removal Efficiency (DRE) of formaldehyde, CAS Registry number 50-00-0, and possibly other aldehydes and ketones from stationary sources as specified in the regulations. The methodology has been applied specifically to formaldehyde; however, many laboratories have extended the application to other aldehydes and ketones. Compounds derivatized with 2,4-dinitrophenylhydrazine can be detected as low as 6.4×10^{-8} lbs/cu ft (1.8 ppbv) in stack gas over a 1 h sampling period, sampling approximately 45 cu ft.

2.0 SUMMARY OF METHOD

2.1 Gaseous and particulate pollutants are withdrawn isokinetically from an emission source and are collected in aqueous acidic 2,4-dinitrophenylhydrazine. Formaldehyde present in the emissions reacts with the 2,4-dinitrophenylhydrazine to form the formaldehyde dinitrophenylhydrazone derivative. The dinitrophenylhydrazone derivative is extracted, solvent-exchanged, concentrated, and then analyzed by high performance liquid chromatography.

3.0 INTERFERENCES

3.1 A decomposition product of 2,4-dinitrophenylhydrazine, 2,4-dinitroaniline, can be an analytical interferent if concentrations are high. 2,4-dinitroaniline can coelute with the 2,4-dinitrophenylhydrazone of formaldehyde under high performance liquid chromatography conditions which may be used for the analysis. High concentrations of highly oxygenated compounds, especially acetone, that have the same retention time or nearly the same retention time as the dinitrophenylhydrazone of formaldehyde and that also absorb at 360 nm will interfere with the analysis.

Formaldehyde, acetone, and 2,4-dinitroaniline contamination of the aqueous acidic 2,4-dinitrophenylhydrazine (DNPH) reagent is frequently encountered. The reagent must be prepared within five days of use in the field and must be stored in an uncontaminated environment both before and after sampling in order to minimize blank problems. Some level of acetone contamination is unavoidable, because acetone is ubiquitous in laboratory and field operations. However, the acetone contamination must be minimized.

4.0 APPARATUS AND MATERIALS

4.1 A schematic of the sampling train is shown in Figure 1. This sampling train configuration is adapted from EPA Method 5 procedures. The sampling train consists of the following components: Probe Nozzle, Pitot Tube, Differential Pressure Gauge, Metering System, Barometer, and Gas Density Determination Equipment.

4.1.1 Probe Nozzle: Quartz or glass with sharp, tapered (30° angle) leading edge. The taper shall be on the outside to preserve a constant inner diameter. The nozzle shall be buttonhook or elbow design. A range of nozzle sizes suitable

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for isokinetic sampling should be available in increments of 0.16 cm (1/16 in), e.g., 0.32 to 1.27 cm (1/8 to 1/2 in), or larger if higher volume sampling trains are used. Each nozzle shall be calibrated according to the procedures outlined in Section 8.1.

4.1.2 Probe Liner: Borosilicate glass or quartz shall be used for the probe liner. The tester should not allow the temperature in the probe to exceed $120 \pm 14^{\circ}\text{C}$ ($248 \pm 25^{\circ}\text{F}$).

4.1.3 Pitot Tube: The Pitot tube shall be Type S, as described in Section 2.1 of EPA Method 2, or any other appropriate device. 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.

4.1.4 Differential Pressure Gauge: The differential pressure gauge shall be an inclined manometer or equivalent device as described in Section 2.2 of EPA Method 2. One manometer shall be used for velocity-head readings and the other for orifice differential pressure readings.

4.1.5 Impingers: The sampling train requires a minimum of four impingers, connected as shown in Figure 1, with ground glass (or equivalent) vacuum-tight fittings. For the first, third, and fourth impingers, use the Greenburg-Smith design, modified by replacing the tip with a 1.3-cm inside diameter (1/2 in) glass tube extending to 1.3 cm (1/2 in) from the bottom of the flask. For the second impinger, use a Greenburg-Smith impinger with the standard tip. Place a thermometer capable of measuring temperature to within 1°C (2°F) at the outlet of the fourth impinger for monitoring purposes.

4.1.6 Metering System: The necessary components are a vacuum gauge, leak-free pump, thermometers capable of measuring temperature 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 may be used which are capable of maintaining sampling rates within 10% of isokinetic collection and of determining sample volumes to within 2%. The metering system may be used in conjunction with a pitot tube to enable checks of isokinetic sampling rates.

4.1.7 Barometer: The barometer may be 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).

4.1.8 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. 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.

4.2 Sample Recovery

4.2.1 Probe Liner: Probe nozzle and brushes; Teflon® 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 impingers.

4.2.2 Wash Bottles: Three wash bottles are required. 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 Graduated Cylinder and/or Balance: A graduated cylinder or balance is required to measure condensed water to the nearest 1 mL or 1 g. Graduated cylinders shall have divisions not >2 mL. Laboratory balances capable of weighing to ± 0.5 g are required.

4.2.4 Amber Glass Storage Containers: One-liter wide-mouth amber flint glass bottles with Teflon®-lined caps are required to store impinger water samples. The bottles must be sealed with Teflon® tape.

4.2.5 Rubber Policeman and Funnel: A rubber policeman and funnel are required to aid in the transfer of materials into and out of containers in the field.

5.0 REAGENTS

Reagent grade chemicals or better grades shall be used in all tests. Unless otherwise indicated, all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.

5.1 Water: HPLC-grade water is used in preparation of DNPH reagent and in all other applications in the sampling train.

5.2 Silica Gel: Silica gel shall be indicating type, 6-16 mesh. If the silica gel has been used previously, dry at 175°C (350°F) for 2 h before using. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used.

5.3 Crushed Ice: Quantities ranging from 10-50 lb may be necessary during a sampling run, depending upon ambient temperature. Samples which have been taken must be stored and shipped cold; sufficient ice for this purpose must be allowed.

5.4 2,4-Dinitrophenylhydrazine Reagent: The 2,4-dinitrophenylhydrazine reagent must be prepared in the laboratory within five days of sampling use in the field. Preparation of DNPH can also be done in the field, with consideration of appropriate procedures required for safe handling of solvent in the field. When a container of prepared DNPH reagent is opened in the field, the contents of the opened container should be used within 48 hours. All laboratory glassware must be washed with detergent and water and rinsed with water, methanol, and methylene chloride prior to use.

NOTE: The glassware must not be rinsed with acetone or unacceptable levels of acetone contamination will be introduced. If field preparation of DNPH is performed, caution must be exercised in avoiding acetone contamination.

Reagent bottles for storage of cleaned DNPH derivatizing solution must be rinsed with acetonitrile and dried before use. Baked glassware is not essential for preparation of DNPH reagent.

NOTE: DNPH crystals or DNPH solution should be handled with plastic gloves at all times, with prompt and extensive use of running water in case of skin exposure.

5.4.1 Preparation of Aqueous Acidic DNPH: The following materials and reagents are required for preparation of the reagent.

5.4.1.1 Bottles/Caps: amber 1- or 2 L bottles with Teflon®-lined caps are required for storing cleaned DNPH solution. Additional 4-L bottles are required to collect waste organic solvents.

5.4.1.2 Large Glass Container: at least one large glass container (8 to 16 L) is required for mixing the aqueous acidic DNPH solution.

5.4.1.3 Stir Plate/Large Stir Bars/Stir Bar Retriever: a magnetic stir plate and large stir bar are required for the mixing of the aqueous acidic DNPH solution. A stir bar retriever is needed for removing the stir bar from the large container holding the DNPH solution.

5.4.1.4 Buchner Filter/Filter Flask/Filter Paper: a large filter flask (2-4 L) with a buchner filter, appropriate rubber stopper, filter paper, and connecting tubing are required for filtering the aqueous acidic DNPH solution prior to cleaning.

5.4.1.5 Separatory Funnels: at least one large separatory funnel (2 L) is required for cleaning the DNPH prior to use.

5.4.1.6 Beakers: beakers (150 mL, 250 mL, and 400 mL) are useful for holding/measuring organic liquids when cleaning the aqueous acidic DNPH solution and for weighing DNPH crystals.

5.4.1.7 Funnels: at least one large funnel is needed for pouring the aqueous acidic DNPH into the separatory funnel.

5.4.1.8 Graduated Cylinders: at least one large graduated cylinder (1 to 2 L) is required for measuring HPLC-grade water and acid when preparing the DNPH solution.

5.4.1.9 Top-Loading Balance: a one-place top loading balance is needed for weighing out the DNPH crystals used to prepare the aqueous acidic DNPH solution.

5.4.1.10 Spatulas: spatulas are needed for weighing out DNPH when preparing the aqueous DNPH solution.

5.4.1.11 HPLC-Grade Water: water (HPLC-grade) is required to mix the aqueous DNPH solution.

5.4.1.12 Hydrochloric Acid: reagent grade hydrochloric acid (approximately 12N) is required for acidifying the aqueous DNPH solution.

5.4.1.13 2,4-Dinitrophenylhydrazine: a supply of moist solid 2,4-dinitrophenylhydrazine (DNPH) is required for preparation of aqueous acidic DNPH solution. The quantity of water may vary from 10 to 30%. Reagent grade or equivalent is required.

5.4.1.14 Methylene Chloride: methylene chloride (suitable for residue and pesticide analysis, GC/MS, HPLC, GC, Spectrophotometry or equivalent) is required for cleaning the aqueous acidic DNPH solution, rinsing glassware, and recovery of sample trains.

5.4.1.15 Cyclohexane: cyclohexane (HPLC grade) is required for cleaning the aqueous acidic DNPH solution.

NOTE: Do not use spectroanalyzed grades of cyclohexane if this sampling methodology is extended to aldehydes and ketones with four or more carbon atoms.

5.4.1.16 Methanol: methanol (HPLC grade or equivalent) is required for rinsing glassware.

5.4.1.17 Acetonitrile: acetonitrile (HPLC grade or equivalent) is required for rinsing glassware.

5.4.1.18 Formaldehyde: Analytical grade or equivalent formaldehyde is required for preparation of standards. If other aldehydes or ketones are used, analytical grade or equivalent is required.

5.4.2 Preparation of Aqueous Acidic DNPH Derivatizing Reagent: Each batch of DNPH reagent should be prepared and purified within five days of sampling, according to the procedure described below.

5.4.2.1 Place an 8-L container under a fume hood on a magnetic stirrer. Add a large stir bar and fill the container half full of HPLC-grade water. Save the empty bottle from HPLC-grade water. Start the stirring bar and adjust the stir rate to be as fast as possible. Using a graduated cylinder, measure 1.4 mL of concentrated hydrochloric acid. Slowly pour the acid into the stirring water. Fumes may be generated and the water may become warm. Weigh the DNPH crystals on a one-place balance (see Table 1 for approximate amounts) and add to the stirring acid solution. Fill the 8 L container to the 8 L mark with HPLC water and stir overnight. If all of the DNPH crystals have dissolved overnight, add additional DNPH and stir for two more hours. Continue the process of adding DNPH with additional stirring until a saturated solution has been formed. Filter the DNPH solution using vacuum filtration. Gravity filtration may be used, but a

much longer time is required. Store the filtered solution in an amber bottle at room temperature.

TABLE 1. APPROXIMATE AMOUNT OF CRYSTALLINE DNPH USED
TO PREPARE A SATURATED SOLUTION

Amount of Moisture in DNPH	Weight Required per 8 L of Solution
10 weight percent	31 g
15 weight percent	33 g
30 weight percent	40 g

Within five days of proposed use, place about 1.6 L of the DNPH reagent in a 2 L separatory funnel. Add approximately 200 mL of methylene chloride and stopper the funnel. Wrap the stopper of the funnel with paper towels to absorb any leakage. Invert and vent the funnel. Then shake vigorously for 3 minutes. Initially, the funnel should be vented frequently (every 10 - 15 sec). After the layers have separated, discard the lower (organic) layer.

Extract the DNPH a second time with methylene chloride and finally with cyclohexane. When the cyclohexane layer has separated from the DNPH reagent, the cyclohexane layer will be the top layer in the separatory funnel. Drain the lower layer (the cleaned extracted DNPH reagent solution) into an amber bottle that has been rinsed with acetonitrile and allowed to dry.

5.4.3 Quality Control: Take two aliquots of the extracted DNPH reagent. The size of the aliquots is dependent upon the exact sampling procedure used, but 100 mL is reasonably representative. To ensure that the background in the reagent is acceptable for field use, analyze one aliquot of the reagent according to the procedure of EPA Draft Method 8315. Save the other aliquot of aqueous acidic DNPH for use as a method blank when the analysis is performed.

5.4.4 Shipment to the Field: Tightly cap the bottle containing extracted DNPH reagent using a Teflon®-lined cap. Seal the bottle with Teflon® tape. After the bottle is labeled, the bottle may be placed in a friction-top can (paint can or equivalent) containing a 1 -2 inch layer of granulated charcoal and stored at ambient temperature until use.

If the DNPH reagent has passed the Quality Control criteria, the reagent may be packaged to meet necessary shipping requirements and sent to the sampling area. If the Quality Control criteria are not met, the reagent solution may be re-extracted or the solution may be re-prepared and the extraction sequence repeated.

If the DNPH reagent is not used in the field within five days of extraction, an aliquot may be taken and analyzed as described Draft Method 8315. If the reagent meets the Quality Control requirements, the reagent may be used. If the reagent does not meet Quality Control requirements, the reagent must be discarded and new reagent must be prepared and tested.

5.4.5 Calculation of Acceptable Levels of Impurities in DNPH Reagent: The acceptable impurity level (AIL, $\mu\text{g/mL}$) is calculated from the expected analyte level in the sampled gas (EAL, ppbv), the volume of air that will be sampled at standard conditions (SVOL, L), the formula weight of the analyte (FW, g/mol), and the volume of DNPH reagent that will be used in the impingers (RVOL, mL):

$$\text{AIL} = 0.1 \times [\text{EAL} \times \text{SVOL} \times \text{FW} / 22.4 \times (\text{FW} + 180) / \text{FW}] / (\text{RVOL} \times 1000).$$

where 0.1 is the acceptable contaminant level, 22.4 is a factor relating ppbv to g/L, 180 is a factor relating the underivatized analyte to the derivatized analyte, and 1000 is a unit conversion factor.

5.4.6 Disposal of Excess DNPH Reagent: Excess DNPH reagent may be returned to the laboratory and recycled or treated as aqueous waste for disposal purposes. 2,4-Dinitrophenylhydrazine is a flammable solid when dry so water should not be evaporated from the solution of the reagent.

5.5 Field Spike Standard Preparation: To prepare a formaldehyde field spiking standard at 4.01 mg/mL, use a 500 μL syringe to transfer 0.5 mL of 37% by weight of formaldehyde (401 mg/mL) to a 50 mL volumetric flask containing approximately 40 mL of methanol. Dilute to 50 mL with methanol.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 Because of the 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.

6.3 Preliminary Field Determinations:

6.3.1 Select the sampling site and the minimum number of sampling points according to EPA Method 1 or other relevant criteria. Determine the stack pressure, temperature, and range of velocity heads using EPA Method 2. A leak-check of the pitot lines according to EPA Method 2, Section 3.1, must 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 below 28 L/min (1.0 cfm). 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 45 ft³ of sample volume is required for the determination of the Destruction and Removal Efficiency (DRE) of formaldehyde from incineration systems (45ft³ is equivalent to one hour of sampling at 0.75 dscf). Additional sample volume shall be collected as necessitated by the capacity of the DNPH reagent and analytical detection limit constraints. To determine the minimum sample volume required, refer to sample calculations in Section 10.

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 0.5 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-volume samples. In these cases, careful documentation must be maintained in order to allow accurate calculation of concentrations.

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 Place 100 mL of cleaned DNPH solution in each of the first two impingers, and leave the third impinger empty. If additional capacity is required for high expected concentrations of formaldehyde in the stack gas, 200 mL of DNPH per impinger may be used or additional impingers may be used for sampling. Transfer approximately 200 to 300 g of pre-weighed silica gel from its container to the fourth impinger. Care should be taken to ensure that the silica gel is not entrained and carried out from the impinger during sampling. Place the silica gel 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.

6.4.3 With a glass or quartz liner, 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. 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.

6.4.4 Assemble the train as shown in Figure 1. During assembly, do not use any silicone grease on ground-glass joints upstream of the impingers. Use Teflon® tape, if required. A very light coating of silicone grease may be used on ground-glass joints downstream of the impingers, but the silicone grease should be limited to the outer portion (see APTD-0576) of the ground-glass joints to

minimize silicone grease contamination. If necessary, Teflon® tape may be used to seal leaks. Connect all temperature sensors to an appropriate potentiometer/display unit. Check all temperature sensors at ambient temperature.

6.4.5 Place crushed ice all around the impingers. . .

6.4.6 Turn on and set the probe heating system at the desired operating temperature. Allow time for the temperature to stabilize. . . .

6.5 Leak-Check Procedures:

6.5.1 Pre-test Leak Check:

6.5.1.1 After the sampling train has been assembled, turn on and set the probe heating system at the desired operating temperature. Allow time for the temperature 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 the lower vacuum is not exceeded during the test.

6.5.1.2 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 to the inlet and then plugging the inlet and pulling a 381-mm Hg (15 in Hg) vacuum. (A lower vacuum may be used if this lower vacuum 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 m³/min (0.02 cfm), whichever is less, are acceptable.

6.5.1.3 The following leak check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with the 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 not reverse direction of the fine-adjust valve, as liquid will back up into the train. If the desired vacuum is exceeded, either perform the leak check at this higher vacuum or end the leak check, as shown below, and start over.

6.5.1.4 When the leak check is completed, first slowly remove the plug from the inlet to the probe. 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 to prevent the liquid in the impingers from being forced backward into the sampling line and silica gel from being entrained backward into the third impinger.

6.5.2 Leak Checks During Sampling Runs:

6.5.2.1 If, during the sampling run, a component change (i.e., impinger) 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 described in Section 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 m³/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable. If a higher leakage rate is obtained, the tester must void the sampling run.

NOTE: Any correction of the sample volume by calculation reduces the integrity of the pollutant concentration data generated and must be avoided.

6.5.2.2 Immediately after a component change and before sampling is re-initiated, 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 the pre-test leak check, except that the post-test leak check 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 m³/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable. If, however, a higher leakage rate is obtained, the tester shall record the leakage rate and 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, below 28 L/min (1.0 cfm). Maintain a temperature around the probe of 120° ± 14°C (248° ± 25°F).

6.6.2 For each run, record the data on a data sheet such as the one shown in Figure 2. 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 2 at least once at each sample point during each time increment and additional readings when significant adjustments (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 ± 0.02 and the stack gas equivalent density (dry molecular weight) is equal to 29 ± 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 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 in order to prevent liquid from backing up through the train. 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, 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 probe at the proper levels. Add more ice and, if necessary, salt, to maintain a temperature of $<20^{\circ}\text{C}$ (68°F) at the silica gel outlet. Also, periodically check the level and zero of the manometer.

6.6.8 A single train shall be used for the entire sampling 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. An additional train or additional trains may also be used for sampling when the capacity of a single train is exceeded.

6.6.9 When two or more trains are used, separate analyses of components from each train shall be performed. If multiple trains have been used because the capacity of a single train would be exceeded, first impingers from each train may be combined, and second impingers from each train may be combined.

6.6.10 At the end of the sampling 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.

6.6.11 Calculate percent isokineticity (see Method 2) to determine whether the run was valid or another test 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 handled safely, 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 because a vacuum will be created, drawing liquid from the impingers back through the sampling train.

7.1.2 Before moving the sampling train to the cleanup site, remove the probe from the sampling train and cap the open outlet, being careful not to lose any condensate that might be present. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used, let any condensed water or liquid drain into the impingers. Cap off any open impinger inlets and outlets. Ground glass stoppers, Teflon® caps, or caps of other inert materials may be used to seal all openings.

7.1.3 Transfer the probe and impinger assembly to an area that is clean and protected from wind so that the chances of contaminating or losing the sample are minimized.

7.1.4 Inspect the train before and during disassembly, and note any abnormal conditions.

7.1.5 Save a portion of all washing solutions (methylene chloride, 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, pre-labeled sample container.

7.2 Sample Containers:

7.2.1 Container 1: Probe and Impinger Catches. Using a graduated cylinder, measure to the nearest mL, and record the volume of the solution in the first three impingers. Alternatively, the solution may be weighed to the nearest 0.5 g. Include any condensate in the probe in this determination. Transfer the impinger solution from the graduated cylinder into the amber flint glass bottle. Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, clean all surfaces to which the sample is exposed (including the probe nozzle, probe fitting, probe liner, first impinger, and impinger connector) with methylene chloride. Use less than 500 mL for the entire wash (250 mL would be better, if possible). Add the washings to the sample container.

7.2.1.1 Carefully remove the probe nozzle and rinse the inside surface with methylene chloride from a wash bottle. Brush with a Teflon® bristle brush, and rinse until the rinse shows no visible particles or yellow color, after which make a final rinse of the inside surface. Brush and rinse the inside parts of the Swagelok® fitting with methylene chloride in a similar way.

7.2.1.2 Rinse the probe liner with methylene chloride. While squirting the methylene chloride into the upper end of the probe, tilt and rotate the probe so that all inside surfaces will be wetted with methylene chloride. Let the methylene chloride drain from the lower end into the sample container. The tester may use a funnel (glass or polyethylene) to aid in transferring the liquid washes to the container. Follow the rinse with a Teflon® brush. Hold the probe in an inclined position, and squirt methylene chloride into the upper end as the probe brush is being pushed with a twisting action through the probe. Hold the sample container underneath the lower end of the probe, and catch any methylene chloride, water, and particulate matter that is brushed from the probe. Run the brush through the probe three times or more. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since there may be small crevices in which particulate matter can be entrapped. Rinse the brush with methylene chloride or water, and quantitatively collect these washings in the sample container. After the brushings, make a final rinse

of the probe as described above.

NOTE: Two people should clean the probe in order to minimize sample losses. Between sampling runs, brushes must be kept clean and free from contamination.

7.2.1.3 Rinse the inside surface of each of the first three impingers (and connecting tubing) three separate times. Use a small portion of methylene chloride for each rinse, and brush each surface to which sample is exposed with a Teflon® bristle brush to ensure recovery of fine particulate matter. Water will be required for the recovery of the impingers in addition to the specified quantity of methylene chloride. There will be at least two phases in the impingers. This two-phase mixture does not pour well, and a significant amount of the impinger catch will be left on the walls. The use of water as a rinse makes the recovery quantitative. Make a final rinse of each surface and of the brush, using both methylene chloride and water.

7.2.1.4 After all methylene chloride and water washings and particulate matter have been collected in the sample container, tighten the lid so that solvent, water, and DNPH reagent will not leak out when the container is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Seal the container with Teflon® tape. Label the container clearly to identify its contents.

7.2.1.5 If the first two impingers are to be analyzed separately to check for breakthrough, separate the contents and rinses of the two impingers into individual containers. Care must be taken to avoid physical carryover from the first impinger to the second. The formaldehyde hydrazone is a solid which floats and froths on top of the impinger solution. Any physical carryover of collected moisture into the second impinger will invalidate a breakthrough assessment.

7.2.2 Container 2: Sample Blank. Prepare a blank by using an amber flint glass container and adding a volume of DNPH reagent and methylene chloride equal to the total volume in Container 1. Process the blank in the same manner as Container 1.

7.2.3 Container 3: Silica Gel. Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. The impinger containing the silica gel may be used as a sample transport container with both ends sealed with tightly fitting caps or plugs. Ground-glass stoppers or Teflon® caps may be used. The silica gel impinger should then be labeled, covered with aluminum foil, and packaged on ice for transport to the laboratory. If the silica gel is removed from the impinger, the tester may use a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use water or other liquids to transfer the silica gel. If a balance is available in the field, the spent silica gel (or silica gel plus impinger) may be weighed to the nearest 0.5 g.

7.2.4 Sample containers should be placed in a cooler, cooled by although not in contact with ice. Sample containers must be placed vertically and, since they are glass, protected from breakage during shipment. Samples should be cooled during shipment so they will be received cold at the laboratory.

8.0 CALIBRATION

8.1 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 the nozzles become nicked or corroded, they shall be replaced and calibrated before use. Each nozzle must be permanently and uniquely identified.

8.2 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 or corroded and if it meets design and intercomponent spacing specifications.

8.3 Metering system:

8.3.1 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 will apply: make a ten-minute calibration run at 0.00057 m³/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 m³/min (0.02 cfm).

8.3.2 After each field use, check the calibration of the metering system by performing three calibration runs at a single intermediate orifice setting (based on the previous field test). Set the vacuum 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.

8.3.3 Leak check of metering system: The 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. Use the following procedure: 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 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 must be voided or calculations for test series must be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

8.4 Probe heater: The probe heating system must 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.

8.5 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 $>1.5\%$.

8.5.1 Impinger and dry-gas meter thermocouples: For the thermocouples used to measure the temperature of the gas leaving the impinger train, 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 $\pm 2^{\circ}\text{C}$ (3.6°F) with those of the absolute value of the reference thermometer.

8.5.2 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. Use of a point at room air temperature is recommended. The thermometer and thermocouple must 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.

8.6 Barometer: Adjust the barometer initially and before each test series to agree to within ± 2.5 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).

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

9.0 CALCULATIONS

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

9.1 Calculation of Total Formaldehyde:

To determine the total formaldehyde in mg, use the following equation:

$$\text{Total mg formaldehyde} = C_d \times V \times DF \times \\ \left(\frac{[\text{g/mole aldehyde}]}{[\text{g/mole DNPH derivative}]} \right) \times \\ 10^{-3} \text{ mg/}\mu\text{g}$$

where:

C_d = measured concentration of DNPH-formaldehyde derivative, $\mu\text{g/mL}$,
 V = organic extract volume, mL
 DF = dilution factor

9.2 Formaldehyde concentration in stack gas:

Determine the formaldehyde concentration in the stack gas using the following equation:

$$C_2 = K [\text{total formaldehyde, mg}] / V_{m(\text{std})}$$

where:

K = 35.31 ft^3/m^3 if $V_{m(\text{std})}$ is expressed in English units
 = 1.00 m^3/m^3 if $V_{m(\text{std})}$ is expressed in metric units

$V_{m(\text{std})}$ = volume of gas sample as measured by dry gas meter, corrected to standard conditions, dscm (dscf)

9.3 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop are obtained from the data sheet.

9.4 Dry Gas Volume: Calculate $V_{m(\text{std})}$ and adjust for leakage, if necessary, using the equation in Section 6.3 of EPA Method 5.

9.5 Volume of Water Vapor and Moisture Content: Calculate the volume of water vapor and moisture content from equations 5-2 and 5-3 of EPA Method 5.

10.0 DETERMINATION OF VOLUME TO BE SAMPLED

To determine the minimum sample volume to be collected, use the following sequence of equations.

10.1 From prior analysis of the waste feed, the concentration of formaldehyde (FORM) 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 FORM allowed to be present in the effluent. This amount may be expressed as:

Max FORM₁ Mass =

$$[(WF) (FORM_1 \text{ conc}) (100 - \%DRE)] / 100$$

where:

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

FORM₁ = concentration of FORM (wt %) introduced into the combustion process

DRE = percent Destruction and Removal Efficiency required

Max FORM = mass flow rate (g/h [lb/h]) of FORM emitted from the combustion source

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

$$\text{Max FORM}_1 \text{ conc} = [\text{Max FORM}_1 \text{ Mass}] / DV_{\text{eff(Std)}}$$

where:

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

FORM₁ conc = anticipated concentration of the FORM in the exhaust gas stream, g/dscm (lb/dscf)

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

$$[LDL_{\text{FORM}} \times 10] / [FORM_1 \text{ conc}] = V_{\text{tbc}}$$

where:

LDL_{FORM} = detectable amount of FORM in entire sampling train

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

10.4 The following analytical detection limits and DNPH Reagent Capacity (based on a total volume of 200 mL in two impingers) must also be considered in determining a volume to be sampled.

Table 2. Instrument Detection Limits and Reagent Capacity for Formaldehyde Analysis¹

Analyte	Detection Limit, ppbv ²	Reagent Capacity, ppmv
formaldehyde	1.8	66
acetaldehyde	1.7	70
acrolein	1.5	75
acetone/propionaldehyde	1.5	75
butyraldehyde	1.5	79
methyl ethyl ketone	1.5	79
valeraldehyde	1.5	84
isovaleraldehyde	1.4	84
hexaldehyde	1.3	88
benzaldehyde	1.4	84
o-/m-/p-tolualdehyde	1.3	89
dimethylbenzaldehyde	1.2	93

¹ Oxygenated compounds in addition to formaldehyde are included for comparison with formaldehyde; extension of the methodology to other compounds is possible.

² Detection limits are determined in solvent. These values therefore represent the optimum capability of the methodology.

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 method includes the analysis of field and method blanks, procedure validations, and analysis of field spikes. The assessment of combustion data and positive identification and quantitation of formaldehyde are dependent on the integrity of the samples received and the precision and accuracy of the analytical methodology. Quality Assurance procedures for this method are designed to monitor the performance of the analytical methodology 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, methylene chloride and water, and unused DNPH reagent. 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 sampling train). The probe of the blank train must 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 Blank 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 Field Spike: A field spike is performed by introducing 200 μ L of the Field Spike Standard into an impinger containing 200 mL of DNPH solution. Standard impinger recovery procedures are followed and the field spike sample is returned to the laboratory for analysis. The field spike is used as a check on field handling and recovery procedures. An aliquot of the field spike standard is retained in the laboratory for derivatization and comparative analysis.

12.0 METHOD PERFORMANCE

12.1 Method performance evaluation: The following expected method performance parameters for precision, accuracy, and detection limits are provided in Table 3.

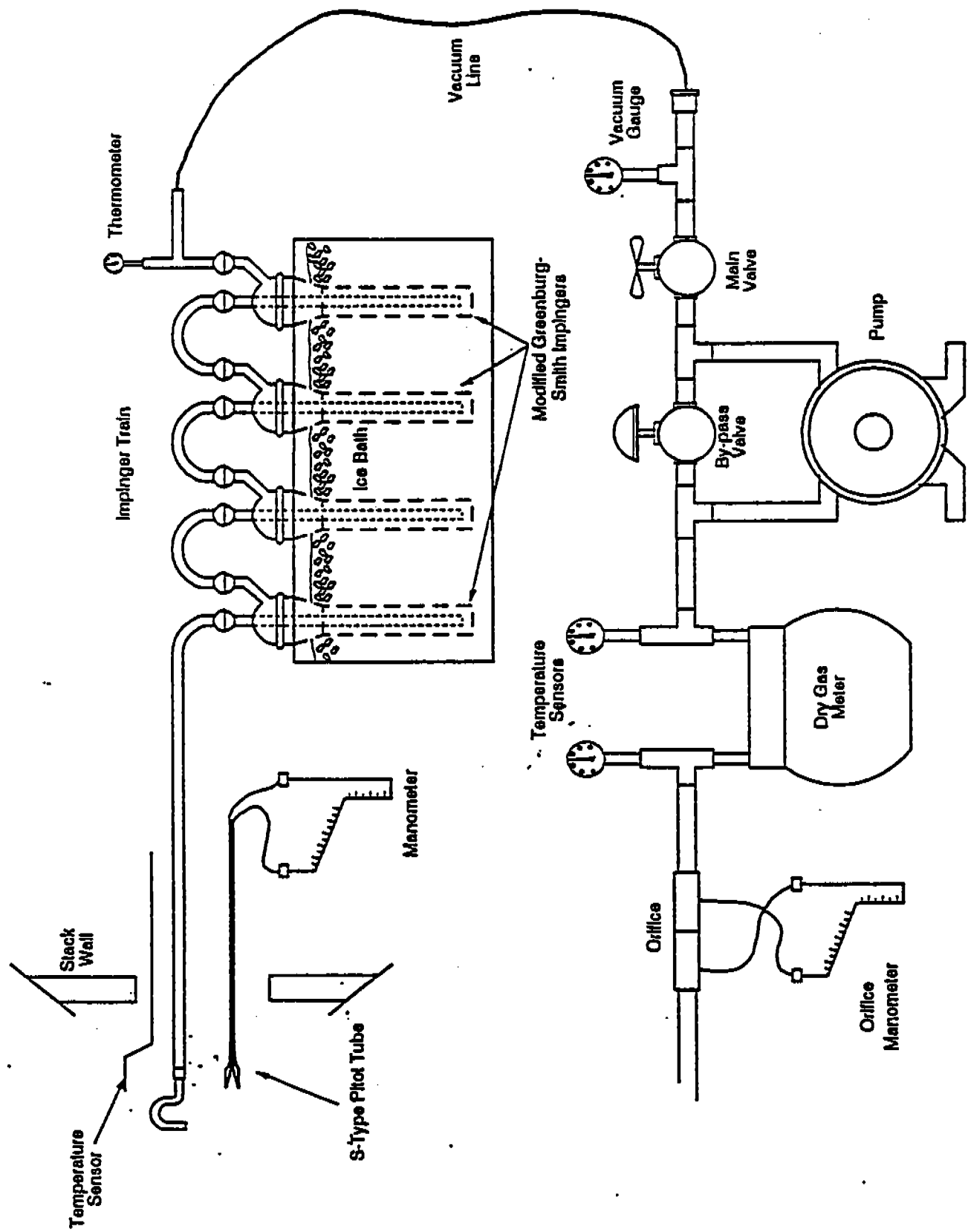
Table 3. Expected Method Performance for Formaldehyde

Parameter	Precision	¹ Accuracy ²	Detection Limit ³
Matrix: Dual trains	$\pm 15\%$ RPD	$\pm 20\%$	1.5×10^{-7} lb/ft ³ (1.8 ppbv)

¹ Relative percent difference limit for dual trains.

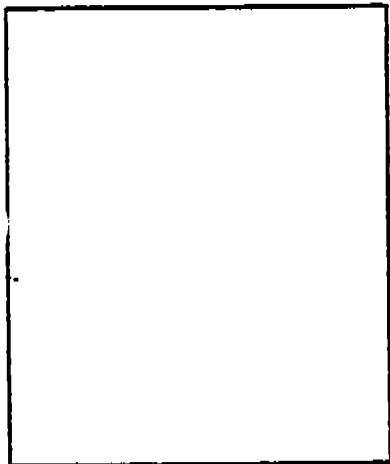
² Limit for field spike recoveries.

³ The lower reporting limit having less than 1% probability of false positive detection.



Formaldehyde Sampling Train

Plant _____
 Location _____
 Operator _____
 Date _____
 Run No. _____
 Sample Box No. _____
 Meter Box No. _____
 Meter H@ _____
 C Factor _____
 Pilot 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 Heating Setting _____
 Leak Rate, m³/min. (cfm) _____
 Probe Liner Material _____
 Static Pressure, mm Hg (in. Hg) _____
 Filter No. _____

Traverse Point Number	Sampling Time (0) Min.	Vacuum mm Hg (in. Hg)	Stack Temperature (T _s) °C (°F)	Velocity Head (P _v) mm (in) H ₂ O	Pressure Differential Across Orifice Meter mm (in) H ₂ O	Gas Sample Volume m ³ (ft ³)	Gas Sample Temp. at Dry Gas Meter		Filter Holder Temperature °C (°F)	Temperature of Gas Leaving Last Impinger °C (°F)
							Inlet °C (°F)	Outlet °C (°F)		
Total							Avg. Avg.			
Average										

Figure 2. Field Data Sheet

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

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Facsimile (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.

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 $>100^{\circ}\text{C}$.

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

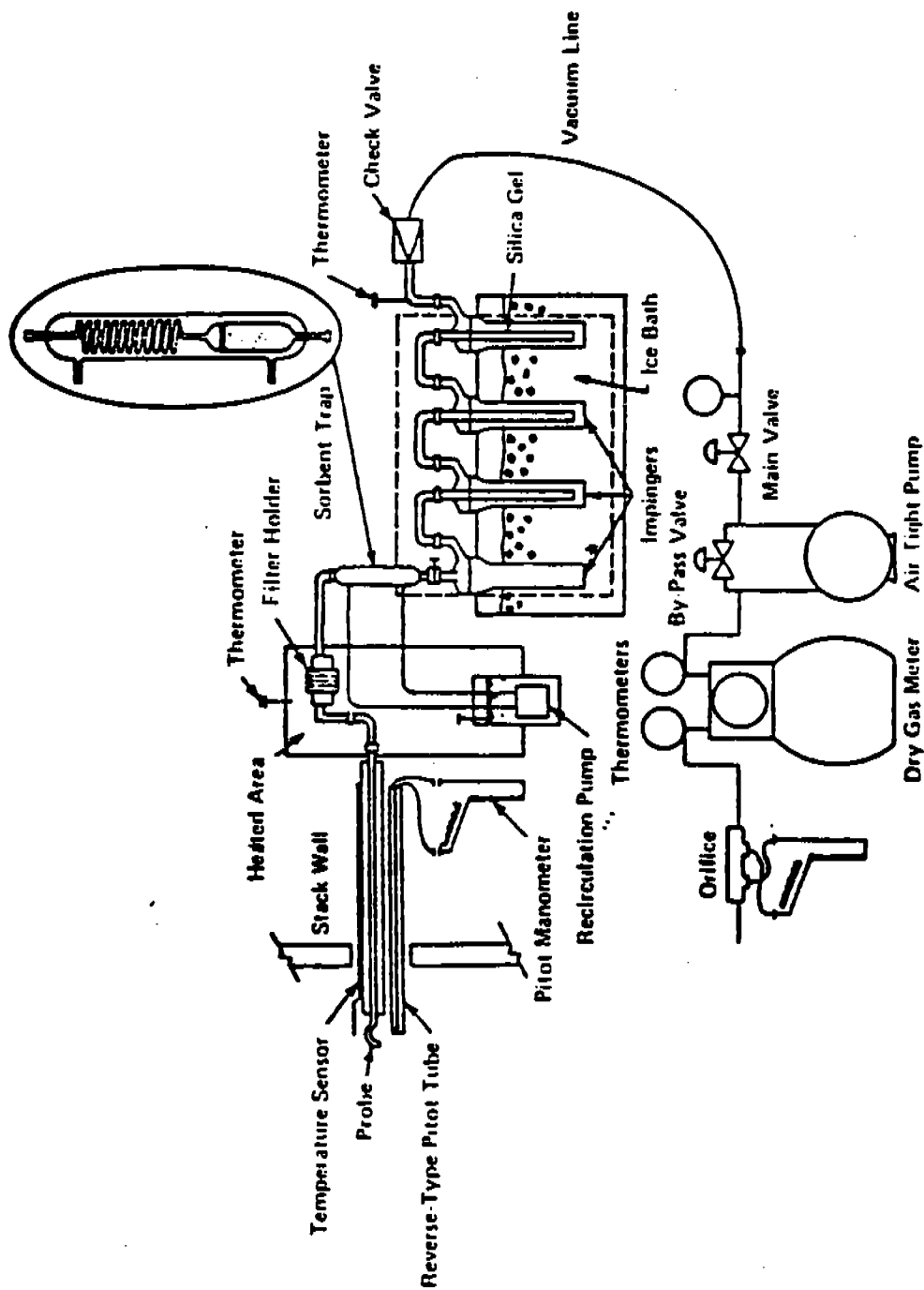


Figure 1. Modified Method 5 Sampling Train.

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 $120 \pm 14^{\circ}\text{C}$ ($248 \pm 25^{\circ}\text{F}$) 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.

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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 $120 \pm 14^\circ\text{C}$ ($248 \pm 25^\circ\text{F}$) 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 $17 \pm 3^\circ\text{C}$ ($62.5 \pm 5.4^\circ\text{F}$). 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.

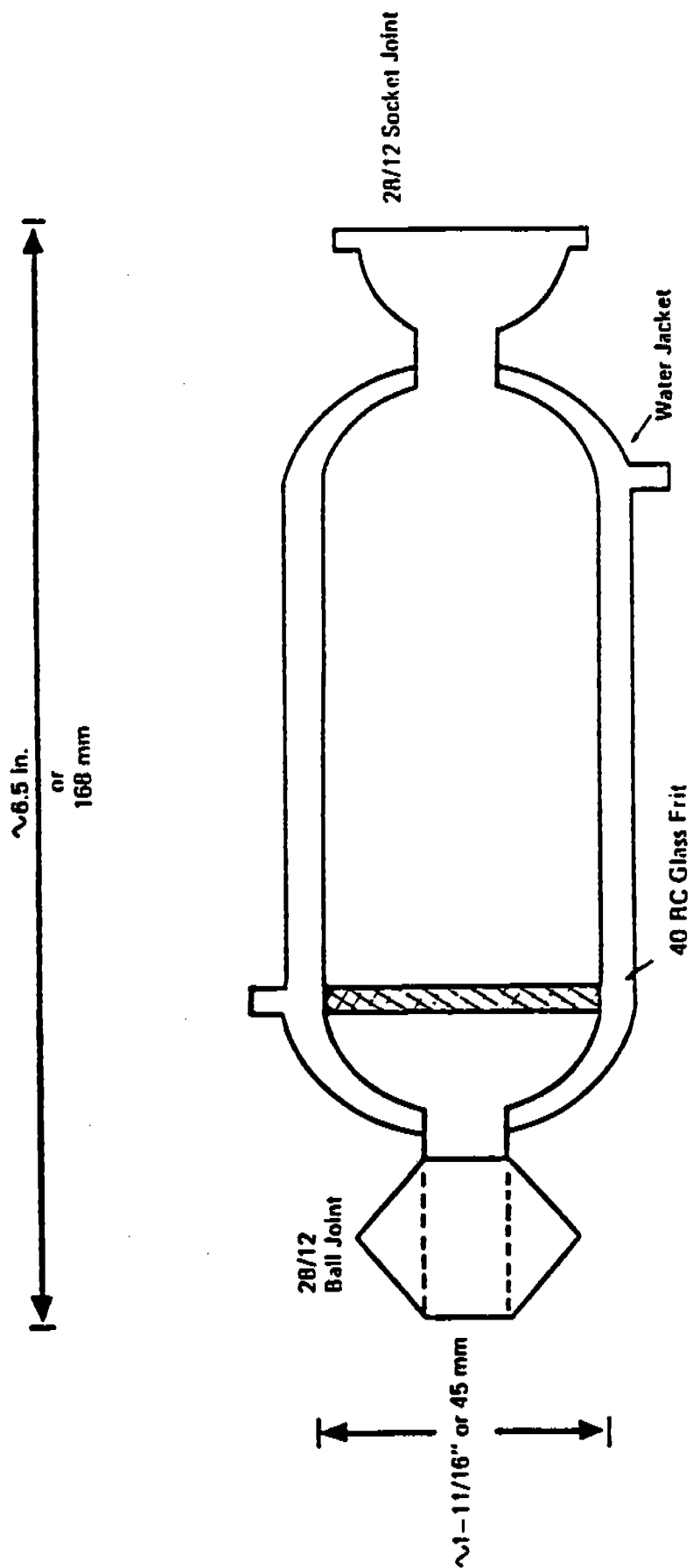


Figure 2. Adsorbent Sampling System.

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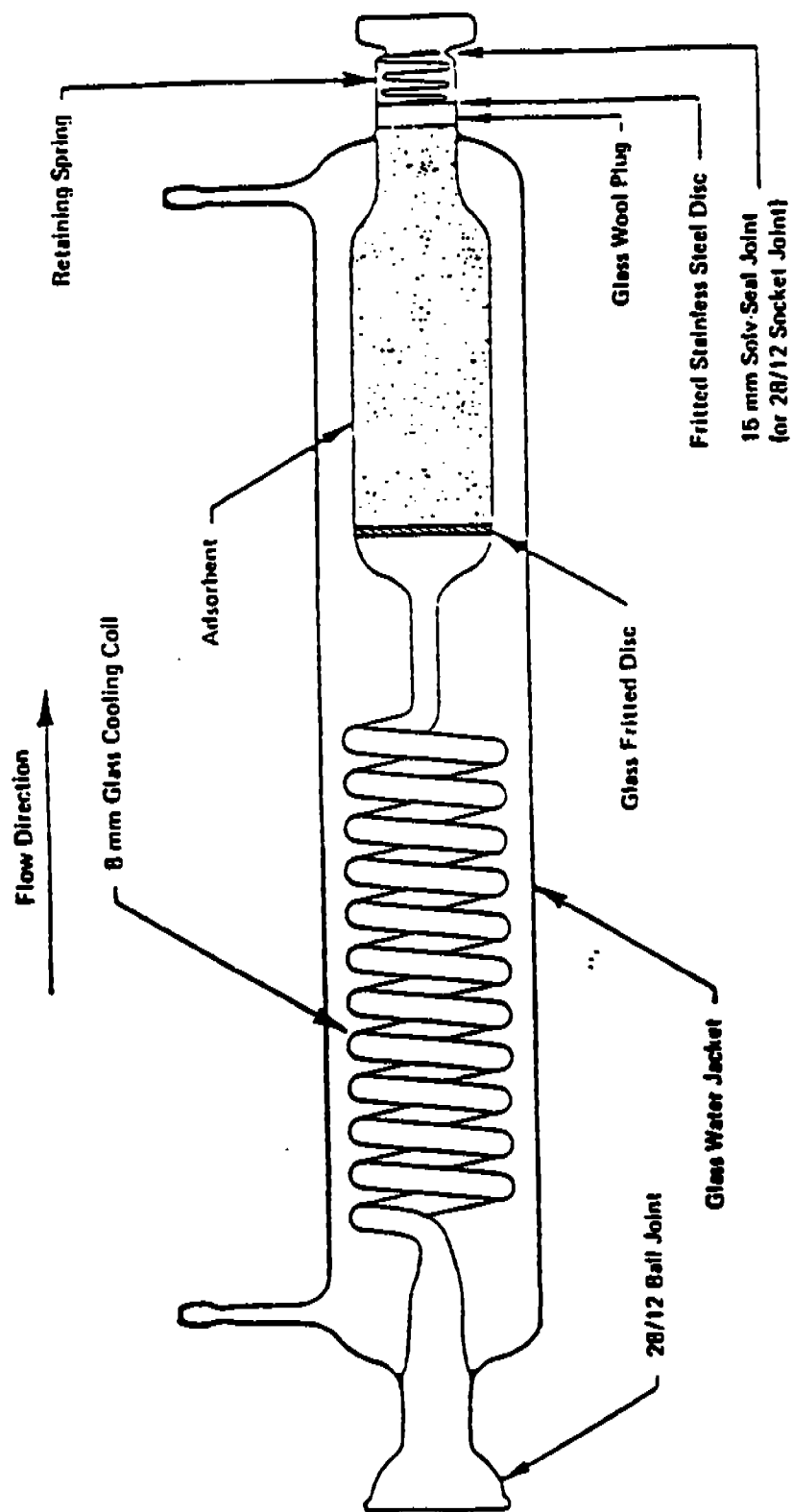


Figure 3. Adsorbent Sampling System.

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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- μ m 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 Schuell #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.

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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 $20 \pm 5.6^{\circ}\text{C}$ ($68 \pm 10^{\circ}\text{F}$) and ambient pressure for at least 24 hr, and weigh at intervals of at least 6 hr to a constant weight (i.e., $<0.5\text{-mg}$ 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.

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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 $<260^{\circ}\text{C}$ (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 $17 \pm 3^{\circ}\text{C}$. 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 $>0.00057 \text{ m}^3/\text{min}$ (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 not 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.

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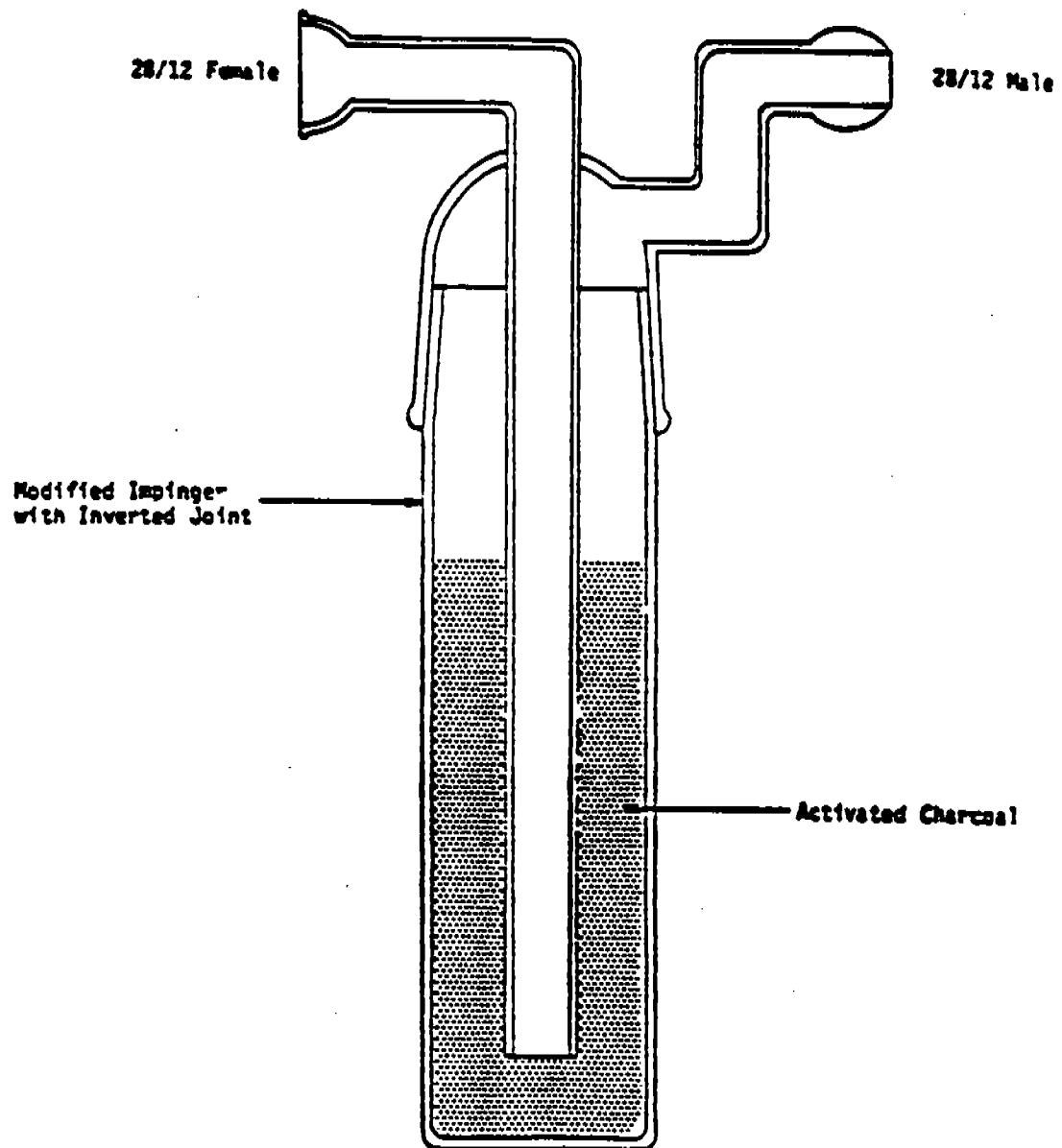


Figure 4. Leak-check impinger.

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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 $0.00057 \text{ m}^3/\text{min}$ (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 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 $0.00057 \text{ m}^3/\text{min}$ (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 $120 \pm 14^\circ\text{C}$ ($248 \pm 25^\circ\text{F}$) and a gas temperature entering the sorbent trap at a maximum of 20°C (68°F).

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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 ± 0.02 and the stack-gas equivalent density (dry molecular weight) is equal to 29 ± 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 $<20^{\circ}\text{C}$ (68°F) at the condenser/silica gel outlet. Also, periodically check the level and zero of the manometer.

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.

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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.

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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.

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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.

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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 $0.00057 \text{ m}^3/\text{min}$ (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 $0.00057 \text{ m}^3/\text{min}$ (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.

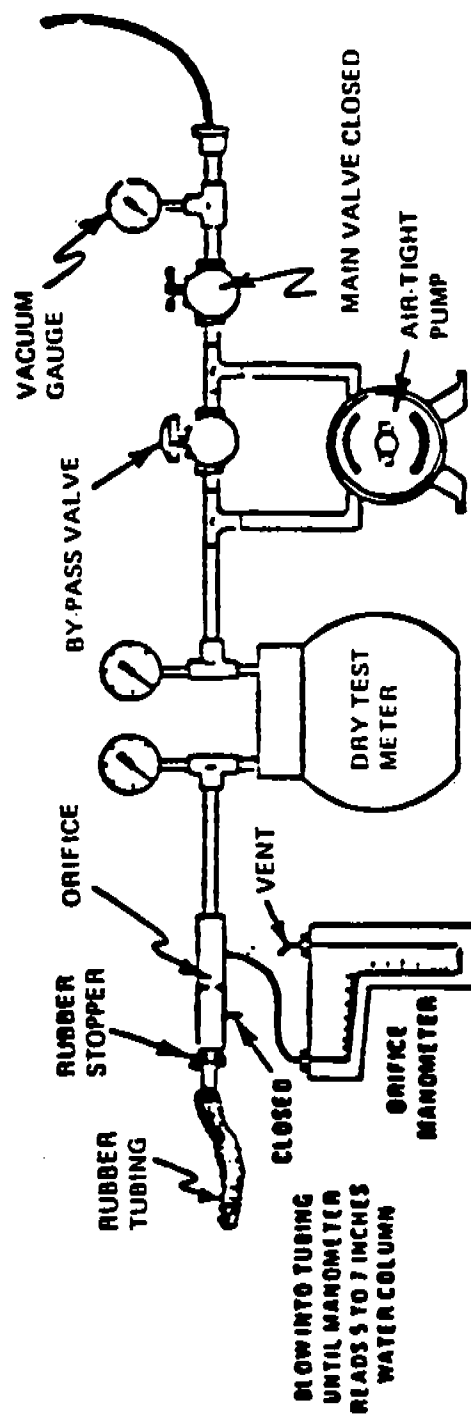


Figure 6. Leak check of meter box.

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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 $\pm 2^{\circ}\text{C}$ (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 $\pm 0.5\%$ 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 $0.00057 \text{ m}^3/\text{min}$ (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 "ith" component change ($i = 1, 2, 3 \dots n$) 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, $0.06236 \text{ mm Hg-m}^3/\text{K-g-mole}$ (21.85 in. Hg-ft³/ $^{\circ}\text{R}$ -lb-mole).
- T_m = Absolute average dry-gas meter temperature (see Figure 6), K ($^{\circ}\text{R}$).
- T_s = Absolute average stack-gas temperature (see Figure 6), K ($^{\circ}\text{R}$).
- T_{std} = Standard absolute temperature, 293K (528 $^{\circ}\text{R}$).
- 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).
- $V_m(\text{std})$ = Volume of gas sample measured by the dry-gas meter, corrected to standard conditions, dscm (dscf).
- $V_w(\text{std})$ = 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 H₂O (in. H₂O).

P_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 (nth) 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:

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

where:

$K_1 = 0.3858 \text{ K/mm Hg for metric units, or}$
 $K_1 = 17.64^\circ\text{R/in. Hg for English units.}$

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:

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

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

10.5 Volume of water vapor:

$$V_{w(std)} = V_{lc} \frac{P_w}{M_w} \frac{RT_{std}}{P_{std}} = K_2 V_{lc} \quad (2)$$

where:

$K_2 = 0.001333 \text{ m}^3/\text{mL}$ for metric units, or
 $K_2 = 0.04707 \text{ ft}^3/\text{mL}$ for English units.

10.6 Moisture content:

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

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 $\pm 1^\circ\text{C}$ (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

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10.8 Isokinetic variation:

10.8.1 Calculation from raw data:

$$I = \frac{100 T_s [K_3 F_{1c} + (V_m/T_m) (P_{bar} + \Delta H/13.6)]}{608 V_s P_s A_n} \quad (4)$$

where:

$K_3 = 0.003454 \text{ mm Hg-m}^3/\text{mL-K}$ for metric units, or
 $K_3 = 0.002669 \text{ in. Hg-ft}^3/\text{mL-}^\circ\text{R}$ for English units.

10.8.2 Calculation for intermediate values:

$$I = \frac{T_s V_m(\text{std}) P_{\text{std}}^{100}}{T_{\text{std}} V_s \theta A_n P_s^{60(1-B_{ws})}} \quad (5)$$

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

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:

$$\frac{(WF) (POHC_1 \text{ conc}) (100 - \%DRE)}{100} = \text{Max POHC}_1 \text{ Mass} \quad (6)$$

where:

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

POHC₁ = concentration of Principal Organic Hazardous Compound (wt %) introduced into the combustion process.

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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:

$$\frac{\text{Max POHC}_i \text{ Mass}}{\text{DV}_{\text{eff}}(\text{std})} = \text{Max POHC}_i \text{ conc} \quad (7)$$

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:

$$\frac{\text{LDL}_{\text{POHC}} \times 10}{\text{POHC}_i \text{ conc}} = V_{\text{TBC}} \quad (8)$$

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 Concentration of any given POHC in the gaseous emissions of a combustion process:

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

$$C_{\text{POHC}} (\text{ug/mL}) \times \text{sample volume (mL)} = \text{amount (ug) of POHC in sample} \quad (9)$$

where:

CPOHC = concentration of POHC as analyzed by Method 8270.

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

$$\text{Total (ug)} = \text{XAD-2 (ug)} + \text{condensate (ug)} + \text{rinses (ug)} + \text{impinger (ug)} \quad (10)$$

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

$$(\text{Total ug})/(\text{train sample volume}) = \text{concentration of POHC (ug/m}^3\text{)} \quad (11)$$

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.

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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.

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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.

<u>Solvent</u>	<u>Procedure</u>
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 ₂ O 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

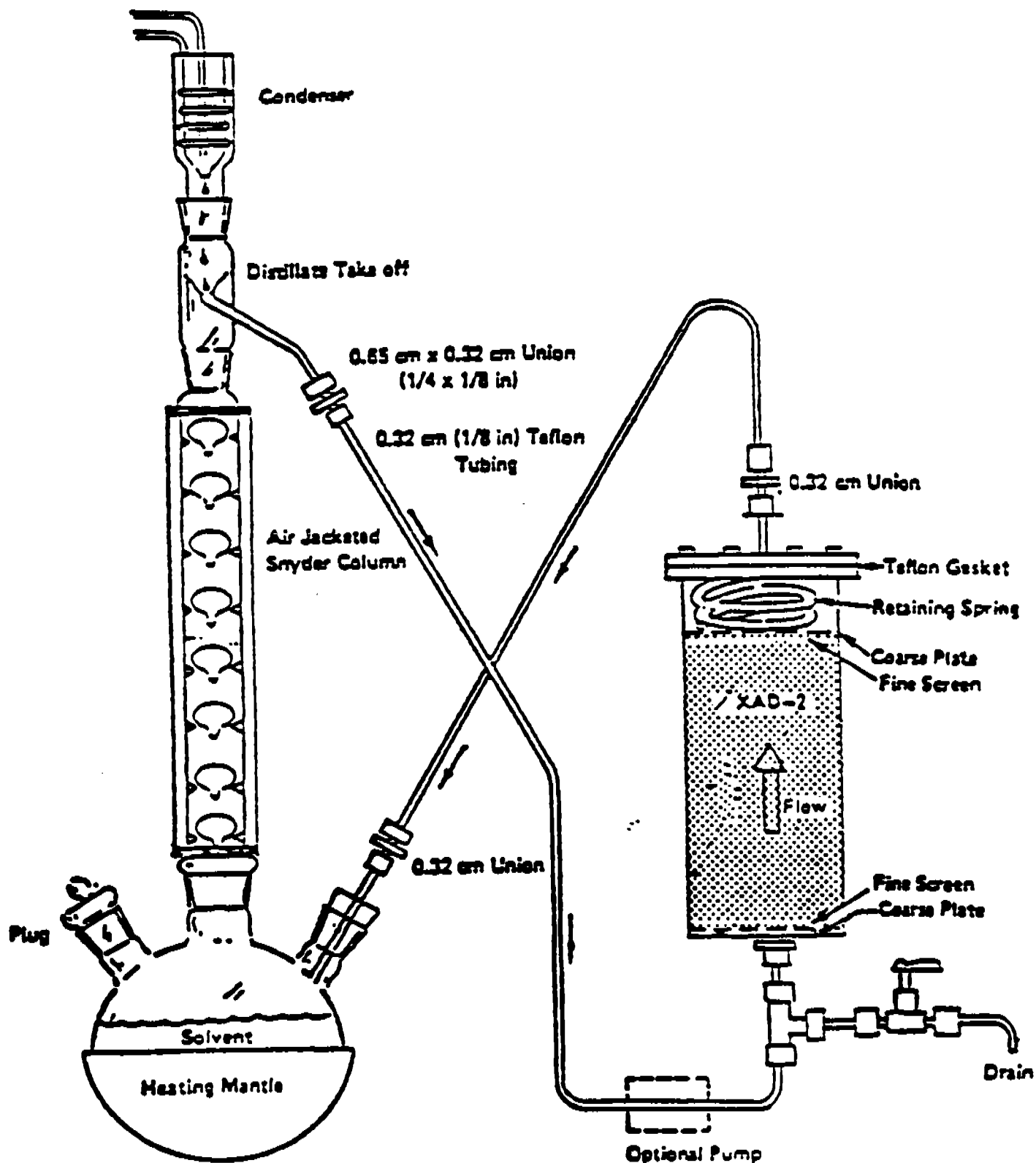


Figure A-1. XAD-2 cleanup extraction apparatus.

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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

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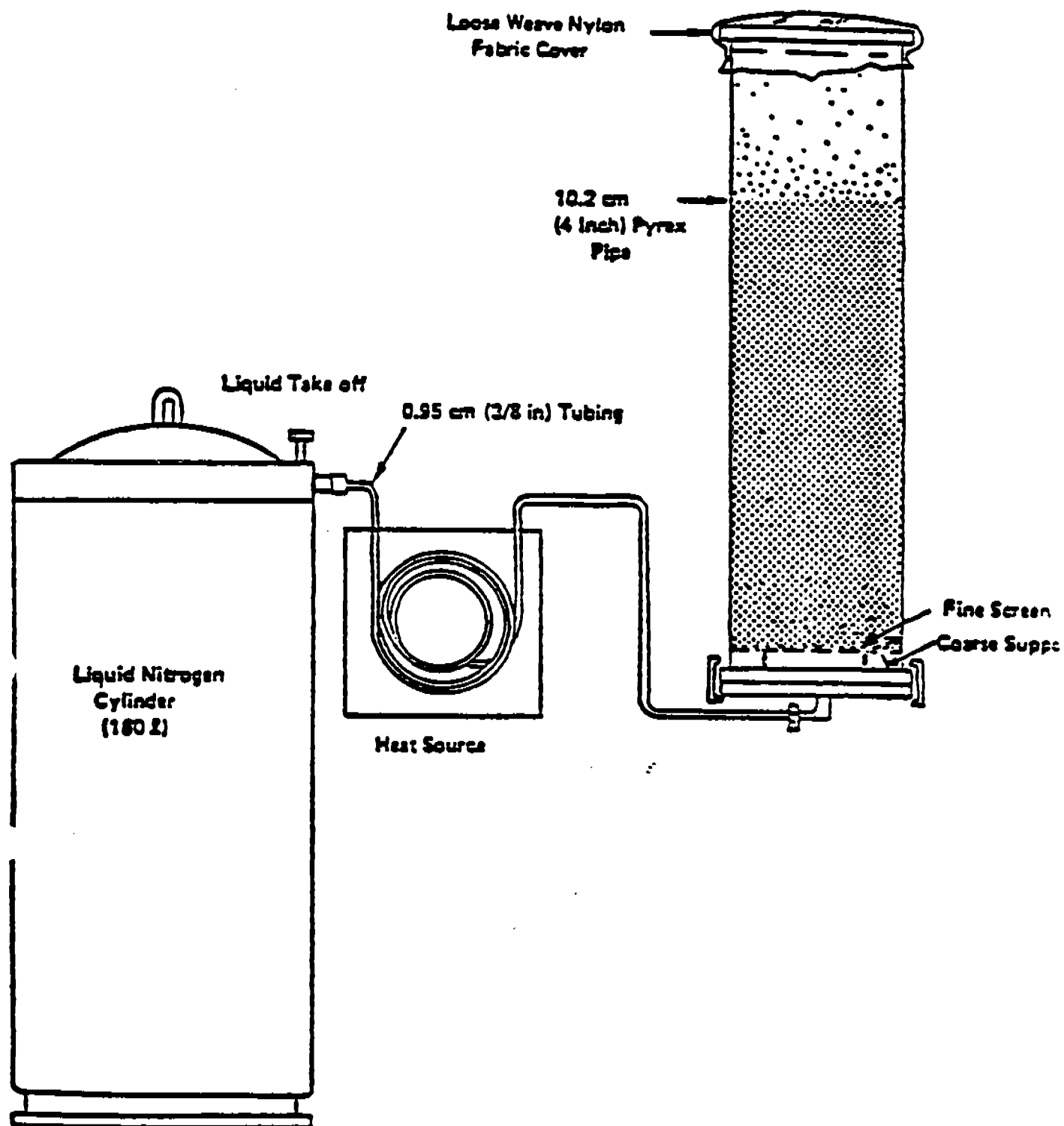


Figure A-2. XAD-2 fluidized-bed drying apparatus.

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of activated charcoal approximately 150 mL in volume. With either type of drying method, the rate of flow should gently agitate the bed. Excessive fluidization may cause the particles to break up.

4.0 QUALITY CONTROL PROCEDURES

4.1 For both Methods 1 and 2, the quality control results must be reported for the batch. The batch must be reextracted if the residual extractable organics are >20 ug/mL by TCO analysis or the gravimetric residue is >0.5 mg/20 g XAD-2 extracted. (See also section 5.1, Method 0010.)

4.2 Four control procedures are used with the final XAD-2 to check for (1) residual methylene chloride, (2) extractable organics (TCO), (3) specific compounds of interest as determined by GC/MS, as described in Section 4.5 below, and (4) residue (GRAV).

4.3 Procedure for residual methylene chloride:

4.3.1 Description: A 1 ± 0.1 -g sample of dried resin is weighed into a small vial, 3 mL of toluene are added, and the vial is capped and well shaken. Five μ L of toluene (now containing extracted methylene chloride) are injected into a gas chromatograph, and the resulting integrated area is compared with a reference standard. The reference solution consists of 2.5 μ L of methylene chloride in 100 mL of toluene, simulating 100 ug of residual methylene chloride on the resin. The acceptable maximum content is 1,000 ug/g resin.

4.3.2 Experimental: The gas chromatograph conditions are as follows:

6-ft x 1/8-in. stainless steel column containing 10% OV-101 on 100/120 Supelcoport;

Helium carrier at 30 mL/min;

FID operated on 4×10^{-11} A/mV;

Injection port temperature: 250°C;

Detector temperature: 305°C;

Program: 30°C(4 min) 40°C/min 250°C (hold); and

Program terminated at 1,000 sec.

4.4 Procedure for residual extractable organics:

4.4.1 Description: A 20 ± 0.1 -g sample of cleaned, dried resin is weighed into a precleaned alundum or cellulose thimble which is plugged with cleaned glass wool. (Note that 20 g of resin will fill a thimble, and the

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/m³, 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)

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 μ L of that solution are analyzed by gas chromatography using the TCO analysis procedure. The concentrated solution should not contain >20 μ g/mL of TCO extracted from the XAD-2. This is equivalent to 10 μ g/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 μ g/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 μ g/g in the XAD-2, or about 3.25 mg in a resin charge of 130 g.

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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/m³ 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.

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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.

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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:

	<u>NBP, °C</u>	<u>Reporting Range, °C</u>	<u>Report As</u>
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 μ L 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%.

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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 $\leq 5\%$.

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.

7.4.2.2 Inject sample.

7.4.2.3 Start integrator and recorder.

7.4.2.4 After isothermal operation for 5 min, begin temperature program.

7.4.2.5 Clean syringe.

7.4.2.6 Return sample; obtain new sample.

7.4.2.7 When analysis is finished, allow instrument to cool. Turn chromatogram and integrator output and data sheet over to data analyst.

7.5 Syringe cleaning procedure:

7.5.1 Remove plunger from syringe.

7.5.2 Insert syringe into cleaner; turn on aspirator.

7.5.3 Fill pipet with pentane; run pentane through syringe.

7.5.4 Repeat with methylene chloride from a separate pipet.

7.5.5 Flush plunger with pentane followed by methylene chloride.

7.5.6 Repeat with methylene chloride.

7.6 Sample analysis decision criterion: The data from the TCO analyses of organic extract and rinse concentrates are first used to calculate the total concentration of C7-C16 hydrocarbon-equivalents (Paragraph 7.7.3) in the sample with respect to the volume of air actually sampled, i.e., $\mu\text{g}/\text{m}^3$. On this basis, a decision is made both on whether to calculate the quantity of each n-alkane equivalent present and on which analytical procedural pathway will be followed. If the total organic content is great enough to warrant continuing the analysis -- $>500 \mu\text{g}/\text{m}^3$ -- a TCO of less than $75 \mu\text{g}/\text{m}^3$ will require only LC fractionation and gravimetric determinations and IR spectra to be obtained on each fraction. If the TCO is greater than $75 \mu\text{g}/\text{m}^3$, then the first seven LC fractions of each sample will be reanalyzed using this same gas chromatographic technique.

7.7 Calculations:

7.7.1 Boiling Point - Retention Time Calibration: The required data for this calibration are on the chromatogram and on the data sheet. The data reduction is performed as follows:

7.7.1.1 Average the retention times and calculate relative standard deviations for each n-hydrocarbon.

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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 corresponding 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/m³.

7.7.3.5 If the value of total C7-C16 hydrocarbons from Step 7.7.3.4 above exceeds 75 ug/m³, 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.

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7.7.4.2 Convert areas ($\mu\text{V}\cdot\text{sec}$) to $\text{ng}/\mu\text{L}$ by dividing by the proper weight response ($\mu\text{V}\cdot\text{sec}\cdot\mu\text{L}/\text{ng}$).

7.7.4.3 Multiply each weight by total concentrate volume (10 mL) to get weight of species in each range of the sample.

7.7.4.4 Using the volume of gas sampled on the total weight of sample acquired, convert the result of Step 7.7.4.3 above to $\mu\text{g}/\text{m}^3$.

8.0 QUALITY CONTROL

8.1 Appropriate QC is found in the pertinent procedures throughout the method.

9.0 METHOD PERFORMANCE

9.1 Even relatively comprehensive error propagation analysis is beyond the scope of this procedure. With reasonable care, peak area reproducibility of a standard should be of the order of 1% RSD. The relative standard deviation of the sum of all peaks in a fairly complex waste might be of the order of 5-10%. Accuracy is more difficult to assess. With good analytical technique, accuracy and precision should be of the order of 10-20%.

10.0 REFERENCES

1. Emissions Assessment of Conventional Stationary Combustion Systems: Methods and Procedure Manual for Sampling and Analysis, Interagency Energy/Environmental R&D Program, Industrial Environmental Research Laboratory, Research Triangle Park, NC 27711, EPA-600/7-79-029a, January 1979.

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APPENDIX M

CALCULATION EQUATIONS

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MC	= moisture content of flue gas on a percent by volume basis
CO-PPM-DRY	= carbon monoxide concentration in ppm by volume on a dry basis
CO-PPM-WET	= carbon monoxide concentration in ppm by volume on a wet or actual basis
GR/DSCF	= concentration of carbon monoxide in flue gas on a grains per dry standard cubic foot basis (68 °F, 29.92 IN.HG.)
mg/dscm	= concentration of carbon monoxide in flue gas on a milligrams per dry standard cubic meter basis (60 °F, 29.92 IN.HG.)
$\dot{m}$	= emission or mass rate of carbon monoxide on a LB/HR basis
$Q_{s,d}$	= volumetric flow rate of flue gas in dry standard cubic feet per minute
E	= emission factor of carbon monoxide in pounds of carbon monoxide emitted per million BTU heat input (LB/MMBTU)
F_d	= F-Factor of respective fuel in dry standard cubic feet of exhaust gas at 0% oxygen per million BTU of heat input (DSCF/MMBTU)

Method 25A

... Total Gaseous Organics Calculation Equations

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

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

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

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 hour

Note 1: The Ratfisch Model RS 55 Heated FID Analyzer as normally operated with a heated filter, sample line and heated detector oven gives ppm,w.

Note 2: ppm,C = ppm as carbon = 3(ppm propane)

CALCULATION EQUATIONS

Chromotropic Acid Method for Formaldehyde

$$m_t = \frac{m_a \times V_{\text{soln}}}{V_{\text{aliq}}}$$

where m_t = mass of formaldehyde in total sample in ug
 m_a = mass of formaldehyde in aliquot in ug
 V_{soln} = volume of total sample in cc (500 cc normally)
 V_{aliq} = volume of aliquot taken for analysis in cc

$$\text{PPM-DRY} = \frac{.0283 m_t}{V_{\text{std}}}$$

$$\text{PPM-WET} = \text{PPM DRY} (1-\text{MC}/100)$$

$$\text{GR/DSCF} = 5.45 \times 10^{-4} (\text{PPM-DRY})$$

$$\text{mg/dscm} = 1.249 (\text{PPM-DRY})$$

$$\dot{m} = 8.5714 \times 10^{-3} (\text{GR/DSCF}) (Q_{s,d})$$

where PPM-DRY = concentration of formaldehyde in parts per million by volume on a dry basis
 PPM-WET = concentration of formaldehyde in parts per million by volume on an actual or wet basis
 MC = moisture content of gas on a percent by volume basis
 GR/DSCF = concentration of formaldehyde in gas on a grains per dry standard cubic foot basis (68°F, 29.92 IN.HG.)
 $\dot{m}$ = emission or mass rate of formaldehyde in pounds per hour (LB/HR)

CALCULATION EQUATIONS
CONCENTRATION AND EMISSION RATE

CALCULATION OF CONCENTRATION:

$$C_x = \frac{0.8495 m_x}{V_{std} M_x}$$

where:

- C_x = Concentration of Compound x in ppm by volume, dry
- m_x = Mass of compound x in exhaust gas sample in ug
- M_x = Molecular weight of Compound x

CALCULATION OF MASS RATE:

$$\dot{m}_x = 1.557 \times 10^{-7} C_x Q_{s,d} M_x$$

where:

- $\dot{m}_x$ = Mass rate of compound x in LB/HR
- C_x = Concentration of compound x in gas stream in ppm (v/v,d)
- $Q_{s,d}$ = Volumetric flow rate of gas in DSCFM
- M_x = Molecular weight of compound x

CALCULATION EQUATIONS

METHOD 2

$$\bar{V}_s = 35.48 C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{T_{s(avg)}}{P_s M_s}}$$

$$Q_{s,d} = 60(1 - B_{ws}) \bar{V}_s A \left(\frac{528}{T_{s(avg)}}\right) \left(\frac{P_s}{29.92}\right)$$

$$Q_a = 60 \bar{V}_s A$$

$$\dot{m}_g = \frac{4.995 Q_{s,d} G_d}{1 - B_{ws}}$$

$$RH^* = 100 (vp_{twb} - 0.0003641 P_s (T_{db} - T_{wb}))/vp_{tdb}$$

$$B_{ws}^* = RH(vp_{tdb})/P_s$$

$$= \frac{4.585 \times 10^{-2} P_s M_s}{T_s (avg)}$$

*Alternate equations for calculating moisture content from wet bulb and dry bulb data.

SYMBOLS

A	= Cross sectional area of stack, SQ. FT.
A _n	= Cross sectional area of nozzle, SQ. FT.
B _{ws}	= Water vapor in gas stream, proportion by volume
C _p	= Pitot tube coefficient, dimensionless
C _a	= Concentration of particulate matter in stack gas, wet basis, GR/ACF
C _s	= Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF
EA	= Excess air, percent by volume
γ	= Dry test meter correction factor, dimensionless
G _d	= Specific gravity (relative to air), dimensionless
I	= Isokinetic variation, percent by volume
M _d	= Molecular weight of stack gas, dry basis, g/g - mole.
$\dot{m}_g$	= Mass flow of wet flue gas, LB/HR
$\dot{m}_p$	= Particulate mass flow, LB/HR
M _s	= Molecular weight of stack gas, wet basis, g/g, mole.
M _p	= Total amount of particulate matter collected, g
P _{bar}	= Atmospheric pressure, IN. HG. (uncompensated)
P _g	= Stack static gas pressure, IN. WC.

P_s = Absolute pressure of stack gas, IN.HG.
 P_{std} = Standard absolute pressure, 29.92 IN. HG.
 A_a = Actual volumetric stack gas flow rate, ACFM
 $Q_{s,d}$ = Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM
 RH = Relative humidity, %
 T_{db} = Dry bulb temperature of stack gas, °F
 T_{wb} = Wet bulb temperature of stack gas, °F
 $T_m(avg)$ = Absolute average dry gas meter temperature, °R
 $T_s(avg)$ = Absolute average stack temperature, °F
 T_{std} = Standard absolute temperature, 528 °F (68 °F)
 θ = Total sampling time, min.
 V_{lc} = Total volume of liquid collected in impingers and silica gel, ml
 V_m = Volume of gas sample as measured by dry gas meter, CF
 $V_m(std)$ = Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF
 $V_w(std)$ = Volume of water vapor in the gas sample corrected to standard conditions, SCF
 $\bar{V}_s$ = Average actual stack gas velocity, FT/SEC
 $v_{p_{tdb}}$ = Vapor pressure at T_{db} , IN. HG.

v_{ptwb} = 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

CALCULATION EQUATIONS

METHOD 3

$$\%EA = \frac{100(\%O_2 -) .5\% CO}{0.264\% N_2 - \%O_2 + 0.5\% CO}$$

$$M_d = 0.44(\%CO_2) + 0.32 (\%O_2) + 0.28 (\%N_2 + \%CO)$$

$$M_s = M_d (I - B_{ws}) + 0.18 B_{ws}$$

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

CALCULATION EQUATIONS

METHOD 5

$$V_{m(std)} = 17.65 V_m \gamma \left(\frac{P_{bar} + \Delta H/13.6}{I_{m(avg)}} \right)$$

$$V_{w(std)} = 0.0472 V_{Is}$$

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

$$I = 0.0944 \left(\frac{T_{s(avg)} V_{m(std)}}{P_s V_s A_n \theta (1 - B_{ws})} \right)$$

$$C_s = \frac{15.43 M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3 M_p P_s}{T_{s(avg)} (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_1 = 8.5714 \times 10^{-3} C_s Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228 \times 10^{-1} M_p A}{O A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

SYMBOLS

A	= Cross sectional area of stack, SQ. FT.
A _n	= Cross sectional area of nozzle, SQ. FT.
B _{ws}	= Water vapor in gas stream, proportion by volume
C _p	= Pitot tube coefficient, dimensionless
C _a	= Concentration of particulate matter in stack gas, wet basis, GR/ACF
C _s	= Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF
EA	= Excess air, percent by volume
γ	= Dry test meter correction factor, dimensionless
G _d	= Specific gravity (relative to air), dimensionless
I	= Isokinetic variation, percent by volume
M _d	= Molecular weight of stack gas, dry basis, g/g --mole.
$\dot{m}_g$	= Mass flow of wet flue gas, LB/HR
$\dot{m}_p$	= Particulate mass flow, LB/HR
M _s	= Molecular weight of stack gas, wet basis, g/g, mole.
M _p	= Total amount of particulate matter collected, g
P _{bar}	= Atmospheric pressure, IN. HG. (uncompensated)
P _g	= Stack static gas pressure, IN. WC.

P_s = Absolute pressure of stack gas, IN.HG.
 P_{std} = Standard absolute pressure, 29.92 IN. HG.
 A_a = Actual volumetric stack gas flow rate, ACFM
 $Q_{s,d}$ = Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM
 RH = Relative humidity, %
 T_{db} = Dry bulb temperature of stack gas, °F
 T_{wb} = Wet bulb temperature of stack gas, °F
 $T_m(avg)$ = Absolute average dry gas meter temperature, °R
 $T_s(avg)$ = Absolute average stack temperature, °F
 T_{std} = Standard absolute temperature, 528 °F (68 °F)
 θ = Total sampling time, min.
 V_{lc} = Total volume of liquid collected in impingers and silica gel, ml
 V_m = Volume of gas sample as measured by dry gas meter, CF
 $V_m(std)$ = Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF
 $V_w(std)$ = Volume of water vapor in the gas sample corrected to standard conditions, SCF
 $\bar{V}_s$ = Average actual stack gas velocity, FT/SEC
 $v_{p_{tdb}}$ = Vapor pressure at T_{db} , IN. HG.

v_{ptwb} = 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

Interpoll Laboratories
(612)786-6020

Calculation of Emission Factor by the
Oxygen F-Factor Method

$$E = \frac{CF(20.9)}{20.9 - \bar{B}'_{O_2}}$$

where

E = Emission factor LB/10⁶BTU

C = Dry standard concentration of particulate - LB/DSCF

F = F-Factor for fuel - DSCF/10⁶BTU

$\bar{B}'_{O_2}$ = Average oxygen concentration (% v/v) of flue gas

If this expression is adjusted to the conventional units and simplified, the following working equation for the fuel in question is obtained:

$$E = \frac{.0029857F C_s}{20.9 - \bar{B}'_{O_2}}$$

where

C_s = Dry standard concentration of particulates - GR/DSCF

CALCULATION EQUATIONS

METHOD 10

$$\text{CO-PPM-DRY} = \text{CO}_{\text{CO}_2\text{-free,dry,avg}} (1 - \text{CO}_{2,d}/100)$$

$$\text{CO-PPM-WET} = \text{CO-PPM-DRY} (1 - \text{MC}/100)$$

$$\text{GR/DSCF} = 5.0885 \times 10^{-4} (\text{CO-PPM-DRY})$$

$$\text{mg/dscm} = 1.165 (\text{CO-PPM-DRY})$$

$$\dot{m} = 8.5714 \times 10^{-3} (\text{GR/DSCF})(Q_{s,d})$$

$$E = \frac{2.9857 \times 10^{-3} F_d (\text{GR/DSCF})}{20.9 - O_{2,d}}$$

Where

$\text{CO}_{\text{CO}_2\text{-free,dry,avg}}$ = average of two determinations of carbon monoxide on a dry, CO_2 -free integrated flue gas sample reported in ppm by volume

$\text{CO}_{2,d}$ = carbon dioxide concentration of flue gas on a dry percent by volume basis

$O_{2,d}$ = oxygen concentration of flue gas on a dry percent by volume basis

CALCULATION OF PAH EMISSION RATES

in g/sec and 10^{-3} g/sec

$$\dot{m} \text{ (g/sec)} = 4.716 \times 10^{-10} C_s (\text{ug/m}^3) Q_{s,d} \text{ (DSCFM)}$$

$$\dot{m} \text{ (} 10^{-3} \text{g/sec)} = 4.716 \times 10^{-7} C_s (\text{ug/m}^3) Q_{s,d} \text{ (DSCFM)}$$

$$\dot{m} \text{ (} 10^{-3} \text{g/sec)} = 4.716 \times 10^{-4} C_s (\text{ug/m}^3) Q_{s,d} \text{ (DSCFM)}$$

where:

$$Q_s = \text{ug/dsm}^3$$

$$Q_{s,d} = \text{DSCF/MIN}$$

APPENDIX N

SAMPLING TRAIN CALIBRATION DATA

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INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job LP-TOMAFIAWK
 Operator SLB

Date 8-18-93
 Module No. 3

Instructions: Operate the control module at a flow rate equal to ΔH_0 for 10 minutes before attaching the umbilical. Record the following data:
 Bar press 28.65 in. Hg. $\tau =$ 9972 ΔH_0 177 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	1560.20		
2.5	562.78	73	73
5.0	564.82	77	73
7.5	566.02	78	74
10	567.90	79	74
	$V_m =$	$Avg(t_m) =$	
		°F	

Calculate Y_{cn} as follows:

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

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

$$Y_{cn} = \underline{\hspace{2cm}}$$

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

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INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job LP/TOMAHAWK

Date 8-16-93

Operator E. T. [Signature]

Module No. 4

Instructions: Operate the control module at a flow rate equal to $\dot{V}_{He}$ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 28.48 in. Hg. $\tau =$ 1.0075 $\dot{V}_{He}$ 1.90 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
<u>1.00</u>	<u>6.000</u>	<u>[Redacted]</u>	
2.5	<u>7.950</u>	<u>86</u>	<u>85</u>
5.0	<u>9.830</u>	<u>87</u>	<u>84</u>
7.5	<u>11.730</u>	<u>89</u>	<u>84</u>
10	<u>13.635</u>	<u>90</u>	<u>85</u>
<u>[Redacted]</u>	$V_m =$ <u>7.635</u>	Avg(t_m) = <u>86.3</u> °F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(1.0075)(7.635)} \left[\frac{(86.3) + 460}{(28.48)} \right]^{0.5} = 4.3797$$

$$Y_{cn} = \underline{1.0168}$$

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

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INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job L.P. TOMAHAWK
 Operator G HOVE

Date 8-18-93
 Module No. 4

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

Bar press 28.65 in. Hg. $\tau =$ 1.0075 Δ He 1.90 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(285.90)		
2.5	287.80	71	71
5.0	289.77	73	71
7.5	291.57	74	72
10	293.44	74	72
	$V_m = 7.54$	Avg(t_m) = 72.25°F	

Calculate Y_{on} as follows:

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

$$Y_{on} = \frac{1.786}{(1.0075)(7.54)} \left[\frac{(72.25) + 460}{(28.65)} \right]^{0.5}$$

$$Y_{on} = \underline{1.013}$$

If Y_{on} 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

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INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job L.P. TOMAHAWK, W1
 Operator Q HOVE

Date 8-19-93
 Module No. 4

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

Bar press 28.50 in. Hg. $\tau = \underline{1.0075}$ ΔH_e 1.90 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	1.548.70		
2.5	550.62	70	69
5.0	552.49	72	70
7.5	554.40	73	70
10	556.28	74	71
	$V_m = 7.48$	Avg(t_m) = 71.125°F	

Calculate Y_{on} as follows:

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

$$Y_{on} = \frac{1.786}{(1.0075)(7.48)} \left[\frac{(71.125 + 460)}{(28.50)} \right]^{0.5}$$

$$Y_{on} = \underline{.9905}$$

If Y_{on} 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

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INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job LP TOMAHAWK

Date 8-19-93

Operator G HOVE

Module No. 4

Instructions: Operate the control module at a flow rate equal to $\dot{V}_{He}$ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 28.50 in. Hg. $\tau = \underline{1.0075}$ $\dot{V}_{He}$ 1.90 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(547.70)		
2.5	550.62	70	69
5.0	552.49	72	70
7.5	554.40	73	70
10	556.28	74	71
	$V_m = 7.48$	Avg(t_m) = $71.125^{\circ}F$	

Calculate Y_{on} as follows:

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

$$Y_{on} = \frac{1.786}{(1.0075)(7.48)} \left[\frac{(71.125 + 460)}{(28.50)} \right]^{0.5}$$

$$Y_{on} = \underline{.9905}$$

If Y_{on} 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

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INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job LP1 TOMAHAWK
 Operator E. [Signature]

Date 8-16-93
 Module No. 7

Instructions: Operate the control module at a flow rate equal to $\dot{V}_H$ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 28.48 in. Hg. $\tau =$ 1.0006 $\dot{V}_H$ 1.93 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(554.50)		
2.5	556.35	86	83
5.0	558.23	88	84
7.5	560.10	89	84
10	562.170	91	84
	$V_m = 7.67$	Avg(t_m) = 86.1 °F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{() ()} \left[\frac{(86.1) + 460}{(28.48)} \right]^{0.5} 4.3789$$

$$Y_{cn} = \underline{1.0190}$$

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

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PHENOL

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job L.P.1 TOMAHAWK Date 8/18/93
 Operator DUKE BRENNAN Module No. 8

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

Bar press 28.60 in. Hg. $\tau =$ 1.0011 ΔH_e 1.85 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(167.000)		
2.5	168.96	78	75
5.0	170.91	79	75
7.5	172.87	81	76
10	174.800	82	76
	$V_m = 7.80$	Avg(t_m) = <u>77.75</u> °F	

Calculate Y_{on} as follows:

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

$$Y_{on} = \frac{1.786}{(7.80)(1.0011)} \left[\frac{(77.75) + 460}{(28.60)} \right]^{0.5}$$

$$Y_{on} = \underline{.9917}$$

If Y_{on} 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

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INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job 2P Thompson Hawk
 Operator E. Smith

Date 8-16-93
 Module No. 8

Instructions: Operate the control module at a flow rate equal to $\dot{V}_{He}$ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 28.48 in. Hg. $\tau = \underline{1.0011}$ $\dot{V}_{He}$ 1.85 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(946.50)		
2.5	947.50	84	82
5.0	949.50	85	82
7.5	951.49	86	83
10	953.41	88	83
	$V_m = 7.91$	Avg(t_m) = 84.1°F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(1.0011)(7.91)} \left[\frac{(84.1) + 460}{()} \right]^{0.5} = 4.3709$$

$$Y_{cn} = \underline{.9858}$$

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

S-432

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job LPI/TOMSAANK

Date 8-16-93

Operator E T LOWBRIDGE

Module No. 9

Instructions: Operate the control module at a flow rate equal to $\dot{V}_m$ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 28.48 in. Hg. $\tau =$.4452 $\dot{V}_m$ 1.72 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(557.500)		
2.5	559.42	86	84
5.0	561.37	87	84
7.5	563.31	88	84
10	565.26	88	85
	$V_m = 7.76$	Avg(t_m) = 85.8 °F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(.4452)(7.76)} \left[\frac{(85.8) + 460}{(28.48)} \right]^{0.5} 4.3777$$

$$Y_{cn} = \underline{1.0124}$$

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

S-432

Part 16
→
Furnace

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job L.P. / TOMAHAWK
Operator DUKE BRENNAN

Date 8/18/93
Module No. 9

Instructions: Operate the control module at a flow rate equal to ΔH_0 for 10 minutes before attaching the umbilical. Record the following data:

Bar press 28.60 in. Hg. $\tau =$.9952 ΔH_0 1.77 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(930.000)		
2.5	931.92	78	75
5.0	933.83	80	76
7.5	935.79	81	77
10	937.737	82	78
	$V_m = 7.737$	$Avg(t_m) = 78.25^\circ F$	

Calculate Y_{on} as follows:

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

$$(.2385) Y_{on} = \frac{1.786}{(7.737)(.9952)} \left[\frac{(78.25) + 460}{(28.60)} \right]^{0.5}$$

$$Y_{on} = \underline{1.0062}$$

If Y_{on} 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

S-432

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: August 25, 1993

Meter Box No. : 3 (Rockwell Dry Test Meter Serial No. 35302)

Date of Last Calibration: August 3, 1993

Calibration Technician: D. Van Hoever

Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter		Final Meter		Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
		Reading		Reading			
August 18, 1993	3-9772	560.990		710.22		149.23	149.23

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report, August 25, 1993

Meter Box No. : 4 (Rockwell Dry Test Meter Serial No. 964553)

Date of Last Calibration: August 13, 1993

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 16, 1993	3-9772	6.00	1002.14	996.14	996.14

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: August 25, 1993

Meter Box No. : 7 (Rockwell Dry Test Meter Serial No. 965550)

Date of Last Calibration: August 11, 1993

Calibration Technician: D. Van Hoever

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, 1993	3-9772	554.50	949.50	395.00	395.00

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-620

Meter Box Calibration and Usage Status

Date of Report: August 25, 1993

Meter Box No. : 8 (Rockwell Dry Test Meter Serial No. 964547)

Date of Last Calibration: July 15, 1993
Calibration Technician: D. Van Hoever
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter		Final Meter		Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
		Reading		Reading			
August 10, 1993	3-9714	688.10		832.77		144.67	144.67
August 11, 1993	3-9715	833.20		943.47		110.27	254.94
August 17, 1993	3-9772	945.50		1317.50		372.00	626.94

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: August 25, 1993

Meter Box No. : 9 (Rockwell Dry Test Meter Serial No. 949231)

Date of Last Calibration: August 11, 1993

Calibration Technician: D. Van Hoever

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, 1993	3-9772	557.50	1259.20	701.70	701.70

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: August 25, 1993

Meter Box No. : 6-S (Rockwell Dry Test Meter Serial No. 649078)

Date of Last Calibration: August 5, 1993

Calibration Technician: D. Van Hoever

Wet Test Meter No.: American Meter AL-17 (0.05 CF/REV)

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
August 17, 1993	3-9772	28.000	42.445	14.445	14.445

* Total volume through meter since last calibration.

Bar. Press. 29.05 in. Hg

INTERPOL LABORATORIES, INC.
METER CALIBRATION SHEET

EPA METHOD 6

Control Module No.

Serial No. DTH

Hot Test Meter No. AL-20

Technician D. VAN HOOVER[illegible]

Positive leak check performed by DCH

Water was in tolerance

Water was not in tolerance ☒; readjusted linkage

Water was not in tolerance ☐; changed dry test meters

Approved by Leann K. Kays Date 8/5/93

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe (

S0102RR 11/91

Bar. Press. 29.23 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. _____

Serial No. DTN 964552

Net Test Water No. AL-20

Technician

[illegible]

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

Approved by Kenneth Egan Date 8/25/93

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91

3/11/8

29.08

9 OCHTAV 143

Serial No. DIN 965550

Wet Test Water No. AL-20

Technician Dr Van Hoover

Positive leak check performed by Dut

Positive leak check performed by Dett
Water was in tolerance A

Water was not in tolerance ☐; readjusted linkage

Water was not in tolerance ☐; changed dry test meters

Approved by David K. Day Date 8/12/93

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91

Bar. Press. 29.22 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET

EPA METHOD 6

Control Module No.

Serial No. DTH

Wat Test Meter No. AL-20

Technician D. Van Hoever

[illegible]

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

Approved by Samir K. Dey Date 7/16/23

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91

Date 8/11/93
Bar. Press. 29.08 In. Hg

**INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 6**

Control Module No. 7
Serial No. DTM 949231
Net Test Meter No. AL-20
Technician D. Van Hoever

[illegible]

Positive leak check performed by DET
 Water was in tolerance ☒
 Water was not in tolerance ☐; readjusted linkage
 Water was not in tolerance ☐; changed dry test meters

Approved by *K. Smith* Date 8/12/93

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91

8/5/93

Bar. Press. 29.16 in. Hg

INTERPOL LABORATORIES
MINIMODULE CALIBRATION SHEET
Flow Rate Range 0-0.13 CFM
(0-4 LPH)

Meter Box No.

Serial No. DTH

Wet Test Meter No. AL-17 (.05 CF/REV)

Technician: D. Van Hoever

[illegible]

~~X~~ Water was in tolerance

Heter was not in tolerance ☐; readjusted linkage

Water was not in tolerance ☐; changed dry test meters

Gas Meter Bimetallic Therm. Calibration/Verification

☐ $\geq \pm 50F$ (Out of control) ☐ Recalibrated

☐ $\leq \pm 50\text{F}$ (In control) ☐ No action required

Approved by Ken Smith Date 8/11/93

*** Verified against mercury in glass thermometer or calibrated platinum resistance thermometer.**

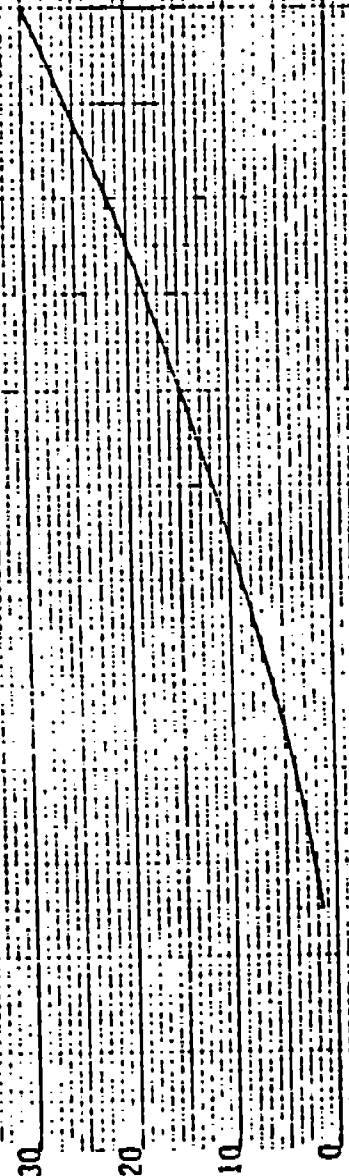
Based on AL-17 wet test meter calibration in August 1989 against Bell Prover (NBS Traceable) - Carl Poe Co.

DIFFERENTIAL PRESSURE AND PROOF CALIBRATION CURVES

WET TEST METER

PULSATION RANGE

DIFFERENTIAL INCHES H₂O



Calibrated with a 10 Ft. American De-
Prover, Serial No. 3157. Traceable to
the Bureau of Standards. Reference No.
5249068, PI-TAPE.

AL-20 American Met 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

PROOF

PROOF

PROOF
100
99

PROOF

PROOF

PROOF

PROOF

PROOF

PROOF

PROOF

PROOF

PROOF

PROOF

PROOF

PROOF

PROOF

PROOF

CORRECT VOLUME = INDEX READING x PROOF + 100

FLOW RATE - CUBIC FEET OF AIR PER HOUR

20 40 60 80 100 120

DAVID BANKS

November, 1999

DIFFERENTIAL PRESSURE PROOF CALIBRATION CURVE

DIFFERENTIAL - INCHES H₂O

PULSATION RANGE

.30
.20
.10
0

42-N

PROOF

101
100
99

CORRECTED VOLUME

INDEX READING x PROOF = 100

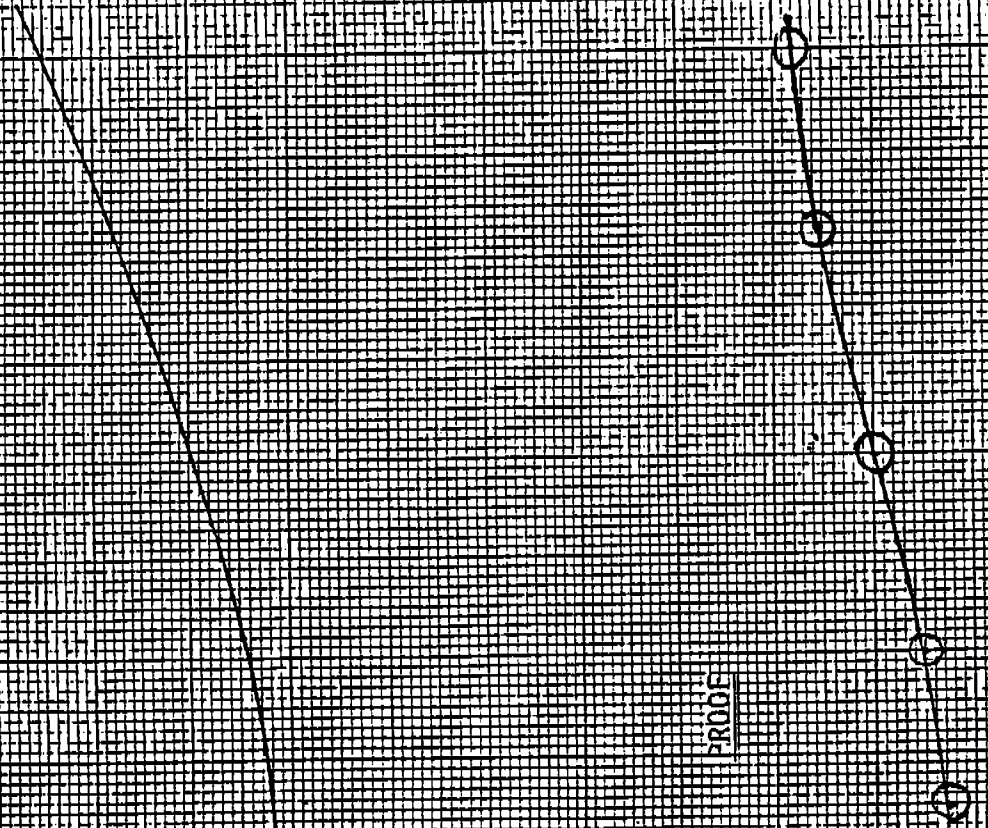
2 4 6 8 10

FLOW RATE - CUBIC FEET OF AIR PER HOUR

DAVID BANKS
AUGUST, 1989

Data obtained on an American 5 Ft.
Bell Prover, Serial No. 2260. Traceable
to the Bureau of Standards. Reference
No. 106870, PI-TAPE.

AL-17 American Wet Test Meter
Serial No. P-718
Stainless Steel w/Removable Back
Calibrated with Saturated Air
Water Temp. 74° F
Air Temp. 74° F
Inlet Pressure 2" H₂O Constant
Calibration Rate: 4 CFH Air
Capacity Rate: 8 CFH Air
Restricted Outlet for Rate Deviation.



Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 8-17-93

Nozzle Number 8-4

Technician: Duke Brennan

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	.242
2	.240
3	.238
Average:	.240

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 8-17-93
Technician: Gary Hove

Nozzle Number M-3

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	.184
2	.185
3	.187
Average:	.185

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 8-18-93

Nozzle Number 3-3

Technician: Duke Brennan

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	.192
2	.190
3	.188
Average:	.190

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 8-19-93
Technician: Gary Hove

Nozzle Number 4-4

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	.250
2	.249
3	.251
Average:	.250

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 8-19-93
Technician: Gary Hove

Nozzle Number 1-4

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	.240
2	.242
3	.245
Average:	.242

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:

Vendor FLUKO PDT-12
 Model 51 Serial Number 5030376
 Range 0-2 °F Thermocouple Type K
 Date of Calibration 7-6-93 Technician E. T. LOWBRIDGE

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 $\pm 0.1\%$ 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)	(%)
0	0	1.2	1.2	.24
100	100	100.2	.2	.03
200	200	202.2	2.2	.33
300	300	301.2	1.2	.15
400	400	399.6	.4	.04
500	500	500.0	0	0
600	600	601.8	1.8	.17
700	700	699.8	.2	.02
800	800	801.4	1.4	.11
900	900	899.8	.2	.01
1000	1000	1006.6	1.6	.11
1100	1100	1101	1	.06
1200	1200	1203.2	3.2	.19
1300	1300	1300	0	0
1400	1400	1403.4	3.4	.18
1500	1500	1500.8	.8	.04
1600	1600	1601.8	1.8	.09
1700	1700	1700.2	.2	.01
1800	1800	1802	2.0	.09
1900	1900	1898.2	1.8	.07
2000	2000	2001.4	1.4	.05
2100	2100	2098.4	1.6	.06
		Averages:	1.25	.09

OF = off scale response by unit under test (°F)
 $\% \text{ dev} = 100 \Delta t / (460 + t)$

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

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:

Vendor OMEGA Serial Number T 82832
Model HH21 Thermocouple Type K
Range 0-2100 °F Technician GA
Date of Calibration 7-16-93

#24

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 $\pm 0.1\%$ 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)	(%)
0	0	-1.8	1.8	.391
100	100	.8	2.0	.357
200	200	2.0	0	0
300	300	2.8	2	.263
400	400	3.8	2	.222
500	500	4.9	1	.204
600	600	6.0	0	0
700	700	6.9	1	.207
800	800	8.0	0	0
900	900	8.9	1	.07
1000	1000	10.0	0	0
1100	1100	10.9	1	.06
1200	1200	12.0	1	.06
1300	1300	12.9	1	.05
1400	1400	14.0	1	.05
1500	1500	14.9	1	.05
1600	1600	16.0	1	.04
1700	1700	16.9	2	.09
1800	1800	18.0	0	0
1900	1900	18.9	2	.08
2000	2000	19.9	1	.04
2100	2100	20.9	2	.07
		Averages:	1.1	.09

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



Unit in tolerance

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

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:

Vendor OMEGAModel HHZ1Range 0-2100Date of Calibration 4-12-93

#25

Serial Number T83070Thermocouple Type KTechnician R. MADISON

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 $\pm 0.1\%$ 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 ($^{\circ}\text{F}$) Nominal	Temperature of Standard or Simulated Temp ($^{\circ}\text{F}$)	Response of Unit Under Test ($^{\circ}\text{F}$)	Deviation	
			Δt ($^{\circ}\text{F}$)	(%)
0	0	-2	2	.43
100	100	97	3	.65
200	200	200	0	0
300	300	298	2	.43
400	400	397	3	.65
500	500	497	2	.43
600	600	600	0	0
700	700	698	2	.43
800	800	800	0	0
900	900	898	2	.43
1000	1000	999	1	.22
1100	1100	1098	2	.43
1200	1200	1200	0	0
1300	1300	1298	2	.43
1400	1400	1400	0	0
1500	1500	1497	3	.65
1600	1600	1600	0	0
1700	1700	1696	4	.86
1800	1800	1798	2	.43
1900	1900	1898	2	.43
2000	2000	1997	3	.65
2100	2100	2096	4	.86
Averages:			1.77	.38

OF = off scale response by unit under test ($^{\circ}\text{F}$)
 $\% \text{ dev} = 100 \Delta t / (460 + t)$



Unit in tolerance



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

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:

#29

Vendor OMEGAModel HH21

Range _____ °F

Serial Number T-97106Thermocouple Type KDate of Calibration 5-10-93Technician SCOTT E BAINVILLE

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 $\pm 0.1\%$ 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)	(%)
0	0	-2	-2	0.43
100	100	98	-2	0.36
200	200	200	0	0
300	300	298	-2	0.26
400	400	398	-2	0.25
500	500	498	-2	0.21
600	600	600	0	0
700	700	698	-2	0.17
800	800	800	0	0
900	900	898	-2	0.15
1000	1000	999	-1	0.07
1100	1100	1098	-2	0.13
1200	1200	1201	+1	0.06
1300	1300	1298	-2	0.11
1400	1400	1401	+1	0.05
1500	1500	1498	-2	0.10
1600	1600	1599	-1	0.05
1700	1700	1697	-3	0.14
1800	1800	1799	-1	0.04
1900	1900	1897	-3	0.13
2000	2000	1998	-2	0.08
2100	2100	2096	-4	0.16
Averages:			1.6818	0.1542

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

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

S-433

S-Type Pitot Tube Inspection SheetPitot No. 23-6Pitot 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) .461 IN.

Alignment:

4. $\alpha_1 < 10^\circ$ 1
5. $\alpha_2 < 10^\circ$ 1
6. $B_1 < 50$ 1
7. $B_2 < 50$ 2
8. $Z < .125"$.02
9. $W < .0625"$.02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 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) .760 IN.

☒ Meets all EPA design criteria thus $C_p = 0.84$
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
 $C_p =$ _____

Date of Inspection:

Inspected by:

4-7-93[Signature]

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. MM5-6

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) .460 IN.

Alignment:

4. α_1 $< 10^\circ$ 0
5. α_2 $< 10^\circ$ 0

6. B_1 $< 5^\circ$ 2
7. B_2 $< 5^\circ$ 2

8. Z $< .125"$ 0
9. W $< .0625"$.01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

- ☒ Meets all EPA design criteria thus $C_p = 0.84$
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
 $C_p =$ _____

Date of Inspection:

4-7-93

Inspected by:

E. Crowder

CFR Title 40 Part 60 Appenidix A Method 2

S-348

4-7-93 GASTACKWPF00MS5-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. MM5-4

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) .460 IN.

Alignment:

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

6. $B_1 < 5^\circ$ 2
7. $B_2 < 5^\circ$ 2

8. $Z < .125"$ 0
9. $W < .0625"$.01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

- ☒ Meets all EPA design criteria thus $C_p = 0.84$
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
 $C_p =$ _____

Date of Inspection:

4-7-93

Inspected by:

E. [Signature]

CFR Title 40 Part 60 Appendix A Method 2

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4-7-93 CASTAGNAPPEFORMS-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 29-6

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) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0
6. B_1 < 5° 1
7. B_2 < 5° 1
8. Z < .125" .02
9. W < .0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

- ☒ Meets all EPA design criteria thus $C_p = 0.84$
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
 $C_p =$ _____

Date of Inspection:

4-7-93

Inspected by:

E. Hawthorne

S-Type Pitot Tube Inspection SheetPitot No. 23-4Pitot tube dimensions:

1. External tubing diameter (D_t) 1.314 IN.
2. Base to Side A opening plane (P_A) 1.400 IN.
3. Base to Side B opening plane (P_B) 1.460 IN.

Alignment:

4. $\alpha_1 < 10^\circ$ 0
5. $\alpha_2 < 10^\circ$ 0
6. $\beta_1 < 50$ 1
7. $\beta_2 < 50$ 1
8. $Z < .125"$.03
9. $W < .0625"$.03

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle 1.755 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) 1.760 IN.

- ☒ Meets all EPA design criteria thus $C_p = 0.84$
- ☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
 $C_p =$ _____

Date of Inspection:

4-7-93

Inspected by:

[Signature]

S-Type Pitot Tube Inspection SheetPitot No. 22-4Pitot 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) .460 IN.

Alignment:

4. $\alpha_1 < 10^\circ$ 0
5. $\alpha_2 < 10^\circ$ 0
6. $B_1 < 5^\circ$ 1
7. $B_2 < 5^\circ$ 1
8. $Z < .125"$.02
9. $W < .0625"$.02

Distance from Pitot to Probe Components:

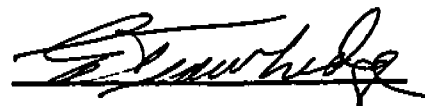
10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus $C_p = 0.84$ ☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
 $C_p =$ _____

Date of Inspection:

4-9-93

Inspected by:



INTERPOLL LABORATORIES
(612)786-6020
Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

ET'S

Date 5-12-93
Technician E. TROWBRIDGE
Mercury Column Barometer No. 46
Aneroid Barometer No. SN-01002008

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (Pba-Pbm)
29.16	75	.12	29.04	29.04	

Has this barometer shown any consistent problems with calibration? Yes/No. If
yes, explain. 720

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. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

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INTERPOLL LABORATORIES

(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration SheetDate 1-4-93Technician B. HOUE

Mercury Column Barometer No. _____

Aneroid Barometer No. 636235

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (Pba-Pbm)
29.27	73	-.114	29.155	29.30	.185

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

Has problem been alleviated? Yes/No. How? _____

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ANEROID TO
MATCH THE Hg

***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. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

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INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 7/23/93
Technician DUKE BRENNAN
Mercury Column Barometer No. 1
Aneroid Barometer No. DUKES ULTIMETER

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (Pba-Pbm)
29.18	79°	.130	29.05	29.06	0.01

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

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. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

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INTERPOLL LABORATORIES

(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration SheetDate 5-10-93Technician SCOTT BAINVILLEMercury Column Barometer No. 1Aneroid Barometer No. 560209

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (Pba-Pbm)
29.29	73	.114	29.18	29.27	.09

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

Has problem been alleviated? Yes/No. How? NA

***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. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

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