Background Report Reference

AP-42 Section Number: 10.6.1

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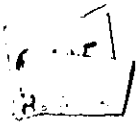
Title: Results of the February 11-13, 1992 EPA-Required Air Emission Compliance Tests At The Louisiana Pacific Waferboard Plant In Two Harbors Minnesota

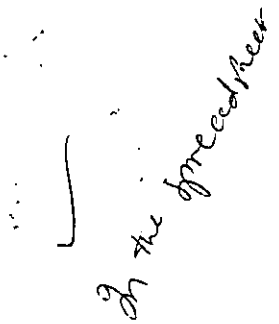
Interpoll Laboratories, Inc.

March 1992

REF 19

TWO HARBORS





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RESULTS OF THE FEBRUARY 11 - 13, 1992 EPA-REQUIRED AIR EMISSION COMPLIANCE TESTS AT THE LOUISIANA PACIFIC WAFERBOARD PLANT IN TWO HARBORS, MINNESOTA

Submitted to:

LOUISIANA PACIFIC CORPORATION
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Attention:

Sue Somers

Approved by:

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Manager
Field Testing Division

Report Number 2-3501
March 17, 1992
SP/slp

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1 INTRODUCTION

During the Period February 11 - 13, 1992 Interpoll Laboratories personnel conducted EPA-required air emission compliance tests on the Press & Unloader vent, Dryer and Thermal Oil Heater,at the Louisiana Pacific Corporation (LP) Waferboard Plant located in Two Harbors, Minnesota. On-site testing was performed by E. Trowbridge, D. VanHoever, C. Mosser, and P. O'Neil. Coordination between testing activities and plant operation was provided by Sue Somers of LP. The test was witnessed by Basim J. Dihu of the Environmental Protection Agency.

The Wafer Dryer tested is an MEC Model 1260 rotary drum dryer. It is equipped with a pneumatic injection system for firing wood fines and has a design heat input capacity of 40 10^6BTU/Hr. Particulate emissions from the wafer dryer are controlled by a primary cyclone followed by a secondary multicyclone also manufactured by MEC Company in series with an electrified filter bed manufactured by E.F.B. Inc. Cleaned flue gas is emitted to the atmosphere by a 100-foot high radial steel stack which has a diameter of 48 inches.

The press vents tested are the exhaust from general ventilators positioned over the board press and unloader. Axial fans in the duct above the roof provide the air movement. Emissions from the board presses are uncontrolled.

The Thermal Oil Heater was manufactured by Konus Kassel in 1985. It is equipped with two screw auger-type stokers and is fired with a mixture of bark and wood. The unit is equipped with an economizer and has a design heat input capacity of 31.0 10^6BTU/HR. Particulate emissions from the Thermal Oil Heater are controlled by a large diameter cyclone manufactured by C.E. Preheater. The baghouse is 6,597 square feet. Cleaned flue gas is emitted to the atmosphere by a 75-foot high radial steel stack which as a diameter of 40 inches.

Particulate evaluations were performed in accordance with EPA Methods 2-5, CFR Title 40, Part 60, Appendix A (revised July 1, 1991). 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 to provide samples for methylene chloride extraction to determine total condensible organic compounds.

PM-10 determinations were performed in accordance with EPA Method 201A (Ibid, Part 51, Appendix M). An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to extract PM-10 samples by means of an Anderson PM-10 cyclone and a stainless steel probe. The cyclone used in this work meets or exceeds the specifications of Method 201A. Velocity pressure measurements were made prior to each run to determine the proper dwell times at each traverse point.

Formaldehyde samples were collected using draft EPA Method 0011 (SW 846 3rd Ed.) as a guideline. The samples were collected isokinetically using a Method 5 sampling train with an aqueous acidic 2,4-dinitropheylhydrazine absorbing solution and analyzed by high performance liquid chromatography.

Total gaseous hydrocarbon concentrations were determined instrumentally using a Ratfisch Model 55RS 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.

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 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.

Carbon monoxide determinations were performed on the three sources tested using a continuous emission monitor in accordance with EPA Method 10.

Testing on the Dryer and Thermal Oil Heater was conducted from two test ports oriented at 90 degrees on each of the respective stacks. The test ports on the Dryer are located 8.5 stack diameters upstream of the nearest flow disturbance and 0.6 diameters upstream of the stack exit. The test ports on the Thermal Oil Heater are located 7.6 stack diameters downstream and 2.8 stack diameters upstream of any flow disturbance. A 24-point traverse was used at the Dryer test site to isokinetically collect the particulate and formaldehyde samples. Each traverse point was sampled 2.5 minutes for a total sampling time of sixty minutes per run. A 12-point traverse was used for PM-10 sampling at the Dryer with run times varying from 95 to 122 minutes. A 12-point traverse was used at the Thermal Oil Heater test site to isokinetically collect the particulate, PM-10 and formaldehyde samples. Each traverse point was sampled five minutes for the particulate and formaldehyde sampling to give a total sampling time of sixty minutes per run. The PM-10 run times for the Thermal Oil Heater varied from 75.9 to 82.6 minutes.

Testing on the Press and Unloader vents was conducted as one source by performing one half of the test run in one vent and one half the test run in the second vent. Sampling was performed from a set of eight test ports (four on each vent) situated horizontally on each vertical section

of duct. A 32-point traverse was used to collect the particulate, PM-10 and formaldehyde samples. Each traverse point was sampled two minutes during particulate and formaldehyde sampling for a total sampling time of 64 minutes per run. The PM-10 run times varied from 60.6 to 70.6 minutes.

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 particulate emission compliance test are summarized in Tables 1-3. The particulate results have been calculated using the dry catch only (a Tables) and again with the organic wet catch added (b Tables). The following emission rates are based on the dry catch only. The particulate emission rate for the Dryer averaged 0.24 LB/KLB of flue gas and 3.7 LB/TFP. The particulate emission rate for the Press & Unloader vents averaged 3.0 LB/HR. The particulate emission rate for the Thermal Oil Heater averaged 0.044 LB/KLB flue gas adjusted to 50% excess air and the emission factor averaged 0.069 LB/10^6BTU.

The PM-10 results are summarized in Tables 4-6. The PM-10 emission rate averaged 31.3, 3.4, and 0.85 LB/HR for the Dryer, the Press & Unloader vents, and the Thermal Oil Heater, respectively.

The carbon monoxide results are summarized in Table 7. The emission rate averaged 124 LB/HR (52 LB/TDF) for the Dryer, 3.4 LB/HR (0.32 LB/TFP) for the Press & Unloader Vents, and 1.5 LB/HR (1.3 LB/TDF) for the Thermal Oil Heater.

A summary of the formaldehyde results are presented in Table 8. The formaldehyde emission rate averaged 1.8 LB/HR (0.16 LB/TFP) for the Dryer, 1.7 LB/HR (0.16 LB/TFP) for the Press & Unloader Vents and 0.0043 LB/HR (0.0039 LB/TDF) for the Thermal Oil Heater.

The results of the Total Hydrocarbons tests are summarized in Table 9. The total hydrocarbon emission rate averaged 4.4 LB/TFP for the Dryer, 7.7 LB/HR for the Press & Unloader Vents and 0.75 LB/HR (0.69 LB/TDF) for the Thermal Oil Heater.

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 February 11, 1992 EPA Particulate Emission Compliance Test on the Dryer Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-11-92	02-11-92	02-11-92
Time runs were done	(HRS)	1045/1147	1305/1408	1450/1552
Process rate	(LB/HR)	22047	22047	22047
Volumetric flow				
actual	(ACFM)	53775	54668	53693
standard	(DSCFM)	31908	30685	31989
Gas temperature	(DEG-F)	204	209	209
Moisture content	(%V/V)	25.08	28.58	24.18
Gas composition	(%V/V,dry)			
carbon dioxide		4.40	4.80	4.00
oxygen		16.20	15.80	16.70
nitrogen		79.40	79.40	79.30
Isokinetic variation	(%)	102.3	106.8	100.3
Particulate concentration				
actual	(GR/ACF)	.0859	.0990	.0798
standard	(GR/DSCF)	0.145	0.176	0.134
Part. emission rate	(LB/HR)	39.60	46.40	36.73
(LB/KLB of Flue Gas)		0.23	0.27	0.21
(LB/TFP)		3.6	4.2	3.3

Note: Dry Catch Only

Source category: Reconstituted wood products
Plant name : L-P, Two Harbors
Test date : 2/11 - 2/13, 1992
Process : wafer board

Date:
Location:
Ref. No.: (15)
Basis for process rate :

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton

Source category: Reconstituted wood products
Plant name : L-P, Two Harbors
Test date : 2/11 - 2/13, 1992
Process : wafer board

Date:
Location:
Ref. No.:
Basis for process rate :

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton
Rotary dryer	Cyclone+ multiclone electrified filter bed	filt. PM	1	39.60	11.02	1.80	3.59
		filt. PM	2	46.40	11.02	2.10	4.21
		filt. PM	3	36.73	11.02	1.67	3.33
				AVERAGE		1.86	3.71
		condens. PM	1	4.90	11.02	0.222	0.445
		condens. PM	2	5.43	11.02	0.246	0.493
		condens. PM	3	4.24	11.02	0.192	0.385
				AVERAGE		0.220	0.441
		PM-10	1	22.03	11.02	1.00	2.00
		PM-10	2	23.11	11.02	1.05	2.10
		PM-10	3	30.21	11.02	1.37	2.74
				AVERAGE		1.14	2.28
		condens. PM	1	5.30	11.02	0.240	0.481
		condens. PM	2	6.01	11.02	0.273	0.545
		condens. PM	3	7.30	11.02	0.331	0.662
				AVERAGE		0.281	0.563
		CO	1	113	11.02	5.13	10.3
		CO	2	171	11.02	7.76	15.5
		CO	3	88	11.02	3.99	7.98
				AVERAGE		5.62	11.2
		CO2	1/1	9,128	11.02	414	828
		CO2	1/2	10,645	11.02	483	966
		CO2	1/3	9,120	11.02	414	828
		CO2	2/1	9,637	11.02	437	874
		CO2	2/2	10,110	11.02	459	917
		CO2	2/3	8,783	11.02	398	797
		CO2	3/1	9,715	11.02	441	881
		CO2	3/2	9,353	11.02	424	848
		CO2	3/3	9,862	11.02	447	895
				AVERAGE		435	870
		formaldehyde	1	0.49	11.02	0.0222	0.0445

Source category: Reconstituted wood products — Date:
Plant name : L-P, Two Harbors — Location:
Test date : 2/11 - 2/13, 1992 — Ref. No.:
Process : wafer board — Basis for process rate :

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton
		formaldehyde	2	2.3	11.02	0.104	0.209
		formaldehyde	3	2.5	11.02	0.113	0.227
		AVERAGE				0.0800	0.160
		total hydrocarbon	1	48.2	11.02	2.19	4.37
		total hydrocarbon	2	45.2	11.02	2.05	4.10
		total hydrocarbon	3	54.2	11.02	2.46	4.92
		AVERAGE				2.23	4.46

::

Ref. No.:

Board press & unloader	none	filt. PM	1	2.49	10.62	0.117	0.234
		filt. PM	2	3.59	10.62	0.169	0.338
		filt. PM	3	2.99	10.62	0.141	0.282
						0.142	0.285
		condens. PM	1	0.48	10.62	0.0226	0.0452
		condens. PM	2	0.38	10.62	0.0179	0.0358
		condens. PM	3	0.36	10.62	0.0169	0.0339
		AVERAGE				0.0191	0.0383
		PM-10	1	4.17	11.04	0.189	0.378
		PM-10	2	3.18	11.04	0.144	0.288
		PM-10	3	0.40	11.04	0.018	0.037
		AVERAGE				0.117	0.234
		condens. PM	1	1.15	11.04	0.0521	0.1042
		condens. PM	2	0.83	11.04	0.0376	0.0752
		condens. PM	3	0.44	11.04	0.0201	0.0401
		AVERAGE				0.0366	0.0732
		CO	1	5.1	10.62	0.240	0.480
		CO	2	3.4	10.62	0.160	0.320
		CO	3	1.7	10.62	0.0800	0.160
		AVERAGE				0.160	0.320
		CO2	5/1	32.4	11.04	1.47	2.94
		CO2	5/2	33.7	11.04	1.52	3.05
		CO2	5/3	34.5	11.04	1.56	3.12
		CO2	7/1	141	10.62	6.64	13.3
		CO2	7/2	129	10.62	6.09	12.2
		CO2	7/3	141	10.62	6.63	13.3
		CO2	8/1	141	10.62	6.65	13.3
		CO2	8/2	145	10.62	6.81	13.6

Source category: Reconstituted wood products Date:
Plant name : L-P, Two Harbors Location:
Test date : 2/11 - 2/13, 1992 Ref. No.:
Process : wafer board Basis for process rate :

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor	
						kg/Mg	lb/ton
		CO2	8/3	136	10.62	6.40	12.8
				AVERAGE		6.54	13.08
		formaldehyde	1	1.7	10.62	0.0800	0.160
		formaldehyde	2	1.7	10.62	0.0800	0.160
		formaldehyde	3	1.6	10.62	0.0753	0.151
				AVERAGE		0.0785	0.157
		total hydrocarbon	1	7.5	11.04	0.340	0.679
		total hydrocarbon	2	7.9	11.04	0.358	0.716
		total hydrocarbon	3	7.8	11.04	0.353	0.707
				AVERAGE		0.350	0.700

Note: Runs 5/1, 5/2, and 5/3 not included in average CO2 emission factor due to low flow rat

Table 1b. Summary of the Results of the February 11, 1992 EPA Particulate Emission Compliance Test on the Dryer Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-11-92	02-11-92	02-11-92
Time runs were done	(HRS)	1045/1147	1305/1408	1450/1552
Process rate	(LB/HR)	22047	22047	22047
Volumetric flow				
actual	(ACFM)	53775	54668	53693
standard	(DSCFM)	31908	30685	31989
Gas temperature	(DEG-F)	204	209	209
Moisture content	(%V/V)	25.08	28.58	24.18
Gas composition	(%V/V,dry)			
carbon dioxide		4.40	4.80	4.00
oxygen		16.20	15.80	16.70
nitrogen		79.40	79.40	79.30
Isokinetic variation	(%)	102.3	106.8	100.3
Particulate concentration				
actual	(GR/ACF)	.0965	0.111	.0890
standard	(GR/DSCF)	0.163	0.197	0.149
Part. emission rate	(LB/HR)	44.50	51.85	40.97
(LB/KLB of Flue Gas)		0.25	0.31	0.23
(LB/TFP)		4.0	4.7	3.7

Note: Dry + Organic Wet Catch

Table 2a. Summary of the Results of the February 13, 1992 EPA Particulate Emission Compliance Test on the Press & Unloader Vents at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-13-92	02-13-92	02-13-92
Time runs were done	(HRS)	820/ 928	1030/1137	1210/1319
Process rate	(LB/HR)	21240	21240	21240
Volumetric flow				
actual	(ACFM)	73669	67911	74242
standard	(DSCFM)	68519	62825	68390
Gas temperature	(DEG-F)	87	88	88
Moisture content	(%V/V)	1.05	1.42	1.82
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	(%)	101.2	100.9	101.4
Particulate concentration				
actual	(GR/ACF)	.00394	.00617	.00470
standard	(GR/DSCF)	.00424	.00667	.00510
Part. emission rate	(LB/HR)	2.49	3.59	2.99

Note: Dry Catch Only

Table 2 b Summary of the Results of the February 13, 1992 EPA Particulate Emission Compliance Test on the Press & Unloader Vents at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-13-92	02-13-92	02-13-92
Time runs were done	(HRS)	820/ 928	1030/1137	1210/1319
Process rate	(LB/HR)	21240.0	21240.0	21240.0
Volumetric flow				
actual	(ACFM)	73669	67911	74242
standard	(DSCFM)	68519	62825	68390
Gas temperature	(DEG-F)	87	88	88
Moisture content	(%V/V)	1.05	1.42	1.82
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	(%)	101.2	100.9	101.4
Particulate concentration				
actual	(GR/ACF)	.00470	.00682	.00525
standard	(GR/DSCF)	.00506	.00738	.00571
Part. emission rate	(LB/HR)	2.97	3.97	3.35

Note: Dry + Organic Wet Catch

Table 3a. Summary of the Results of the February 12, 1992 EPA Particulate Emission Compliance Test on the Konus Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-12-92	02-12-92	02-12-92
Time runs were done	(HRS)	1600/1702	1731/1833	1937/2040
Process rate	(LB/HR)	22070	22070	22070
Volumetric flow				
actual	(ACFM)	24513	23992	26537
standard	(DSCFM)	15432	15120	16779
Gas temperature	(DEG-F)	307	306	310
Moisture content	(%V/V)	8.49	8.19	7.70
Gas composition	(%V/V,dry)			
carbon dioxide		5.00	4.90	4.60
oxygen		15.50	15.60	15.90
nitrogen		79.50	79.50	79.50
Isokinetic variation	(%)	101.7	100.7	99.1
Particulate concentration				
actual	(GR/ACF)	.00720	.00864	.00796
standard	(GR/DSCF)	.0114	.0137	.0126
Part. emission rate	(LB/HR)	1.51	1.78	1.81
(LB/KLB Flue Gas @50% Excess Air)		0.039	0.047	0.046
(LB/MMBTU by O2 F-Factor)		0.061	0.074	0.072

Note: Dry Catch Only

Table 3b Summary of the Results of the February 12, 1992 EPA Particulate Emission Compliance Test on the Konus Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-12-92	02-12-92	02-12-92
Time runs were done	(HRS)	1600/1702	1731/1833	1937/2040
Process rate	(LB/HR)	22070	22070	22070
Volumetric flow				
actual	(ACFM)	24513	23992	26537
standard	(DSCFM)	15432	15120	16779
Gas temperature	(DEG-F)	307	308	310
Moisture content	(%V/V)	8.49	8.19	7.70
Gas composition	(%V/V,dry)			
carbon dioxide		5.00	4.90	4.60
oxygen		15.50	15.60	15.90
nitrogen		79.50	79.50	79.50
Isokinetic variation	(%)	101.7	100.7	99.1
Particulate concentration				
actual	(GR/ACF)	.00804	.00912	.00836
standard	(GR/DSCF)	.0128	.0145	.0132
Part. emission rate	(LB/HR)	1.69	1.88	1.90
(LB/KLB Flue Gas @50% Excess Air)		0.045	0.051	0.050
(LB/MMBTU by O2 F-Factor)		0.068	0.078	0.075

Note: Dry + Organic Wet Catch

Table 4. Summary of the Results of the February 11, 1992 EPA PM-10 Emission Compliance Testing on the Dryer Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-11-92	02-11-92	02-11-92
Time runs were done	(HRS)	1633/2003	2036/2242	2350/ 130
Process rate	(LB/HR)	22047	22047	22047
Volumetric flow				
actual	(ACFM)	55460	55887	56404
standard	(DSCFM)	32916	33233	32655
Gas temperature	(DEG-F)	207	205	204
Moisture content	(%V/V)	24.03	24.03	26.21
Gas composition	(%V/V,dry)			
carbon dioxide		4.30	4.10	4.40
oxygen		16.50	16.60	16.20
nitrogen		79.20	79.30	79.40
Isokinetic variation	(%)	87.7	87.9	90.1
Particulate concentration				
actual	(GR/ACF)	.0575	.0608	.0776
standard	(GR/DSCF)	.0969	0.102	0.134
Part. emission rate	(LB/HR)	27.33	29.12	37.51
		2.5 lb/hr	2.6	3.4

← = 2.80

Note: Dry + Organic Wet Catch

Table 4a. Summary of the Results of the February 11, 1992 EPA PM-10 Emission Compliance Testing on the Dryer Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-11-92	02-11-92	02-11-92
Time runs were done	(HRS)	1633/2003	2036/2242	2350/ 130
Process rate	(LB/HR)	22047.0	22047.0	22047.0
Volumetric flow				
actual	(ACFM)	55460	55887	56404
standard	(DSCFM)	32916	33233	32655
Gas temperature	(DEG-F)	207	205	204
Moisture content	(%V/V)	24.03	24.03	26.21
Gas composition	(%V/V,dry)			
carbon dioxide		4.30	4.10	4.40
oxygen		16.50	16.60	16.20
nitrogen		79.20	79.30	79.40
Isokinetic variation	(%)	87.7	87.9	90.1
Particulate concentration				
actual	(GR/ACF)	.0463	.0482	.0625
standard	(GR/DSCF)	.0781	.0811	0.108
Part. emission rate	(LB/HR)	22.03	23.11	30.21
		2.0	2.1	2.7

2.3 lb/ton

Note: Dry Catch Only

Table 5. Summary of the Results of the February 12, 1992 EPA PM-10 Emission Compliance Test on the Press & Unloader Vents at the Louisiana Pacific Waferboard Plant in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of Test		02-12-92	02-12-92	02-12-92
Time runs were done	(HRS)	1128/1322	1342/1540	1602/1750
Process rate	(LB/HR)	22070	22070	22070
Volumetric flow				
actual	(ASFM)	81437	82742	83190
standard	(DSCFM)	79533	80793	81076
Gas temperature	(DEG-F)	73	75	76
Moisture content	(%V/V)	1.44	1.08	1.04
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	(%)	108.0	104.9	109.8
PM-10 concentration.....				
actual.....(GR/ACF)		.0076	.0078	.0020
dry standard.....(GR/DSCF)		.0078	.0080	.0021
PM-10 mass rate.....(LB/HR)		5.32	4.01	0.847
		0.48	0.36	0.077 = 0.3/16/4

Note: Dry + Organic Wet Catch

Table 5. Summary of the Results of the February 12, 1992 EPA PM-10 Emission Compliance Test on the Press & Unloader Vents at the Louisiana Pacific Waferboard Plant in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of Test		02-12-92	02-12-92	02-12-92
Time runs were done	(HRS)	1128/1322	1342/1540	1602/1750
Process rate	(LB/HR)	22070	22070	22070
Volumetric flow				
actual	(ASFM)	81437	82742	83190
standard	(DSCFM)	79533	80793	81076
Gas temperature	(DEG-F)	73	75	76
Moisture content	(%V/V)	1.44	1.08	1.04
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	(%)	108.0	104.9	109.8
PM-10 concentration.....				
actual.....(GR/ACF)				
dry standard.....(GR/DSCF)		.0061	.0063	.0010
PM-10 mass rate.....(LB/HR)		4.17	3.18	.4043
		0.38	0.29	0.037

= 0.24 LB/Hour

Note: Dry Catch Only

Table 6. Summary of the Results of the February 13, 1992 EPA PM-10 Emission Compliance Test on the Konus Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-13-92	02-13-92	02-13-92
Time runs were done	(HRS)	1300/1426	1455/1615	1640/1800
Process rate	(LB/HR)	21240	21240	21240
Volumetric flow				
actual	(ACFM)	26633	26264	25423
standard	(DSCFM)	16320	16154	15605
Gas temperature	(DEG-F)	311	312	308
Moisture content	(%V/V)	7.95	7.48	8.09
Gas composition	(%V/V,dry)			
carbon dioxide		4.60	4.80	5.10
oxygen		15.90	15.80	15.40
nitrogen		79.50	79.40	79.50
Isokinetic variation	(%)	106.7	109.5	115.4
Particulate concentration				
actual	(GR/ACF)	.00323	.00396	.00420
standard	(GR/DSCF)	.00528	.00644	.00685
Part. emission rate	(LB/HR)	0.738	0.892	0.916

Note: Dry + Organic Wet Catch

Table 6a. Summary of the Results of the February 13, 1992 EPA PM-10 Emission Compliance Test on the Konus Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-13-92	02-13-92	02-13-92
Time runs were done	(HRS)	1300/1426	1455/1615	1640/1800
Process rate	(LB/HR)	21240.0	21240.0	21240.0
Volumetric flow				
actual	(ACFM)	26633	26264	25423
standard	(DSCFM)	16320	16154	15605
Gas temperature	(DEG-F)	311	312	308
Moisture content	(%V/V)	7.95	7.48	8.09
Gas composition	(%V/V,dry)			
carbon dioxide		4.60	4.80	5.10
oxygen		15.90	15.80	15.40
nitrogen		79.50	79.40	79.50
Isokinetic variation	(%)	106.7	109.5	115.4
Particulate concentration				
actual	(GR/ACF)	.00219	.00285	.00289
standard	(GR/DSCF)	.00358	.00464	.00472
Part. emission rate	(LB/HR)	0.501	0.643	0.631

Note: Dry Catch Only

Table 7. Summary of the February 11 - 13, 1992 Carbon Monoxide Emission Compliance Tests at the Louisiana Pacific Waferboard Plant in Two Harbors, Minnesota.

Test/Run	Volumetric Flow Rate (DSCFM)	Concentration (ppm,w)	Emission Rate (LB/HR)	
(Dryer 2-11-92)				(LB/TDF)
2/1	31910	607	113	47
2/2	30685	911	171	71
2/3	31990	478	88	37
Avg.		665	124	52
(Press & Unloader Vents 2-13-92)				(LB/TFP)
8/1	30930	17	5.1	0.48
8/2	31650	11	3.4	0.32
8/3	32405	6	1.7	0.16
Avg.		11	3.4	0.32
(Thermal Oil Heater 2-12-92)				(LB/TDF)
10/1	15430	7.3	.54	0.50
10/2	15120	46	3.3	3.0
10/3	16780	7.4	.59	0.54
Avg.		20	1.5	1.3

Design = 36,800 acfm flow rates look OK to me DB

Flow Rates Look Wrong See P917 Dryer Rates

Note: TFP = Ton Finished Product (10.62/HR), TDF = Ton Dry Fuel (Dryer 2.4/HR, Thermal Oil Heater 1.09/HR)

Table 8. Summary of the February 11 - 13, 1992 Formaldehyde Emission Compliance Tests at the Louisiana Pacific Waferboard Plant in Two Harbors, Minnesota.

Test/Run	Volumetric Flow Rate (DSCFM)	Concentration (ppm,w)	Emission Rate (LB/HR)	(LB/TFP)
(Dryer)				(LB/TFP)
1/1	30930	2.5	0.49	0.044
1/2	31650	11	2.3	0.21
1/3	32405	12	2.5	0.23
Avg.		8.5	1.8	0.16
(Press & Unloader Vents 2-13-92)				(LB/TFP)
8/1	34290	5.3	1.7	0.16
8/2	35140	5.0	1.7	0.16
8/3	33015	5.2	1.6	0.15
Avg.		5.2	1.7	0.16
(Thermal Oil Heater 2-12-92)				(LB/TDF)
9/1	16450	0.04	0.0032	0.0029
9/2	17080	0.05	0.0039	0.0036
9/3	16110	0.07	0.0057	0.0052
Avg.		0.05	0.0043	0.0039

Flow Rates Seem Low

Note: TFP = Ton Finished Product (Dryer 11.02/HR, Press & Unloader 10.62) TDF = Ton Dry Fuel (Thermal Oil Heater 1.09/HR)

Table 9. Summary of the Results of the February 11 - 13, 1992 Total Hydrocarbon Determinations at the Louisiana Pacific Waferboard Plant Located in Two Harbors, Minnesota.

Test/Run	Time (HRS)	Concentration (ppmC,w)	Emission Rate (LB/HR)	(LB/TFP)
(Dryer 2-11-92)				
4/1	1721-1821	595	48.2	4.4
4/2	1845-1945	558	45.2	4.1
4/3	1950-2050	669	54.2	4.9
Average		607	49.2	4.5
(Press & Unloader Vents 2-12-92)				
6/1	1250-1410	49.5	7.5	0.68
6/2	1425-1600	52.2	7.9	0.72
6/3	1610-1730	51.3	7.8	0.70
Average		51.0	7.7	0.70
(Thermal Oil Heater 2-13-92)				(LB/TDF)
11/1	0925-1025	20.7	0.69	0.63
11/2	1035-1135	15.0	0.50	0.46
11/3	1145-1245	32.4	1.07	0.98
Average		22.7	0.75	0.69

Note: TFP = Ton Finished Product (Dryer 11.02/HR, Press & Unloader 11.04) TDF = Ton Dry Fuel (Thermal Oil Heater 1.09/HR)

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, PM-10, carbon monoxide and formaldehyde 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
Dryer stack

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

Date of run	Run 1 02-11-92	Run 2 02-11-92	Run 3 02-11-92
Dry basis (orsat)			
carbon dioxide.....	4.30	4.90	4.10
oxygen.....	16.30	15.70	16.60
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.40	79.40	79.30
Wet basis (orsat)			
carbon dioxide.....	3.21	3.61	3.12
oxygen.....	12.17	11.56	12.64
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	59.30	58.45	60.36
water vapor.....	25.31	26.38	23.88
Dry molecular weight.....	29.34	29.41	29.32
Wet molecular weight.....	26.47	26.40	26.62
Specific gravity.....	0.914	0.912	0.919
Water mass flow.....(LB/HR)	0.00	0.00	0.00
FO	1.070	1.061	1.049

Test No. 2
Dryer Stack

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

Date of run	Run 1 02-11-92	Run 2 02-11-92	Run 3 02-11-92
Dry basis (orsat)			
carbon dioxide.....	4.40	4.80	4.00
oxygen.....	16.20	15.80	16.70
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.40	79.40	79.30
Wet basis (orsat)			
carbon dioxide.....	3.30	3.43	3.03
oxygen.....	12.14	11.28	12.66
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	59.48	56.71	60.13
water vapor.....	25.08	28.58	24.18
Dry molecular weight.....	29.35	29.40	29.31
Wet molecular weight.....	26.50	26.14	26.57
Specific gravity.....	0.916	0.903	0.918
Water mass flow.....(LB/HR)	29969	34448	28609
FO	1.068	1.062	1.050

Test No. 3
Dryer Stack

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

Date of run	Run 1 02-11-92	Run 2 02-11-92	Run 3 02-11-92
Dry basis (orsat)			
carbon dioxide.....	4.30	4.10	4.40
oxygen.....	16.50	16.60	16.20
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.20	79.30	79.40
Wet basis (orsat)			
carbon dioxide.....	3.27	3.11	3.25
oxygen.....	12.53	12.61	11.95
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	60.17	60.24	58.59
water vapor.....	24.03	24.03	26.21
Dry molecular weight.....	29.35	29.32	29.35
Wet molecular weight.....	26.62	26.60	26.38
Specific gravity.....	0.920	0.919	0.911
Water mass flow.....(LB/HR)	29208	29485	32536
FO	1.023	1.049	1.068

Test No. 5
Press & Unloader Vents

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

Date of run	Run 1 02-12-92	Run 2 02-12-92	Run 3 02-12-92
Dry basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.90	20.90	20.90
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.60	20.67	20.68
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	77.93	78.21	78.25
water vapor.....	1.44	1.08	1.04
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.69	28.72	28.73
Specific gravity.....	0.991	0.992	0.992
Water mass flow.....(LB/HR)	1955	1487	1424
FO	0.000	0.000	0.000

Test No. 7
Press & Unloader Vents

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

Date of run	Run 1 02-13-92	Run 2 02-13-92	Run 3 02-13-92
Dry basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.90	20.90	20.90
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.68	20.60	20.52
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	78.24	77.94	77.63
water vapor.....	1.05	1.42	1.82
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.73	28.69	28.64
Specific gravity.....	0.992	0.991	0.989
Water mass flow.....(LB/HR)	2032	2546	3548
FO	0.000	0.000	0.000

Test No. 8
Press & Unloading Vents

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

	Run 1	Run 2	Run 3
Date of run	02-13-92	02-13-92	02-13-92
Dry basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.90	20.90	20.90
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.62	20.66	20.59
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	78.03	78.15	77.89
water vapor.....	1.32	1.16	1.50
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.70	28.71	28.68
Specific gravity.....	0.991	0.992	0.991
Water mass flow.....(LB/HR)	0.00	0.00	0.00
FO	0.000	0.000	0.000

Test No. 9
Konus Stack

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

	Run 1	Run 2	Run 3
Date of run	02-12-92	02-12-92	02-12-92
Dry basis (orsat)			
carbon dioxide.....	4.90	4.70	4.80
oxygen.....	15.60	15.80	15.70
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.50	79.50	79.50
Wet basis (orsat)			
carbon dioxide.....	4.57	4.37	4.45
oxygen.....	14.56	14.71	14.54
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	74.20	74.00	73.65
water vapor.....	6.66	6.92	7.36
Dry molecular weight.....	29.41	29.38	29.40
Wet molecular weight.....	28.65	28.60	28.56
Specific gravity.....	0.990	0.988	0.986
Water mass flow.....(LB/HR)	0.00	0.00	0.00
FO	1.082	1.085	1.083

Test No. 10
Konus Stack

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

Date of run	Run 1 02-12-92	Run 2 02-12-92	Run 3 02-12-92
Dry basis (orsat)			
carbon dioxide.....	5.00	4.90	4.60
oxygen.....	15.50	15.60	15.90
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.50	79.50	79.50
Wet basis (orsat)			
carbon dioxide.....	4.58	4.50	4.25
oxygen.....	14.18	14.32	14.68
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	72.75	72.99	73.38
water vapor.....	8.49	8.19	7.70
Dry molecular weight.....	29.42	29.41	29.37
Wet molecular weight.....	28.45	28.47	28.50
Specific gravity.....	0.983	0.984	0.984
Water mass flow.....(LB/HR)	4014	3783	3924
FO	1.080	1.082	1.087

Test No. 12
Konus Stack

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

Date of run	Run 1 02-13-92	Run 2 02-13-92	Run 3 02-13-92
Dry basis (orsat)			
carbon dioxide.....	4.60	4.80	5.10
oxygen.....	15.90	15.80	15.40
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	79.50	79.40	79.50
Wet basis (orsat)			
carbon dioxide.....	4.23	4.44	4.69
oxygen.....	14.64	14.62	14.15
carbon monoxide.....	0.00	0.00	0.00
nitrogen.....	73.18	73.46	73.07
water vapor.....	7.95	7.48	8.09
Dry molecular weight.....	29.37	29.40	29.43
Wet molecular weight.....	28.47	28.55	28.51
Specific gravity.....	0.983	0.986	0.985
Water mass flow.....(LB/HR)	3956	3664	3852
FO	1.087	1.062	1.078

3.2 Results of Particulate Determinations

Test No. 2
Dryer Stack

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

	Run 1	Run 2	Run 3
Date of run	02-11-92	02-11-92	02-11-92
Time run start/end.....(HRS)	1045/1147	1305/1408	1450/1552
Static pressure.....(IN.WC)	-2.80	-2.80	-2.80
Cross sectional area (SQ.FT)	12.57	12.57	12.57
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	211.0	256.0	194.0
desiccant.....(GRAMS)	9.0	8.0	12.0
total.....(GRAMS)	220.0	264.0	206.0
Total particulate material..			
.....collected(grams)	0.3267	0.3974	0.2950
Gas meter coefficient.....	0.9993	0.9993	0.9993
Barometric pressure..(IN.HG)	30.01	30.01	30.01
Avg. orif.pres.drop..(IN.WC)	0.88	0.88	0.83
Avg. gas meter temp..(DEF-F)	60.4	60.4	64.1
Volume through gas meter....			
at meter conditions...(CF)	30.41	30.53	30.12
standard conditions.(DSCF)	30.98	31.10	30.46
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.191	.191	.191
Avg.stack gas temp ..(DEG-F)	204	209	209
Volumetric flow rate.....			
actual.....(ACFM)	53775	54668	53693
dry standard.....(DSCFM)	31908	30685	31989
Isokinetic variation.....(%)	102.3	106.8	100.3
Particulate concentration...			
actual.....(GR/ACF)	0.09651	0.11062	0.08899
dry standard.....(GR/DSCF)	0.16272	0.19716	0.14942
Particle mass rate...(LB/HR)	44.504	51.855	40.970

Test No. 7
Press & Unloader Vents

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

	Run 1	Run 2	Run 3
Date of run	02-13-92	02-13-92	02-13-92
Time run start/end.....(HRS)	820/ 928	1030/1137	1210/1319
Static pressure.....(IN.WC)	-0.80	-0.80	-0.80
Cross sectional area (SQ.FT)	42.01	42.01	42.01
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	2.0	2.0	4.0
desiccant.....(GRAMS)	6.0	8.0	10.0
total.....(GRAMS)	8.0	10.0	14.0
Total particulate material..			
.....collected(grams)	0.0117	0.0156	0.0132
Gas meter coefficient.....	1.0083	1.0083	1.0083
Barometric pressure..(IN.HG)	29.20	29.20	29.20
Avg. orif.pres.drop..(IN.WC)	1.32	1.16	1.36
Avg. gas meter temp..(DEF-F)	94.2	97.1	96.9
Volume through gas meter....			
at meter conditions...(CF)	37.95	34.90	38.14
standard conditions.(DSCF)	35.68	32.63	35.69
Total sampling time....(MIN)	64.00	64.00	64.00
Nozzle diameter.....(IN)	.249	.249	.249
Avg.stack gas temp ..(DEG-F)	87	88	88
Volumetric flow rate.....			
actual.....(ACFM)	73669	67911	74242
dry standard.....(DSCFM)	68519	62825	68390
Isokinetic variation.....(%)	101.2	100.9	101.4
Particulate concentration...			
actual.....(GR/ACF)	0.00470	0.00682	0.00525
dry standard.....(GR/DSCF)	0.00506	0.00738	0.00571
Particle mass rate...(LB/HR)	2.971	3.972	3.345

Test No. 10
Konus Stack

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

	Run 1	Run 2	Run 3
Date of run	02-12-92	02-12-92	02-12-92
Time run start/end.....(HRS)	1600/1702	1731/1833	1937/2040
Static pressure.....(IN.WC)	-0.15	-0.15	-0.15
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)	85.0	84.0	86.0
desiccant.....(GRAMS)	19.0	13.0	13.0
total.....(GRAMS)	104.0	97.0	99.0
Total particulate material..			
.....collected(grams)	0.0438	0.0481	0.0480
Gas meter coefficient.....	0.9951	0.9951	0.9951
Barometric pressure..(IN.HG)	29.90	29.90	29.90
Avg. orif.pres.drop..(IN.WC)	2.46	2.38	2.83
Avg. gas meter temp..(DEF-F)	67.0	75.2	73.5
Volume through gas meter....			
at meter conditions...(CF)	52.77	51.98	56.51
standard conditions.(DSCF)	52.87	51.27	55.98
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.311	.311	.311
Avg.stack gas temp ..(DEG-F)	307	308	310
Volumetric flow rate.....			
actual.....(ACFM)	24513	23992	26537
dry standard.....(DSCFM)	15432	15120	16779
Isokinetic variation.....(%)	101.7	100.7	99.1
Particulate concentration...			
actual.....(GR/ACF)	0.00804	0.00912	0.00836
dry standard.....(GR/DSCF)	0.01278	0.01448	0.01323
Particle mass rate...(LB/HR)	1.691	1.876	1.903

3.3 Results of PM-10 Determinations

Test No. 3
Dryer Stack

Results of PM-10 Determinations

	Run 1	Run 2	Run 3
Date of run	02-11-92	02-11-92	02-11-92
Time run start/end.....(HRS)	1633/2003	2036/2242	2350/ 130
Static pressure.....(IN.WC)	-2.80	-2.80	-2.80
Cross sectional area (SQ.FT)	12.57	12.57	12.57
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	223.0	250.0	225.0
desiccant.....(GRAMS)	9.0	10.0	4.0
total.....(GRAMS)	232.0	260.0	229.0
Total PM-10 material.....			
.....collected(grams)	0.2171	0.2568	0.2640
Gas meter coefficient.....	0.9993	0.9993	0.9993
Barometric pressure..(IN.HG)	29.72	29.72	29.72
Avg. orif.pres.drop..(IN.WC)	0.31	0.31	0.31
Avg. gas meter temp..(DEF-F)	61.9	61.9	59.5
Volume through gas meter....			
at meter conditions...(CF)	34.42	38.58	30.12
standard conditions.(DSCF)	34.58	38.76	30.40
Total sampling time....(MIN)	110.62	122.55	95.45
Nozzle diameter.....(IN)	.158	.158	.158
Avg.stack gas temp ..(DEG-F)	207	205	204
Volumetric flow rate.....			
actual.....(ACFM)	55460	55887	56404
dry standard.....(DSCFM)	32916	33233	32655
Isokinetic variation.....(%)	87.7	87.9	90.1
PM-10 cutpoint.....(um)	10.27	10.16	9.84
PM-10 concentration.....			
actual.....(GR/ACF)	0.05747	0.06077	0.07755
dry standard.....(GR/DSCF)	0.09688	0.10224	0.13401
PM-10 mass rate.....(LB/HR)	27.333	29.122	37.508

Test No. 12
Konus Stack

Results of PM-10 Determinations

	Run 1	Run 2	Run 3
Date of run	02-13-92	02-13-92	02-13-92
Time run start/end.....(HRS)	1300/1426	1455/1615	1640/1800
Static pressure.....(IN.WC)	-0.41	-0.41	-0.41
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)	52.0	47.0	51.0
desiccant.....(GRAMS)	8.0	6.0	7.0
total.....(GRAMS)	60.0	53.0	58.0
Total PM-10 material.....			
.....collected(grams)	0.0112	0.0129	0.0138
Gas meter coefficient.....	0.9993	0.9993	0.9993
Barometric pressure..(IN.HG)	29.10	29.10	29.10
Avg. orif.pres.drop..(IN.WC)	0.52	0.56	0.57
Avg. gas meter temp..(DEF-F)	53.0	65.2	69.1
Volume through gas meter....			
at meter conditions...(CF)	32.70	31.60	32.01
standard conditions.(DSCF)	32.74	30.91	31.08
Total sampling time....(MIN)	82.64	76.77	75.86
Nozzle diameter.....(IN)	.198	.198	.198
Avg.stack gas temp ..(DEG-F)	311	312	308
Volumetric flow rate.....			
actual.....(ACFM)	26633	26264	25423
dry standard.....(DSCFM)	16320	16154	15605
Isokinetic variation.....(%)	106.7	109.5	115.4
PM-10 cutpoint.....(um)	9.91	10.14	9.97
PM-10 concentration.....			
actual.....(GR/ACF)	0.00323	0.00396	0.00420
dry standard.....(GR/DSCF)	0.00528	0.00644	0.00685
PM-10 mass rate.....(LB/HR)	0.738	0.892	0.916

Summary of PM-10 Results

The PM-10 determinations on the Press Vents at this facility were complicated by the fact that one nozzle was not adequate to perform an isokinetic traverse of the duct. Therefore, two nozzles were used, one to sample the low velocity pressure points and another to sample the high velocity pressure points. These two samplings were then combined to obtain the total PM-10 catch. A summary of critical parameters is given below:

Parameter	Run 1	Run 2	Run 3
Total Sampling Time (MIN)			
Low velocity	3.77	9.15	11.84
High Velocity	56.84	59.15	58.77
Total	60.61	68.30	70.61
Gas Meter Volume (DSCF)			
Low velocity	1.74	4.26	5.67
High velocity	25.89	25.79	26.90
Total	27.63	30.05	35.89
Isokinetics (%)			
Low velocity	137.2	133.1	130.1
High velocity	106.1	100.5	105.7
Total (Time weighted)	108.0	104.9	109.8
D_{50} (um)			
Low velocity	9.71	9.68	9.67
High velocity	9.73	10.07	9.74
Total (Volume weighted)	9.73	10.01	9.73
Concentration (GR/DSCF)			
Low velocity	0.0150	0.0065	0.0045
High velocity	0.0073	0.0082	0.0016
Total (Volume weighted)	0.0078	0.0080	0.0021
Mass Rate (LB/HR)			
Low velocity	2.031	0.913	0.642
High velocity	3.975	4.527	0.886
Total	5.32	4.01	0.847

Test No. 5
Press & Unloader Vent

Results of PM-10 Determinations

	Run 1	Run 2	Run 3
Date of run	02-12-92	02-12-92	02-12-92
Time run start/end.....(HRS)	1304/1322	1523/1540	1732/1750
Static pressure.....(IN.WC)	0.60	0.60	0.60
Cross sectional area (SQ.FT)	14.06	14.06	14.06
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	0.0	0.0	0.0
desiccant.....(GRAMS)	0.0	0.0	0.0
total.....(GRAMS)	0.0	0.0	0.0
Total PM-10 material.....			
.....collected(grams)	0.0017	0.0018	0.0016
Gas meter coefficient.....	1.0083	1.0083	1.0083
Barometric pressure..(IN.HG)	29.90	29.90	29.90
Avg. orif.pres.drop..(IN.WC)	0.65	0.65	0.65
Avg. gas meter temp..(DEF-F)	86.6	87.5	86.8
Volume through gas meter....			
at meter conditions...(CF)	1.79	4.38	5.67
standard conditions.(DSCF)	1.74	4.26	5.52
Total sampling time....(MIN)	3.77	9.15	11.84
Nozzle diameter.....(IN)	.235	.235	.235
Avg.stack gas temp ..(DEG-F)	74	74	76
Volumetric flow rate.....			
actual.....(ACFM)	15927	16499	16994
dry standard.....(DSCFM)	15753	16342	16746
Isokinetic variation.....(%)	137.2	133.1	130.1
PM-10 cutpoint.....(um)	9.71	9.68	9.67
PM-10 concentration.....			
actual.....(GR/ACF)	0.01487	0.00645	0.00440
dry standard.....(GR/DSCF)	0.01504	0.00652	0.00447
PM-10 mass rate.....(LB/HR)	2.031	0.913	0.642

Test No. 5
Press & Unloader Vents

Results of PM-10 Determinations

	Run 1	Run 2	Run 3
Date of run	02-12-92	02-12-92	02-12-92
Time run start/end.....(HRS)	1128/1232	1342/1450	1602/1708
Static pressure.....(IN.WC)	-0.80	-0.80	-0.80
Cross sectional area (SQ.FT)	28.00	28.00	28.00
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	0.0	0.0	0.0
desiccant.....(GRAMS)	8.0	6.0	6.0
total.....(GRAMS)	8.0	6.0	6.0
Total PM-10 material.....			
.....collected(grams)	0.0122	0.0137	0.0028
Gas meter coefficient.....	1.0083	1.0083	1.0083
Barometric pressure..(IN.HG)	29.90	29.90	29.90
Avg. orif.pres.drop..(IN.WC)	0.66	0.65	0.66
Avg. gas meter temp..(DEF-F)	85.8	89.7	86.9
Volume through gas meter....			
at meter conditions...(CF)	26.53	26.62	27.62
standard conditions.(DSCF)	25.89	25.79	26.90
Total sampling time....(MIN)	56.84	59.15	58.77
Nozzle diameter.....(IN)	.186	.186	.186
Avg.stack gas temp ..(DEG-F)	73	75	76
Volumetric flow rate.....			
actual.....(ACFM)	65510	66243	66196
dry standard.....(DSCFM)	63780	64451	64330
Isokinetic variation.....(%)	106.1	100.5	105.7
PM-10 cutpoint.....(um)	9.73	10.07	9.74
PM-10 concentration.....			
actual.....(GR/ACF)	0.00708	0.00797	0.00156
dry standard.....(GR/DSCF)	0.00727	0.00820	0.00161
PM-10 mass rate.....(LB/HR)	3.975	4.527	0.886

3.4 Results of Carbon Monoxide Determinations

Test No. 2
Dryer Stack

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	02-11-92	02-11-92	02-11-92
Time run start/end.....(HRS)	1045-1147	1305-1408	1450-1552
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	25.08	28.58	24.18
O2 Concentration.....(%V/V)	16.20	15.80	16.70
Volumetric flow rate (DSCFM)	31910	30685	31990
CO concentration.....			
(GR/DSCF).....	0.4122	0.6488	0.3206
(MG/DSCM).....	943.65	1485.38	733.95
(PPM-WET).....	606.85	910.61	477.67
(PPM-DRY).....	810.00	1275.00	630.00
CO emission rate.....(LB/HR)	112.728	170.631	87.897

CO = Carbon monoxide

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

Test No. 8
Press & Unloader Vents

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	02-13-92	02-13-92	02-13-92
Time run start/end.....(HRS)	1355-1406	1540-1650	1703-1810
Total sampling time....(MIN)	64.0	64.0	64.0
Moisture content.....(%V/V)	1.32	1.16	1.50
O2 Concentration.....(%V/V)	20.90	20.90	20.90
Volumetric flow rate (DSCFM)	68585	70275	66030
CO concentration.....			
(GR/DSCF).....	0.0087	0.0056	0.0031
(MG/DSCM).....	19.81	12.82	6.99
(PPM-WET).....	16.78	10.87	5.91
(PPM-DRY).....	17.00	11.00	6.00
CO emission rate.....(LB/HR)	5.085	3.371	1.728

CO = Carbon monoxide

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

Test No. 10
Konus Stack

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	02-12-92	02-12-92	02-12-92
Time run start/end.....(HRS)	1600-1702	1731-1833	1937-2040
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	8.49	8.19	7.70
O2 Concentration.....(%V/V)	15.50	15.60	15.90
Volumetric flow rate (DSCFM)	15430	15120	16780
CO concentration.....			
(GR/DSCF).....	0.0041	0.0254	0.0041
(MG/DSCM).....	9.32	58.25	9.32
(PPM-WET).....	7.32	45.91	7.38
(PPM-DRY).....	8.00	50.00	8.00
CO emission rate.....(LB/HR)	0.538	3.297	0.585

CO = Carbon monoxide

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

3.5 Results of Formaldehyde Determinations

Test No. 1
Dryer stack

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

	Run 1	Run 2	Run 3
Date of run	02-11-92	02-11-92	02-11-92
Time run start/end.....(HRS)	1045/1147	1305/1407	1450/1553
Static pressure.....(IN.WC)	-2.80	-2.80	-2.80
Cross sectional area (SQ.FT)	12.57	12.57	12.57
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	336.0	330.0	305.0
desiccant.....(GRAMS)	21.0	51.0	20.0
total.....(GRAMS)	357.0	381.0	325.0
Formaldehyde in sample..(uG)	5900	27000	28000
Gas meter coefficient.....	1.0083	1.0083	1.0083
Barometric pressure..(IN.HG)	30.01	30.01	30.01
Avg. orif.pres.drop..(IN.WC)	2.18	2.25	2.17
Avg. gas meter temp..(DEF-F)	49.6	57.2	60.8
Volume through gas meter....			
at meter conditions...(CF)	47.17	48.30	47.40
standard conditions.(DSCF)	49.67	50.12	48.84
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.245	.245	.245
Avg.stack gas temp ..(DEG-F)	204	209	209
Volumetric flow rate.....			
actual.....(ACFM)	52287	54685	54162
dry standard.....(DSCFM)	30928	31649	32406
Isokinetic variation.....(%)	102.8	101.4	96.5
CH2O concentration.....			
(GR/DSCF).....	0.0018	0.0084	0.0089
(MG/DSCM).....	4.22	19.13	20.36
(PPM-DRY).....	3.38	15.33	16.31
(PPM-WET).....	2.52	11.28	12.41
CH2O emission rate...(LB/HR)	0.48827	2.26635	2.46927

CH2O = Formaldehyde

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

Interpoll Labs Report No. 2-3501
Louisiana Pacific - Two Harbors
Two Harbors, Minnesota

Test No. 8
Press & Unloading Vents

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

	Run 1	Run 2	Run 3
Date of run	02-13-92	02-13-92	02-13-92
Time run start/end.....(HRS)	1355/1406	1540/1650	1703/1810
Static pressure.....(IN.WC)	-0.80	-0.80	-0.80
Cross sectional area (SQ.FT)	42.01	42.01	42.01
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	4.0	3.0	4.0
desiccant.....(GRAMS)	6.0	6.0	7.0
total.....(GRAMS)	10.0	9.0	11.0
Formaldehyde in sample..(uG)	6700	6400	6400
Gas meter coefficient.....	1.0083	1.0083	1.0083
Barometric pressure..(IN.HG)	29.20	29.20	29.20
Avg. orif.pres.drop..(IN.WC)	1.30	1.33	1.29
Avg. gas meter temp..(DEF-F)	96.9	99.5	98.0
Volume through gas meter....			
at meter conditions...(CF)	37.65	38.70	36.54
standard conditions.(DSCF)	35.23	36.04	34.12
Total sampling time....(MIN)	64.00	64.00	64.00
Nozzle diameter.....(IN)	.249	.249	.249
Avg.stack gas temp ..(DEG-F)	88	90	87
Volumetric flow rate.....			
actual.....(ACFM)	74091	76040	71324
dry standard.....(DSCFM)	68583	70275	66028
Isokinetic variation.....(%)	99.8	99.6	100.4
CH2O concentration.....			
(GR/DSCF).....	0.0029	0.0027	0.0029
(MG/DSCM).....	6.74	6.29	6.65
(PPM-DRY).....	5.40	5.04	5.32
(PPM-WET).....	5.33	4.98	5.24
CH2O emission rate...(LB/HR)	1.73018	1.65518	1.64272

CH2O = Formaldehyde

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

Test No. 9
Konus Stack

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

	Run 1	Run 2	Run 3
Date of run	02-12-92	02-12-92	02-12-92
Time run start/end.....(HRS)	1031/1133	1221/1323	1400/1502
Static pressure.....(IN.WC)	-0.15	-0.15	-0.15
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)	55.0	78.0	73.0
desiccant.....(GRAMS)	26.0	14.0	16.0
total.....(GRAMS)	81.0	92.0	89.0
Formaldehyde in sample..(uG)	77	100	140
Gas meter coefficient.....	0.9951	0.9951	0.9951
Barometric pressure..(IN.HG)	29.90	29.90	29.90
Avg. orif.pres.drop..(IN.WC)	2.60	2.94	2.50
Avg. gas meter temp..(DEF-F)	77.7	70.0	71.7
Volume through gas meter....			
at meter conditions...(CF)	54.48	58.50	53.20
standard conditions.(DSCF)	53.52	58.35	52.84
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.311	.311	.311
Avg.stack gas temp ..(DEG-F)	313	307	308
Volumetric flow rate.....			
actual.....(ACFM)	25822	26687	25323
dry standard.....(DSCFM)	16453	17078	16108
Isokinetic variation.....(%)	96.6	101.5	97.4
CH2O concentration.....			
(GR/DSCF).....	0.0000	0.0000	0.0000
(MG/DSCM).....	0.05	0.06	0.09
(PPM-DRY).....	0.04	0.05	0.08
(PPM-WET).....	0.04	0.05	0.07
CH2O emission rate...(LB/HR)	0.00316	0.00391	0.00569

CH2O = Formaldehyde

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

4 RESULTS OF FUEL ANALYSES

INTERPOLL LABORATORIES INC.

Fuel Laboratory
(612) 786-6020

03-06-1992

Client: LP/TWO HARBORS

Laboratory Log Number: 5371-98-1242

Sample Identification: BARK KONUS FUEL

Short Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			42.63
Ash		2.93	1.68
Sulfur	0.14	0.13	0.08
Heating Value, BTU/LB.	9447	9170	5261

Respectfully submitted,

Jeannie F. O'Neil,
Manager
Inorganic Chemistry Group

INTERPOLL LABORATORIES INC.

Fuel Laboratory
(612) 786-6020

03-06-1992

Client: LP/TWO HARBORS

Laboratory Log Number: 5371-99-1243

Sample Identification: DRYER FUEL (WOOD) DRY FINES

Short Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			2.93
Ash		0.75	0.73
Sulfur	0.11	0.11	0.10
Heating Value, BTU/LB.	8370	8307	8063

Respectfully submitted,

Jeannie F. O'Neil,
Manager
Inorganic Chemistry Group

APPENDIX A

RESULTS OF VOLUMETRIC FLOW RATE DETERMINATIONS

Test No. 1
Dryer stack

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

Date of Determination.....	02-11-92
Time of Determination.....(HRS)	822
Barometric pressure.....(IN.HG)	30.01
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	48
Duct area.....(SQ.FT)	12.57
Direction of flow.....	UP
Static pressure.....(IN.WC)	-2.8
Avg. gas temp.....(DEG-F)	205
Moisture content.....(% V/V)	25.31
Avg. linear velocity.....(FT/SEC)	70.6
Gas density.....(LB/ACF)	.05437
Molecular weight.....(LB/LBMOLE)	29.34
Mass flow of gas.....(LB/HR)	173686
Volumetric flow rate.....	
actual.....(ACFM)	53246
dry standard.....(DSCFM)	31454

Test No. 2
Dryer Stack

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

Date of Determination.....	02-11-92
Time of Determination.....(HRS)	822
Barometric pressure.....(IN.HG)	30.01
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	48
Duct area.....(SQ.FT)	12.57
Direction of flow.....	UP
Static pressure.....(IN.WC)	-2.8
Avg. gas temp.....(DEG-F)	200
Moisture content.....(% V/V)	25.08
Avg. linear velocity.....(FT/SEC)	70.3
Gas density.....(LB/ACF)	.05485
Molecular weight.....(LB/LBMOLE)	29.35
Mass flow of gas.....(LB/HR)	174457
Volumetric flow rate.....	
actual.....(ACFM)	53011
dry standard.....(DSCFM)	31648

Test No. 3
Dryer Stack

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

Date of Determination.....	02-11-92
Time of Determination.....(HRS)	1600
Barometric pressure.....(IN.HG)	29.72
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	48
Duct area.....(SQ.FT)	12.57
Direction of flow.....	UP
Static pressure.....(IN.WC)	-2.8
Avg. gas temp.....(DEG-F)	206
Moisture content.....(% V/V)	24.03
Avg. linear velocity.....(FT/SEC)	73.3
Gas density.....(LB/ACF)	.05406
Molecular weight.....(LB/LBMOLE)	29.35
Mass flow of gas.....(LB/HR)	179195
Volumetric flow rate.....	
actual.....(ACFM)	55243
dry standard.....(DSCFM)	32819

Test No. 5
Unloader Vent

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

Date of Determination.....	02-12-92
Time of Determination.....(HRS)	930
Barometric pressure.....(IN.HG)	29.9
Pitot tube coefficient.....	.84
Number of sampling ports.....	4
Total number of points.....	24
Shape of duct.....	Rectangular
Duct width.....(IN)	55
Duct length.....(IN)	55
Duct area.....(SQ.FT)	21.01
Direction of flow.....	UP
Static pressure.....(IN.WC)	.6
Avg. gas temp.....(DEG-F)	71
Moisture content.....(% V/V)	0.00
Avg. linear velocity.....(FT/SEC)	29.1
Gas density.....(LB/ACF)	.07453
Molecular weight.....(LB/LBMOLE)	28.84
Mass flow of gas.....(LB/HR)	163995
Volumetric flow rate.....	
actual.....(ACFM)	36672
dry standard.....(DSCFM)	36494

Test No. 5
Press Vent

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

Date of Determination.....	02-12-92
Time of Determination.....(HRS)	930
Barometric pressure.....(IN.HG)	29.9
Pitot tube coefficient.....	.84
Number of sampling ports.....	4
Total number of points.....	24
Shape of duct.....	Rectangular
Duct width.....(IN)	55
Duct length.....(IN)	55
Duct area.....(SQ.FT)	21.01
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.8
Avg. gas temp.....(DEG-F)	70
Moisture content.....(% V/V)	1.44
Avg. linear velocity.....(FT/SEC)	29.6
Gas density.....(LB/ACF)	.07401
Molecular weight.....(LB/LBMOLE)	28.84
Mass flow of gas.....(LB/HR)	165444
Volumetric flow rate.....	
actual.....(ACFM)	37255
dry standard.....(DSCFM)	36484

Test No. 9
Konus Stack

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

Date of Determination.....	02-12-92
Time of Determination.....(HRS)	945
Barometric pressure.....(IN.HG)	29.9
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	41.5
Duct area.....(SQ.FT)	9.39
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.15
Avg. gas temp.....(DEG-F)	312
Moisture content.....(% V/V)	6.66
Avg. linear velocity.....(FT/SEC)	39.6
Gas density.....(LB/ACF)	.05083
Molecular weight.....(LB/LBMOLE)	29.41
Mass flow of gas.....(LB/HR)	68053
Volumetric flow rate.....	
actual.....(ACFM)	22314
dry standard.....(DSCFM)	14230

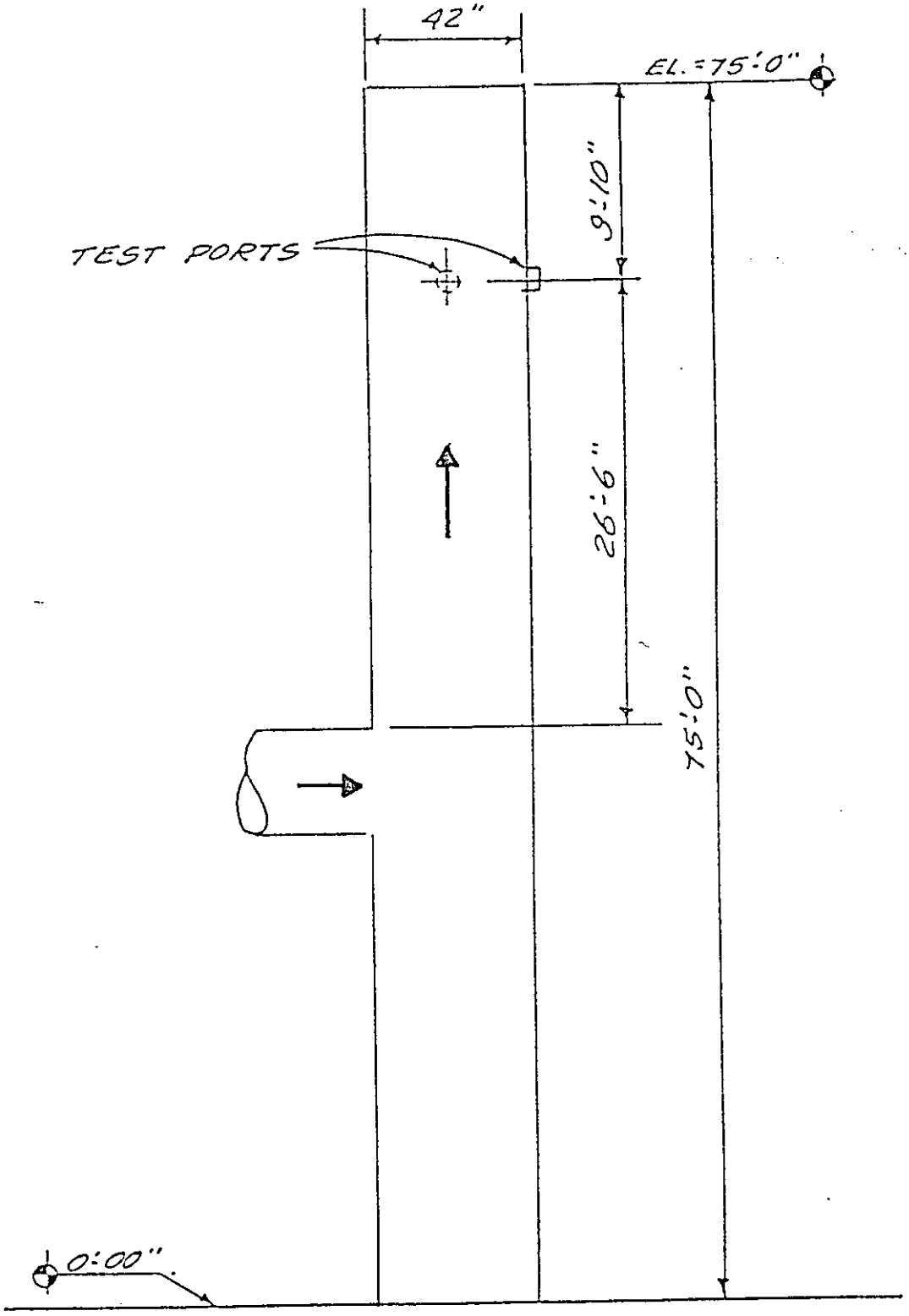
Test No. 12
Konus Stack

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

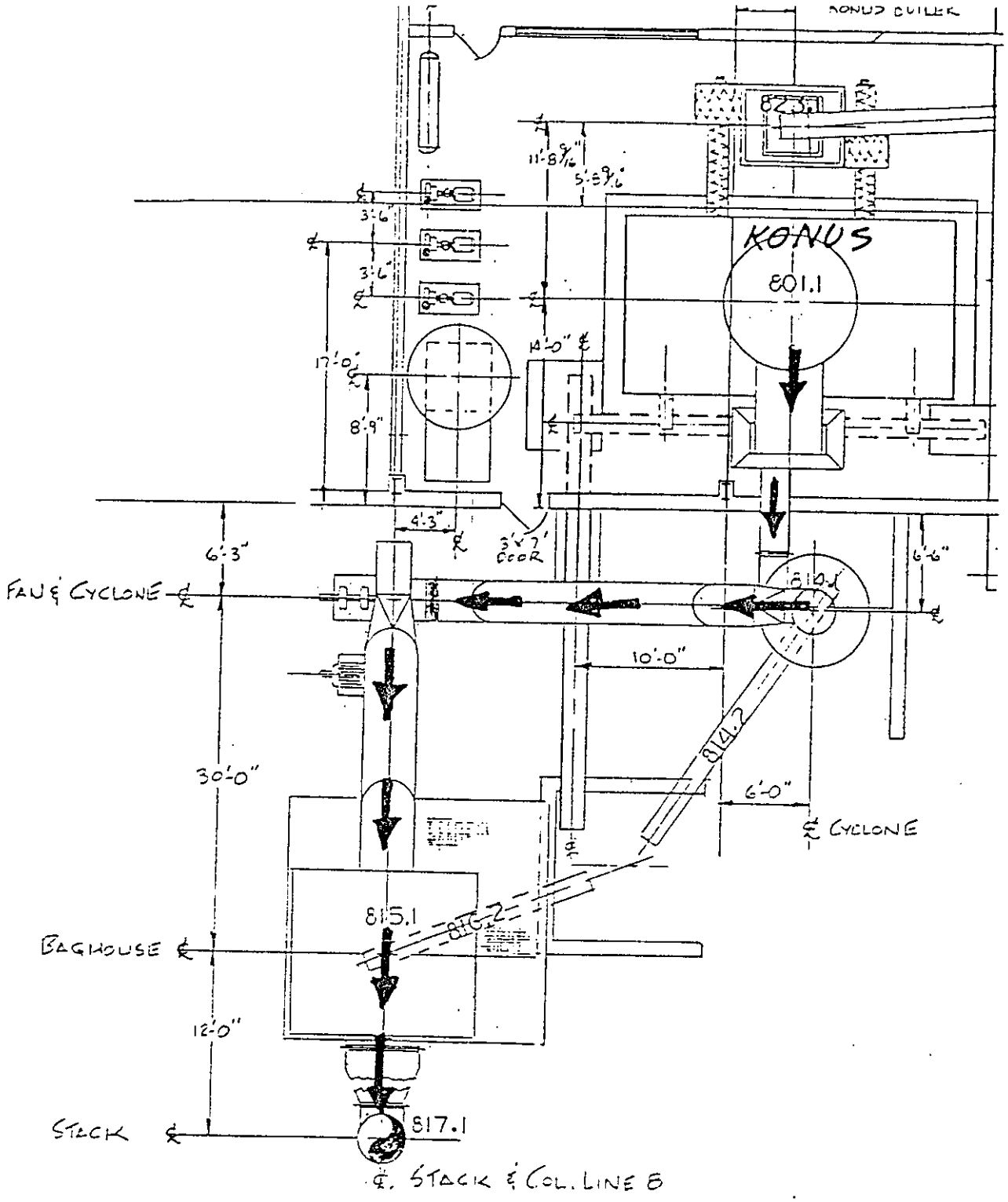
Date of Determination.....	02-13-92
Time of Determination.....(HRS)	1230
Barometric pressure.....(IN:HG)	29.1
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	41.5
Duct area.....(SQ.FT)	9.39
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.41
Avg. gas temp.....(DEG-F)	304
Moisture content.....(% V/V)	7.95
Avg. linear velocity.....(FT/SEC)	44.4
Gas density.....(LB/ACF)	.04964
Molecular weight.....(LB/LBMOLE)	29.37
Mass flow of gas.....(LB/HR)	74559
Volumetric flow rate.....	
actual.....(ACFM)	25034
dry standard.....(DSCFM)	15472

APPENDIX B

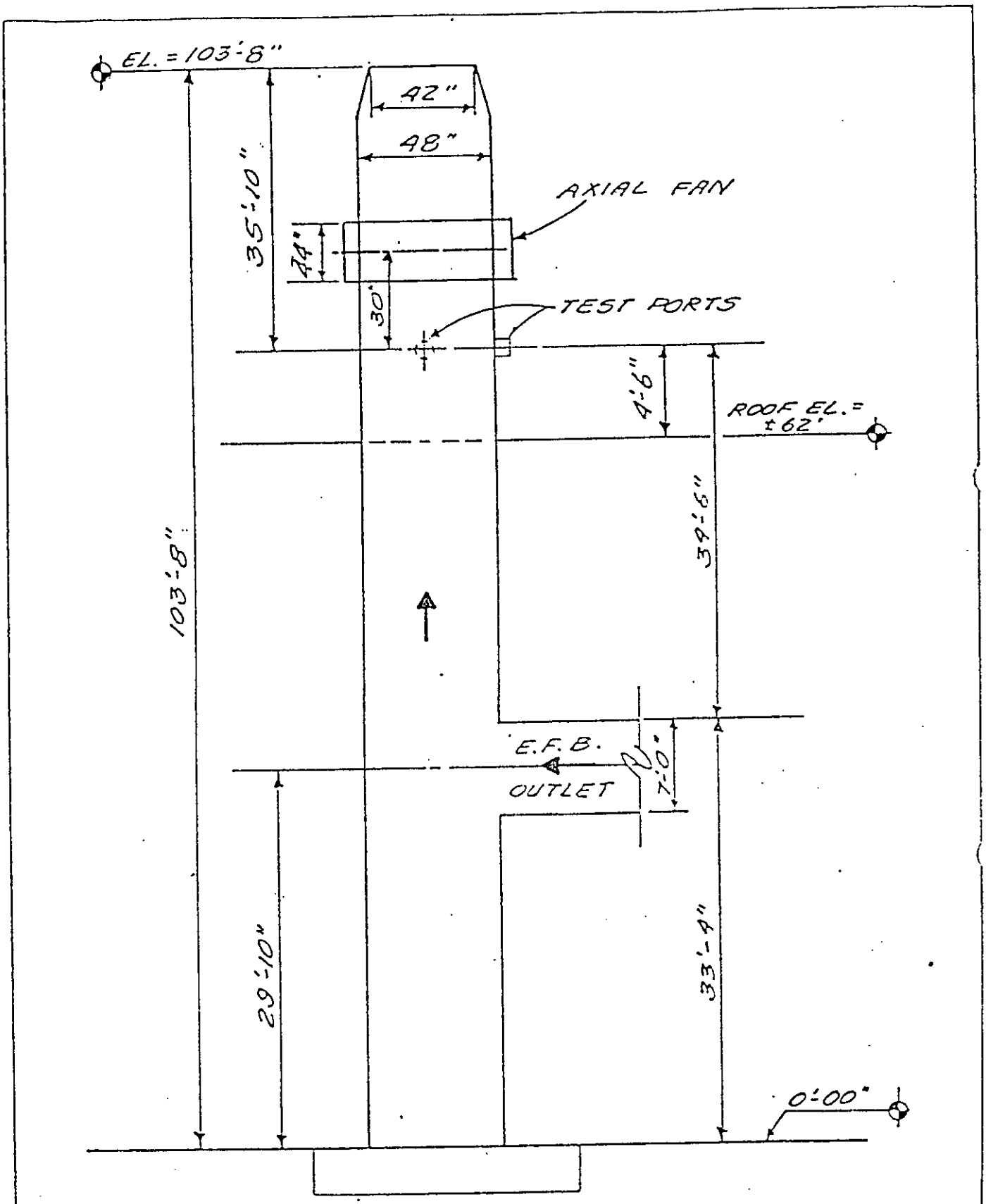
LOCATION OF TEST PORTS



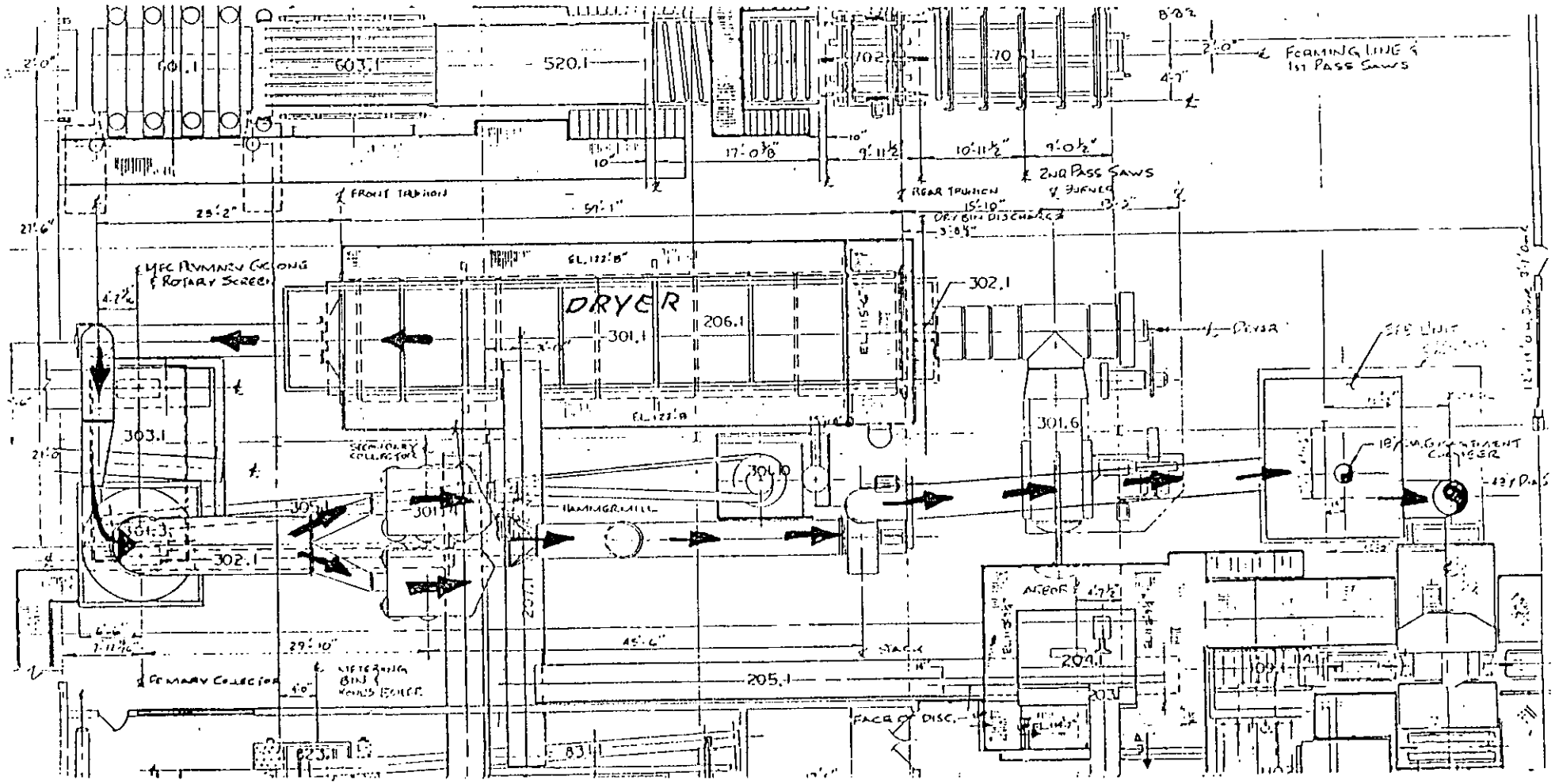
L-P TWO HARBORS
THERMAL OIL HEATER STACK
32,600 ACFM AT 350°F



TWO HARBORS, MN.
THERMAL OIL
HEATER
EXHAUST GAS
FLOW 1-22-92

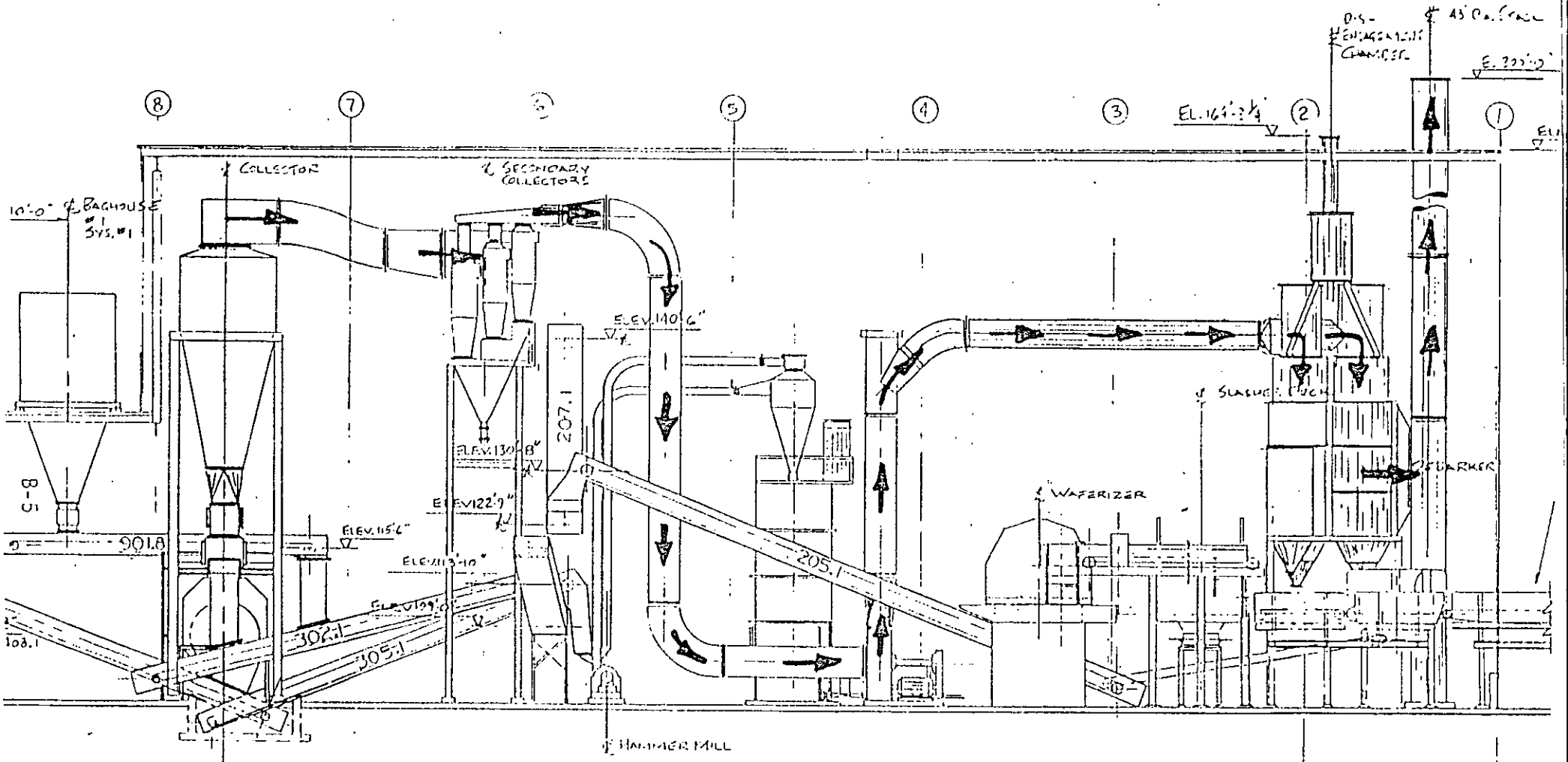


L-P TWO HARBORS
DRYER STACK
50,000 ACFM AT 250°F

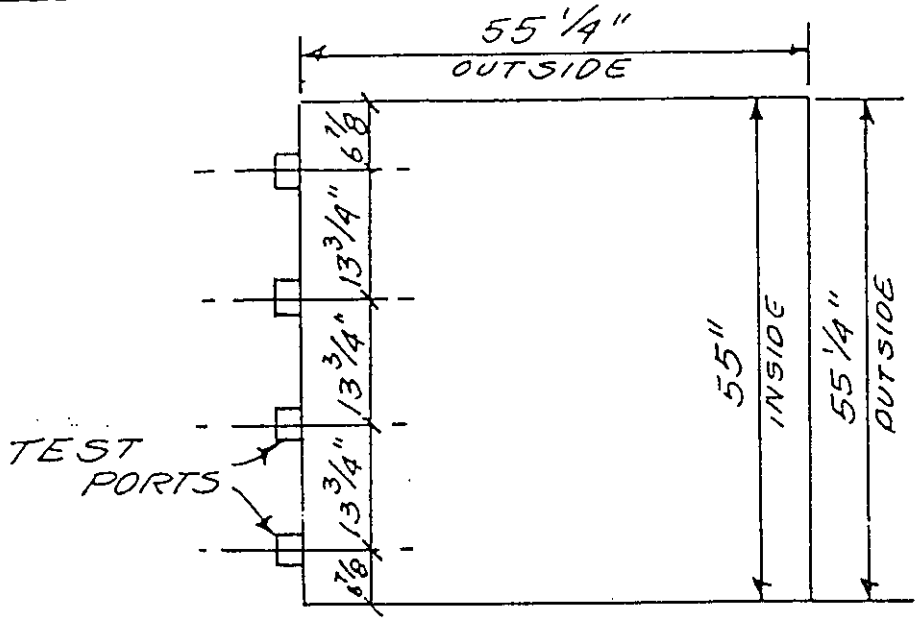


B-4

TWO HARBORS, MN
DRYER EXHAUST GAS FLOW
1-22-92



TWO HARBORS, MN.
DRYER EXHAUST GAS FLOW
1-22-92

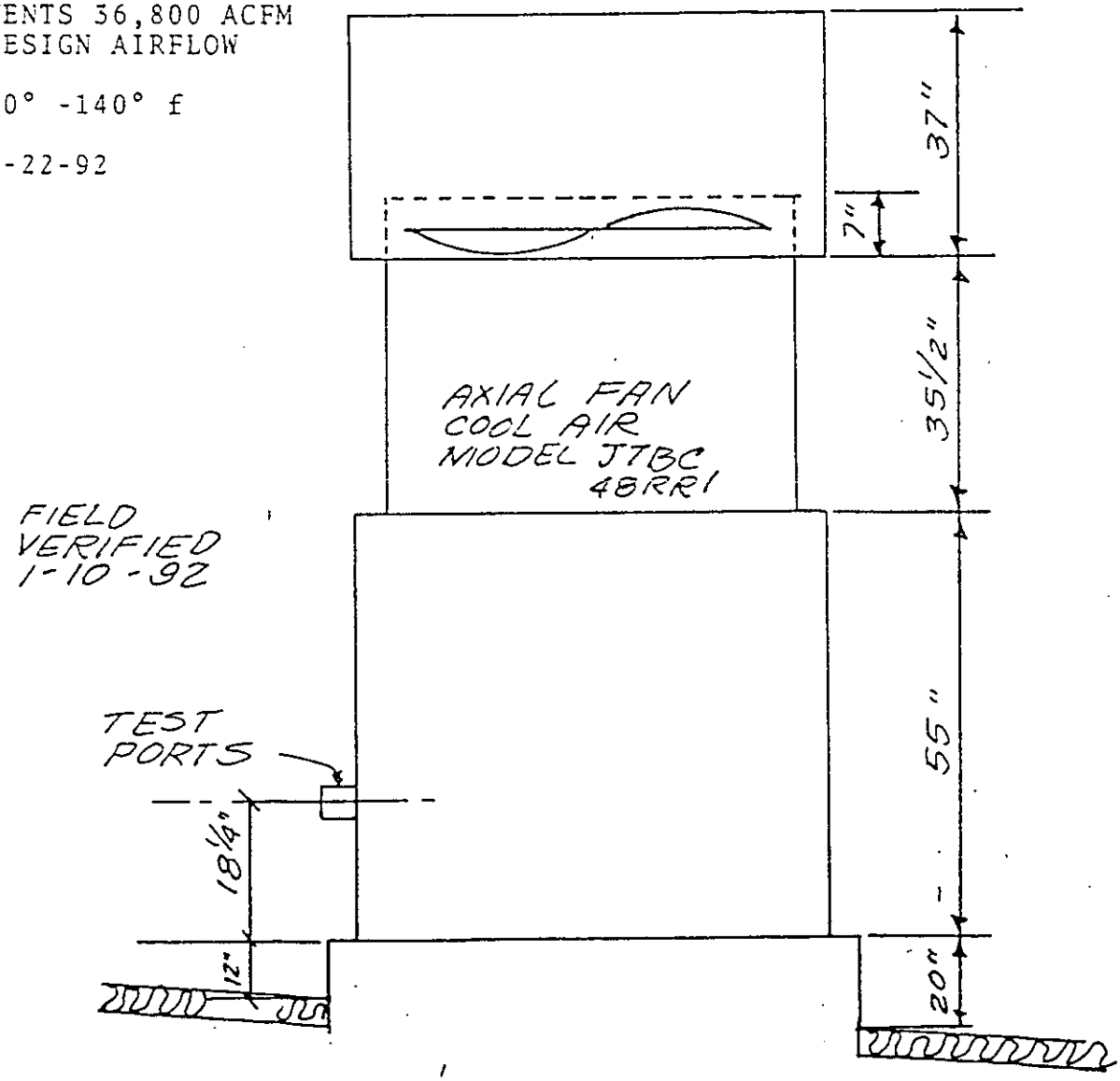


PLAIN VIEW

TWO HARBORS, MN.
PRESS AND UNLOADER
VENTS 36,800 ACFM
DESIGN AIRFLOW

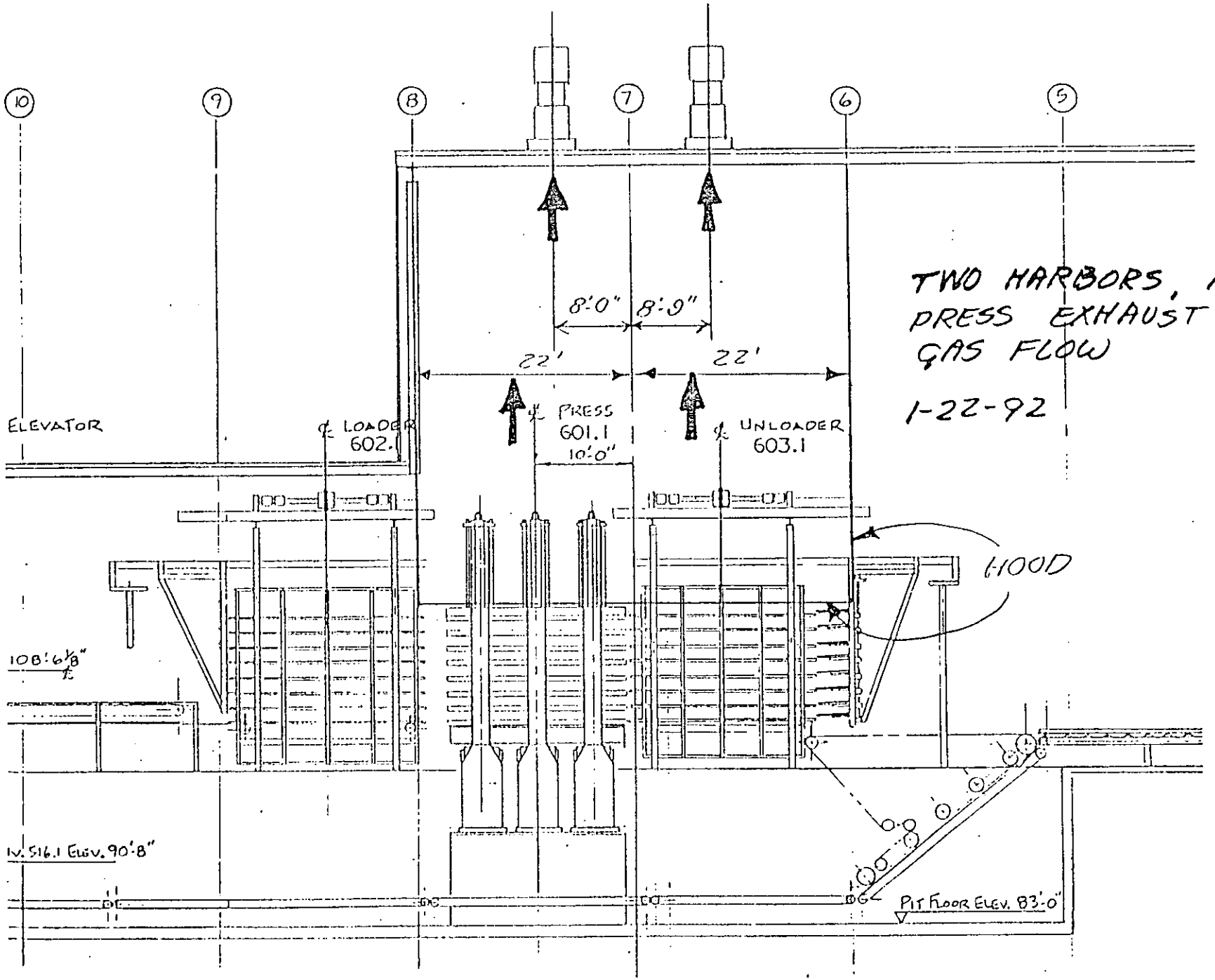
60° -140° f

1-22-92



N.T.S.

PRESS & UNLOADER VENTS


10
9
8
7
6
5
8'-0"
8'-9"
22'
22'
ELEVATOR
℄ LOADER
602.
℄ PRESS
601.1
10'-0"
℄ UNLOADER
603.1
HOOD
108'-6⅛"
℄
N. 516.1 Elev. 90'-8"
PIT FLOOR ELEV. 83'-0"
TWO HARBORS, MN
PRESS EXHAUST
GAS FLOW
1-22-92

APPENDIX C

THERMAL OIL HEATER FIELD DATA SHEETS

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job L.P. / Two Harbors

Source Konus Stack

Test 10 Run ____ Date 2/12/92

Stack dimen. 41.5 IN.

Dry bulb ____ °F Wet bulb ____ °F

Manometer: ☐ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.90 in Hg

Static pressure -.15 in WC

Operators D. Van Hoever + J. Bergstrom

Pitot No. V23-4 Cp .84

Schematic of Cross Section

Particulate

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 in.		Time start: hrs	
A 1	.044				
2	.146				
3	.296				
4	.704				
5	.854				
6	.956				
B 1					
2					
3					
4					
5					
6					
Temp. meas. tool & S/N:				Time end: hrs	

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

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / Two HARBORS Date 2/12/92 Test 10 Run 1
Source KONUS Stack No. of traverse points 12
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: .007 cfm at 7 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 3940

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

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	285	200	85
Impinger No. 3			
Condenser			
Desiccant	1499	1480	19
Total			104

Integrated Gas Sampling Data:

Bag Pump No. 3 Box No. 17 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1604 (HRS) Time end: 1702 (HRS)
Sampling rate: 400 cc/min Operator: DAH
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Two Harbors
Source Kilns Stack
Date 2/12/92 Test 10 Run 1

Operators D.W. + J.B.
Meter Box No. 2 ΔH@ 1.57 (IN WC)
Coeff. .9951

Pitot No. V23-4 Cp .84
Bar. Press. 27.90 inHg H2O 7 x
Nozzle No. 7-5 Nozzle Dia. .311 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/x)
	1600	814.91											
6	5	824.31	.40	2.44	4.29	6	303	253	256	40	62	62	16.1
5	10	838.84	.41	2.64	8.80	6.5	305				66	62	16.0
4	15	833.27	.43	2.57	3.26		309				69	63	15.5
3	20	837.84	.42	2.52	7.68	7	309	257	254	42	71	63	15.4
2	25	842.13	.41	2.46	2.06	7	309				70	62	17.5
1	30	846.13	.32	1.94	5.95	5	303				74	64	15.7
6	35	850.38	.37	2.37	0.26	6	305	270	256	40	72	64	14.9
5	40	854.81	.42	2.54	4.71	6.5	305				73	63	16.8
4	45	859.30	.41	2.48	9.11	6.5	305				73	63	16.5
3	50	863.61	.43	2.59	3.60	6.5	310	259	263	42	72	63	16.5
2	55	868.29	.44	2.64	8.14	6.5	311				74	64	14.7
1	60	872.68	.38	2.30	2.38	6	307				75	66	14.4
	(1702)												
	θ = 60	Vs = 52.77		ΔH = 2.46							Avg. = 67		

C-3

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P/Two Harbors Date 8/12/92 Test 10 Run 2
Source Konus Stack No. of traverse points 12
Method 0011 Filter holder: — Filter type: —

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 9 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 3991

Recovery solvent(s)
☐ acetone
☒ other(s) $MeCl_2$ + DI H_2O

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		300	
Impinger No. 2	284		84
Impinger No. 3			
Condenser			
Desiccant	1404	1391	13
Total			97

Integrated Gas Sampling Data:

Bag Pump No. 32 Box No. 17 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1735 (HRS) Time end: 1837 (HRS)
Sampling rate: 400 cc/min Operator: DRT
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / TWO HARBORS Operators DUH & J.B Pitot No. 123-4 Cp .84
Source ROTUS STACK Meter Box No. 2 ΔH@ 1.37 IN WC Bar. Press. 29.90 inHg H2O Z x
Date 2/12/92 Test 10 Run 2 Coeff. .9951 Nozzle No. 4-5 Nozzle Dia. 3.1 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (v/v)
	1731	873.07											
B 6	5	877.10	.36	2.18	7.19	5.5	304	234	251	43	71	69	16.6
5	10	881.68	.40	2.47	1.55	6	307				76	70	14.8
4	15	886.07	.41	2.49	5.98	6	310				76	68	15.2
3	20	890.52	.42	2.54	0.45	6	311	239	250	41	77	69	14.6
2	25	894.80	.40	2.43	4.82	6	310				82	71	16.5
1	30	898.73	.30	1.83	8.04	5	310				81	71	15.5
A 6	35	902.98	.37	2.24	2.87	5.5	310	249	252	41	78	71	15.8
5	40	907.35	.42	2.56	7.37	6	308				81	72	14.8
4	45	911.80	.41	2.51	1.83	6	309				81	73	14.6
3	50	916.47	.43	2.64	6.41	6.5	308	254	253	40	80	73	15.9
2	55	920.84	.39	2.39	0.77	6	307				83	75	15.8
1	60	925.05	.37	2.28	5.03	5.5	307				84	74	15.0
	(1833)												
	θ = 60	Vm = 51.98		ΔH = 2.28							Avg. = 75.2		

C-5

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P./Two Harbors Date 9/12/92 Test 10 Run 3
Source Konus Stack No. of traverse points 12
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

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

Particulate Catch Data:

No.s of filters used: 3997

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

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		200	
Impinger No. 2	286		86
Impinger No. 3			
Condenser			
Desiccant	1416	1403	13
Total			99

Integrated Gas Sampling Data:

Bag Pump No. B2 Box No. 17 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1940 (HRS) Time end: 2040 (HRS)
Sampling rate: 400 cc/min Operator: ~~BCH~~
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Two Harbors
Source Kraus Stack
Date 2/12/92 Test 10 Run 3

Operators DWH & J.B
Meter Box No. 2 ΔH@ 1.81 IN WC
Converter coeff. .9951

Pitot No. V23-4 Cp .84
Bar. Press. 29.90 inHg H2O 8 x
Nozzle No. 7-5 Nozzle Dia. 3.7 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1937	940.00											
A 6	5	944.96	.50	3.00	4.57	7.0	305	239	257	42	68	67	6.3
5	10	949.98	.55	3.23	9.88	7.5	307				71	68	16.9
4	15	954.97	.54	3.17	4.86	7.5	310				72	70	15.6
3	20	959.94	.57	3.34	9.97	7.5	313	243	257	42	71	72	15.9
2	25	964.86	.50	2.93	4.77	7	313				72	71	16.0
1	30	969.30	.44	2.60	9.29	6.5	308				72	72	16.0
B 6	35	973.90	.45	2.66	3.86	6	308	252	256	42	74	72	16.1
5	40	978.64	.47	2.77	8.53	6.5	312				76	72	16.3
4	45	983.20	.47	2.78	3.21	6.5	311				80	73	16.5
3	50	988.03	.49	2.81	8.02	6.5	311	257	258	41	82	72	16.2
2	55	992.96	.47	2.79	2.72	6.5	311				84	74	15.8
1	60	996.51	.29	1.73	6.45	5	311				84	75	14.8
	(2040)												
	θ = 60	Vm = 56.51		ΔH = 2.75							Avg. = 73.5		

S-0037R

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job LP/Two Harbors

Source Kouns Stack

Test 12 Run 1 Date 2-13-92

Stack dimen. 41.5 IN.

Dry bulb ______ °F Wet bulb ______ °F

Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

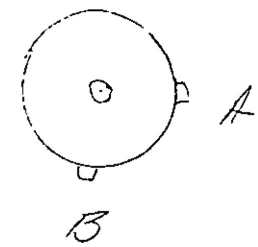
Barometric pressure 29.10 in Hg

Static pressure -.41 in WC

Operators E.TROWBRIDGE-C.MOSSER

Pitot No. 23V-5 Cp .840

PM-10



Schematic of Cross Section

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 in.		Time start: 1230	hrs
A	1	.044	1.83	5.83	.37	305
	2	.146	6.06	10.06	.45	
	3	.296	12.28	16.28	.43	
	4	.704	29.21	33.21	.45	
	5	.854	35.44	39.44	.43	
	6	.956	39.67	43.67	.40	
B	1				.30	302
	2				.46	
	3				.49	
	4				.42	
	5				.40	
	6				.39	
Temp. meas. tool & S/N:			PDT-12		Time end:	hrs

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

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP / TWO HARBORS Date 2-13-92 Test 12 Run 1
Source KONUS STACK No. of traverse points 12
Method PM 10 Filter holder: ERC Filter type: 2½" GLASS FIBER

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5610

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	252	100	52
Impinger No. 3		0	
Condenser			
Desiccant	1403	1395	8
Total			60

Integrated Gas Sampling Data:

Bag Pump No. B3 Box No. 18 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1301 (HRS) Time end: 1425 (HRS)
Sampling rate: 400 cc/min Operator: ET
S/N of O_2 Analyzer used to monitor train outlet: 8

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP/ TWO HARBORS
Source KONUS STACK
Date 2-13-98 Test 1,2 Run 1

Operators E.TROWBRIDGE-C.MOSSIL
Meter Box No. 8 ΔH 1.88 IN WC
Coeff. .9993

Pitot No. 22Y-4 Cp .84
Bar. Press. 29.10 inHg H2O x
Nozzle No. #10 Nozzle Dia .198 IN.

Traverse Point No.		Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (x v/v)
		1300	50.60											
B	1	6.66	53.20	.50	.51	6.66	1.0	304	245	242	34	46	45	15.3
	2	13.77	56.05	.49	.52	7.11	1.0	312				47	46	15.7
	3	20.96	58.90	.50	.52	7.18	1.0	312	242	240	36	50	47	16.0
	4	27.93	61.62	.47	.52	6.96	1.0	310				53	48	14.8
	5	34.90	64.40	.47	.52	6.96	1.0	311	240	243	38	54	50	16.1
	6	41.56	67.10	.43	.52	6.66	1.0	311				56	50	16.4
A	1	48.53	69.70	.47	.52	6.96	1.0	312	242	246	40	57	52	16.0
	2	55.64	72.50	.49	.53	7.11	1.0	312				58	52	15.8
	3	62.68	75.27	.48	.53	7.04	1.0	310	244	245	40	59	52	15.7
	4	69.72	78.07	.46	.53	7.04	1.0	310				59	54	16.2
	5	76.54	80.85	.45	.53	6.81	1.0	312	250	248	42	62	56	16.7
	6	83.64	83.30	.36	.53	6.09	1.0	311				66	60	16.0
		(1426)												

Θ = 83.64 Vm = 32.70 ΔH = .52 Avg. = 57.6

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job CP/Two Harbors — Date 2-13-92 Test 12 Run 2
Source Rotus Stack — No. of traverse points 12
Method EPA 10 Filter holder: ERC — Filter type: 2½" GLASS FIBER

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5618

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	241	100	41
Impinger No. 3		0	
Condenser			
Desiccant	1403	1397	6
Total			53

Integrated Gas Sampling Data:

Bag Pump No. B3 Box No. 18 Bag No. 2

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

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

Time start: 1456 (HRS) Time end: 1614 (HRS)

Sampling rate: 300 cc/min Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 8

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP / TWO HARBORS
Source RADIUS STACK
Date 2-13-92 Test 02 Run 2

Operators ET + CW
Meter Box No. 8 ΔH@ 1.85 IN WC
Calibrator coeff. .9993

Pitot No. 22K-U Cp .840
Bar. Press. 27.10 inHg H2O x
Nozzle No. 1-10 Nozzle Dia .198 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (v/v)
	1455	83.50											
A 1	6.58	86.30	.48	.55	6.58	1.0	312	247	242	40	58	57	16.2
2	13.17	94.00	.48	.55	6.59	1.0	311				64	60	16.0
3	19.69	91.66	.47	.55	6.51	1.0	311	252	264	35	66	60	15.9
4	26.34	94.47	.49	.56	6.65	1.0	312				67	62	15.4
5	32.65	97.12	.44	.56	6.20	1.0	31~	258	265	37	68	62	15.7
6	38.66	99.66	.40	.56	6.01	1.0	310				68	62	15.3
B 1	44.97	102.30	.44	.56	6.30	1.0	312	260	262	36	68	62	16.6
2	51.34	104.89	.45	.56	6.37	1.0	314				70	65	16.9
3	57.79	107.46	.46	.56	6.40	1.0	314	258	260	37	72	65	17.2
4	64.38	110.10	.48	.56	6.58	1.0	311				72	65	17.7
5	70.76	112.64	.45	.56	6.37	1.0	311	254	259	37	72	65	17.5
6	76.77	115.10	.40	.56	6.01	1.0	310				72	65	17.5
	16.15												
	Θ = 76.77	Vm = 31.6		ΔH = .56							Avg. = 65.2		

C-12

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP / TWO HARBORS — Date 2-13-92 Test 12 Run 3
Source KILNS STACK — No. of traverse points 12
Method PM 10 Filter holder: ERC — Filter type: 2½" GLASS FIBER

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5596

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		180	
Impinger No. 2	251	200	51
Impinger No. 3		0	
Condenser			
Desiccant	1410	1403	7
Total			58

Integrated Gas Sampling Data:

Bag Pump No. 33 Box No. 18 Bag No. 3

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

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

Time start: 1641 (HRS) Time end: 1759 (HRS)

Sampling rate: 700 cc/min Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 8

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: 2P/TWO HARBORS
Source: BONUS STACK
Date: 2-13-92 Test 12 Run 3

Operator: ET-CM
Meter Box No: 2 ΔH@ 1.88 IN WC
Coefficient: .9993

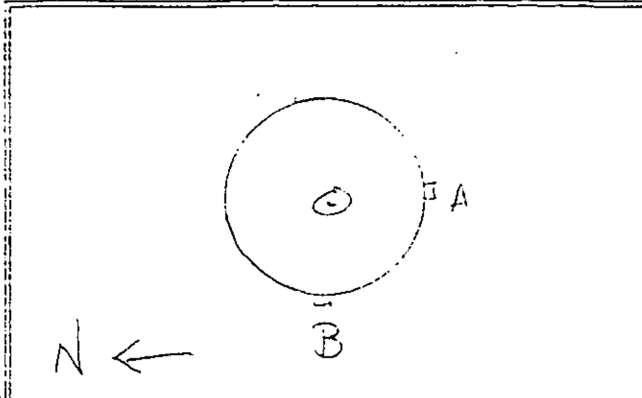
Pitot No. 22V-4 Cp .840
Bar. Press. 29.10 inHg H2O x
Nozzle No. B-11 Nozzle Dia .198 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (v/v)
	1640	115.30											
B 1	6:12	118.00	.42	.51	6.28	1.0	310	257	248	37	66	65	15.2
2	12.56	120.61	.42	.51	6.26	1.0	308				66	66	14.7
3	18.98	123.40	.44	.51	6.42	1.0	308	255	252	39	65	66	14.8
4	25.56	126.12	.46	.51	6.57	1.0	309				70	66	15.1
5	32.06	128.75	.45	.51	6.50	1.0	309	254	256	39	71	67	15.1
6	38.18	131.34	.40	.51	6.12	1.0	305				72	67	16.0
E 1	44.47	133.97	.42	.51	6.28	1.0	307	256	250	38	72	67	16.3
2	50.89	136.75	.44	.51	6.42	1.0	308				74	68	16.4
3	57.25	139.40	.43	.51	6.35	1.0	308	252	254	38	74	68	15.0
4	63.45	141.98	.41	.51	6.20	1.0	309				74	68	16.2
5	69.73	144.62	.42	.51	6.29	1.0	310	250	253	38	74	68	15.5
6	75.86	147.31	.40	.51	6.12	1.0	307				74	68	14.6
	(1800)												
	θ = 1586	Vs = 32.01		ΔH = .51							Avg. = 69.1		

C-14

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job: L.P. Two Harbors
Source: KONUS STACK
Test: 9 Run: ____ Date: 2/12/92
Stack dimen. 41.5 IN.
Dry bulb ______ °F Wet bulb ______ °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 29.90 in Hg
Static pressure -.15 in WC
Operators D. VanHoever + J. Bergstrom
Pitot No. V23-4 Cp .84



Schematic of Cross Section

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:	4 in.	Time start: 0945 hrs	
A	1	.044	1.83	5.83	.11	
	2	.146	6.06	10.06	.16	
	3	.296	12.28	16.28	.20	
	4	.704	29.21	33.21	.30	
	5	.854	35.44	39.44	.35	
	6	.956	39.67	43.67	.42	
B	1				.33	
	2				.45	
	3				.50	
	4				.49	
	5				.46	
	6				.45	
Temp. meas. tool & S/N: PDT 15					Time end: hrs	

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

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / Two Harbors Date 2.12/92 Test 9 Run 1
Source KONUS Stack No. of traverse points 12
Method 0011 Filter holder: — Filter type: A

Sample Train Leak Check:

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

Particulate Catch Data:

No.s of filters used: NA

Recovery solvent(s)
☐ acetone
☒ other(s) MEC [illegible] H_2O

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

Condensate Data:

Item	Weight (g)		
	Final	[illegible]	Difference
Impinger No. 1			
Impinger No. 2	255	200	55
Impinger No. 3			
Condenser			
Desiccant	1300	1274	26
			81

Integrated Gas Sampling Data:

Bag Pump No. B2 Box No. 13 Bag No. 4
Bag Material: 5-layer Aluminized Tedlar Side: R L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1035 (HRS) Time end: 1133 (HRS)
Sampling rate: 400 cc/min Operator: DHH
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-033

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: L.P./Two Harbors
Source: Kennis Stack
Date: 2/17/92 Test 4 Run 2

Operators: D.GH & J.B
Meter Box No. 2 ΔH@ 1.81 IN WC
Calibration coeff. .995

Pitot No. V23-4 Cp .84
Bar. Press. 29.95 inHg H2O 10 %
Nozzle No. Z-5 Nozzle Dia .311 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (in H2O)	Orifice ΔH (in H2O)	Dry Vol. (cf)	VAC. (inHg)	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (%v/v)
	1031	653.09											
B 6	5	657.40	.46	[illegible]	7.36	7	312	238	241	34	70	67	16.0
5	10	662.20	.48	2.[illegible]	1.98	8	312				75	68	16.4
4	15	666.65	.50	2.80	6.72	8.5	313				81	71	16.0
3	20	671.50	.51	2.93	1.53	9	314	246	248	36	83	73	15.6
2	25	676.04	.46	2.66	6.13	8	314				82	72	15.4
1	30	679.80	.30	1.73	9.84	5.5	314				82	74	16.1
A 6	35	684.54	.45	2.60	4.39	8	314				83	77	16.0
5	40	689.35	.51	2.90	9.25	9	312	256	262	37	85	78	15.9
4	45	693.99	.48	2.80	3.98	8	312				86	78	15.8
3	50	698.90	.48	2.74	5.71	8	315				83	77	16.3
2	55	703.67	.45	2.61	3.27		313				81	78	15.3
1	60	707.57	.38	2.11	7.38	6	307	260	263	40	83	78	16.4
	(1133)												
	θ = 60	Vm = 54.48		ΔH = 2.60							Avg. = 77.7		

Barini D'Ivan

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / Two Harbors Date 2/12/92 Test 8 Run 2
Source KONUS Stack No. of traverse points 12
Method 0011 Filter holder: — Filter type: —

Sample Train Leak Check:

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

Particulate Catch Data:

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

☐ acetone
☒ other(s) MECL, + DI H2O

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	278	200	78
Impinger No. 3			
Condenser			
Desiccant	1480	1466	14
Total			92

Integrated Gas Sampling Data:

Bag Pump No. B2 Box No. 13 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1221 (HRS) Time end: 1323 (HRS)
Sampling rate: 400 cc/min Operator: DWH
S/N of O_2 Analyzer used to monitor train outlet: 2

CF-023

S-0046RR

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: L.P. / Two Harbors
Source: Radius Stack
Date: 2/12/96 Test: 9 Run: 2

Operators: D.V.N. / T.B.
Meter Box No.: 2 ΔH@ 1.51 IN WC
Coeff.: .9957

Pitot No.: 123-7 Cp: .84
Bar. Press.: 29.92 inHg H2O 7 %
Nozzle No.: 7-5 Nozzle Dia: .311 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	1021	707.10											
A 6	5	713.01	.50	3.08	3.05	7	304	237	256	37	61	69	15.7
5	10	718.10	.55	3.30	8.01	8	300				64	63	15.8
4	15	723.08	.54	3.23	3.08	8	307				70	65	15.4
3	20	728.19	.56	3.36	8.19	8	310	246	255	38	74	66	16.3
2	25	733.12	.50	3.01	3.05	7.5	311				72	64	16.3
1	30	737.40	.39	2.35	7.33	6.5	307				72	64	16.3
B 6	35	742.00	.47	2.84	2.04	8	307	252	256	40	73	67	16.5
5	40	746.64	.46	2.80	6.72	8	303				77	69	16.2
4	45	751.50	.48	2.91	1.51	8	310				78	69	16.8
3	50	756.40	.51	3.09	6.44	8	311	254	256	40	79	69	15.6
2	55	761.30	.48	2.91	1.33	8	311				81	71	16.5
1	60	765.60	.39	2.40	5.59	7	305				80	71	16.1
	1323												

θ = 60 Vs = 58.5 ΔH = 2.74 Avg. = 70

C-19

S-0037R

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / Two Harbors Date 2/12/92 Test 9 Run 3
Source Ronus Stack No. of traverse points 12
Method 0011 Filter holder: — Filter type: —

Sample Train Leak Check:

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

Particulate Catch Data:

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

☒ acetone
☒ other(s) $MECl_2$ & DI H_2O

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	213	200	13
Impinger No. 3			
Condenser			
Desiccant	1314	1315	1
Total			89

Integrated Gas Sampling Data:

Bag Pump No. B_2 Box No. B Bag No. 3

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

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

Time start: 1405 (HRS) Time end: 1502 (HRS)

Sampling rate: 400 cc/min Operator: DAH

S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: L.P. / TWO HARBOR
Source: ROHUS Stack
Date: 2/12/92 Test: 9 Run: 3

Operators: DCH & J.B
Meter Box No.: 2 ΔH@: 1.91 IN WC
Gasmeter coeff.: .9951

Pitot No.: K23-Y Cp
Bar. Press.: 29.5 inHg H2O: 10 %
Nozzle No.: 7-5 Nozzle Dia: 3.1 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgs. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1400	766.00											
B 6	5	770.31	.41	2.37	0.30	6	303	231	237	39	68	65	16.3
5	10	774.81	.46	2.63	4.84	7	307				70	68	16.5
4	15	779.34	.44	2.52	9.27	7	309				74	69	16.8
3	20	783.56	.48	2.78	3.96	8	311				75	68	14.7
2	25	788.55	.49	2.80	5.65	8	312	272	273	40	75	67	15.1
1	30	793.14	.44	2.54	3.12	8	305				73	66	15.5
F 6	35	797.46	.42	2.42	7.47	6.5	305				70	66	16.3
5	40	801.88	.45	2.57	1.95	7	308	267	269	43	73	67	17.0
4	45	806.40	.46	2.63	6.48	7	311				76	68	16.6
3	50	810.69	.43	2.47	0.89	7	311				79	70	16.1
2	55	815.21	.41	2.36	5.21	7	311	266	268	43	80	71	16.5
1	60	819.20	.34	1.98	9.17	5.5	305				80	70	16.3
	1500												
	θ = 60	Vm = 53.20		ΔH = 2.5							Avg. = 71.7		

S-0037R

APPENDIX D

PRESS & UNLOADER VENT FIELD DATA SHEETS

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job L.P./Two Harbor

Source Press & Unloading Vents

Test 1 Run ____ Date 2/13/92

Stack dimen. 55 x 55 (110) IN.

Dry bulb ____ °F Wet bulb ____ °F

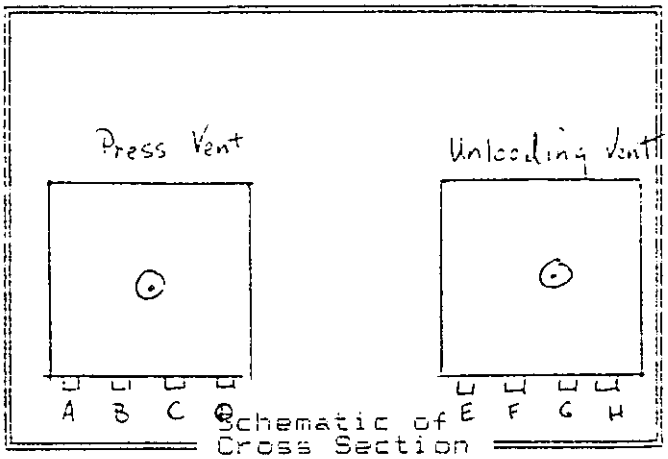
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.20 in Hg

Static pressure -.80 in WC

Operators D. VanHoever & J. Bergstrom

Pitot No. V23-5 Cp .84



Particulate

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 in.		Time start:	hrs
A1 61		6.88	10.88		
2 2		20.62	24.62		
3 3		34.38	38.38		
4 4		48.12	52.12		
B5 H1					
2 2					
3 3					
4 4					
C1					
2					
3					
4					
D1					
2					
3					
4					
E1					
2					
3					
4					
F1					
2					
3					
4					
Temp. meas. tool & S/N:				Time end:	hrs

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

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / Two Harbors Date 2/13/92 Test 7 Run 1
Source Press & Unloader Vents No. of traverse points: 32
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 9 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 3778

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

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		200	
Impinger No. 2	202		2
Impinger No. 3			
Condenser			
Desiccant	1368	1362	6
Total			8

Integrated Gas Sampling Data:

Bag Pump No. 35 Box No. 12 Bag No. 1

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

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

Time start: 0825 (HRS) Time end: 0928 (HRS)

Sampling rate: 400 cc/min Operator: DCH

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

CF-023

S-0046RR

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Two Harbors
Source Press. & Unloader Vents
Date 2/13/93 Test 1 Run 1

Operators D.V.N. & J.B
Meter Box No. 7 ΔH@ 1.86 IN WC
Barometer confit. 1.0083

Pitot No. U23-5 Cp .84
Bar. Press. 27.20 inHg H2O (x
Nozzle No. 7-4 Nozzle Dia .247 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (x/y)
	0820	38.90											
A 4	2	39.58	.19	.78	9.88	2.5	90	248	259	36	85	85	AMBIEN
3	4	40.52	.06	.25	0.44	.5	90				86	85	AIR
2	6	41.65	.22	.93	1.53	3	83				89	86	
1	8	41.65	.0	.00	1.53	—	87	256	258	37	90	86	
B 4	10	43.30	.53	2.23	3.10	6	87				91	86	
3	12	44.90	.51	2.13	4.84	6	90				93	89	
2	14	46.50	.40	1.69	6.30	5	87	259	257	36	95	90	
1	16	47.35	.16	.67	7.23	2.5	90				95	90	
C 4	18	48.96	.54	2.27	8.93	6	90				96	91	
3	20	50.62	.53	2.24	0.62	6	89	257	260	36	97	91	
2	22	52.07	.46	1.95	2.19	5	89				97	92	
1	24	52.95	.09	.38	2.89	.5	88				97	92	
D 4	26	54.44	.42	1.78	4.40	5	88	260	258	35	97	92	
3	28	55.41	.16	.68	5.34	.5	89				97	92	
2	30	56.81	.36	1.52	6.73	5	90				98	93	
1	32	56.91	0	.00	6.73	—	85	261	257	35	96	93	
E 4	34	57.50	.10	.42	7.41	1.5	85				97	93	
3	36	58.35	.08	.33	8.13	1.5	92				96	93	
2	38	59.22	.22	.93	9.22	3	88	265	259	36	97	93	
1	40	59.22	.0	.00	9.22	—	88				95	93	
F 4	42	60.86	.46	1.95	0.88	6	88				95	93	
3	44	62.61	.60	2.54	2.60	7	89	260	259	36	99	94	
2	46	64.47	.60	2.57	4.41		85				100	94	
1	48	65.55	.26	1.10	5.60		91				99	95	
	(over)												
	Q =	Vs =		ΔH =							Avg. =		

D-3

S-0037R

(Pg 2 of 2)

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Two Harbors
Source Press + Unfoulder Vent
Date 2/13/92 Test 1 Run 1

Operators
Meter Box No. ΔH ΔH IN WC
Cosmeter coeff.

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

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (x v/v)
G. 4	50	67.30	.53	2.27	7.30	7	85	257	263	37	100	96	AMBIENT AIR
3	52	69.05	.55	2.36	9.04	7	85				101	97	
2	54	70.82	.61	2.60	0.87	8	89				101	97	
1	56	71.88	.18	.78	1.87	1.5	82	260	263	37	101	97	
H 4	58	73.52	.49	2.12	3.52	5	82				100	96	
3	60	74.75	.24	1.03	4.67	3	85				99	96	
2	62	76.13	.39	1.69	6.15		79	256	262	37	99	96	
1	64	76.85	.01	.04	6.38		83				99	96	
	(0928)												
	θ = 64	Vm = 37.95		ΔH 1.32							Avg. = 94.2		

D-4

S-0937R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / Two Harbors Date 2/13/92 Test 7 Run 2
Source Press & Unloading Vent No. of traverse points 32
Method 5 Filter Holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: .02 cfm at 9 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 3983

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

No. of probe wash bottles: 1
Sample recovered by: [illegible]

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	202	200	2
Impinger No. 3			
Condenser			
Desiccant	1376	1368	8
Total			10

Integrated Gas Sampling Data:

Bag Pump No. 38 Box No. 12 Bag No. 2

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

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

Time start: 1035 (HRS) Time end: 1137 (HRS)

Sampling rate: 400 cc/min Operator: DH

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

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: L.P. Two Harbors
Source: Press. & Unloading Vents Stack
Date: 2/13/92 Test 4 Run 2

Operators: DWH & JJB
Meter Box No. 7 ΔH@ 1.86 IN WC
Coeff. 1.0083

Pitot No. V23-5 Cp .84
Bar. Press. 29.20 inHg H2O 1 x
Nozzle No. 7-4 Nozzle Dia .449 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (x v/v)
	1030	79.8											
H 4	2	81.17	.34	1.46	8.16	4	83	239	257	39	92	92	Ambient
3	4	82.16	.16	.68	2.09	2	86				94	92	Air
2	6	83.50	.35	1.48	3.46	4	90				94	92	
1	8	83.90	.03	.12	3.87	.5	85	246	256	40	94	92	
G 4	10	85.46	.46	1.96	5.44	6	85				94	93	
3	12	86.99	.44	1.86	6.98	6	90				97	93	
2	14	88.70	.46	1.96	8.56	6	86	264	258	41	99	94	
1	16	89.61	.16	.69	9.51	2	81				99	94	
F 4	18	91.06	.45	1.94	1.08	5	82				100	95	
3	20	92.73	.48	2.04	2.70	5	90	263	256	40	101	96	
2	22	94.46	.47	2.01	4.31	5	87				101	96	
1	24	95.47	.19	.81	5.33	3	89				101	96	
E 4	26	95.96	.06	.25	5.90	.5	89	264	257	41	99	96	
3	28	96.43	.07	.29	6.52	.5	93				98	95	
2	30	97.49	.17	.72	7.48	2.5	93				99	95	
1	32	97.49	.0	.0	7.48	—	91	263	257	40	98	95	
D 4	34	99.09	.52	2.20	9.16	6	91				100	95	
3	36	100.30	.27	1.15	0.38	4	88				101	96	
2	38	101.69	.25	1.06	1.55	4	91	264	258	40	101	96	
1	40	101.80	.0	0	1.55	—	85				102	96	
C 4	42	103.31	.51	2.19	3.23	6	85				101	96	
3	44	105.00	.59	2.52	5.03	6.5	88	260	259	41	102	96	
2	46	106.63	.48	2.03	6.64	6	93				102	96	
1	48	107.20	.05	.21	7.17		96				103	96	
	Over												
	θ =	Vm =		ΔH =							Avg. =		

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P / Two Harbors
Source Press & Untreating Vent Stack
Date 2/13/93 Test 1 Run 2

Operators DG ZOH2
Meter Box No. ____ ΔH ____ IN WC
Barometer corr't. ____

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

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/y)
B 4	50	108.97	.56	2.40	8.93	7	86	256	257	40	102	96	Ambient
3	52	110.65	.46	1.97	0.52	6	88				102	96	Air
2	54	112.06	.41	1.74	2.02	5	91				102	96	
1	56	112.45	.04	.17	2.49	.5	89	257	258	40	100	96	
A 4	58	113.15	.07	.30	3.11	1	89				99	96.0	
3	60	113.90	.10	.42	3.85	1	89				99	96	
2	62	114.70	.10	.42	4.59	1	89	260	256	40	99	96	
1	64	114.70	0	.00	4.59	0	87				99	96	
	(1137)												
	Θ = 64	V_m = 34.90		ΔH = 1.16							Avg. = 97.1		

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S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / Two Harbors Date 2/13/92 Test 7 Run 3
Source Press & Unloading Vents Stacks No. of traverse points 32
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 9 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 3990

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

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	204	200	4
Impinger No. 3			
Condenser			
Desiccant	1448	1438	10
Total			14

Integrated Gas Sampling Data:

Bag Pump No. B8 Box No. 12 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1215 (HRS) Time end: 1319 (HRS)
Sampling rate: 400 cc/min Operator: DHH
S/N of O_2 Analyzer used to monitor train outlet: —

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CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: L.P. / Two Harbors
Source: Press. Unloading Vent Stack
Date: 2/13/92 Test # 7 Run 3

Operators: D. Wid & T. B
Meter Box No. 7 ΔH@ 1.86 IN WC
Meter coeff.: 1.0083

Pitot No. V23-5 Cp .84
Bar. Press.: 29.20 inHg H2O / x
Nozzle No. 7-4 Nozzle Dia .249 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	1210	115.00											
A 4	2	116.36	.3	1.30	6.29	4.5	80	249	250	40	94	91	Ambient
3	4	116.98	.07	.29	6.90	15	91				95	94	AIR
2	6	117.95	.22	.93	7.89	3	91				95	94	
1	8	117.95	.0	0	7.99	—	92				97	94	
B 4	10	119.67	.57	2.40	9.74	6	93	256	257	40	94	93	
3	12	121.21	.44	1.85	1.28	5.6	92				99	94	
2	14	122.66	.37	1.58	2.70	5	88				99	95	
1	16	123.16	.02	.08	3.03	—	91	261	256	40	98	94	
C 4	18	124.78	.55	2.33	4.76	7	91				99	94	
3	20	126.47	.54	2.29	6.47	7	91				100	95	
2	22	128.15	.50	2.13	8.12	6.5	88	257	258	42	101	95	
1	24	128.50	.03	.12	8.53	.5	95				99	95	
D 4	26	130.26	.54	2.27	0.23	7	95				101	96	
3	28	131.64	.37	1.58	1.66	6	88	256	260	43	101	97	
2	30	133.22	.45	1.95	3.23	6.5	85				102	98	
1	32	133.22	0	0	3.23	—	88				101	97	
E 4	34	134.31	.20	.86	4.29	3	88	258	261	43	101	97	
3	36	135.11	.11	.47	5.07	2	85				100	97	
2	38	136.30	.29	1.25	6.34	45	82				99	97	
1	40	136.30	0	0	6.34	—	85	260	263	43	99	97	
F 4	42	137.91	.5	2.15	8.00	6	85				99	97	
3	44	139.76	.55	2.35	9.73	6.5	88				100	97	
2	46	141.37	.52	2.20	1.41	6	93	261	259	42	100	97	
1	48	143.40	.19	.80	3.43	4.5	97				100	97	
	(OVER)												
	Θ =	Vm =		ΔH =							Avg. =		

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Pg 2 of 2

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: L.P. / Two Harbors
Source: Press & Unloading Vent Stack
Date: 2/13/81 Test 1 Run 3

Operators: DLH & J.B
Meter Box No. HF ____ IN WC
Gasmeter coeff. ____

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

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
4	50	144.14	.55	2.35	4.17	7	88	257	255	41	99	96	Ambient
3	52	145.90	.58	2.40	5.95	7.5	84				98	96	Air
2	54	147.61	.54	2.33	7.68	7.5	80				98	96	
1	56	148.84	.23	.99	8.81	4.5	85	253	254	40	97	95	
4	58	150.16	.38	1.63	0.25	5.5	85				96	95	
3	60	151.56	.26	1.11	1.44	4.5	88				95	94	
2	62	152.95	.37	1.58	2.86	5	83	257	256	41	95	94	
1	64	153.14	.00	.00	2.86		86				95	93	
	(1319)												
	θ = 64	Vm = 35.14		ΔH = 1.36							Avg. = 96.9		

S-0037R

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job LPI Two Harbors

Source Press + Unloader VENTS

Test 5 Run 1 Date 2-12-92

Stack dimen. 55 x 55 (10) IN.

Dry bulb ____ °F Wet bulb ____ °F

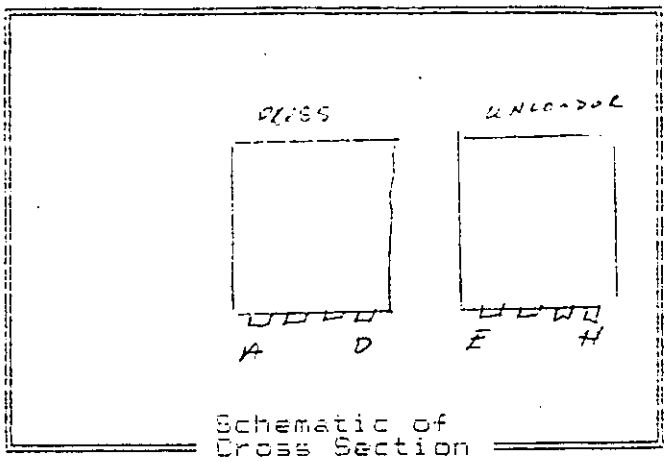
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.90 in Hg

Static pressure -.80 / .60 in WC

Operators E.T + CM

Pitot No. 23V-5 Cp .840



Schematic of Cross Section

PM-10

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 in.		Time start: 0930 hrs	
A/E 1		4.58	8.58	.00 / .02	68 / 70
2		8.25	17.25	.06 / .06	
3		22.92	26.92	.30 / .46	
4		32.08	36.08	.08 / .18	
5		41.25	1/4.25	.14 / .33	
6		50.41	54.41	.15 / .35	
B/F 1				.07 / .08	
2				.57 / .45	
3				.47 / .40	
4				.48 / .40	
5				.56 / .45	
6				.56 / .45	
C/G 1				.00 / .08 72 / 72	
2				.38 / .43	
3				.45 / .42	
4				.35 / .44	
5				.62 / .45	
6				.60 / .38	
D/H 1				.09 / .00	
2				.05 / .08	
3				.34 / .34	
4				.14 / .34	
5				.26 / .30	
6				.34 / .25	
Temp. meas. tool & S/N: PDT-12				Time end: 1060 hrs	

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

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/Two Harbors Date 2-12-92 Test 5 Run 1
Source Recirculation Vent No. of traverse points
Method PM10 Filter holder: ERC Filter type: 2½" GLASS FIBER

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5580

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		100	0
Impinger No. 3		0	
Condenser			
Desiccant	1430	1422	8
Total			8

Integrated Gas Sampling Data:

Bag Pump No. _____ Box No. N/A Bag No. _____

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

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

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

Sampling rate: _____ cc/min Operator: _____

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

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job A-P/TWIN HARBORS
Source PRESS VANCOUVER VENTS
Date 2-12-92 Test 5 Run 1

Operators CT-CM
Meter Box No. 7 ΔH@ .886 IN WC
Coeneter coeff. 1.0093

Pitot No. 25V-5 Cp .840
Bar. Press. 28.90 inHg H2O x
Nozzle No. CM-12 Nozzle Dia .186 IN.

Traverse Point No.		Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (v/v)
		1128	944.60											
B	2	3.29	946.10	.55	.65	3.29	3.0	69	245	250	39	81	80	
	3	6.79	947.70	.45	.65	3.49	3.0	69				84	81	
	4	10.13	949.21	.41	.65	3.33	3.0	70	249	252	40	84	82	
	5	13.75	950.90	.48	.65	3.61	3.0	70				84	82	
C	2	16.96	952.38	.38	.65	3.21	3.0	70	245	251	40	84	82	
	3	20.72	954.15	.52	.66	3.76	3.0	74				87	83	
	4	24.41	955.85	.50	.66	3.68	3.0	74	251	247	42	88	83	
	5	28.52	957.80	.62	.66	4.10	3.0	73				89	84	
E	2	32.13	959.44	.48	.66	3.61	3.0	75	248	253	45	88	84	
	3	35.63	961.07	.45	.66	3.49	3.0	73				89	84	
	4	39.01	962.70	.42	.66	3.38	3.0	76	250	255	45	91	85	
	5	42.77	964.60	.52	.66	3.76	3.0	76				91	86	
S	2	46.27	966.22	.45	.66	3.48	3.0	76	247	250	44	91	86	
	3	49.73	967.82	.44	.66	3.45	3.0	76				92	86	
	4	53.23	969.48	.45	.66	3.49	3.0	76	245	251	45	92	86	
	5	56.84	971.13	.48	.66	3.61	3.0	76				92	86	
		(1732)												
		Θ = 56.84	Vm = 24.53		ΔH = .66							Avg. = 85.8		

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S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job IPITUO HARBORS Date 2-12-92 Test 5 Run 2
Source TRUCK UNLOADER VENTS No. of traverse points
Method PM10 Filter holder: Filter type: 2½" GLASS FIBER

Sample Train Leak Check:

Pretest: ☒ 0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ☐ ____ cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 562

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

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2	0	100	0
Impinger No. 3		0	
Condenser			
Desiccant	1436	1430	6
Total			6

Integrated Gas Sampling Data:

Bag Pump No. ____ Box No. N/A Bag No. ____

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

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

Time start: ____ (HRS) Time end: ____ (HRS)

Sampling rate: ____ cc/min Operator: ____

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

CF-023

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INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP/TWO HARBORS
Source PRESS HOUSE/COOLER VENT
Date 2-12-92 Test 5 Run 2

Operators ET-CM
Meter Box No. 7 ΔH@ 1.86 IN WC
Coefficient coeff. 1.0085

Pitot No. 33F-5 Cp .846
Bar. Press. 29.80 inHg H2O — %
Nozzle No. #11 Nozzle Dia .186 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/v)
	1342	973.30											
B 2	3.76	975.00	.52	.65	3.76	3.0	77	245	247	46	86	85	
3	7.42	975.70	.47	.65	7.45	3.0	77				88	86	
4	10.87	976.83	.42	.65	3.45	3.0	77	247	252	47	88	86	
5	14.56	978.58	.48	.65	3.67	3.0	73				88	86	
C 2	18.02	980.20	.42	.65	3.15	3.0	74	250	253	48	88	86	
3	21.86	981.95	.52	.67	3.84	3.0	77				88	86	
4	25.70	983.40	.52	.67	3.84	3.0	77				92	89	
5	29.90	985.80	.62	.65	4.19	3.0	77	252	251	49	93	90	
F 2	33.67	987.60	.50	.65	3.76	3.0	77				93	90	
3	37.24	989.35	.45	.65	3.57	3.0	75				93	90	
4	40.82	990.96	.45	.65	3.57	3.0	75	250	253	50	93	90	
5	44.66	992.90	.52	.65	3.84	3.0	75				93	90	
G 2	48.27	994.92	.46	.65	3.61	3.0	75				93	90	
3	51.85	996.50	.45	.65	3.57	3.0	70	252	251	50	93	90	
4	55.50	998.20	.47	.65	3.65	3.0	75				93	90	
5	59.15	999.97	.47	.65	3.65	3.0	75				94	91	
	(1450)												
	θ = 59.15	Vm = 26.62		ΔH = 1.62							Avg. = 88.7		

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S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LPI / Two Harbors — Date 2-12-92 Test 5 Run 3
Source Glass Unloader Vent — No. of traverse points 16
Method PM-10 Filter holder: EAC — Filter type: 2½" Glass Fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5575

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	200	} 100 }	0
Impinger No. 3		(0)	
Condenser			
Desiccant	1363	1357	6
Total			6

Integrated Gas Sampling Data:

Bag Pump No. _____ Box No. N/A Bag No. _____

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

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

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

Sampling rate: _____ cc/min Operator: _____

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

CF-023

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: LP/TWO HARBORS
Source: PRESS UNLOADER VENT
Date: 2-25-92 Test: 5 Run: 3

Operators: ET-CM
Meter Box No.: 7 ΔH@ 1.86 IN WC
Cuentec coeff.: 1.0085

Pitot No.: 734-5 Cp: .840
Bar. Press.: 29.60 inHg H2O x
Nozzle No.: PN-10 Nozzle Dia: .382 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/x)
	1602	4.80											
B 2	3.74	6.57	.50	.66	3.71	3.0	75	245	250	46	88	87	
3	7.33	8.23	.46	.66	3.59	3.0	77				88	87	
4	10.76	10.00	.42	.66	3.43	3.0	77	247	253	45	90	88	
5	14.47	11.57	.49	.66	3.70	3.0	77				90	88	
C 2	17.82	13.00	.40	.66	3.34	3.0	77				90	88	
3	21.37	14.90	.45	.66		3.0	77	247	252	46	90	88	
4	25.40	16.80	.58	.66	4.03	3.0	77				90	88	
5	29.51	18.70	.60	.66	4.10	3.0	77				90	88	
D 2	33.75	20.42	.50	.66	3.74	3.0	75	250	253	46	90	88	
3	36.88	22.10	.47	.66	3.63	3.0	75				90	88	
4	40.55	23.95	.48	.66	3.66	3.0	75				92	90	
5	44.31	25.72	.52	.66	3.81	3.0	77	251	255	47	92	90	
E 2	47.96	27.38	.46	.66	3.59	3.0	77				93	90	
3	51.47	29.07	.44	.66	3.51	3.0	77				93	90	
4	55.14	30.82	.48	.66	3.66	3.0	75	251	252	47	93	90	
5	58.77	32.42	.47	.66	3.63	3.0	75				93	90	
	1768												
	θ = 58.77	Vs = 27.62		ΔH = .66							Avg. = 86.9		

D-17

S-0037R

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job LP-TwoHarbors

Source Press unloader vents

Test 5B Run ____ Date 2-12-92

Stack dimen. ______________ in.

Dry bulb ____ °F Wet bulb ____ °F

Manometer: □ Req. □ Exp. □ Elec.

Barometric pressure ________ in Hg

Static pressure ________ in WC

Operators LT-CM

Pitot No. ________ Cp ________

PM-10

Schematic of Cross Section

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	
Temp. meas. tool & S/N:				Time end: hrs	

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

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job AP/TWO HARBORS Date 2-12-92 Test 5 Run 1
Source BLAST FURNACE VENTS No. of traverse points 8
Method _____ Filter holder: ERC Filter type: 2½ GLASS FIBER

Sample Train Leak Check:

Pretest: ~~0~~ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: ~~0~~ cfm at ~~5~~ in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used:	Recovery solvent(s)	
5577	☒	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		100	0
Impinger No. 3		0	
Condenser			
Desiccant	1320	1320	
Total			0

Integrated Gas Sampling Data:

Bag Pump No. _____ Box No. N/A Bag No. _____

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

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

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

Sampling rate: _____ cc/min Operator: _____

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

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job CF1
Source DRYER EXHAUST VENT
Date 2-12-92 Test 3 Run 1B

Operators ET-CM
Meter Box No. 7 ΔH@ 1.86 IN WC
Coumbter coeff. 1.0083

Pitot No. Cp
Bar. Press. 29.90 inHg H2O x
Nozzle No. #10 Nozzle Dia .235 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/x)
	1304	971.40											
A 1	1.09	971.91	.05	.65	1.09	3.0	75	245	249	40	87	86	
6	1.64	972.20	.25	.65	.54	3.0	75				87	86	
E 2	1.90	972.40	.06	.65	.26	3.0	75				87	86	
4	2.39	972.52	.20	.65	.48	3.0	73				87	86	
D-2	2.70	972.70	.08	.65	.30	3.0	73	247	250	40	87	86	
4	3.19	972.90	.20	.65	.48	3.0	73				87	86	
A 2	3.46	973.02	.06	.65	.26	3.0	73				87	86	
4	3.77	973.19	.08	.65	.30	3.0	77	245	248	40	87	86	
	(1322)												
	θ = 3.77	Vm = 1.79		ΔH = 1.65							Avg. = 86.6		

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/Two Harbors Date 7-12-94 Test 5 Run 2B
Source Kilns & Unloader Vents No. of traverse points 8
Method PM 10 Filter holder: ERC Filter type: 2½ GLASS FIBER

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 1 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5608

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		100	
Impinger No. 2	200	160	0
Impinger No. 3		0	
Condenser			
Desiccant	1370	1370	
Total			0

Integrated Gas Sampling Data:

Bag Pump No. _____ Box No. N/A Bag No. _____

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

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

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

Sampling rate: _____ cc/min Operator: _____

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

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: LP Turo Harbor
Source: Glass Furnace Vent
Date: 3-12-92 Test 2 Run 2B

Operators: ET-CM
Meter Box No.: 7 ΔH@ 1.86 IN WC
Barometer coeff.: 1.0083

Pitot No.: Cp .84
Bar. Press.: 29.98 inHg H2O X
Nozzle No.: GAI-10 Nozzle Dia .235 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (x v/v)
	1523	1000.20											
H- 1	1.01	1000.70	.05	.65	1.01	3.0	75	248	240	45	88	87	
6	2.67	1001.50	.27	.65	1.66	3.0	75				88	87	
E - 2	3.51	1001.95	.07	.65	.84	3.0	72				88	87	
4	5.01	1002.61	.22	.65	1.49	3.0	72				88	87	
D - 2	5.86	1003.10	.07	.65	.86	3.0	72	250	252	45	88	87	
4	7.36	1003.72	.22	.65	1.49	3.0	72				88	87	
A - 2	8.14	1004.10	.06	.65	.78	3.0	75				88	87	
4	9.15	1004.58	.10	.65	1.01	3.0	75	251	249	45	88	87	
	(1540)												
	θ = 9.15	Vm = 4.38		ΔH = .65							Avg. = 87.5		

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job 20/Two Harbors Date 7-12-92 Test 5 Run 3B
Source Glass + Molybdenum Vent No. of traverse points 8
Method PM 17 Filter holder: ERC Filter type: 2½ GLASS FIBER

Sample Train Leak Check:

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

Particulate Catch Data:

No.s of filters used: 5578

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	701	100	C
Impinger No. 3		0	
Condenser			
Desiccant	1290	1290	✓
Total			

Integrated Gas Sampling Data:

Bag Pump No. _____ Box No. N/A Bag No. _____

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

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

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

Sampling rate: _____ cc/min Operator: _____

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

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP / Two Harbors
Source Recy + Unloader Duct
Date 2-12-92 Test 3 Run 3B

Operators ET - CM
Meter Box No. 7 ΔH 1.82 IN WC
Counter coeff. 1.0083

Pitot No. 28-5 Cp .840
Bar. Press. 29.30 inHg H2O x
Nozzle No. Prim Nozzle Dia .255 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/x)
	1732	32.70											
H-1	1.28	33.30	.06	.65	1.28	3.0	75	245	247	42	87	86	
6	3.43	34.32	.28	.65	2.14	3.0	75				87	86	
E 2	4.58	35.00	.08	.65	1.14	3.0	75				87	86	
4	6.39	35.82	.20	.65	1.81	3.0	77	249	245	42	88	86	
D 2	7.47	36.32	.07	.65	1.07	3.0	77				88	86	
4	9.11	37.22	.23	.65	1.34	3.0	77				88	86	
A-2	10.56	37.75	.08	.65	1.14	3.0	77	248	249	42	88	86	
4	11.84	38.37	.10	.65	1.28	3.0	77				88	86	
	(1750)												
	θ = 1184	Vm = 5.67		ΔH = .65							Avg. = 86.0		

INTERFOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job L.P. Two Harbors

Source Press & Unloading Vent Stack

Test 8 Run ___ Date 2/13/92

Stack dimen. 55 x 55 (110) IN.

Dry bulb ____ °F Wet bulb ____ °F

Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.20 in Hg

Static pressure -.80 in WC

Operators D. VanHoever & T. Bergstrom

Pitot No. V23-5 Cp .84

Schematic of Cross Section

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: in.		Time start: hrs	
A 1 6					
2 2					
3 3					
4 4					
B 1 H 1					
2 2					
3 3					
4 4					
C 1					
2					
3					
4					
D 1					
2					
3					
4					
E 1					
2					
3					
4					
F 1					
2					
3					
4					
Temp. meas. tool & S/N:				Time end:	hrs

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

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P./Two Harbors Date 2/13/92 Test 8 Run 1
Source Press & Unloading Vents Stack No. of traverse points 32
Method 0011 Filter holder: — Filter type: 9

Sample Train Leak Check:

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

Particulate Catch Data:

No.s of filters used: —

Recovery solvent(s)

☐ acetone
☒ other(s) MECL₂ + DI H₂O

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	204	200	4
Impinger No. 3			
Condenser			
Desiccant	1374	1368	6
Total			10

Integrated Gas Sampling Data: – Ambient Air

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

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

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

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

Sampling rate: _____ cc/min Operator: _____

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

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Two Harbors
Source Probe & Unloading Vent Stack
Date 2/13/92 Test 8 Run 2

Operators D.U.H & J.B
Meter Box No. 7 ΔH@ 1.86 IN WC
Calibrator coeff. 1.0083

Pitot No. 1123-5 Cp .8
Bar. Press. 27.20 inHg H2O 1.3 x
Nozzle No. 7-4 Nozzle Dia .247 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (v/v)
	1355	153.30											
H 4	2	154.68	.42	1.79	4.81	5	55	246	253	41	91	91	Ambient
3	4	155.97	.24	1.01	5.94	3.5	86				94	92	Air
2	6	157.41	.40	1.69	7.41	5	86				95	92	
1	8	157.90	.05	.21	7.93	1	86	254	254	40	94	92	
G 4	10	159.56	.47	1.98	9.51	6	86				97	93	
3	12	161.19	.50	2.11	11.15	6	86				98	94	
2	14	162.77	.49	2.06	12.78	6	89	254	256	46	99	94	
1	16	163.99	.26	1.10	13.97	3.5	85				99	94	
F 4	18	164.68	.16	1.95	15.55	6	85				99	94	
3	20	166.97	.37	1.57	16.97	5	86	258	257	46	100	95	
2	22	168.62	.49	2.07	18.60	6	90				101	95	
1	24	169.60	.13	.55	19.44	2	87				99	94	
E 4	26	170.90	.34	1.44	20.80	4.5	87	262	255	47	99	94	
3	28	171.89	.19	.80	21.81	2.5	92				100	94	
2	30	173.18	.27	1.15	23.03	3	84				100	95	
1	32	173.18	0	00	23.03	—	88	260	257	46	100	94	
D 4	34	174.85	.51	2.16	24.69	6.5	88				100	95	
3	36	175.84	.25	1.05	25.85	3.5	94				101	95	
2	38	177.28	.33	1.40	27.19	4	88	261	258	45	100	95	
1	40	177.35	.0	0	27.19	—	90				100	95	
C 4	42	179.14	.60	2.53	28.99	7	90				100	95	
3	44	180.69	.48	2.02	30.60	6	92	263	257	46	101	95	
2	46	182.27	.48	2.01	32.20		93				101	95	
1	48	182.79	.07	.29	32.82		93				100	95	
	(Over)												
	θ =	Vm =		ΔH = 1							Avg. =		

D-27

S-0037R

CF-D11

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P./Two Harbors — Operators Pg 2 of 2 — Pitot No. ____ — Cp ____
Source Press & Unloading Vents — Meter Box No. ____ Y/N ____ IN WC — Bar. Press. ____ inHg H2O ____ X
Date 2/13/92 — Test 81 — Run 7 — Meter coeff. ____ — Nozzle No. ____ Nozzle Dia ____ IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/v)
B 4	50	184.61	.57	2.40	4.57	7	90	256	260	44	101	96	Ambient
3	52	186.28	.54	2.30	6.29	7	86				102	97	A.P.
2	54	187.94	.47	1.98	7.89	6	91				102	97	
1	56	188.40	.04	.17	8.36	.5	89	258	260	45	101	97	
A 4	58	189.32	.19	.80	9.38	25	89				101	97	
3	60	189.96	.06	.25	9.95	.5	85				100	96	
2	62	190.95	.18	.78	0.94		91	257	261	45	100	96	
1	64	190.95	0	0	0.94		86				100	96	
	1406												
	θ 64	Vm = 37.65		ΔH = 1.50							Avg. = 96.9		

D-28

S-0037R

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P./Two Harbors Date 2/13/92 Test 8 Run 2
Source Press & Unloading Vent Stack No. of traverse points 32
Method 0011 Filter holder: — Filter type: —

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac)
Postest: 0 cfm at 9 in. Hg. (vac)

Particulate Catch Data:

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

☐ acetone
☒ other(s) $MeCl_2$ & DiH_2O

No. of probe wash bottles: 1
Sample recovered by: [illegible]

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	203	200	3
Impinger No. 3			
Condenser			
Desiccant	1410	1404	6
—			
Total			9

Integrated Gas Sampling Data: - Ambient Air

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

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

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

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

Sampling rate: _____ cc/min Operator: _____

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

CF-023

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: L.P. / Two Harbors — Operators: DWH & J.B — Pitot No.: V23-5 — Cp: .84
Source: Press & Unloading Vent Stack — Meter Box No.: 1 — ΔH: 1.86 IN WC — Bar. Press.: 29.20 inHg — H2O 7.5 x
Date: 2/13/92 — Test: 8 — Run: 2 — Counter coeff.: 1.0083 — Nozzle No.: 2-4 — Nozzle Dia: .249 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (x v/v)
	1540	191.20											
A 4	2	192.18	.17	.72	2.16	3	88	246	247	42	96	94	AMBIENT
3	4	193.23	.23	.93	3.27	3.5	89				98	95	AIR
2	6	193.63	.03	.12	3.68	.5	89				98	95	
1	8	194.80	.25	1.05	4.84	3.5	93	253	248	43	98	95	
B 4	10	196.55	.56	2.34	6.57	7	93				100	96	
3	12	198.25	.52	2.16	8.23	6	94				102	96	
2	14	199.78	.43	1.81	9.76	5.5	93	254	251	43	102	97	
1	16	200 60	.09	.38	0.46	2	92				101	97	
C 4	18	202.24	.34	2.27	2.17	6	92				101	97	
3	20	203 97	.37	2.41	3.93	6.5	89	254	252	40	103	97	
2	22	205.71	.52	2.19	5.60	6	93				103	97	
1	24	206.36	.07	.29	6.22	.5	91				103	97	
D 4	26	207.82	.51	2.16	7.89	6	91	258	254	41	103	97	
3	28	209.15	.31	1.31	9.19	3.5	90				102	97	
2	30	210.50	.33	1.40	0.53	3.5	90				103	98	
1	32	210.50	.0	0	0.53	—	90	260	255	41	103	98	
E 4	34	211.22	.09	.38	1.24	1.5	92				101	97	
3	36	211.93	.08	.33	1.89	15	99				101	97	
2	38	212.85	.18	.76	2.89	3	88	258	256	40	101	97	
1	40	212.85	.0	0	2.89	—	90				101	97	
F 4	42	214.51	.46	1.94	4.47	5.5	90	-			102	98	
3	44	216.05	.42	1.78	5.98		90	260	257	42	103	98	
2	46	217.65	.51	2.16	7.65		89				103	98	
1	48	218.79	.24	1.02	8.80		89				104	98	
	Cover												
	Q =	Vm =		ΔH =							Avg. =		

D-30

S-0037R

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job K.P. / Two Harbors
Source Press & Unloading Vents
Date 2/13/92 Test # Run 2

Operators DOH + TB
Meter Box No. ____ ΔH ____ ΔH ____
Barometer coeff. ____

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

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (x/y)
G 4	50	220.40	.44	1.87	0.36	5	89	260	258	43	102	98	AMBIENT
3	52	222.04	.52	2.22	2.05	6	85				103	98	AIR
2	54	223.68	.50	2.12	3.70	6	89				104	98	
1	56	225.16	.33	1.41	5.05	4	85	261	257	42	104	99	
H 4	58	226.63	.43	1.84	6.60	4.8	85				104	99	
3	60	227.79	.27	.93	7.70	3.5	89				103	99	
2	62	229.23	.37	1.66	9.16	4.5	87	260	258	42	103	99	
1	64	229.90	.10	.43	9.91	1.5	85				103	99	
	(1650)												
	θ = 64	Vm = 38.70		ΔH = 1.33							Avg. = 97.5		

D-31

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P. / Two Harbors. Date 4/13/92 Test 8 Run 3
Source Press & Unloading Vent Stack No. of traverse points 32
Method 0011 Filter holder: ——— Filter type: ———

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 13 in. Hg. (vac) ☒

Particulate Catch Data:

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

☐ acetone
☒ other(s) MeCl₂ & DI H2O

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	204	200	4
Impinger No. 3			
Condenser			
Desiccant	1379	1372	7
Total			11

Integrated Gas Sampling Data: Ambient Air

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

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

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

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

Sampling rate: _____ cc/min Operator: _____

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

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: L.P./Two Harbors
Source: Press → Unloading Vents
Date: 4/3/91 Test: 8 Run: 3

Operators: D. Van Hoosen & JB
Meter Box No.: 7 ΔH: 1.86 (H) (W)
Cpeanter coeff.: 1.0083

Pitot No.: 6123-5 Cp: .84
Bar. Press.: 29.22 inHg H2O / X
Nozzle No.: 7-0 Nozzle Dia.: .247 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry Gas Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (x v/v)
	1703	230.10											
H 4	2	231.43	.30	1.29	1.39	4	86	258	260	45	96	95	Ambient
3	4	232.57	.20	.86	2.44	2.5	81				97	96	Air
2	6	233.60	.26	1.11	3.63	3.5	85				98	96	
1	8	234.05	.03	.12	4.04	.5	88	260	257	43	98	96	
G 4	10	235.75	.52	2.22	5.72	6	88				99	96	
3	12	237.51	.55	2.35	7.46	6	86				100	97	
2	14	239.26	.60	2.56	9.27	7	85	264	255	43	101	97	
1	16	240.27	.18	.77	0.27	2.5	88				101	97	
F 4	18	242.09	.53	2.27	1.98	6	80				101	98	
3	20	243.67	.52	2.21	3.66	6	91	260	257	43	101	98	
2	22	245.41	.48	2.05	5.34	5.5	90				101	98	
1	24	246.35	.2	.86	6.34	2.5	84				101	98	
E 4	26	247.31	.18	.78	7.34	2.5	84	261	258	43	99	96	
3	28	248.10	.11	.47	8.12	1.5	88				99	96	
2	30	249.35	.28	1.11	9.36	3.5	90				99	96	
1	32	241.35	.00	0	9.36	—	90	260	247	46	99	96	
D 4	34	251.11	.54	2.29	1.07	6	90				100	96	
3	36	252.33	.25	1.07	2.25	3.5	87				100	96	
2	38	253.65	.33	1.41	3.60	4	88	260	257	46	99	96	
1	40	253.65	.0	.00	3.60	—	84				98	96	
C 4	42	255.30	.55	2.36	5.33	6	84				100	96	
3	44	257.08	.62	2.66	7.18	7	85	260	257	46	101	96	
2	46	258.80	.48	2.04	8.80	6	91				101	96	
1	48	258.80	0	0	8.80	—	87				101	96	
	over												
	Σ =	Vm =		ΔH =							Avg. =		

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Two Harbors
Source Press Vent & Unloading Vent
Date 2/13/92 Test 5 Run 3

Operators Dg Zoffe
Meter Box No. ____ ΔH ____ TN WC
Barometer corr. ____

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

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (xx/x)
B 4	50	260.64	.57	2.44	6.50	7	87	260	258	43	101	96	Ambient
3	57	262.45	.57	2.43	2.33	7	90				102	96	AIR
2	54	263.96	.44	1.89	3.89	5	86				102	97	
1	56	264.30	.04	.17	4.36	.5	88	263	257	43	100	96	
A 4	58	265.04	.09	.38	5.06	1.5	88				100	96	
3	60	265.81	.11	.47	5.84	2	88				100	96	
2	62	266.63	.11	.47	6.62		87	264	258	43	100	96	
1	64	266.64	0	0	6.62		85				100	96	
	(1810)												
	θ = 64	Vm = 36.54		ΔH = 1.29							Avg. = 98		

D-34

S-0037R

APPENDIX E

DRYER FIELD DATA SHEETS

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job LOUISIANA PACIFIC / TWO HARBORS, MN

Source DRYER - STACK

Test 2 Run 1 Date 2-11-92

Stack dimen. 48 IN.

Drv bulb ____ °F Wet bulb ____ °F

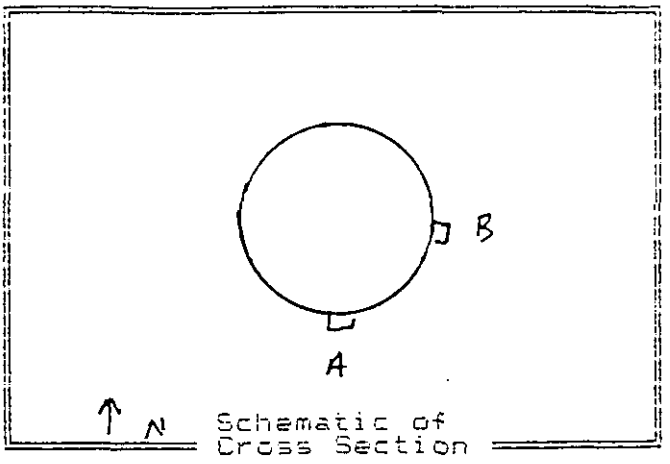
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 30.01 in Hg

Static pressure -2.80 in WC

Operators E. TRAWBRIDGE - C. MASSOK

Pitot No. 22Y-6 Cp .840



Particulate

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 in.		Time start: 0802 hrs	
A	1	.021	1.00		.75	200
	2	.067	3.22		.85	
	3	.118	5.66		1.20	
	4	.177	8.50		1.50	
	5	.250	12.00		1.50	
	6	.356	17.09		1.50	
	7	.644	30.91		1.35	
	8	.750	36.00		1.20	
	9	.823	39.50		1.10	
	10	.882	42.34		.97	
	11	.933	44.78		1.0	
	12	.979	46.99		1.0	
B	1				.66	200
	2				.85	
	3				1.20	
	4				1.20	
	5				1.40	
	6				1.50	
	7				1.30	
	8				1.20	
	9	NCFM = 53650			1.15	
	10	DSCFM = 23 49			1.20	
	11				1.15	
	12				1.10	
Temp. meas. tool & S/N: TDT-12					Time end: 0831 hrs	

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

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job CP/TWO HARBORS
Source DRYER STACK
Method 5 Filter holder: 4"GLASS

Date 2-11-92 Test 2 Run 1
No. of traverse points 24
Filter type: 4"GLASS FIBER

Sample Train Leak Check:

Pretest: ~~0.02~~ cfm at 15 in. Hg. (vac) ~~OK~~
Postest: 0 cfm at 5 in. Hg. (vac) ~~OK~~

Particulate Catch Data:

No.s of filters used: 4041

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		140	
Impinger No. 2	411	140	271
Impinger No. 3		0	
Condenser			
Desiccant	1484	1475	9
Total			220

Integrated Gas Sampling Data:

Bag Pump No. B3 Box No. 1 Bag No. 1

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

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

Time start: 1046 (HRS) Time end: 1146 (HRS)

Sampling rate: 400 cc/min Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

Barry Dahm
USEPA

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LOUISIANA PACIFIC / TWO HARBORS — Operators E. THOMBRINO - C. MOSSAK — Pitot No. 12V-6 — Cp .940
Source DRYER STACK — Meter Box No. 3 ΔH@ 1.98 IN WC — Bar. Press. 30.01 inHg H2O x
Date 2-11-92 — Test 2 — Run 1 — Coefficient coeff. .9993 — Nozzle No. 4-3 — Nozzle Dia .191 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (x v/v)
	1045	854.00											
B 12	2.5	854.02	.65	.47	4.92	2.2	200	252	265	34	49	48	16.6
11	5	856.75	.84	.96	6.16	3.2	200				52	48	16.5
10	7.5	857.40	1.10	.79	7.36	3.0	200	250	267	49	54	48	16.0
9	10	858.75	1.30	.93	7.66	3.7	200				56	50	16.0
8	12.5	860.10	1.50	1.10	0.07	4.2	200	253	265	51	57	51	16.4
7	15	861.60	1.60	1.18	1.54	4.3	200				58	51	16.0
6	17.5	862.98	1.40	1.03	2.90	4.0	205	250	260	51	60	52	16.2
5	20	864.29	1.30	.96	4.22	3.9	205				60	52	15.9
4	22.5	865.54	1.20	.88	5.49	3.7	205	254	260	49	60	53	16.1
3	25	866.75	1.10	.81	6.71	3.5	205				60	53	15.9
2	27.5	867.95	1.10	.81	7.93	3.5	205	253	263	52	60	53	15.9
1	30	869.15	1.10	.81	9.14	3.5	205				60	53	15.6
A 12	32.5	870.30	.95	.70	0.27	2.5	205	250	261	47	60	53	15.7
11	35	871.48	1.10	.81	1.49	3.5	205				60	53	15.6
10	37.5	872.95	1.20	.88	2.76	3.7	205	254	263	48	62	55	15.7
9	40	874.15	1.40	1.03	4.14	4.2	205				62	55	15.8
8	42.5	875.53	1.40	1.03	5.52	4.2	205	252	259	45	63	55	15.6
7	45	876.96	1.50	1.11	6.94	4.5	205				63	55	16.2
6	47.5	878.32	1.35	1.00	8.30	4.4	205	250	261	44	64	56	16.0
5	50	879.61	1.20	.88	9.57	4.0	208				63	56	16.0
4	52.5	880.86	1.10	.81	0.80	4.0	206	247	262	49	64	56	16.0
3	55	882.01	1.00	.74	1.96	3.8	206				64	57	16.4
2	57.5	883.20	1.05	.78	3.16	3.8	206	248	258	49	64	57	16.4
1	60	884.41	.98	.72	4.32	3.8	206				64	57	16.3
	1141												
	θ = 60	Vm = 30.41		ΔH = .86							Avg. = 60.4		

Barry Dalton
U.S. EPA

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L P/ TWO HARBORS
Source DRYER STACK
Method 5 Filter holder: 4" GLASS

Date 2-11-92 Test 2 Run 2
No. of traverse points 24
Filter type: 4" GLASS FILTER

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: .001 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 4052

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		1104	
Impinger No. 2	456	200	256
Impinger No. 3		0	
Condenser			
Desiccant	1355	1347	8
Total			264

Integrated Gas Sampling Data:

Bag Pump No. B3 Box No. 1 Bag No. 2

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

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

Time start: 1306 (HRS) Time end: 1407 (HRS)

Sampling rate: 416 cc/min Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

Brian Dillon
USEPA

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP / TWO HANKINS Operators ET - CM Pitot No. 2216 Cp .540
Source FRYER STACK Meter Box No. 8" XHR 1.58 IN WC Bar. Press. 30.27 inHg H2O x
Date 2-11-92 Test 2 Run 2 Counter coeff. .9945 Nozzle No. 4-5 Nozzle Dia .191 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (x v/v)
	1305	884.60											
A 12	2.5	885.68	.68	.50	5.56	2.7	201	R39	237	52	53	52	16.4
11	5	886.60	.62	.45	6.47	2.0	205				54	53	15.6
10	7.5	887.92	1.20	.87	7.73	3.2	209	242	248	47	58	53	15.7
9	10	889.15	1.35	.99	9.07	3.8	209				59	55	15.8
8	12.5	890.60	1.40	1.02	10.44	3.8	209	240	247	55	60	55	15.8
7	15	891.94	1.50	1.10	1.86	3.9	209				61	55	15.6
6	17.5	893.30	1.40	1.03	3.23	3.8	209	246	250	55	61	55	15.5
5	20	894.70	1.25	.97	4.53	3.5	209				63	56	15.6
4	22.5	895.89	1.20	.88	5.80	3.5	212	247	252	56	64	57	15.6
3	25	897.12	1.05	.77	6.99	3.2	210				64	57	15.5
2	27.5	898.28	1.05	.77	8.19	3.2	209	250	256	52	64	57	15.3
1	30	899.40	.98	.72	9.34	3.0	209				64	57	15.6
B 12	32.5	900.65	1.05	.77	10.53	3.2	209	253	255	53	64	57	16.0
11	35	901.90	1.20	.88	1.81	3.5	209				64	58	16.1
10	37.5	903.25	1.30	.96	3.14	3.8	209	250	258	55	65	58	15.8
9	40	904.70	1.40	1.03	4.52	3.8	209				65	58	15.8
8	42.5	906.10	1.50	1.11	5.95	4.0	209	253	259	55	67	59	15.7
7	45	907.40	1.60	1.18	7.43	4.2	211				68	60	15.9
6	47.5	908.70	1.30	.96	8.76	4.0	211	250	254	55	68	60	15.7
5	50	910.00	1.20	.89	0.05	4.0	211				68	60	15.9
4	52.5	911.36	1.25	.92	1.36	4.0	211	249	256	55	68	60	15.6
3	55	912.60	1.10	.81	2.59	4.0	211		2		68	60	15.8
2	57.5	913.87	1.10	.81	3.82	4.0	210	251	268	55	68	60	15.6
1	60	915.13	1.10	.81	5.05	4.0					69	61	15.6
	(1408)												
	θ = 60	Vm = 30.53		ΔH = .88							Avg. = 60.4		

E-5

Barrie Dillon
U.S.C.P.A.

S-0037R

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/TAMPA HARBORS Date 2-11-92 Test 2 Run 3
Source DRYER-STACK 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) ☒
Postest: 0 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 4081

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	319.4	100	19.4
Impinger No. 3		0	
Condenser			
Desiccant	1496.	1484	12
Total			206

Integrated Gas Sampling Data:

Bag Pump No. 13 3 Box No. 1 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1451 (HRS) Time end: 1551 (HRS)
Sampling rate: 400 cc/min Operator: ET
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

Basim Dihu
USEPA

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP/TWO HARBORS
Source BOILER STACK
Date 2-11-92 Test 2 Run 3

Operators ET-CM
Meter Box No. 8 ΔH@ 1.68 IN WC
Counter coeff. .9995

Pitot No. 228-6 Cp .840
Bar. Press. 30.01 inHg H2O x
Nozzle No. 4-3 Nozzle Dia .191 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/v)
	1450	915.30											
B 12	2.5	916.12	.65	.32	6.07	2.0	209	248	246	54	57	56	16.7
11	5	917.30	.95	.66	7.17	3.0	209				59	56	16.4
10	7.5	918.60	1.20	.84	8.41	3.2	209	252	255	48	61	57	16.3
9	10	919.85	1.30	.91	9.71	3.5	211				62	58	16.2
8	12.5	921.25	1.40	.98	1.05	3.7	211	255	258	45	63	59	16.2
7	15	922.62	1.50	1.06	2.45	4.0	211				63	59	16.2
6	17.5	924.00	1.35	.95	3.77		210	257	256	46	66	60	16.4
5	20	925.30	1.20	.85	5.03	3.5	210				67	60	16.3
4	22.5	926.55	1.20	.85	6.28	3.5	210	259	258	47	67	60	16.3
3	25	927.67	1.15	.82	7.51	3.5	207				67	61	16.0
2	27.5	928.78	1.10	.78	8.72	3.4	207	262	268	56	68	62	16.4
1	30	930.15	1.10	.78	9.93	3.4	207				68	62	16.5
A 12	32.5	931.10	.82	.58	0.97	2.8	210	260	265	55	68	62	16.5
11	35	932.18	.85	.60	2.03	2.8	210				68	62	16.5
10	37.5	933.40	1.20	.85	3.29	3.4	208	262	264	56	69	63	17.1
9	40	934.75	1.30	.93	4.60	4.0	208				70	63	16.9
8	42.5	936.18	1.50	1.07	6.02	4.2	208	252	259	50	70	63	16.9
7	45	937.58	1.50	1.07	7.43	4.2	208				70	63	17.0
6	47.5	938.90	1.30	.93	8.74	4.0	208	255	261	50	71	64	16.7
5	50	940.20	1.20	.85	0.01	3.9	212				71	64	16.9
4	52.5	941.40	1.20	.85	1.27	3.8	212	252	259	51	71	64	16.8
3	55	942.60	1.10	.78	2.48	3.6	212				71	64	16.9
2	57.5	943.85	1.00	.71	3.63	3.5	210	250	261	52	71	64	17.0
1	60	945.42	1.10	.77	4.85	3.6	208				71	64	17.0
	(1552)												
	θ = 60	Vm = 30.12		ΔH = .83							Avg. = 64.1		

E-7

Basim Dihu
USEPA

S-0037R

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job LP/Two Harbors

Source DRYER STACK

Test 3 Run 1 Date 2-11-92

Stack dimen. 48 IN.

Dry bulb _____ °F Wet bulb _____ °F

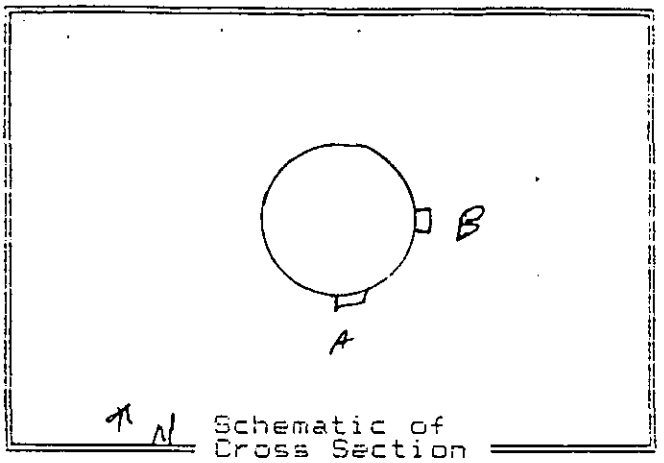
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.72 in Hg

Static pressure -2.8 in WC

Operators E. Trembley C. Miller

Pitot No. 23V-6 Cp .840



PM-10

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 in.		Time start: 1600 hrs	
A	1	.044	2.11	6.11	1.30	207
	2	.146	7.01	11.01	1.20	
	3	.296	14.21	18.21	1.30	
	4	.704	33.79	37.79	1.40	
	5	.854	40.99	44.99	1.20	
	6	.956	45.89	49.89	1.00	
B	1				1.00	205
	2				1.20	
	3				1.40	
	4				1.30	
	5				1.50	
	6				1.00	

Temp. meas. tool & S/N:

Time end: 1612 hrs

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

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP / T&O HARRIS — Date 2-11-92 Test 3 Run 1
Source DRYER - STACK — No. of traverse points 12
Method RM-10 Filter holder: ERC — Filter type: 2½" GLASS FIBER

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 1 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5626, 5602, 5576, 4043

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	423	100	223
Impinger No. 3		0	
Condenser			
Desiccant	1459	1450	9
Total			232

Integrated Gas Sampling Data:

Bag Pump No. B3 Box No. 15 Bag No. 1
Bag Material: 3-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1634 (HRS) Time end: 2002 (HRS)
Sampling rate: 400 cc/min Operator: ET
S/N of O_2 Analyzer used to monitor train outlet: 1

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP/Two Harbors
Source DRYER STACK
Date 2-11-92 Test 3 Run 1

Operators E.T. Squibb, Dap-Gamesik
Meter Box No. 8 ΔH@ 1.88 IN WC
Coeff. .9993

Pitot No. PM-10 Cp .84
Bar. Press. 29.72 inHg H2O x
Nozzle No. PM-10 Nozzle Dia .558 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (xx/x)
	1633	945.70											
B 1	8.29	948.30	1.00	.31	8.29	2.0	210	254	261	50	60	59	16.1
2	16.98	951.04	1.10	.31	8.69	2.0	210	252	263	51	61	60	16.1
3	26.79	954.37	1.40	.32	9.80	3.0	206	252	264	52	65	62	16.6
4	36.94	957.70	1.50	.32	10.15	3.0	206	250	261	52	66	63	16.4
5	46.39	959.50	1.30	.32	9.45	2.0	206	248	263	50	67	63	16.7
6	55.09	962.09	1.10	.31	8.69	10.0	206	247	265	50	60	59	16.5
A 1	64.54	965.30	1.30	.31	9.45	2.0	207	240	241	48	62	60	16.9
2	73.62	968.16	1.20	.31	9.08	2.0	206	242	248	48	62	60	16.1
3	83.07	971.35	1.30	.31	9.45	2.0	206	240	252	49	63	60	16.1
4	93.06	974.50	1.45	.32	9.98	2.0	206	242	250	50	64	60	16.6
5	102.33	977.37	1.25	.31	9.26	2.0	206	240	251	50	65	60	16.6
6	110.62	980.12	1.00	.31	8.29	2.0	205	245	250	50	65	60	16.6
	(2003)												
Deduct for Lk chk. -.38													
	Θ = 110.62	Vm = 34.04		ΔH = .31							Avg. = 61.9		

(Change for F. leak. -.16 for lk chk at end)
(-.1 final ck)
(-.1 final ck)

E-10

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP / TWO HARBORS — Date 2-11-92 — Test 3 — Run 2
Source DRYER STACK — No. of traverse points 12
Method 5/17 — Filter holder: _____ — Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 4043

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	450	{100}	250
Impinger No. 3		(0)	
Condenser			
Desiccant	1477	1467	10
Total			260

Integrated Gas Sampling Data:

Bag Pump No. B3 Box No. 15 Bag No. 2

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

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

Time start: 2037 (HRS) Time end: 2241 (HRS)

Sampling rate: 400 cc/min Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job 21 / Two Harbors
Source Dryer Stack
Date 2-11-92 Test 3 Run 2

Operators ET-CM
Meter Box No. 8 ΔH 1.88 IN WC
Coeffecient coeff. .9993

Pitot No. PM-10 Cp .840
Bar. Press. 29.72 inHg H2O x
Nozzle No. CM-10 Nozzle Dia .158 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	2036	980.40											
A 1	9.12	983.40	1.05	.31	9.12	2.0	206	244	251	48	58	57	16.1
2	19.12	986.70	1.20	.31	9.99	2.0	205	248	253	48	63	59	15.8
3	29.72	990.02	1.35	.31	10.60	2.0	205	251	250	49	64	59	16.0
4	40.90	993.90	1.50	.31	11.17	2.0	206	250	253	49	64	59	16.3
5	51.70	997.00	1.40	.31	10.79	2.0	205	252	255	50	65	60	16.4
B 6	61.90	1000.20	1.25	.31	10.20	2.0	205	253	256	50	65	60	16.7
1	71.03	1003.07	1.00	.31	9.12	2.0	205	250	249	50	64	60	16.9
2	80.60	1006.12	1.10	.31	9.57	2.0	205	248	245	50	65	60	16.8
3	91.40	1009.16	1.40	.31	10.79	2.0	205	250	246	50	66	60	16.8
4	102.57	1012.93	1.50	.31	11.17	2.0	206	247	249	51	66	60	16.4
5	112.48	1016.00	1.30	.31	10.40	2.0	206	250	247	51	66	60	16.3
6	122.55	1018.98	1.10	.31	9.57	3.0	206	251	245	51	66	60	16.4
	(0242)												

θ = 122.55 Vm = 38.58 ΔH = .31 Avg. = 61.9

E-12

S-0037R

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job LP/Two Harbors — Date 2-11-92 Test 3 Run 3
Source DRYER STACK — No. of traverse points 12
Method 5/17 Filter holder: — Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒ ~~☐~~
Postest: 0 cfm at 5 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 4049

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	425	100	225
Impinger No. 3		0	
Condenser			
Desiccant	1420	1416	4
Total			229

Integrated Gas Sampling Data:

Bag Pump No. 53 Box No. 15 Bag No. 3

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

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

Time start: 2351 (HRS) Time end: 0129 (HRS)

Sampling rate: 340 cc/min Operator: ET

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

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP/Zero Harbor
Source Dyer Stack
Date 2-11-92 Test 3 Run 3

Operators ET-CW
Meter Box No. 5 ΔH 1.88 IN WC
Counter coeff. 1.0285

Pitot No. 25V-5 Cp .840
Bar. Press. 29.72 inHg H2O x
Nozzle No. AM-10 Nozzle Dia .158 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (xv/v)
	2350	20.40											
G 1	6.68	22.57	.90	.31	6.68	2.0	205	252	242	46	55	54	15.9
2	14.08	24.85	1.10	.31	7.39	2.0	205	255	248	46	60	56	16.1
3	22.12	27.40	1.30	.31	8.03	2.0	205	252	250	46	61	57	15.8
4	30.46	29.99	1.40	.31	8.34	2.0	204	250	251	47	62	57	15.9
5	38.80	32.59	1.40	.31	8.34	2.0	204	247	249	47	63	58	15.6
6	46.84	35.15	1.30	.31	8.03	2.0	204	248	251	47	63	58	16.1
H 1	54.07	37.42	1.05	.31	7.22	2.0	204	250	249	46	62	58	15.8
2	62.11	39.95	1.30	.31	8.03	2.0	203	252	248	47	62	58	15.6
3	70.74	42.70	1.50	.31	8.63	2.0	203	254	251	47	63	58	15.8
4	79.38	45.30	1.50	.31	8.63	2.0	203	252	250	47	63	58	16.0
5	87.10	47.85	1.20	.31	7.72	0.3	203	250	248	47	63	58	16.4
6	95.45	50.52	1.40	.31	8.34	2.4	203	252	245	47	63	58	16.1
	0130												
	θ = 95.45	Vm = 30.12		ΔH = .31							Avg. = 57.5		

INTERPOLL LABORATORIES EPA METHOD 2 FIELD DATA SHEET

Job L.P. / Two Harbors

Source Dryer Stack

Test 1 Run ____ Date 2/11/92

Stack dimen. 48 IN.

Dry bulb ____ °F Wet bulb ____ °F

Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

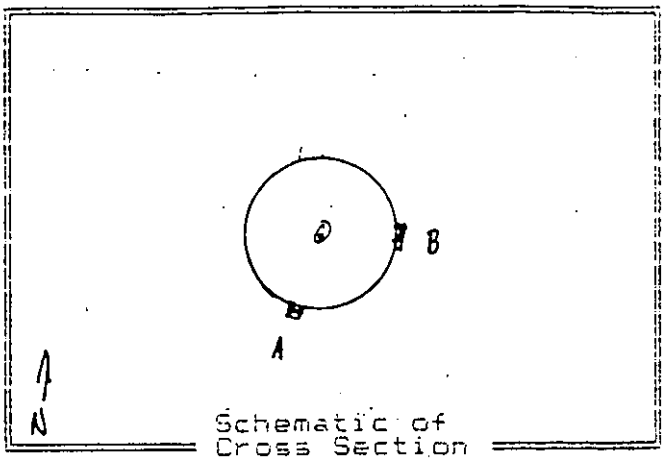
Barometric pressure 30.01 in Hg

Static pressure -2.8 in WC

Operators D. VanHoever + T. Bergstrom

Pitot No. V23-5 Cp .84

formaldehyde



Schematic of Cross Section

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 in.		Time start: 1822 hrs	
A 1	.021	1.01	5.41	.75	
2	.067	3.22	7.22	.85	
3	.118	5.66	9.66	1.20	
4	.177	8.50	17.50	1.50	
5	.250	12	16	1.50	
6	.356	17.09	21.09	1.50	
7	.644	30.91	34.91	1.35	
8	.750	36	40	1.2	205
9	.823	39.50	43.5	1.10	
10	.882	42.34	46.34	.97	
11	.933	44.78	48.78	1.0	
12	.979	46.99	50.99	1.0	
B 1				.46	
2				.85	
3				1.20	
4				1.20	
5				1.40	
6				1.50	
7				1.30	
8				1.20	
9				1.15	
10				1.20	
11				1.15	
12				1.10	
Temp. meas. tool & S/N: PDT 18				Time end: 1831 hrs	

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

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job I.P. / Two Harbors Date 2/11/92 Test 1 Run 1
Source Dryer Stack No. of traverse points 24
Method 0431 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 13 in. Hg. (vac) ☒

Particulate Catch Data:

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

☐ acetone
☒ other(s) DI H2O + MECL2

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	536	200	336
Impinger No. 3			
Condenser			
Desiccant	1430	1409	21
Total			357

Integrated Gas Sampling Data:

Bag Pump No. B8 Box No. 30 Bag No. 1.
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1050 (HRS) Time end: 1147 (HRS)
Sampling rate: 400 cc/min Operator: DHH
S/N of O_2 Analyzer used to monitor train outlet: 8

Brian Dillon
USEPA

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P./Two Harbors Operators D.W & T.B Pitot No. V23-5 Cp .84
Source Dryer Stack Meter Box No. 1 ΔH 1.86 IN WC Bar. Press. 30.17 inHg H2O 25%
Date 2/11/92 Test 1 Run 1 Coefficient coeff. 1.0053 Nozzle No. 7-C Nozzle Dia .245 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (xv/v)
	1045	789.90											
A 12	2.5	791.60	.94	1.74	1.65	6	200	249	268	31	45	45	16.2
11	5	793.44	.95	1.76	3.41	6	201				47	44	16.4
10	7.5	795.19	.98	1.81	5.20	6	201				48	45	16.1
9	10	797.08	1.10	2.04	7.10	8	201	257	267	32	44	45	15.8
8	12.5	799.03	1.15	2.13	9.04	9	202				50	46	16.0
7	15	801.09	1.25	2.32	1.07	10	202				51	48	16.4
6	17.5	803.22	1.45	2.87	3.33	13	205	261	268	32	52	47	16.1
5	20	805.50	1.40	2.77	5.55	13	205				52	46	16.1
4	22.5	807.60	1.25	2.47	7.64	11.5	205				52	46	16.0
3	25	809.56	1.10	2.17	9.61	9	205	260	267	32	52	46	15.8
2	27.5	811.55	.97	1.92	1.46	7	205				52	47	15.6
1	30	813.15	.82	1.62	3.16	6	205				52	47	15.7
B 12	32.5	815.16	1.10	2.18	5.13	9	205	262	259	32	51	46	15.7
11	35	817.10	1.10	2.17	7.09	9	205				54	46	15.6
10	37.5	819.10	1.10	2.18	9.06	9	205				53	48	16.0
9	40	821.00	1.15	2.28	1.08	10	205	260	263	32	53	49	15.6
8	42.5	823.03	1.20	2.38	3.14	11	205				55	49	15.9
7	45	825.30	1.35	2.68	5.33	13	205				55	49	16.5
6	47.5	827.52	1.40	2.78	7.56	13	205	261	264	32	55	49	16.2
5	50	829.64	1.35	2.67	9.74	13	208				54	49	16.2
4	52.5	831.80	1.25	2.48	1.84	11.5	206				54	49	16.3
3	55	833.81	1.05	2.09	3.78	9	204	261	263	33	57	49	15.9
2	57.5	835.52	.76	1.51	5.42	6	204				54	49	15.8
1	60	837.07	.65	1.29	6.95	5.5	205				56	50	15.4
	(1147)												
	θ = 60	Vm = 47.17		ΔH = 2.15							Avg. = 49.6		

E-17

Barry Dalton
USEPA

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P./Two Harbors Date 2/11/91 Test 1 Run 2
Source Dryer Stack No. of traverse points 24
Method 0011 Filter holder: — Filter type: —

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: .005 cfm at 11 in. Hg. (vac) ☒

Particulate Catch Data:

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

☐ acetone
☒ other(s) $MECl_2$ & D.I H_2O

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	530	200	330
Impinger No. 3			
Condenser			
Desiccant	1280	1229	51
Total			381

Integrated Gas Sampling Data:

Bag Pump No. Bg Box No. 30 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1310 (HRS) Time end: 1407 (HRS)
Sampling rate: 400 cc/min Operator: DCH
S/N of O_2 Analyzer used to monitor train outlet: 8

CF-023

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S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Two Harbors — Operators DWH + J.B — Pitot No. V23-5 — Cp .84
Source Dryer Stack — Meter Box No. 7 — ΔH 1.86 IN WC — Bar. Press. 30.01 inHg — H2O 2.5 x
Date 2/14/92 — Test 1 — Run 2 — Counter coeff. 1.0083 — Nozzle No. T-4 — Nozzle Dia .245 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (v/v)
	1305	839.40											
B 12	2.5	841.28	1.10	2.05	1.31	7	201	236	260	47	49	49	15.5
11	5	843.11	1.10	2.04	3.21	7	205				53	50	15.6
10	7.5	845.14	1.10	2.05	5.13	7	203				56	51	15.5
9	10	847.01	1.15	2.14	7.08	7	209	238	260	40	58	52	15.7
8	12.5	849.04	1.20	2.23	9.09	7	209				59	53	15.8
7	15	851.14	1.30	2.42	1.18	8	209				60	53	15.8
6	17.5	853.31	1.50	2.80	3.42	10	209	239	264	40	60	53	15.5
5	20	855.60	1.50	2.79	5.67	10	210				60	54	14.7
4	22.5	857.77	1.35	2.52	7.80	8.9	210				61	56	15.4
3	25	859.72	1.15	2.15	9.77	8.5	210	241	261	40	61	59	15.5
2	27.5	861.66	1.15	2.15	1.74	8.5	209				61	55	15.3
1	30	863.63	1.05	1.97	3.63	8.0	209				62	55	15.5
A 12	32.5	865.57	.99	1.86	5.47	6.5	209	246	262	40	59	55	16.3
11	35	867.30	.99	1.85	7.29	6.5	210				60	55	16.3
10	37.5	869.20	.97	1.81	9.11	6.5	210				61	55	15.7
9	40	871.04	1.10	2.06	1.04	8	210	250	263	40	62	55	15.7
8	42.5	873.06	1.15	2.15	3.01	8	210				62	55	15.4
7	45	875.16	1.35	2.52	5.15	8.5	211				63	56	15.8
6	47.5	877.28	1.40	2.62	7.33	9	211	251	264	41	63	56	16.0
5	50	879.60	1.50	2.81	9.58	10	211				63	56	15.4
4	52.5	881.73	1.45	2.71	1.80	10	211				63	56	15.7
3	55	883.96	1.35	2.53	3.94	9	210	255	263	41	63	56	15.7
2	57.5	885.96	1.15	2.16	5.92	7.5	210				63	56	14.3
1	60	887.70	.90	1.69	7.67	6	210				63	57	15.6
	1407												
	θ = 60	Vm = 48.30		ΔH = 2.25							Avg. = 57.2		

Brian Dahm
10/22/92

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job L.P./Two Harbors Date 2/11/92 Test 1 Run 3
Source Dryer Stack No. of traverse points 24
Method 0011 Filter holder: — Filter type: O

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 14 in. Hg. (vac) ☒

Particulate Catch Data:

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

☐ acetone
☒ other(s) DI H_2O + MeCl

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

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	505	200	305
Impinger No. 3			
Condenser			
Desiccant	1450	1430	20
Total			325

Integrated Gas Sampling Data:

Bag Pump No. B8 Box No. 30 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1450 (HRS) Time end: 1553 (HRS)
Sampling rate: 400 cc/min Operator: DOH
S/N of O_2 Analyzer used to monitor train outlet: 8

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S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Two Harbors
Source DRYER STACK
Date 2/11/92 Test 1 Run 3

Operators D.W.H. & J.B.
Meter Box No. 7 ΔH 1.86 IN WC
Cal. Factor 1.0083

Pitot No. V23-5 Cp .84
Bar. Press. 30.01 inHg H2O 25 x
Nozzle No. 7-6 Nozzle Dia .245 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (x v/v)
	1450	888.00											
1 12	2.5	889.87	1.00	1.87	9.83	9	209	246	270	40	52	52	16.1
11	5	891.69	.96	1.78	1.62	9	209				57	54	16.0
10	7.5	893.50	.96	1.79	3.42	9	209				59	54	16.1
9	10	895.41	1.05	1.96	5.30	9	211	247	265	40	59	54	16.0
8	12.5	897.18	1.15	2.14	7.26	9	211				60	55	16.0
7	15	899.29	1.30	2.42	9.35	11	211				61	56	16.2
6	17.5	901.45	1.45	2.71	1.57	13	210	250	266	40	62	56	16.3
5	20	903.65	1.40	2.62	3.75	13	210				61	56	16.2
4	22.5	905.76	1.30	2.43	5.84	12	212				60	56	15.5
3	25	907.89	1.25	2.33	7.90	11	212	245	266	42	60	56	16.1
2	27.5	909.76	.97	1.82	9.71	9	207				61	56	16.2
1	30	911.50	.94	1.77	1.51	8	207				62	57	16.4
B 12	32.5	913.36	1.0	1.88	3.36	8	207	248	262	42	61	56	17.0
11	35	915.26	1.05	1.97	5.25	8	207				62	56	16.4
10	37.5	917.26	1.15	2.16	7.22	8	207				62	56	16.3
9	40	919.19	1.25	2.35	9.24	11	207	250	263	43	63	57	16.7
8	42.5	921.30	1.25	2.35	1.36	11	208				63	57	16.8
7	45	923.40	1.35	2.54	3.51	12	208				63	57	16.9
6	47.5	925.69	1.50	2.81	5.77	13	211	251	264	43	63	58	16.7
5	50	928.00	1.50	2.81	8.02	13	211				62	57	16.8
4	52.5	930.13	1.30	2.43	0.13	11	211				62	57	16.7
3	55	932.14	1.15	2.16	2.11	10	208	254	263	47	60	57	16.8
2	57.5	933.87	.91	1.71	3.87	9	208				61	57	17.2
1	60	935.40	.66	1.24	5.37	6	208				62	58	16.8
	(1553)												
	θ = 60	Vm = 47.40		ΔH = 2.17							Avg. = 60.8		

E-21

Brian Dahm
INTERPOLL

S-05

APPENDIX F

INTERPOLL LABORATORIES ANALYTICAL DATA

TABLE OF CONTENTS

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job LP/Two Harbors
Team Leader DVH
Date Submitted 2-14-92
Test No. 1
Date of Analysis 2-17-92

Source Dryer
Test Site STACK
Date of Test 2-11-92
No. of Runs Completed 3
Technician R. [illegible]

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
1/1	5371-100	1	0.00	4.30	20.60	4.30	16.30	1.07
		2	0.00	4.30	20.60	4.30	16.30	1.07
	☑ B ☐ F	Avg				4.30	16.30	
1/2	-101	1	0.00	4.90	20.60	4.90	15.70	1.06
		2	0.00	4.90	20.60	4.90	15.70	1.06
	☑ B ☐ F	Avg				4.90	15.70	
1/3	-102	1	0.00	4.10	20.70	4.10	16.60	1.05
		2	0.00	4.10	20.70	4.10	16.60	1.05
	☑ B ☐ F	Avg				4.10	16.60	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	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	F0 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

Job LP/Twin Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 2
Date of Analysis 2-18-92

Source Dryer
Test Site STACK
Date of Test 2-11-92
No. of Runs Completed 3
Technician R. [illegible]

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	5371-10	1	0.00	4.40	20.60	4.40	16.20	1.07
		2	0.00	4.40	20.60	4.40	16.20	1.07
	☑ B ☐ F	Avg				4.40	16.20	
2/2	-14	1	0.00	4.80	20.60	4.80	15.80	1.06
		2	0.00	4.80	20.60	4.80	15.80	1.06
	☑ B ☐ F	Avg				4.80	15.80	
2/3	-18	1	0.00	4.00	20.70	4.00	16.70	1.05
		2	0.00	4.00	20.70	4.00	16.70	1.05
	☑ B ☐ F	Avg				4.00	16.70	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	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	F0 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

Job LP/Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 3
Date of Analysis 2-18-92

Source Dryer
Test Site STACK
Date of Test 2-11-92
No. of Runs Completed 3
Technician A C.

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			
3/1		1	0.00	4.30	20.80	4.30	16.50	1.02
	5371-25	2	0.00	4.30	20.80	4.30	16.50	1.02
	☑ B ☐ F	Avg				4.30	16.50	
3/2		1	0.00	4.10	20.70	4.10	16.60	1.05
	-29	2	0.00	4.10	20.70	4.10	16.60	1.05
	☑ B ☐ F	Avg				4.10	16.60	
3/3		1	0.00	4.40	20.60	4.40	16.20	1.07
	-33	2	0.00	4.40	20.60	4.40	16.20	1.07
	☑ B ☐ F	Avg				4.40	16.20	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_0 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	F0 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

Job L.P. / Two Harbors
Team Leader DVH
Date Submitted 2-14-92
Test No. 9
Date of Analysis 2-18-92

Source Konus
Test Site STACK
Date of Test 2-12-92
No. of Runs Completed 3
Technician R.G.

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			
9/1		1	0.00	4.90	20.50	4.90	15.60	1.08
	5371-67	2	0.00	4.90	20.50	4.90	15.60	1.08
	☒ B ☐ F	Avg	■	■	■	4.90	15.60	■
9/2		1	0.00	4.70	20.50	4.70	15.80	1.09
	-68	2	0.00	4.70	20.50	4.70	15.80	1.09
	☒ B ☐ F	Avg	■	■	■	4.70	15.80	■
9/3		1	0.00	4.80	20.50	4.80	15.70	1.08
	-69	2	0.00	4.80	20.50	4.80	15.70	1.08
	☒ B ☐ F	Avg	■	■	■	4.80	15.70	■
		1						
		2						
	☐ B ☐ F	Avg	■	■	■			■
		1						
		2						
	☐ B ☐ F	Avg	■	■	■			■
		1						
		2						
	☐ B ☐ F	Avg	■	■	■			■
		1						
		2						
	☐ B ☐ F	Avg	■	■	■			■
		1						
		2						
	☐ B ☐ F	Avg	■	■	■			■
		1						
		2						
	☐ B ☐ F	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	F0 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

Job L.P./Two Harbors
Team Leader DVIT
Date Submitted 2-14-92
Test No. 10
Date of Analysis 2-18-92

Source Konus
Test Site Stack
Date of Test 2-12-92
No. of Runs Completed 3
Technician

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			
10/1	5371-73	1	0.00	5.00	20.50	5.00	15.50	1.08
		2	0.00	5.00	20.50	5.00	15.50	1.08
	☑ B ☐ F	Avg				5.00	15.50	
10/2	-77	1	0.00	4.90	20.50	4.90	15.60	1.08
		2	0.00	4.90	20.50	4.90	15.60	1.08
	☑ B ☐ F	Avg				4.90	15.60	
10/3	-85	1	0.00	4.60	20.50	4.60	15.90	1.09
		2	0.00	4.60	20.50	4.60	15.90	1.09
	☑ B ☐ F	Avg				4.60	15.90	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	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	F0 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

Job LP/Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 12
Date of Analysis 2-17-92

Source Konus
Test Site STACK
Date of Test 2-12-92
No. of Runs Completed 3
Technician K.C.

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			
12/1	5371-85	1	0.00	4.60	20.50	4.60	15.90	1.09
		2	0.00	4.60	20.50	4.60	15.90	1.09
	☑ B ☐ F	Avg				4.60	15.90	
12/2	-89	1	0.00	4.80	20.60	4.80	15.80	1.06
		2	0.00	4.80	20.60	4.80	15.80	1.06
	☑ B ☐ F	Avg				4.80	15.80	
12/3	-93	1	0.00	5.10	20.50	5.10	15.40	1.08
		2	0.00	5.10	20.50	5.10	15.40	1.08
	☑ B ☐ F	Avg				5.10	15.40	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	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	F0 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 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job LP Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 2
Date of Analysis 2-18-92

Source Dryer
Test Site Stack
Date of Test 2-11-92
No. of Runs Completed 3
Technician C. Helgeson

0	Test 2 Run 0 Field Blank Log Number 5371-06 Comments	Dish No. 22 Dish Tare Wt. 51.3597 g Dish+Sample Wt. 51.3602 g Sample Wt. 0.0005 g
1	Test 2 Run 1 Log Number -09 Comments	Dish No. 39 Dish Tare Wt. 49.4374 g Dish+Sample Wt. 49.4739 g Sample Wt. 0.0365 g
2	Test 2 Run 2 Log Number -13 Comments	Dish No. 44 Dish Tare Wt. 47.6232 g Dish+Sample Wt. 47.6655 g Sample Wt. 0.0423 g
3	Test 2 Run 3 Log Number -17 Comments	Dish No. 46 Dish Tare Wt. 46.2256 g Dish+Sample Wt. 46.2562 g Sample Wt. 0.0306 g
4	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

Blank Solvent Wt. 0.0005 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0360	0.0418F-1	0.0305		

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job LP Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 2
Date of Analysis 2-17-92
Transport Leakage ☒ None ☐ _____ ml

Source Dryer
Test Site Stack
Date of Test 2-11-92
No. of Runs Completed 3
Technician C. Helgeson
Solvent Acetone

0
Test 2 Run 0
Field Blank
Log Number 5371-04
Vol. of Solvent 150 ml
*Solvent Residue 3.33 ug/ml

Dish No. 86
Dish Tare Wt. 73.5471 g
Dish+Sample Wt. 73.5476 g
Sample Wt. 0.0005 g

1
Test 2 Run 1
Vol. of Solvent 100 ml
Log Number -07
Comments _____

Dish No. 87
Dish Tare Wt. 73.3551 g
Dish+Sample Wt. 73.4961 g
Sample Wt. 0.1410 g

2
Test 2 Run 2
Vol. of Solvent 100 ml
Log Number -11
Comments _____

Dish No. 89
Dish Tare Wt. 71.7493 g
Dish+Sample Wt. 71.8832 g
Sample Wt. 0.1339 g

3
Test 2 Run 3
Vol. of Solvent 90 ml
Log Number -15
Comments _____

Dish No. 88
Dish Tare Wt. 55.9087 g
Dish+Sample Wt. 56.0245 g
Sample Wt. 0.1158 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 ___ ug/ml = [(Sample Wt. 0.0005 g)(10⁶)]/Vol. of Sol. 150 ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1407	0.1336	0.1155		

F-8

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job LP Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 2
Date of Analysis 2-17-92

Source Dryer
Test Site Stack
Date of Test 2-11-92
No. of Runs Completed 3
Technician C. Helgeson

0
Test 2 Run 0
Field Blank
Log Number 5371-05
Comments
Filter No. 4042
Filter Type 4" GFF
Filter Tare Wt. .9690 g
Filter+Sample Wt. .9691 g
Sample Wt. 0.0001 g

1
Test 2 Run 1
Log Number -08
Comments
Filter No. 4041
Filter Type 4" GFF
Filter Tare Wt. .9669 g
Filter+Sample Wt. 1.1169 g
Sample Wt. 0.1500 g

2
Test 2 Run 2
Log Number -12
Comments
Filter No. 4052
Filter Type 4" GFF
Filter Tare Wt. .9700 g
Filter+Sample Wt. 1.1392 g
Sample Wt. 0.2220 g

3
Test 2 Run 3
Log Number -16
Comments
Filter No. 4081
Filter Type 4" GFF
Filter Tare Wt. .9670 g
Filter+Sample Wt. 1.1160 g
Sample Wt. 0.1490 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
	0.1500	0.2220	0.1490		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.3267	0.3977	0.2950		

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job L P Two Harbors — Source Press + Unloading Vents
Team Leader DUH — Test Site Stack
Date Submitted 2-14-92 — Date of Test 2-13-92
Test No. 7 — No. of Runs Completed 3
Date of Analysis 2-19-92 — Technician C. Helgeson

0	Test ____ Run 0 ____ Field Blank Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 7 Run 1 Log Number 5371-54 Comments ____	Dish No. 507 Dish Tare Wt. 47.8419 g Dish+Sample Wt. 47.8443 g Sample Wt. 0.0024 g
2	Test 7 Run 2 Log Number -57 Comments ____	Dish No. 518 Dish Tare Wt. 48.1020 g Dish+Sample Wt. 48.1040 g Sample Wt. 0.0020 g
3	Test 7 Run 3 Log Number -60 Comments ____	Dish No. 524 Dish Tare Wt. 48.0408 g Dish+Sample Wt. 48.0427 g Sample Wt. 0.0019 g
4	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Blank Solvent Wt. ____ g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0019	0.0015F-10	0.0014		

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job LP Two Harbors
Team Leader DJH
Date Submitted 2-14-92
Test No. 7
Date of Analysis 2-17-92
Transport Leakage ☒ None ☐ _____ ml

Source Press + unloading vent
Test Site stack
Date of Test 2-13-92
No. of Runs Completed 3
Technician C. Helgeson
Solvent Acetone

0	Test ____ Run 0 Field Blank Log Number ____ Vol. of Solvent ____ ml *Solvent Residue 3.33 ug/ml	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 7 Run 1 Vol. of Solvent 180 ml Log Number 5371-52 Comments ____	Dish No. 61A Dish Tare Wt. 51.4746 g Dish+Sample Wt 51.4830 g Sample Wt. 0.0084 g
2	Test 7 Run 2 Vol. of Solvent 180 ml Log Number -55 Comments ____	Dish No. 66 Dish Tare Wt. 48.3105 g Dish+Sample Wt. 48.3228 g Sample Wt. 0.0123 g
3	Test 7 Run 3 Vol. of Solvent 170 ml Log Number -58 Comments ____	Dish No. 112 Dish Tare Wt. 47.3858 g Dish+Sample Wt. 47.3959 g Sample Wt. 0.0101 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 ___ ug/ml = [(Sample Wt. ____ g)(10⁶)]/Vol. of Sol. ____ ml
EPA-MS Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.008	0.0117 F-1	0.0095		

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job LP @ Two Harbors
Team Leader DUH
Date Submitted 2-14-92
Test No. 7
Date of Analysis 2-17-92

Source Press + Unloading Vent
Test Site Stack
Date of Test 2/13/92
No. of Runs Completed 3
Technician C. Helgeson

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g
1	Test 7 Run 1 Log Number 5371-53 Comments ____	Filter No. 3978 Filter Type 4" GFF Filter Tare Wt. .9449 g Filter+Sample Wt. .9469 g Sample Wt. 0.0020 g
2	Test 7 Run 2 Log Number -56 Comments ____	Filter No. 3983 Filter Type 4" GFF Filter Tare Wt. .9551 g Filter+Sample Wt. .9575 g Sample Wt. 0.0024 g
3	Test 7 Run 3 Log Number -59 Comments ____	Filter No. 3990 Filter Type 4" GFF Filter Tare Wt. .9358 g Filter+Sample Wt. .9381 g Sample Wt. 0.0023 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
	0.0020	0.0024	0.0023		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0117	0.0156	0.0132		

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job LP Two Harbors — Source Konus
Team Leader DUH — Test Site Stack
Date Submitted 2-14-92 — Date of Test 2-12-92
Test No. 10 — No. of Runs Completed 3
Date of Analysis 2-19-92 — Technician C. Helgeson

0	Test ____ Run 0	Dish No. ____
	Field Blank	Dish Tare Wt. ____ g
	Log Number ____	Dish+Sample Wt. ____ g
	Comments ____	Sample Wt. ____ g
1	Test 10 Run 1	Dish No. 24
	Log Number 5371-72	Dish Tare Wt. 56.8228 g
	Comments ____	Dish+Sample Wt. 56.8279 g
	____	Sample Wt. 0.0051 g
2	Test 10 Run 2 -76	Dish No. 30
	Log Number ____	Dish Tare Wt. 47.2627 g
	Comments ____	Dish+Sample Wt. 47.2657 g
	____	Sample Wt. 0.0030 g
3	Test 10 Run 3 -80	Dish No. 43
	Log Number ____	Dish Tare Wt. 46.5914 g
	Comments ____	Dish+Sample Wt. 46.5942 g
	____	Sample Wt. 0.0028 g
4	Test ____ Run ____	Dish No. ____
	Log Number ____	Dish Tare Wt. ____ g
	Comments ____	Dish+Sample Wt. ____ g
	____	Sample Wt. ____ g
5	Test ____ Run ____	Dish No. ____
	Log Number ____	Dish Tare Wt. ____ g
	Comments ____	Dish+Sample Wt. ____ g
	____	Sample Wt. ____ g

Blank Solvent Wt. 0.0005g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0046	0.0025 F-12	0.0023		

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job CP Two Harbors
Team Leader DVH
Date Submitted 2-14-92
Test No. 10
Date of Analysis 2-17-92
Transport Leakage ☒ None ☐ _____ ml

Source Kohns
Test Site Stack
Date of Test 2-12-92
No. of Runs Completed 3
Technician C. Helgeson
Solvent Acetone

0	Test ____ Run 0 Field Blank Log Number ____ Vol. of Solvent ____ ml *Solvent Residue 3.33 ug/ml	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 10 Run 1 Vol. of Solvent 150 ml Log Number 5371-70 Comments ____	Dish No. 78 Dish Tare Wt. 85.5461 g Dish+Sample Wt. 85.5752 g Sample Wt. 0.0291 g
2	Test 10 Run 2 Vol. of Solvent 180 ml Log Number -74 Comments ____	Dish No. 84 Dish Tare Wt. 79.0117 g Dish+Sample Wt. 79.0478 g Sample Wt. 0.0361 g
3	Test 10 Run 3 Vol. of Solvent 210 ml Log Number -78 Comments ____	Dish No. 82 Dish Tare Wt. 60.7655 g Dish+Sample Wt. 60.8018 g Sample Wt. 0.0363 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 ___ ug/ml = [(Sample Wt. ____ g)(10^6)]/Vol. of Sol. ____ ml
EPA-MS Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0286	0.0355	0.0856	F-14	

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L.P Two Harbors
Team Leader DUH
Date Submitted 12-14-92
Test No. 10
Date of Analysis 12-17-92

Source Konus
Test Site Stack
Date of Test 2-12-92
No. of Runs Completed 3
Technician C. Helgeson

0
Test ____ Run 0
Field Blank
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

1
Test 10 Run 1
Log Number 5371-71
Comments ____
Filter No. 3940
Filter Type 4" GFF
Filter Tare Wt. .9460 g
Filter+Sample Wt. .9566 g
Sample Wt. 0.0106 g

2
Test 10 Run 2
Log Number 5371-75
Comments ____
Filter No. 3991
Filter Type 4" GFF
Filter Tare Wt. .9597 g
Filter+Sample Wt. .9698 g
Sample Wt. 0.0101 g

3
Test 10 Run 3
Log Number -79
Comments ____
Filter No. 3977
Filter Type 4" GFF
Filter Tare Wt. .9507 g
Filter+Sample Wt. .9608 g
Sample Wt. 0.0101 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
	0.0106	0.0101	0.0101		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0438	0.0481	0.0480		

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job LP Two Harbors — Source Dryer
Team Leader CT — Test Site Stack
Date Submitted 2-14-92 — Date of Test 2-11-92
Test No. 3 — No. of Runs Completed 3
Date of Analysis 2-18-92 — Technician C. Helgeson

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 3 Run 1 Log Number 5371-24 Comments ____	Dish No. 58 Dish Tare Wt. 50.2234 g Dish+Sample Wt. 50.2660 g Sample Wt. 0.0426 g
2	Test 3 Run 2 Log Number -28 Comments ____	Dish No. 203 Dish Tare Wt. 46.8692 g Dish+Sample Wt. 46.9227 g Sample Wt. 0.0535 g
3	Test 3 Run 3 Log Number -32 Comments ____	Dish No. 402 Dish Tare Wt. 47.5785 g Dish+Sample Wt. 47.6304 g Sample Wt. 0.0519 g
4	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Blank Solvent Wt. 0.0005 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0421	0.0530 F-1	60.0514		

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job: LP Two Harbors
Team Leader: ET
Date Submitted: 2-14-92
Test No.: 3
Date of Analysis: 2-17-92
Transport Leakage: [X] None [ ] _____ ml

Source: Dryer
Test Site: Stack
Date of Test: 2-11-92
No. of Runs Completed: 3
Technician: C. Helgeson
Solvent: Acetone

0
Test _____ Run 0
Field Blank
Log Number _____
Vol. of Solvent _____ ml
*Solvent Residue 3.33 ug/ml
Dish No. _____
Dish Tare Wt. _____ g
Dish+Sample Wt. _____ g
Sample Wt. _____ g

1
Test 3 Run 1
Vol. of Solvent 230 ml
Log Number 5371-19
Comments _____
Dish No. 72A
Dish Tare Wt. 60.0620 g
Dish+Sample Wt. 60.0871 g
Sample Wt. 0.0251 g

2
Test 3 Run 2
Vol. of Solvent 250 ml
Log Number -26
Comments _____
Dish No. 302
Dish Tare Wt. 53.5965 g
Dish+Sample Wt. 53.6430 g
Sample Wt. 0.0465 g

3
Test 3 Run 3
Vol. of Solvent 250 ml
Log Number -30
Comments _____
Dish No. 304
Dish Tare Wt. 60.5543 g
Dish+Sample Wt. 60.6336 g
Sample Wt. 0.0793 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 ___ ug/ml = [(Sample Wt. _____ g)(10^6)]/Vol. of Sol. _____ ml
EPA-MS Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	m A2.U2	m A457F-17b.0785			

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job LP Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 3
Date of Analysis 2-17-92

Source Dryer
Test Site Stack
Date of Test 2-11-92
No. of Runs Completed
Technician C. Helgeson

0
Test Run 0
Field Blank
Log Number
Comments
Filter No.
Filter Type
Filter Tare Wt. g
Filter+Sample Wt. g
Sample Wt. g

1
Test 3 Run 1-1
Log Number 5371-20
Comments
Filter No. 5602
Filter Type 2.5 CRC
Filter Tare Wt. .2636 g
Filter+Sample Wt. .2969 g
Sample Wt. 0.0333 g

2
Test 3 Run 2
Log Number 5371-27
Comments
Filter No. 4048
Filter Type 4" GFF
Filter Tare Wt. .9719 g
Filter+Sample Wt. 1.1300 g
Sample Wt. 0.1581 g

3
Test 3 Run 3
Log Number -31
Comments
Filter No. 4049
Filter Type 4" GFF
Filter Tare Wt. .9746 g
Filter+Sample Wt. 1.1087 g
Sample Wt. 0.1341 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
	0.0333	0.1581	0.1341		

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job LP Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 3
Date of Analysis 2-17-92

Source Dryer
Test Site Stack
Date of Test 2-11 92
No. of Runs Completed 3
Technician C. Helgeson

0
Test ____ Run 0
Field Blank
Log Number ____
Comments ____

Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

1
Test 3 Run 1-2
Log Number 5371-21
Comments ____

Filter No. 5626
Filter Type 2.5" ERC
Filter Tare Wt. .2537 g
Filter+Sample Wt. .2884 g
Sample Wt. 0.0347 g

2
Test ____ Run ____
Log Number ____
Comments ____

Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

3
Test ____ Run ____
Log Number ____
Comments ____

Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ 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
	0.0347				

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job: LP Two Harbors
Team Leader: ET
Date Submitted: 2-14-92
Test No.: 3
Date of Analysis: 2-17-92
Source: Dryer
Test Site: Stack
Date of Test: 2-11-92
No. of Runs Completed:
Technician: C. Helgaas

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g
1	Test 3 Run 1-3 Log Number 5371-22 Comments ____	Filter No. 5576 Filter Type 2.5" Type G Filter Tare Wt. .2248 g Filter+Sample Wt. .2250 g Sample Wt. 0.0002 g
2	Test ____ Run ____ Log Number ____ Comments ____	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g
3	Test ____ Run ____ Log Number ____ Comments ____	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ 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
	0.0002				

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job: CP Two Harbors
Team Leader: CT
Date Submitted: 2-14-92
Test No.: 3
Date of Analysis: 2-17-92

Source: Dryer
Test Site: Stack
Date of Test: 2-11-92
No. of Runs Completed:
Technician: C. Helgeson

0
Test ____ Run 0
Field Blank
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

1
Test 3 Run 1 - 4
Log Number 5371-23
Comments ____
Filter No. 4043
Filter Type 4" GFF
Filter Tare Wt. .9885 g
Filter+Sample Wt. 1.0710 g
Sample Wt. 0.0825 g

2
Test ____ Run ____
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

3
Test ____ Run ____
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ 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
	0.0825				

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.2171	0.2568	0.2640		

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job LP Two Harbors — Source Press unloader
Team Leader FT — Test Site Vent
Date Submitted 2-14-92 — Date of Test 2-12-92
Test No. 5 A — No. of Runs Completed 3
Date of Analysis 2-18-92 — Technician C. Helgeson

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 5 Run 1 A Log Number 5371-36 Comments ____	Dish No. 27 Dish Tare Wt. 52.4446 g Dish+Sample Wt. 52.4477 g Sample Wt. 0.0031 g
2	Test 5 Run 2 A Log Number -39 Comments ____	Dish No. 31 Dish Tare Wt. 45.8046 g Dish+Sample Wt. 45.8075 g Sample Wt. 0.0029 g
3	Test 5 Run 3 A Log Number -41 Comments ____	Dish No. 36 Dish Tare Wt. 43.5641 g Dish+Sample Wt. 43.5662 g Sample Wt. 0.0021 g
4	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Blank Solvent Wt. 0.0005g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0026	0.0024 F	2b.0016		

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job LP Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 5A
Date of Analysis 2-17-92
Transport Leakage ☒ None ☐ _____ ml

Source Press & Unloader
Test Site Vents
Date of Test 2-12-92
No. of Runs Completed 3
Technician C. Helgeson
Solvent Acetone

0	Test ____ Run 0 Field Blank Log Number ____ Vol. of Solvent ____ ml *Solvent Residue 3.33 ug/ml	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 5 Run 1 A Vol. of Solvent 20 ml Log Number 5371-34 Comments ____	Dish No. 1 Dish Tare Wt. 51.9718 g Dish+Sample Wt. 51.9728 g Sample Wt. 0.0010 g
2	Test 5 Run 2 A Vol. of Solvent 20 ml Log Number -37 Comments ____	Dish No. 3 Dish Tare Wt. 52.1220 g Dish+Sample Wt. 52.1228 g Sample Wt. 0.0008 g
3	Test 5 Run 3 A Vol. of Solvent 20 ml Log Number -40 Comments ____	Dish No. 5 Dish Tare Wt. 50.6836 g Dish+Sample Wt. 50.6844 g Sample Wt. 0.0008 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 ___ 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
	0.0006	0.0007	0.0007		

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job LP Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 5 A
Date of Analysis 2-17-92

Source Press + unload
Test Site Vents
Date of Test 2-12-92
No. of Runs Completed 3
Technician C. Helgeson

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g
1	Test 5 Run 1 A Log Number 5371-35 Comments ____	Filter No. 5580 Filter Type 2.5" ERC Filter Tare Wt. .2295 g Filter+Sample Wt. .2382 g Sample Wt. 0.0087 g
2	Test 5 Run 2 A Log Number -38 Comments ____	Filter No. 5621 Filter Type 2.5" ERC Filter Tare Wt. .2520 g Filter+Sample Wt. .2626 g Sample Wt. 0.0106 g
3	Test 5 Run 3 A Log Number -41 Comments ____	Filter No. 5575 Filter Type 2.5" ERC Filter Tare Wt. .2380 g Filter+Sample Wt. .2385 g Sample Wt. 0.0005 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
	0.0087	0.0106	0.0005		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0122	0.0137	0.0028		

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job LP Two Harbors — Source Press + unloader
Team Leader ET — Test Site Vent
Date Submitted 2-14-92 — Date of Test 2-12-92
Test No. 5 B — No. of Runs Completed 3
Date of Analysis 2-15-92 — Technician C. Helgeson

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 5 Run 1 B Log Number 5371-45 Comments ____	Dish No. 57A Dish Tare Wt. 47.9153 g Dish+Sample Wt. 47.9162 g Sample Wt. 0.0009 g
2	Test 5 Run 2 B Log Number -48 Comments ____	Dish No. 502 Dish Tare Wt. 46.9002 g Dish+Sample Wt. 46.9015 g Sample Wt. 0.0013 g
3	Test 5 Run 3 B Log Number -51 Comments ____	Dish No. 504 Dish Tare Wt. 50.0215 g Dish+Sample Wt. 50.0227 g Sample Wt. 0.0012 g
4	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Blank Solvent Wt. 0.0005 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0004	0.0008 F-25	0.0007		

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job LP Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 5 B
Date of Analysis 2-17-92

Source Press + unload
Test Site Vents
Date of Test 2-12-92
No. of Runs Completed 3
Technician C. Helgeson

0
Test ____ Run 0
Field Blank
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

1
Test 5 Run 1 B
Log Number 5371-44
Comments ____
Filter No. 5577
Filter Type 2.5" ERC
Filter Tare Wt. .2271 g
Filter+Sample Wt. .2280 g
Sample Wt. 0.0009 g

2
Test 5 Run 2 B -47
Log Number ____
Comments ____
Filter No. 5608
Filter Type 2.5" ERC
Filter Tare Wt. .2662 g
Filter+Sample Wt. .2667 g
Sample Wt. 0.0005 g

3
Test 5 Run 3 B
Log Number -50
Comments ____
Filter No. 5578
Filter Type 2.5" ERC
Filter Tare Wt. .2323 g
Filter+Sample Wt. .2328 g
Sample Wt. 0.0005 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
	0.0009	0.0005	0.0005		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0017	0.0018	0.0016		

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job LP Two Harbors — Source Kilns
Team Leader CT — Test Site Stack
Date Submitted 2-14-92 — Date of Test 2-13-92
Test No. 12 — No. of Runs Completed 3
Date of Analysis 2-19-92 — Technician C. Helgeson

0	Test ___ Run 0 Field Blank Log Number ___ Comments ___	Dish No. ___ Dish Tare Wt. ___ g Dish+Sample Wt. ___ g Sample Wt. ___ g
1	Test 11 Run 1 Log Number 5371-84 Comments ___	Dish No. 57 Dish Tare Wt. 50.0202 g Dish+Sample Wt. 50.0243 g Sample Wt. 0.0041 g
2	Test 11 Run 2 Log Number -88 Comments ___	Dish No. 407 Dish Tare Wt. 47.9936 g Dish+Sample Wt. 47.9977 g Sample Wt. 0.0041 g
3	Test 11 Run 3 Log Number -92 Comments ___	Dish No. 505 Dish Tare Wt. 48.4521 g Dish+Sample Wt. 48.4569 g Sample Wt. 0.0048 g
4	Test ___ Run ___ Log Number ___ Comments ___	Dish No. ___ Dish Tare Wt. ___ g Dish+Sample Wt. ___ g Sample Wt. ___ g
5	Test ___ Run ___ Log Number ___ Comments ___	Dish No. ___ Dish Tare Wt. ___ g Dish+Sample Wt. ___ g Sample Wt. ___ g

Blank Solvent Wt. 0.004/g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0036	0.0036 F-2	0.0043		

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job CP Two Harbors
Team Leader CT
Date Submitted 2-14-92
Test No. 12
Date of Analysis 2-17-92
Transport Leakage ~~X~~ None ☐ _____ ml

Source Kenns
Test Site Stack
Date of Test 2-13-92
No. of Runs Completed 3
Technician C. Helgeson
Solvent Acetone

0	Test ____ Run 0 Field Blank Log Number ____ Vol. of Solvent ____ ml *Solvent Residue ____ ug/ml	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 11 Run 1 Vol. of Solvent 50 ml Log Number 5371-82 Comments ____	Dish No. 14 Dish Tare Wt. 49.7356 g Dish+Sample Wt. 49.7374 g Sample Wt. 0.0018 g
2	Test 11 Run 2 Vol. of Solvent 40 ml Log Number -86 Comments ____	Dish No. 105 Dish Tare Wt. 47.8639 g Dish+Sample Wt. 47.8660 g Sample Wt. 0.0021 g
3	Test 11 Run 3 Vol. of Solvent 30 ml Log Number -90 Comments ____	Dish No. 409 Dish Tare Wt. 46.1907 g Dish+Sample Wt. 46.1919 g Sample Wt. 0.0012 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 ___ ug/ml = [(Sample Wt. ____ g)(10^6)]/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
	0.0016	0.0020	0.0011		

Interpoll Laboratories
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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job LP Two Harbors
Team Leader ET
Date Submitted 2-14-92
Test No. 12
Date of Analysis 2-17-92

Source Kenus
Test Site stack
Date of Test 2-13-92
No. of Runs Completed 3
Technician C. Helgeson

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g
1	Test 11 Run 1 Log Number 5371-83 Comments ____	Filter No. 5610 Filter Type 2.5" ERC Filter Tare Wt. .2617 g Filter+Sample Wt. .2672 g Sample Wt. 0.0060 g
2	Test 11 Run 2 Log Number -87 Comments ____	Filter No. 5618 Filter Type 2.5" ERC Filter Tare Wt. .2550 g Filter+Sample Wt. .2623 g Sample Wt. 0.0073 g
3	Test 11 Run 3 Log Number -91 Comments ____	Filter No. 5596 Filter Type 2.5" ERC Filter Tare Wt. .2618 g Filter+Sample Wt. .2702 g Sample Wt. 0.0084 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
	0.0060	0.0073	0.0084		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0112	0.0129	0.0138		

LSC-02PR

INTERPOLL LABORATORIES
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S-305R
(1/90)

EPA Method 10 NDIR Analysis

Job Name LP/Two Harbors
Source Dryer
Date of Analysis 2-18-92
Technician R. Gutzmann

NDIR Analyzer:
- Fuji ACS Model 3300
- Mon. Lab Model 8310
- ✓ Dasibi Model 3003

Range: 0 - 200 ppm
Flow rate: 1000 cc/min

Pretest Calibration

	Conc.	Reading	Vendor
Zero gas:	0.00 ppm	0.00 ppm	Linde
Upscale gas:	38 ppm	38 ppm	Linde
Upscale gas:	148 ppm	148 ppm	Linde
Upscale gase	ppm	ppm	

Post-test Calibration

	Conc.	Reading	Vendor
Zero gas:	0.00 ppm	0.00 ppm	Linde
Upscale gas:	38 ppm	38 ppm	Linde
Upscale gas:	148 ppm	147.9 ppm	Linde
Upscale gase	ppm	ppm	

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry) Dilution Factor	Reading	Actual ppm
2/1	5371-10	15	54	810
2/2	-14	15	85	1275
2/3	-18	15	42	630

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry) Dilution Factor	Reading	Actual ppm

F-31

Note 1: If sample dilution is required the sample is diluted with CO-free gas prior to analysis.
Note 2: The Fuji ACS model 3300 has a rejection ratio for CO to CO_2 greater then 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater then 200,000:1 and thus CO_2 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
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S-305R
(1/90)

EPA Method 10 NDIR Analysis

Job Name LP / Two Harbors
Source Press 4 Unloading
Date of Analysis 2-17-92
Technician R. Elkins

NDIR Analyzer:
Fuji ACS Model 3300
Mon. Lab Model 8310
✓ Dasibi Model 3003
Range: 0 - 200 ppm
Flow rate: 1000 cc/min

Pretest Calibration

	Conc.		Reading		
Zero gas:	0.00	ppm	0.00	ppm	Vendor: Linde
Upscale gas:	38	ppm	38	ppm	Vendor: 〃
Upscale gas:	148	ppm	148	ppm	Vendor: 〃
Upscale gase		ppm		ppm	Vendor:

Post-test Calibration

	Conc.		Reading		
Zero gas:	0.00	ppm	0.00	ppm	Vendor: Linde
Upscale gas:	38	ppm	38	ppm	Vendor: 〃
Upscale gas:	148	ppm	147.9	ppm	Vendor: 〃
Upscale gase		ppm		ppm	Vendor:

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry)		
		Dilution Factor	Reading	Actual ppm
S/1	5371-94	1	17	17
S/2	-95	1	11	11
S/3	-96	1	6	6

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 Fuji ACS model 3300 has a rejection ratio for CO to CO_2 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 CO_2 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.

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S-305R
(1/90)

EPA Method 10 NDIR Analysis

Job Name L.P./Two Harbors
Source Kanus
Date of Analysis 2-18-92
Technician R. Gallon

NDIR Analyzer:
Fuji ACS Model 3300
Mon. Lab Model 8310
✓ Dasibi Model 3003
Range: 0 - 200 ppm
Flow rate: 1000 cc/min

Pretest Calibration

	Conc.	Reading	Vendor
Zero gas:	0.00 ppm	0.00 ppm	Linde
Upscale gas:	38 ppm	38 ppm	Linde
Upscale gas:	148 ppm	148 ppm	Linde
Upscale gase	ppm	ppm	

Post-test Calibration

	Conc.	Reading	Vendor
Zero gas:	0.00 ppm	0.00 ppm	Linde
Upscale gas:	38 ppm	38 ppm	Linde
Upscale gas:	148 ppm	147.9 ppm	Linde
Upscale gase	ppm	ppm	

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry) Dilution Factor	Reading	Actual ppm
10/1	5371-73	1	8	8
10/2	-77	1	50	50
10/3	-81	1	8	8

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 Fuji ACS model 3300 has a rejection ratio for CO to CO_2 greater then 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater then 200,000:1 and thus CO_2 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.
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Louisiana Pacific/Two Harbors
Laboratory Log No. 5371

Results of Formaldehyde Analysis

Test: 1

Source: Dryer Stack

Sample Type: Impinger Catch

Sample Log No.	Sample Description	Formaldehyde[a] Total ug
5371-97	Run 0, Field Blank	9.7
5371-01	Run 1	5900
5371-02	Run 2	27000
5371-03	Run 3	28000

[a]EPA Method 0011

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Louisiana Pacific/Two Harbors
Laboratory Log No. 5371

Results of Formaldehyde Analysis

Test: 8

Source: Press & Unloading Vents Stack

Sample Type: Impinger Catch

Sample Log No.	Sample Description	Formaldehyde[a] Total ug
5371-61	Run 1	6700
5371-62	Run 2	6400
5371-63	Run 3	6400

[a]EPA Method 0011

INTERPOLL LABORATORIES, INC.
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Louisiana Pacific/Two Harbors
Laboratory Log No. 5371

Results of Formaldehyde Analysis

Test: 9
Source: Konus Stack
Sample Type: Impinger Catch

Sample Log No.	Sample Description	Formaldehyde[a] Total ug
5371-64	Run 1	87
5371-65	Run 2	110
5371-66	Run 3	150

[a]EPA Method 0011

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job L.F. / Two Harbors
Team Leader DH
Date Submitted 2/14/92
Test No. 1

Source Dryer
Test Site Stack
Date of Test 2/11/92
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
	Probe Wash: ☐Acetone ☐D.I. Water	☐As per EPA M-5 ☐Other _____	
	Filter: ☐4" G.F. ☐S.S. Thimble ☐2.5" G.F. ☐47 mm G.F.	☐As per EPA M-5 ☐As per EPA M-17 ☐Other _____	
#4	Impinger Catch: ☐D.I. Water ☐3% H_2O_2 ☐4M5 Hg Only ☐4M5 Metals ☐1.0 N NaOH ☒Other DNPH	☐MN Protocol ☐WI Protocol ☐EPA M-6 or 8 ☐Acid Gases ☒Formaldehyde ☐Metals ☒Other 0011	
	Integrated Gas sample	☐As per EPA M-3 ☐As per EPA M-10 ☐Other _____	
	Oxides of Nitrogen (NO_x)	☐As per EPA M-7A ☐Other _____	Date _____ Time (HRS) _____
	☐ Fuel Sample ☐ Aggregate	☐Attached fuel Form #S-0163RRR	
	Particle Size	☐X-Ray Sedigraph ☐Bahco Method ☐Other _____	
	Audit Samples ☐Sulfur Dioxide ☐Oxides of Nit. ☐Other _____	☐As per EPA M-6 ☐As per EPA M-7A ☐Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☒ Dryer ☐ Other _____
2) Fuel: ☐ Coal ☒ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain _____

S-278RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job LP/TWO HARBORS
Team Leader E. TRIMBRIDGE
Date Submitted 2-13-92
Test No. 2

Source DRYER
Test Site STACK
Date of Test 2-11-92
No. of Runs Completed 5

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

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☒ Dryer ☐ Other _____
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☐ No ☐ Yes
4) Does sample need special handling? ☐ No ☐ Yes If yes, explain _____

S-279RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job LP/TWO HARBORS
Team Leader E TROWBRIDGE
Date Submitted 2-13-92
Test No. 3

Source DRYER
Test Site STACK
Date of Test 2-11-92
No. of Runs Completed 3

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

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☒ Dryer ☐ Other
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other
3) Is sample combustible? ☐ No ☐ Yes
4) Does sample need special handling? ☐ No ☐ Yes If yes, explain

S-278RRRR

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Chain of Custody
Sample Deposition Sheet

Job LP / TWO HARBORS
Team Leader ETROWBRIDGE
Date Submitted 2-13-92
Test No. 5

Source PRESS WILLAPER
Test Site VENTS
Date of Test 2-12-92
No. of Runs Completed 3

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

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other _____
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☐ No ☐ Yes
4) Does sample need special handling? ☐ No ☐ Yes If yes, explain _____

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Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job L.P. / Two Harbors
Team Leader DW
Date Submitted 2/14/92
Test No. 7

Source Press + Unloader Vent
Test Site Stacks
Date of Test 2/13/92
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
3	Probe Wash: ☒ Acetone ☐ D.I. Water	☒ As per EPA M-5 ☐ Other _____	
3	Filter: ☒ 4" G.F. ☐ S.S. Thimble ☐ 2.5" G.F. ☐ 47 mm G.F.	☒ As per EPA M-5 ☐ As per EPA M-17 ☐ Other _____	
3	Impinger Catch: ☒ D.I. Water ☐ 3% H_2O_2 ☐ 4M5 Hg Only ☐ 4M5 Metals ☐ 1.0 N NaOH ☐ Other _____	☐ MN Protocol ☐ WI Protocol ☐ EPA M-6 or 8 ☐ Acid Gases ☐ Formaldehyde ☐ Metals ☒ Other MECL2 Extraction	
	Integrated Gas sample	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	Date _____ Time (HRS) _____
	☐ Fuel Sample ☐ Aggregate	☐ Attached fuel Form #S-0163RRR	
	Particle Size	☐ X-Ray Sedigraph ☐ Bahco Method ☐ Other _____	
	Audit Samples ☐ Sulfur Dioxide ☐ Oxides of Nit. ☐ Other _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Source Information

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

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Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job L.P. / Two Harbors
Team Leader DWH
Date Submitted 2/14/92
Test No. 8

Source Press & Unloading Vents
Test Site Stack
Date of Test 2/13/92
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
0	Probe Wash: ☒ Acetone ☐ D.I. Water	☒ As per EPA M-5 ☐ Other	
0	Filter: ☒ 4" G.F. ☐ S.S. Thimble ☐ 2.5" G.F. ☐ 47 mm G.F.	☒ As per EPA M-5 ☐ As per EPA M-17 ☐ Other	
3	Impinger Catch: ☒ D.I. Water ☐ 3% H_2O_2 ☐ 4M5 Hg Only ☐ 4M5 Metals ☐ 1.0 N NaOH ☒ Other DNPH	☐ MN Protocol ☐ WI Protocol ☐ EPA M-6 or 8 ☐ Acid Gases ☒ Formaldehyde ☐ Metals ☒ Other Method 0011	
3	Integrated Gas sample	☐ As per EPA M-3 ☒ As per EPA M-10 ☐ Other	CO only
	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other	Date Time (HRS)
	☐ Fuel Sample ☐ Aggregate	☐ Attached fuel Form #S-0163RRR	
	Particle Size	☐ X-Ray Sedigraph ☐ Bahco Method ☐ Other	
	Audit Samples ☐ Sulfur Dioxide ☐ Oxides of Nit. ☐ Other	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other	

Source Information

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

S-278RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job L.T.P. / Two Harbors
Team Leader D'H
Date Submitted 2/14/92
Test No. 9

Source KOHUS
Test Site STACK
Date of Test 2/12/92
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
	Probe Wash: ☐Acetone ☐D.I. Water	☐As per EPA M-5 ☐Other _____	
	Filter: ☐4" G.F. ☐S.S. Thimble ☐2.5" G.F. ☐47 mm G.F.	☐As per EPA M-5 ☐As per EPA M-17 ☐Other _____	
3	Impinger Catch: ☐D.I. Water ☐3% H_2O_2 ☐4M5 Hg Only ☐4M5 Metals ☐1.0 N NaOH ☒Other DNPH	☐MN Protocol ☐WI Protocol ☐EPA M-6 or 8 ☐Acid Gases ☒Formaldehyde ☐Metals ☒Other 0011 Method	
3	Integrated Gas sample	☒As per EPA M-3 ☐As per EPA M-10 ☐Other _____	
	Oxides of Nitrogen (NO_x)	☐As per EPA M-7A ☐Other _____	Date _____ Time (HRS) _____
	☐ Fuel Sample ☐ Aggregate	☐Attached fuel Form #S-0163RRR	
	Particle Size	☐X-Ray Sedigraph ☐Bahco Method ☐Other _____	
	Audit Samples ☐Sulfur Dioxide ☐Oxides of Nit. ☐Other _____	☐As per EPA M-6 ☐As per EPA M-7A ☐Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☒ Dryer ☒ Other Oil Heat
2) Fuel: ☐ Coal ☒ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain _____

S-278RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job L.P. / Two Harbors
Team Leader DUH
Date Submitted 2/14/92
Test No. 10

Source Konus
Test Site Stack
Date of Test 2/12/92
No. of Runs Completed 3

No. of Samples	Type of Sample	Analysis Required	Comments
3	Probe Wash: ☒ Acetone ☐ D.I. Water	☒ As per EPA M-5 ☐ Other _____	
3	Filter: ☒ 4" G.F. ☐ S.S. Thimble ☐ 2.5" G.F. ☐ 47 mm G.F.	☒ As per EPA M-5 ☐ As per EPA M-17 ☐ Other _____	
3	Impinger Catch: ☒ D.I. Water ☐ 3% H_2O_2 ☐ 4M5 Hg Only ☐ 4M5 Metals ☐ 1.0 N NaOH ☐ Other _____	☐ MN Protocol ☐ WI Protocol ☐ EPA M-6 or 8 ☐ Acid Gases ☐ Formaldehyde ☐ Metals ☒ Other MECl2 Extraction	
3	Integrated Gas sample	☒ As per EPA M-3 ☒ As per EPA M-10 ☐ Other _____	CO A/S
	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	Date _____ Time (HRS) _____
	☐ Fuel Sample ☐ Aggregate	☐ Attached fuel Form #S-0163RRR	
	Particle Size	☐ X-Ray Sedigraph ☐ Bahco Method ☐ Other _____	
	Audit Samples ☐ Sulfur Dioxide ☐ Oxides of Nit. ☐ Other _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other _____
2) Fuel: ☐ Coal ☒ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain _____

S-278RRRR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job LP / Two Harbors
Team Leader E Tauriello
Date Submitted 2-13-92
Test No. #2

Source Kiln
Test Site Stack
Date of Test 2-13-92
No. of Runs Completed 3

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

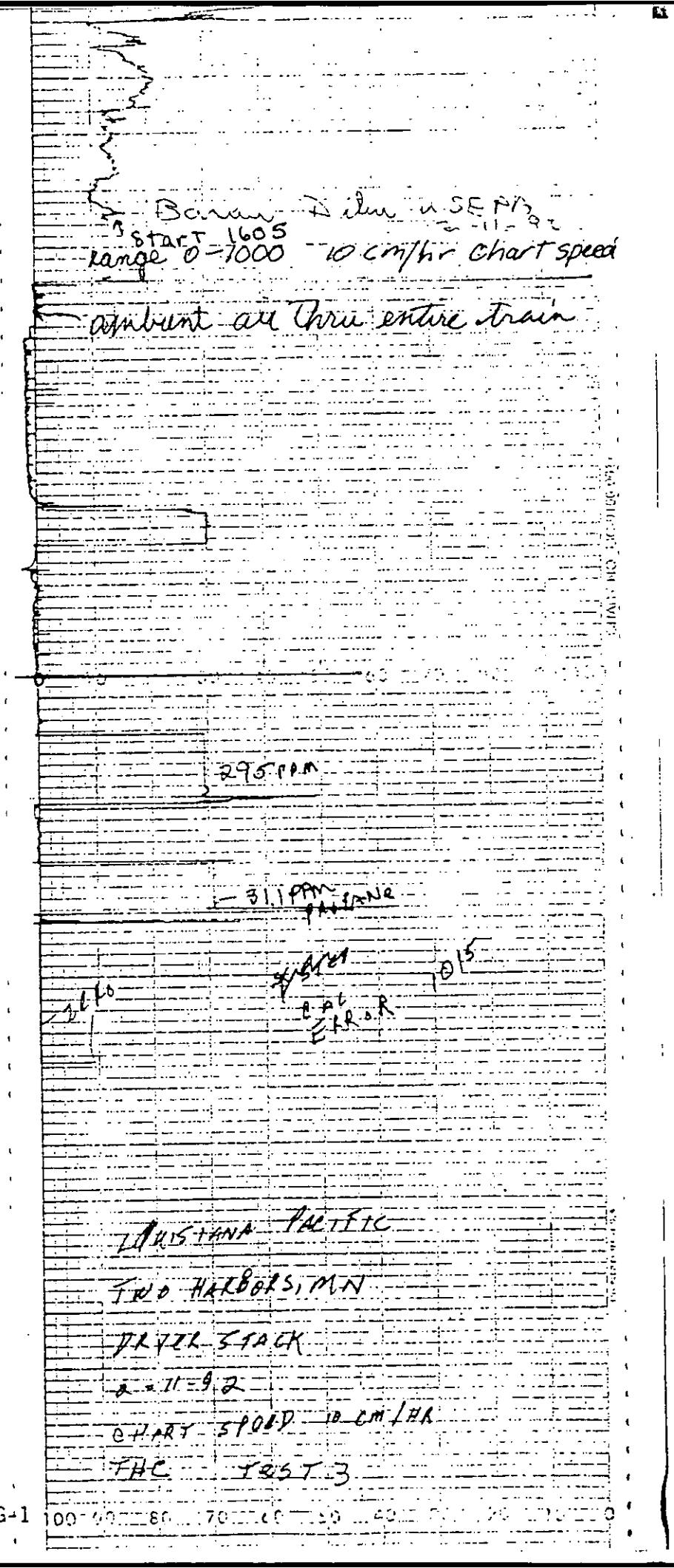
Source Information

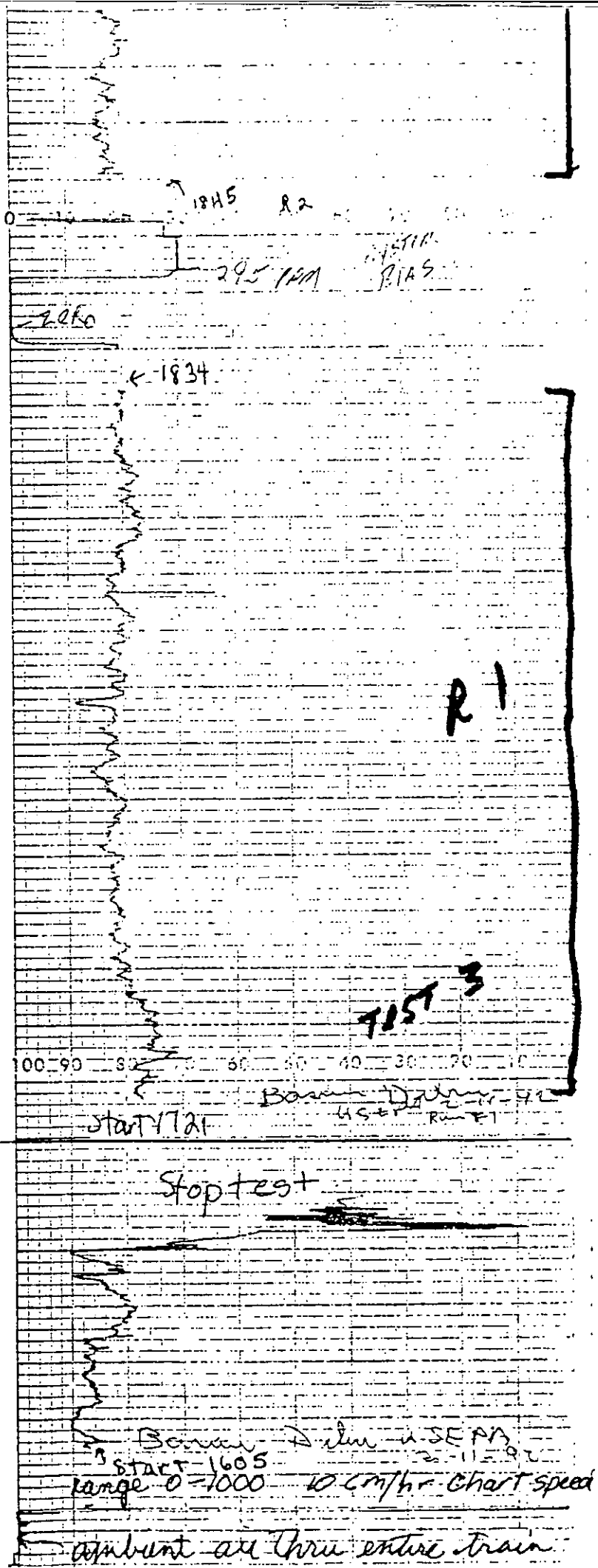
1) Type of Source: ☒ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☐ Other _____
2) Fuel: ☐ Coal ☐ Wood ☐ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☐ No ☐ Yes
4) Does sample need special handling? ☐ No ☐ Yes If yes, explain _____

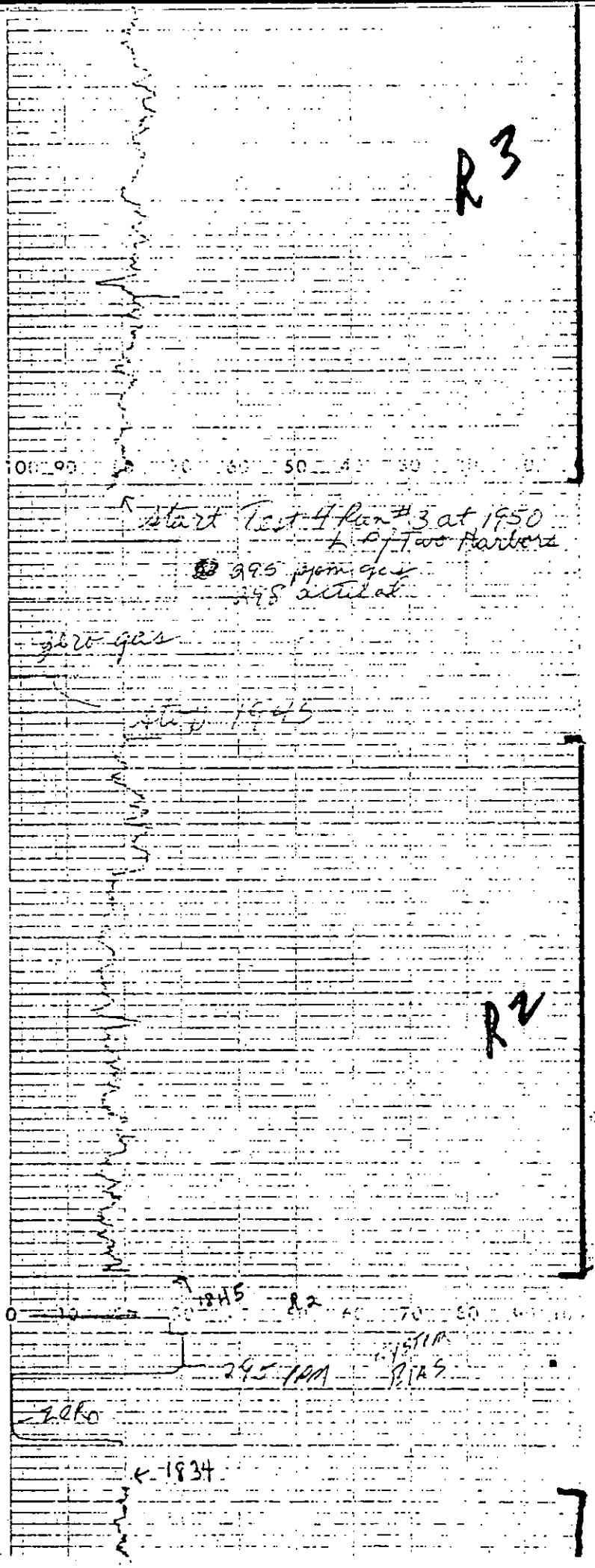
S-278RRRR

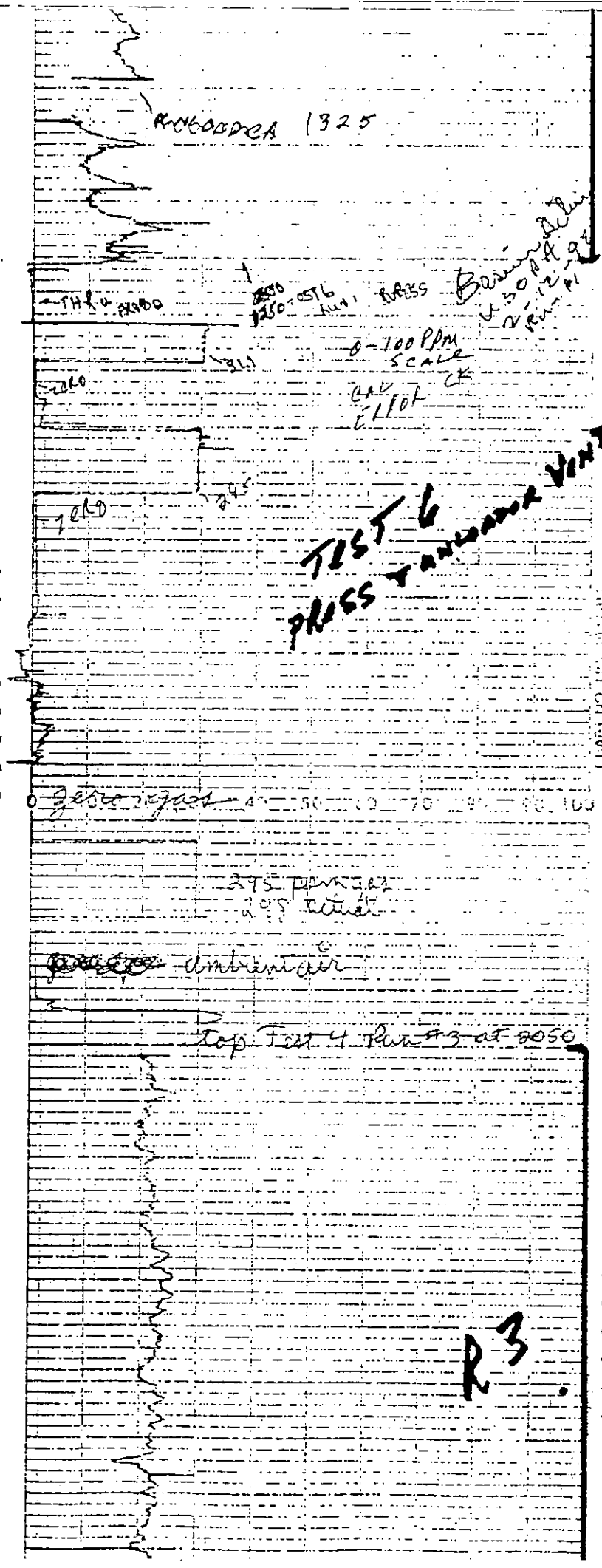
APPENDIX G

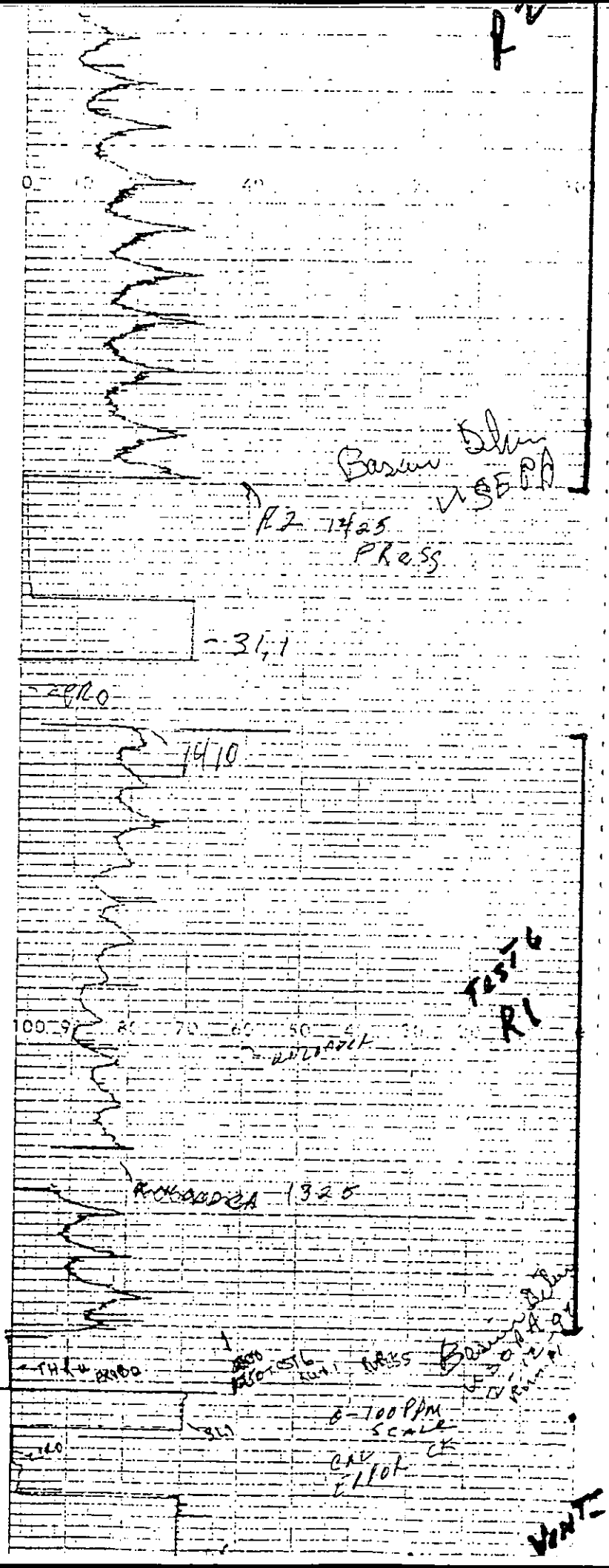
TOTAL HYDROCARBONS STRIPCHART


Start 1605
range 0-1000 10 cm/hr chart speed
295 rpm
311 PPM RANGE
LAT ERROR
LOUISIANA PACIFIC
TWO HARBORS, MN
DRYER STACK
9-11-92
CHART SPEED 10 CM/HR
FHC TEST 3

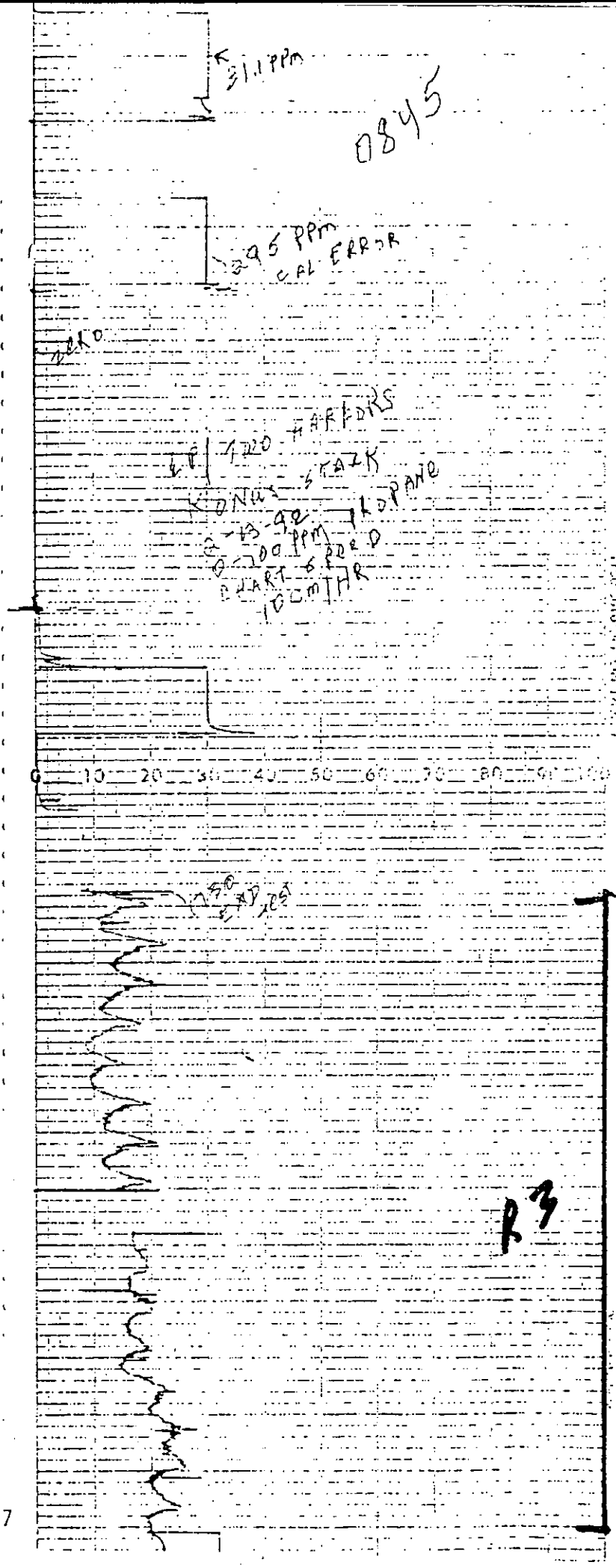

1845 R2
0
295 ppm
BIAS
zero
1834
R1
415
100 90 80 60 50 40 30 20 10
Start 1721
Stop test
Start 1605
range 0-1000
10 cm/hr chart speed
ambient air thru entire train

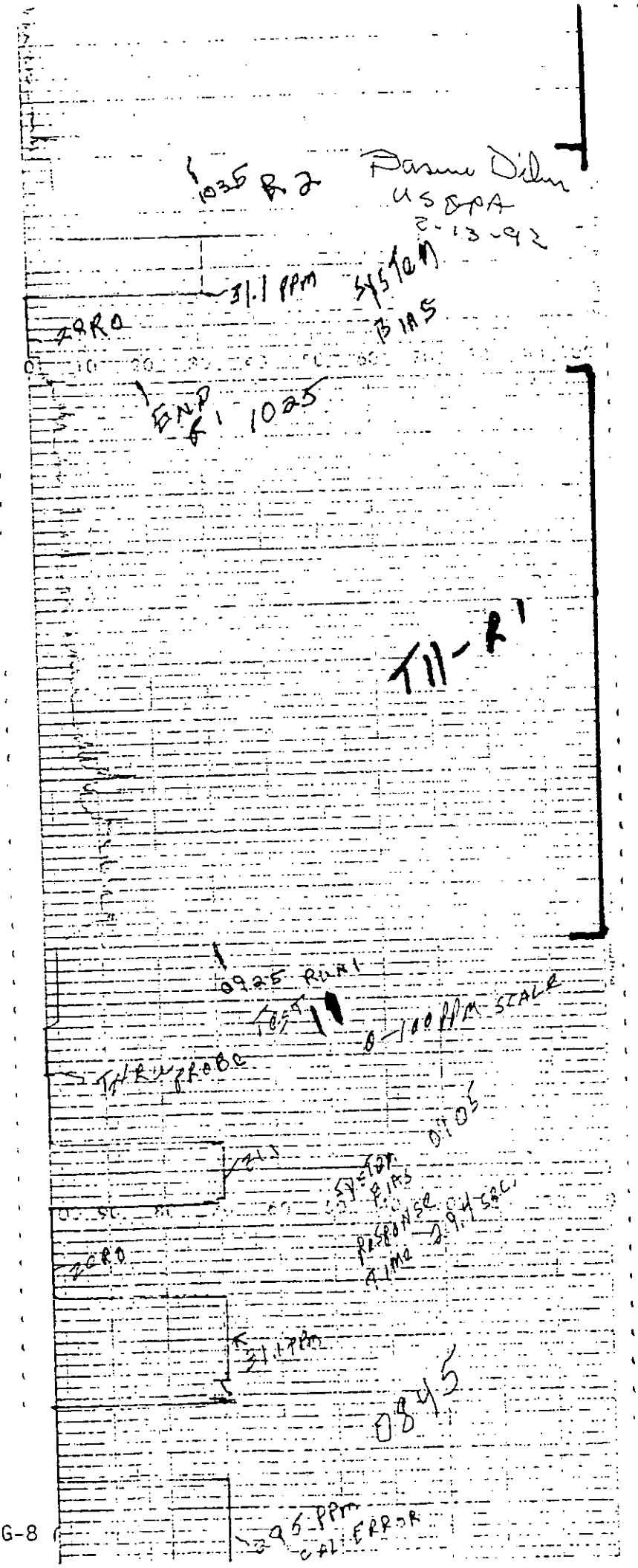

R3
start Test 4 Run #3 at 1950
995 ppm ppm gas
995 actual
zero gas
R2
1845
R2
245 ppm
1834

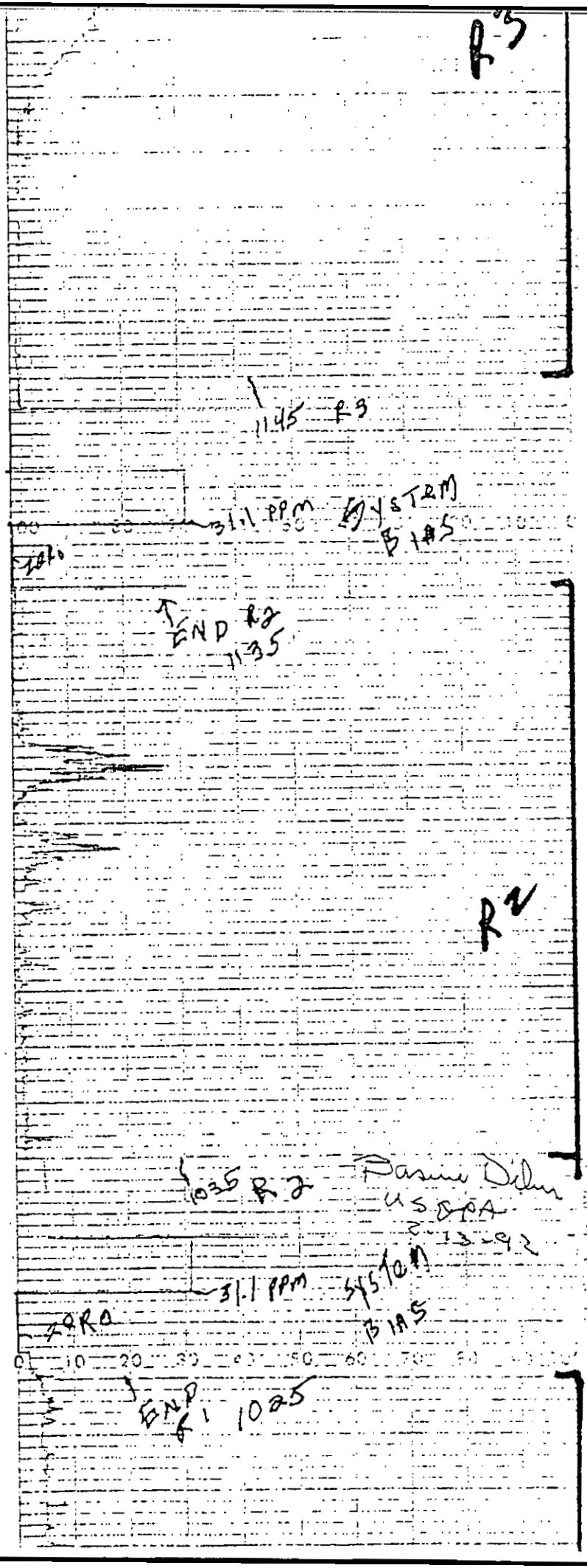

RECORDER 1325
TEST 6
PRESSURIZED VENT-
R3

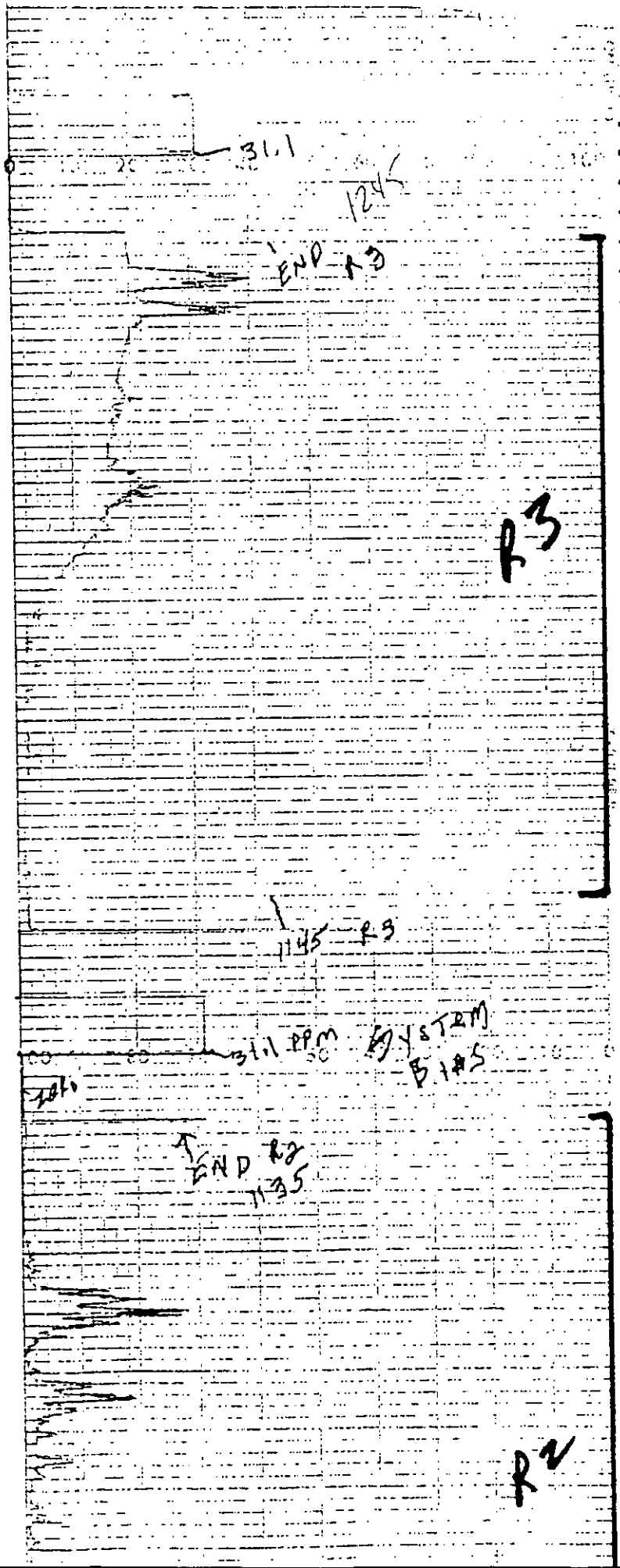

Basin
USEPA
R2 1425
PRESS
-31.1
zero
1410
R1
1325
0-100 PPM
scale
CK

R3
160
100
41.1
1600
R2
R2


31.1 PPM
0845
2.95 PPM
CAL ERROR
ZERO
AIR PEAKS
1220
METHANE
STACK
2.95 PPM
0.00 PPM
CHART SPEED
10 CM/HR
0 10 20 30 40 50 60 70 80 90 100
R3


1035 R 2
Dawn Dilon
USEPA
2-13-92
31.1 ppm
SYSTEM
BIAS
ZERO
END @ 1025
T11-R1
0925 RUN 1
0-100 PPM SCALE
TUBE PROBE
0105
ZERO
0945
96 PPM
CAL ERROR


R-5
1145 R-5
31.1 PPM
SYSTEM
BIAS
END R2
1135
R2
1035 R2
Pasmi Dilu
USDA
2-13-92
31.1 PPM
SYSTEM
BIAS
END R2 1025


31.1
124
END R3
R3
1145 R3
31.1 PPM SYSTEM
B1#5
END R2
1135
R2

APPENDIX H

THC ANALYZER SPECIFICATIONS

Ratfisch INSTRUMENTE

TOTAL HYDROCARBON ANALYZER (FLAME IONIZATIC
Model RS 55

TECHNICAL DATES

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

MODEL: X Manual switching
__ Solenoid valves
HOUSING: __ Case, __ 19"-Rack
MEASURING RANGES:

1 = 0 -	10	C_1
2 = 0 -	100	C_1
3 = 0 -	1,000	C_1
4 = 0 -	10,000	C_1

SPECIAL OPTIONS:

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

ANALYZER CONDITIONS:

Temperature : 160 °C

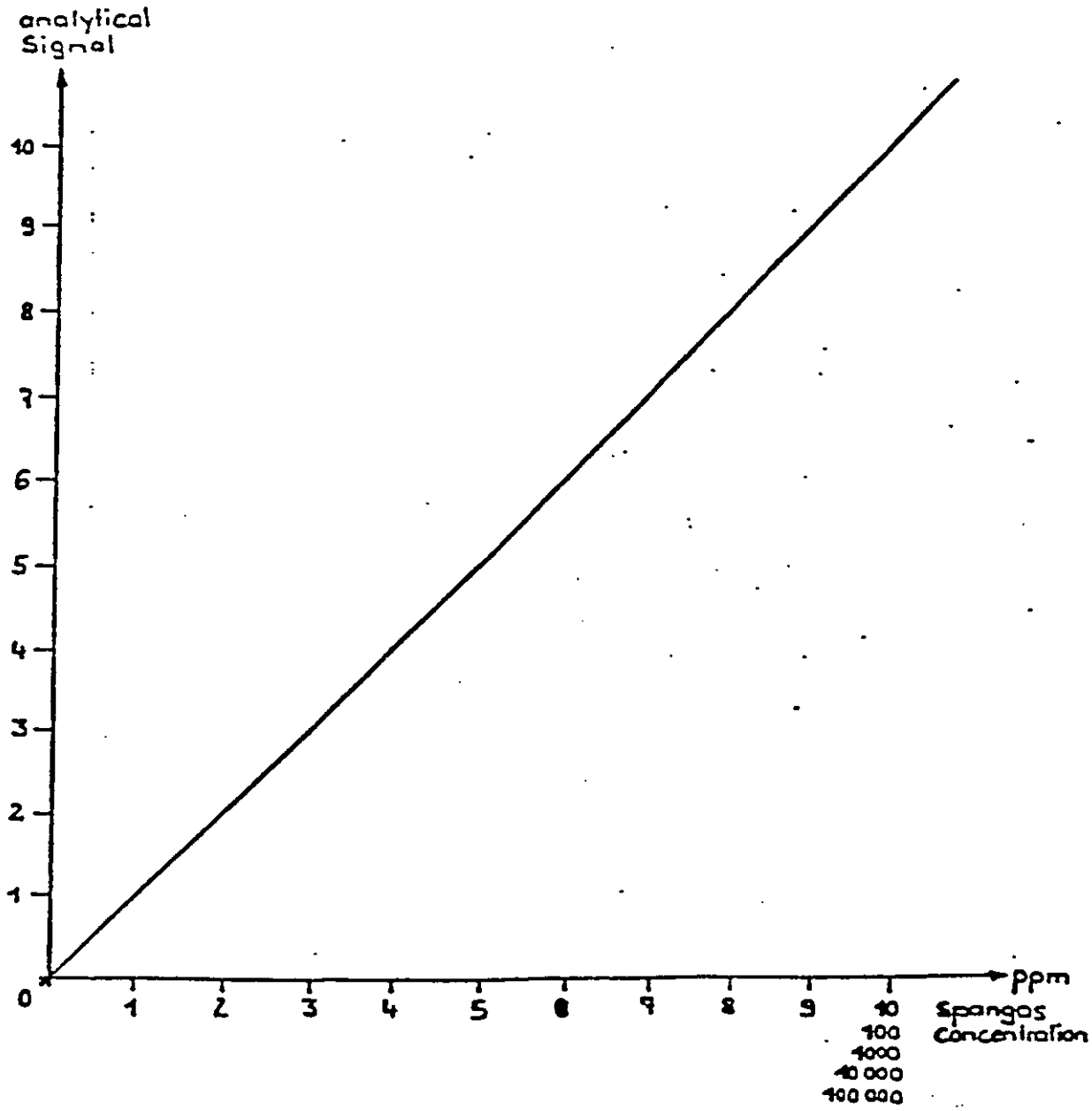
Zero Point : 3,90
Gain : 7,70

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

Span Gases : 300 ppm C_1
24.000 ppm C_1

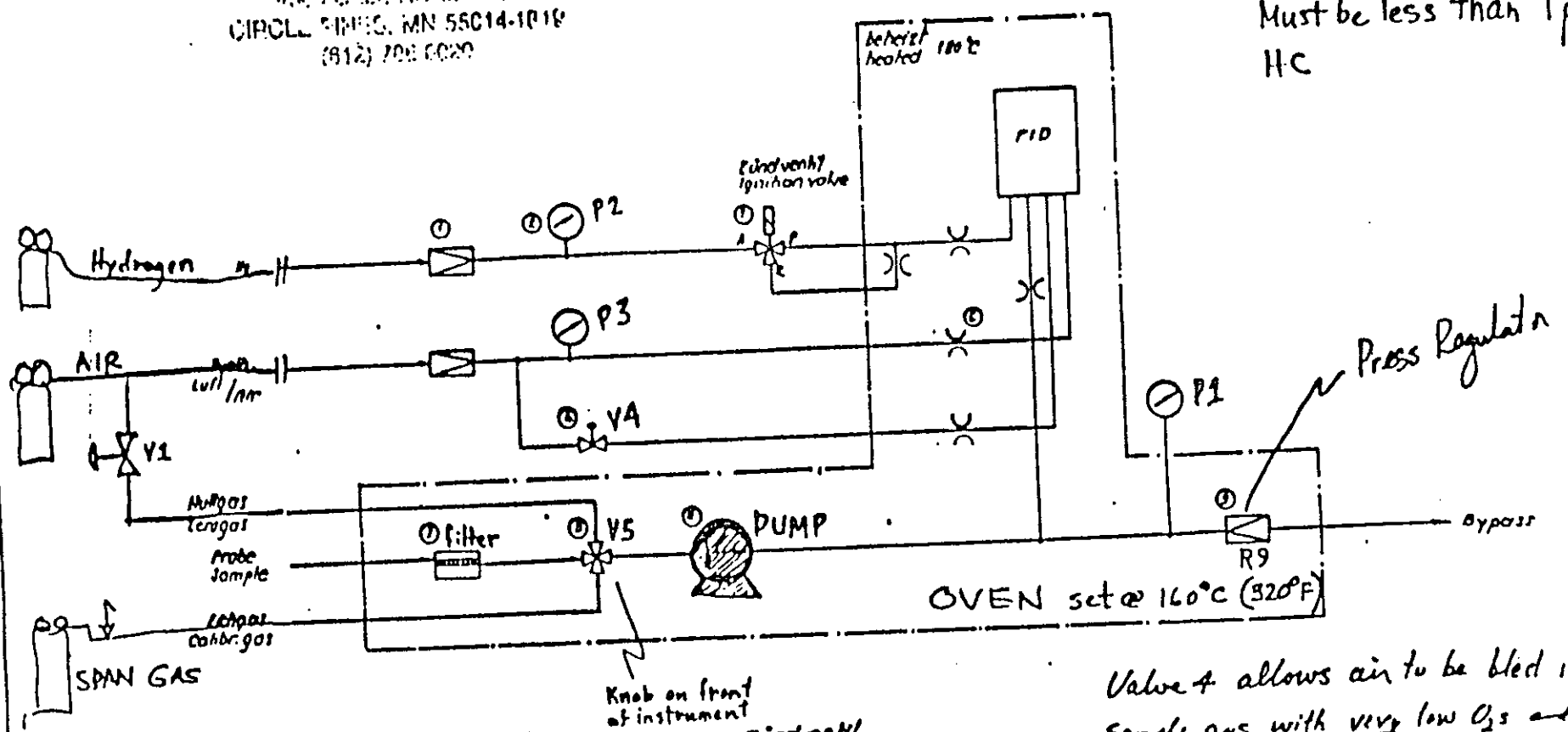
INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MN 55014-1819
(612) 786-6020

CALIBRATION DIAGRAMM



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

Hydrogen & Air
Must be less than 1 ppm
H·C



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

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

Zündventil Ignition valve

R-A angelegen energised
R-A at rest

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

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

Handumschaltung
Manual switching

Ratfisch INSTRUMENTS

FLAMMEN. IONISATIONS DETEKTOR
Flame Ionisation Detector

FlieBplan
Flowdiagram

RS 55
13.04.88

H-3

Range 4 = 10,000

APPENDIX I

MEASUREMENT SYSTEMS PERFORMANCE SPECIFICATIONS

EPA Method 25A
Calibration Error Check & Drift Determination

Job LP-Two Harbors (Dryer)

Test 4 Run ____ Date 2-11-92
Operator ET-DVH

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

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	100	0
Low level	21.1	31	.1	100	.1
Mid level	295	300	5	1000	.5
High level					

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

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

O_2 Calibration: Time(HRS) ____

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

CO_2 Calibration: Time(HRS) ____

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

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

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

Job I-P/TWIO HARBORS

Test 4 Run ____ Date 2-11-92
Operator E Tomlinson

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

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	100	0
Low level	31.1	30	1.1	100	1.1
Mid level	295	300	5	1000	.5
High level	3000			10,000	

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

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	1000	0
Span	295	300	5	1000	.5

O_2 Calibration: Time(HRS) ____

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

CO_2 Calibration: Time(HRS) ____

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

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

INTERPOLL LABORATORIES
(612) 786-6020

[illegible] System Bias Check

Job [illegible] Source Dryer Stack
Test 2 Run 1 Date 2-11-92 Site
Operator DAH PET

Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Resp (ppm)		Diff. CE-SB (ppm)	Span Val (PPM)	% of span
				Cal Err	Sys Bias			
1		Zero gas	0	0	0	0	1000	0
		Upscale	295.0	300	300	5	1000	.5
2	1840	Zero gas	0	0	0	0	1000	0
		Upscale	295.0	295	300	5	1000	.5
3	1945	Zero gas	0	0	0	0	1000	0
		Upscale	295	300	298	2	1000	.2
4	2050	Zero gas	0	0	0	0	1000	.0
		Upscale	295	300	298	2	1000	.2
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

INTERPOLL LABORATORIES
(612) 786-6020

THC System Bias Check

Job LP / TWO HACKBERS Source PROCESS EXHAUST DUCT
Test 6 Run 1,2,3 Date 2-12-92 Site VENT
Operator ET

Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Resp (ppm)		Diff. CE-SB (ppm)	Span Val (PPM)	% of span
				Cal Err	Sys Bias			
1	1200	Zero gas	0		.2	.2	100	.2
		Upscale	31.1		30.5	.6	100	.6
2	1411	Zero gas	0		0	0	100	0
		Upscale	31.1		30.5	.6	100	.6
3	1602	Zero gas	0		0	0	100	0
		Upscale	31.1		30.0	1.1	100	1.1
4	1752	Zero gas	0		0	0	100	0
		Upscale	31.1		30.5	.6	100	.6
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

EPA Method 25A

Calibration Error Check & Drift Determination

Job LP/TWO HARBORS

Test 6 Run ____ Date 2-12-92

Operator EWT

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

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0.2	100	0.2
Low level	31.1	30.5	0.6	100	.6
Mid level	295	298	3	1000	.3
High level					

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

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

O_2 Calibration: Time(HRS) ____

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

CO_2 Calibration: Time(HRS) ____

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

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

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

Job LP / Two Harbors

Test 1A Run 1 Date 2-13-92
Operator E Trumbold

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

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	100	0
Low level	31.1		30	100	
Mid level	295	300	5	1000	.5
High level					

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

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

O_2 Calibration: Time(HRS) _____

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

CO_2 Calibration: Time(HRS) _____

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

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

INTERPOLL LABORATORIES
(612) 786-6020

THC System Bias Check

Job LP/TWO HARBORS Source KOPPERS
Test THC Run 1203 Date 2-13-92 Site STACK
Operator [illegible]

Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Resp (ppm) Cal Err	Sys Bias	Diff. CE-SB (ppm)	Span Val (PPM)	% of span
1	0905	Zero gas	0	0	0	0	100	0
		Upscale	31.1	30.5	30.5	.6	100	.6
2	1027	Zero gas	0		0	0	100	0
		Upscale	31.1		31	.1	100	.1
3	1137	Zero gas	0		0	0	100	0
		Upscale	31.1		31	.1	100	.1
4	1250	Zero gas	0		0	0	100	0
		Upscale	31.1		31	.0	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

APPENDIX J

CALIBRATION GAS CERTIFICATION SHEETS

GS# 150

LINDE

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

DATE : FEBRUARY 7, 1990

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

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

DEAR SIR/MADAM:

THIS IS YOUR CERTIFICATE OF ANALYSIS FOR:

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

RECEIVED
FEB 15 1990
INTERPOLL LABORATORIES

Dale A. Kuglin
APPROVED BY

COA-GMP

GS# 148

LINDE

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

DATE : FEBRUARY 7, 1990

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

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

DEAR SIR/MADAM:

THIS IS YOUR CERTIFICATE OF ANALYSIS FOR:

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

RECEIVED
FEB 15 1990
INTERPOLL LABORATORIES

Dale A. Kugler
APPROVED BY

COA-6MP

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Shipped From : Scott Michigan

Our Project # : 528651

Your P.O. # : 4571-SA

Expiration Date : 4-16-93

Cylinder Number : ALM-001720

Cylinder Pressure 1900 psig

Customer :
OXYGEN SERVICE
111 PIERCE BUTLER ROUTE
ST. PAUL, MN. 55104

CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES

PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Procedure # G1
Protocol # 1

File # PO-1356

Certified Accuracy 1 % NBS Traceable

ANALYZED CYLINDER

COMPONENT	CERTIFIED CONC.
PROPANE	31.10 PPM

BALANCE GAS : AIR

REFERENCE STD

SRM # (CRM #)	CYLINDER NUMBER	CONC.
1668B	CLM-000694	95.30 PPM
GMIS#	ALM-008846	31.20 PPM

INSTRUMENTATION

INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
BECKMAN 400 1002039	9-25-91	FLAME IONIZATION DETECTOR

EPA

ANALYSIS

DATE : 10-16-91

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	31.40	31.10	95.30 PPM	95.30	95.30
0.00	31.40	31.10		95.30	95.30
0.00	31.40	31.10		95.30	95.30
	CALCULATED RESULTS	31.10			
		31.10			
		31.10			
	AVERAGE :	31.10 PPM			

CALIBRATION CURVE 2 nd DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
1668B	95.30	100	95.30	95.30	-0.00
	31.20	33	31.60	31.30	0.32
	22.61	24	22.70	22.45	-0.72
	8.171	9	8.30	8.171	0.00
	0.0000	0	0.00	0.0000	0.00
		0		0.0000	0.00
		0		0.00	0.00
GMIS	8.171	LOW	8.30	8.171	0.00
1668B	95.30	HIGH	95.30	95.30	-0.00

J-3

GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : L P Doan

Approved By : L Shapiro

APPENDIX K

PROCESS RATE INFORMATION

TWO HARBORS TESTING FEB 11-13, 1992

PROCESS DATA, CONTENTS

1

TWO HARBORS STACK TESTING 2-11 — 2-13, 1992

TEST SCHEDULE

DRYER TESTING FEB 11, 1992

TEST NO	DATE	ITEM	RUN #1	RUN #2	RUN #3
1	2-11	HCHO	1045-1147	1305-1407	1450-1553
2	2-11	PM	1045-1147	1305-1408	1450-1552
3	2-11	PM-10	1633-2003	2036-2242	2350-0130
4	2-11	VOC	1721-1834	1845-1945	1950-2050

PRESS VENTS FEB 12 & 13, 1992

5	2-12	PM-10	1128-1232 1304-1322	1342-1450 1523-1540	1602-1708 1732-1750
6	2-12	VOC	1250-1410	1425-1600	1610-1730
7	2-13	PM	0820-0928	1030-1137	1210-1319
8	2-13	HCHO	1355-1406	1540-1650	1703-1810

THERMAL OIL HEATER FEB 12 & 13, 1992

9	2-12	HCHO	1031-1133	1221-1323	1400-1502
10	2-12	PM	1600-1700	1731-1833	1937-2040
8	2-13	PM-10	1300-1426	1455-1615	1640-1800
11	2-13	VOC	0925-1025	1035-1135	1145-1245

7a. THERMAL OIL HEATER OPERATING DATA:

7a1. Design heat input is 31mm BTU. Operating heat input to be based on f factor. Heat output to be determined by efficiency calculations. SEE ATTACHED

7a2. Type of fuel to be used is 100% green bark and green wood fines.

7a3. ACFM of air through the Thermal Oil Heater will be provided. SEE ATTACHED

7a4. Tons of dry fuel burned during testing will be determined by bark infeed counts and moisture content and auger calibration. SEE ATTACHED

7a5. Plant production rate is tons of finished product per hour as described in 7c10. SEE ATTACHED

7a6. Thermal Oil Heater operating parameters including:
- Refractory temperature
- Incoming oil temperature
- Outgoing oil temperature
- Fuel feed setting
- Pond heat set point, building heat setpoint and thermal oil temperature setpoint.

7a7. Control equipment parameters to be recorded include:
- Baghouse pressure drop

7b. DRYER OPERATING DATA:

7b1. Moisture content of wet wafers. SEE ATTACHED
Moisture content of dry wafers.

7b2. Wood to be processed will be $\geq$ 99% green wood, $\leq$ 1% dried, dead wood.

7b3. Wood to be processed will be $\geq$ 99% hardwood, $\leq$ 1% softwood.

7b4. Dryer operating temperature to be recorded:
- Burner outlet temperature is not monitored or recorded.
- Inlet temperature, and operating.
- Outlet temperature, operating and setpoint.

7b5. Design airflow rate is 50,000 acfm, actual airflow will be determined during sampling.

7b6. Type of fuel to be burned is dry fines. Waste oil is not burned in the drying process. The percent of reacted (solid, not liquid) resin burned will be determined by percent of resin in finished product and percent of trim material in dry fuel. SEE ATTACHED

7b7. The heat content of the dry fuel will be determined by analysis.

7b8. The dryer is 12' diameter and 60' long. Actual and design revolutions per minute will be recorded. 8.5 RPM

7b9. Dryer production rate in pounds of dry furnish per hour based on press production plus screened fines and board trim using the following formula:

$$\frac{\text{lb. Dryer Production}}{\text{HR}} = \frac{\text{Tons press production/hr.}}{1 - (0.7 \div 0.08)} / 2000$$

Where: Board Trim = 7% of finished product weight
screened fines = ~~8~~ 13% of finished product weight

Design rate is 29,100 lb. dry furnish/hr.
Test rate is 27,000 lb. dry furnish/hr.
ACTUAL TEST RATE = 27,559 lb/hr

BINS = 87"H 106"W 42'L

7b10. The level of the dry fines (in feet) will be recorded before and after testing and bin dimensions will be supplied.
BINS WERE AT 1/2 (21 FEET) BEFORE + AFTER TESTING

7b11. Plant production rate in tons of finished product per hour based on press production. See 7c10.
11.02 TONS FINISHED PRODUCT/HR

7b12. Additional dryer operating parameters to be recorded include
- Wet bin feed rate

7b13. EFB operating parameters to be recorded include:
- Bed voltage
- Bed amperage
- Ionizer voltage
- Ionizer amperage
- EFB pressure drop

7c. PRESS OPERATING DATA:

7c1. Board thickness. 7/16"

7c2. Number of sheets produced per hour to be determined by press chart. SEE ATTACHED

7c3. Pounds of resin used per hour to be recorded. SEE ATTACHED

7c4. Pounds of wax used per hour to be recorded. SEE ATTACHED

7c5. Type of resin used to be recorded. MDI

7c6. Press temperature to be recorded. 400°F

7c7. Press vent hooding to be verified. SEE ATTACHED

7c8. There are two exhaust fans.

7c9. Design airflow is 36,800 acfm each. Actual acfm will be determined during sampling.

7c10. Tons of finished product produced during test will be determined by board weights and press charts.

8. Copies of field data forms are included in attachment.

9. The names and titles of personnel are not available at this time. Testing will be performed by Interpoll Laboratories, Inc.

10. Procedures for maintaining sample integrity and chain of custody are provided in the attachments. Interpoll Laboratories QA-QC manual will be followed. Due to the size of this document, it has not been included here but can be provided on request.

11. Calibration sheets will be provided prior to testing.

12. Filter lists will be provided prior to testing.

TWC HARBORS TESTING FEB 11-13, 1992

PROCESS DATA SUMMARY

DRYER TESTING 2-11-92 1030-0130

PLANT PRODUCTION RATE 11.02 TONS FINISHED PRODUCT/HR

DRY FUEL INPUT (BY AUGER COUNTS) = 4832 lb/HR, 2.4 TONS/HR

FURNISH PRODUCED BY DRYER = 27,559 lb/HR

AVERAGE INLET = 1457°F

WOOD MOISTURE 51.0% IN 5.5% OUT

PRESS VENT TESTING	2-12-92	2-13-92
PLANT PRODUCTION RATE TONS FINISHED PROD./HR	11.04 TFP/HR	10.62 TFP/HR
MDI RESIN USAGE	745 lb HR 3.4%	749 lb/HR 3.5%
WAX USAGE	191 lb HR 0.87%	159 lb/HR 0.75%

KONUS TESTING	2-12-92	2-13-92
PLANT PRODUCTION RATE TONS FINISHED PROD./HR	11.04 TFP/HR	10.62 TFP/HR
DRY FUEL INPUT (BY AUGER COUNTS)	1.09 TONS/HR	1.18 TONS/HR

TWO HARBORS DRYER TESTING 2-11-92

BOARD WEIGHTS - LBS

WEIGHTS OF APPROX EVERY 50 th UNTRIMMED BOARD FROM TAPES 1030 - 0130

198	198	204	206
200	203	204	202
195	201	200	196
198	209	204	201
203	209	203	198
209	205	200	
208	195	203	
206	197	203	
204	205	211	
199	205	204	

AVERAGE UNTRIMMED MAT WEIGHT = 202.0 lb

TRIMMED BOARD (7% TRIM) = 202.0 x 0.93 = 187.9 LB PER FINISHED BOARD

PRODUCTION RATE

PRESSLOADS FROM 1030 - 0130 = 220

BOARDS (8'x16') PRODUCED = 220 x 8 = 1,760

LBS FINISHED PRODUCT = 1760 x 187.9 = 330,704 lb

LBS F.P. PRODUCED PER HOUR = 330704 ÷ 15 HRS = 22,047 lb F.P/HR

TONS F.P. PER HOUR 22,047 lb / 2000 lb = 11.02 TONS FINISHED PRODUCT PER HOUR

TWO HARBORS DRYER TESTING 2-11-92

DRYER PRODUCTION RATE

$$\text{lb DRYER PRODUCTION/HR} = \text{lb FINISHED PRODUCT} \Big/ 1-(\%\ \text{TRIM} + \%\ \text{FINES})$$

DETERMINATION OF FINES %:

DRYER FUEL = BOARD TRIM + SIDING TRIM + FINES

$$4832\ \text{lb/HR}_{\text{DRYER FUEL}} = 7\%\ \text{F.P.} + 2\%\ \text{EP} + \text{FINES}$$

$$4832\ \text{lb} = (0.07 \times 22047) + (0.02 \times 22047) + \text{FINES}$$

$$4832\ \text{lb} = 1984\ \text{lb} + \text{FINES}$$

$$2848\ \text{lb} = \text{FINES}$$

$$2848\ \text{lb} / 22047\ \text{lb} = 13\%\ \text{OF FINAL PRODUCT} = \text{FINES}$$

$\therefore$ lb DRYER PRODUCTION =

$$\frac{22047\ \text{lb F.P.}}{1-(0.07+0.13)} = 27,559\ \text{lb}$$

TWO HARBORS DRYER TESTING 2-11-92

FUEL BURNING RATE

FUEL BURNED FROM 1030-0115, 14.75 HRS

(10430 COUNTS - 2012 COUNTS) + 6009 COUNTS = 14,427 COUNTS TOTAL

FUEL CALIBRATION = 4.94 lb PER COUNT

TOTAL FUEL BURNED = 14,427 CTS x 4.94 lb = 71,269 lbs

71,269 lb / 14.75 HRS = 4832 lb/HR

ESTIMATED BTU INPUT =

4832 lb DRY FUEL x 8494 BTU/LB = 40.8 MM BTU/HR

RESIN BURNED

RESIN USED = 16,075 lb FOR 309 PRESSLOADS
= 16,075 ÷ 309 = 52.0 lb / PRESSLOAD
PRESSLOAD = 8 BOARDS x 187.9 lb = 1503 lb
RESIN % = 52 lb ÷ 1503 lb = 3.5%

FUEL = 1984 lb/HR TRIM + 2848 lb/HR FINES
= 41% FROM TRIM + 59% FROM FINES

% OF MDI IN TRIM = 3.5%

RESIN BURNED = 4832 lb/HR TOTAL FUEL x 0.41 (% FROM TRIM) x 0.035 (% RESIN IN TRIM) = 69 lb MDI BURNED PER HOUR

* BASED ON 1990 FUEL ANALYSIS
TO BE VERIFIED BY 1992 ANALYSIS

DRYER DATA SHEET

DATE: 2-11-92

BY: Dryer Operator 1S

PLANT: TWO HARBORS

OUTLET TEMP SET POINT: 257°F

REVOLUTIONS per MINUTE: 8.5

FUEL CALIBRATION: 4.99 lb/ct.

1. READINGS EVERY ~~10~~ MINUTES.
2. MOISTURE % EVERY HOUR.
3. BIN LEVEL EVERY HOUR.
4. NOTE ANY CHANGES IN SETPOINTS.

TIME	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	1/HR FLAKE MOISTURE IN	1/HR FLAKE MOISTURE OUT	DRY BIN LEVEL	FUEL
1006	90	1476	250			1/2 1/2	1646
1015	90	1445	253	49			
1030	92	1474	254				2012
1045	92	1435	252		5.2	100. 3/4	2272
11 00	93	1407	255			3/4 3/4	2460
11:15	93	1532	257	50.9		3/4 3/4	2749
11 30	93	1432	255		4.7	4/4 3/4	3011
1145	93	1410	255		~~6.8~~	4/4 3/4	3280
12:00	93	11:15?	260		~~6.0~~	3/4 3/4	3527
12:15	93	1548	255	45.2	~~6.6~~ (2)	3/4 3/4	—
12:30	93	1504	255		6.8	4/4 3/4	4011
1245	95	1493	258			4/4 3/4	4232
1300 PM	94	1545	255			3/4 3/4	4509
1315	94	1581	259	49.0		3/4 4/4	4762
1330	93	1624	257		5.5	3/4 3/4	5040
1345	93	1529	255			4/4 4/4	~~5517~~ 5294
1400	93	1537	255			~~4/4~~ 4/4 4/4	~~5517~~ 5517
1415	93	1564	257	52.2		4/4 4/4	5934
1430	93	1432	256		5.0	4/4 4/4	~~6317~~
1445	93	1478	253			4/4 4/4	6317
1500	93	1411	253			4/4 4/4	6532
1515	93	1478	256	48.4		4/4 4/4	6772
1530	88	1280	256		5.0	4/4 4/4	7013
1545	90	1268	252			3/4 3/4	7263
1600	90	1421	254			4/4 3/4	7446
1615	90	1457	256	52.4		3/4 3/4	7718
1630	90	1564	255		5.0	3/4 3/4	7970
1645	90	1468	257			3/4 3/4	8221
1700	90	1541	258				8470

FILE: 123\WGEN-DRY1.WK1 K-10

9

DRYER DATA SHEET

DATE: 2-11-92

BY: Ryan Cronin

PLANT: Two Harbors

OUTLET TEMP SET POINT: 257°

REVOLUTIONS per MINUTE: 8.5

FUEL CALIBRATION: 4.94 lb/ct.

15

1. READINGS EVERY ~~10~~ MINUTES.
2. MOISTURE % EVERY HOUR.
3. BIN LEVEL EVERY ~~HOUR~~ 15
4. NOTE ANY CHANGES IN SETPOINTS.

TIME	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FLAKE MOISTURE IN	FLAKE MOISTURE OUT	DRY BIN LEVELS		FUEL
1715	90	1545	260	51.4		3/4	3/4	8742
1730	90	1497	259		5.6	3/4	3/4	8999
1745	90	1442	259			3/4	1/2	9236
1900	88	1434	259			3/4	3/4	9465
1815	88	1452	257	51.3		3/4	3/4	9738
1830	84	1435	257		5.7	3/4	1/2	9954
1845	88	1441	257			1/2	1/2	10199
1900	88	1425	257		—	3/4	1/2	10480 RESET
1915	88	1471	260	53.2	—	3/4	1/2	219
1930	88	1415	259	—	4.0	3/4	3/4	547
2000	90	1436	260	—	6.0	3/4	3/4	1000
2030	90	1472	257	45.8	—	1/2	3/4	1477
2045	90	1458	257	—	—	1/2	1/2	1718
2100	90	1412	257	—	9.4	1/2	1/2	1954
2100	90	1436	256	—	—	1/2	1/2	297
2130	90	1334	257	52.	—	1/2	1/2	2432
2145	90	1304	257	—	—	1/2	1/2	2683
2200	90	1315	257	—	4.0	1/2	1/2	2567
2215	90	1325	257	—	—	1/2	1/2	3082
2230	90	1383	257	—	—	1/2	1/2	3344
2245	90	1407	257	—	—	1/2	1/2	3564
2300	90	1455	257	—	5.4	1/2	1/4	3788
2315	90	1439	257	—	—	1/2	1/4	4053
2330	90	1443	257	54.6	—	1/4	1/4	4286
2345	90	1455	257	—	—	1/4	1/4	4541
000	90	1526	257	—	5.2	1/4	1/4	4800
015	90	1520	257	—	—	1/4	1/4	5060
030	90	1447	257	~~55.6~~	—	1/4	1/4	5292
045	90	1508	257	—	—	1/4	1/4	5559

K-11

FILE: 123:\WGEN-DRY1.WK1

3 of 3

DRYER DATA SHEET

DATE: 2-11-92 - 2-12

BY: Dryer Operator

PLANT: Tuf Hoolah

1. READINGS EVERY ~~10~~ 15 MINUTES.
2. MOISTURE % EVERY HOUR.
3. BIN LEVEL EVERY ~~HOUR~~ 15.
4. NOTE ANY CHANGES IN SETPOINTS.

OUTLET TEMP SET POINT: 257°

REVOLUTIONS per MINUTE: 9.5

FUEL CALIBRATION: 4.94 lb/ct.

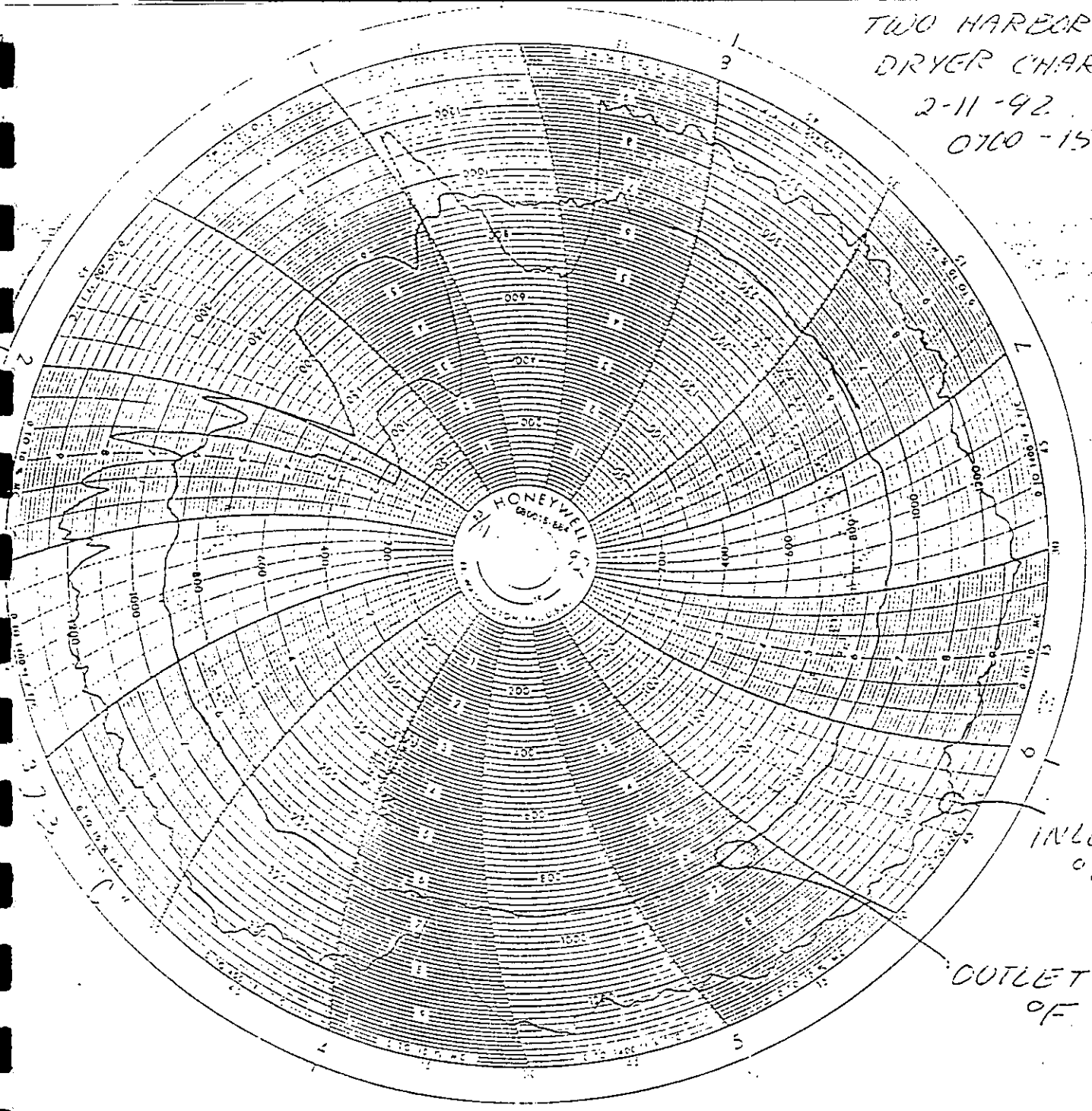
TIME	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FLAKE MOISTURE IN	FLAKE MOISTURE OUT	DRY BIN LEVELS	
100	90	1410	257	—	4.8	1/4	1/2
115	90	1399	257	—	—	1/4	1/4
130	90	1448	257	—	—	1/2	1/2

5769
6009

FILE: 123:\AGEN-DRY1.WK1

11

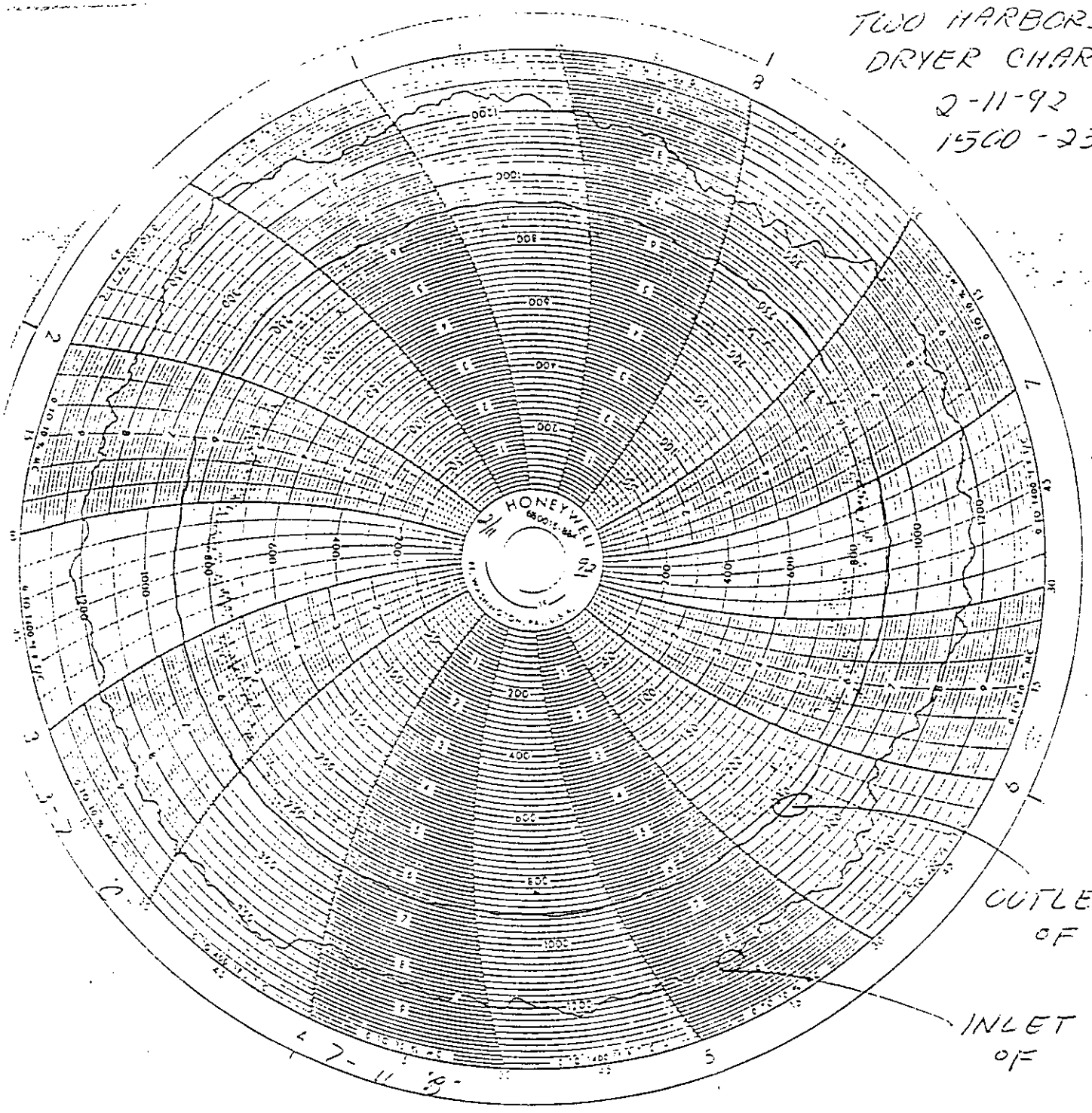
TWO HARBORS
DRYER CHART
2-11-92
0700 - 1500



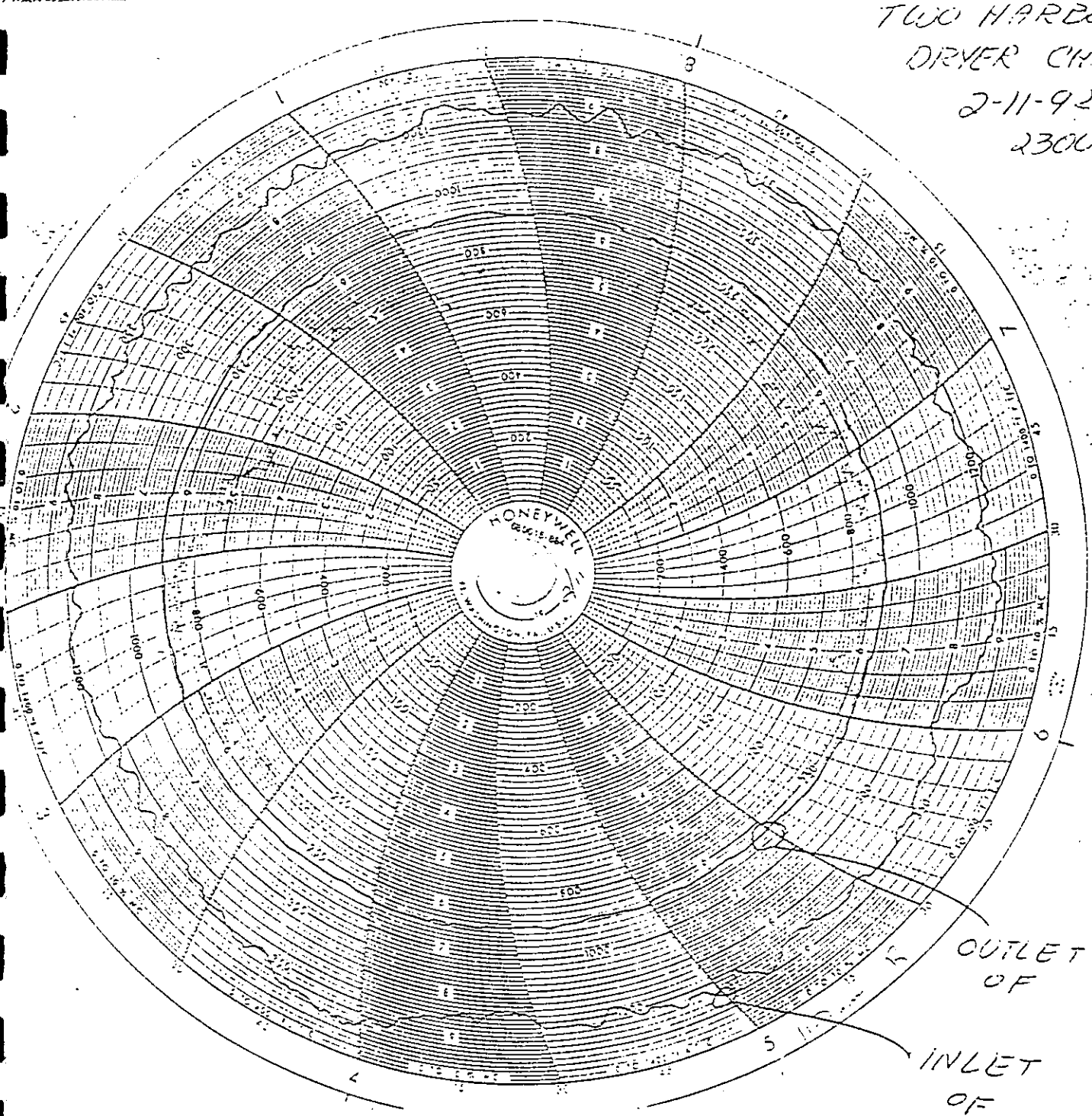
INLET °F

OUTLET °F

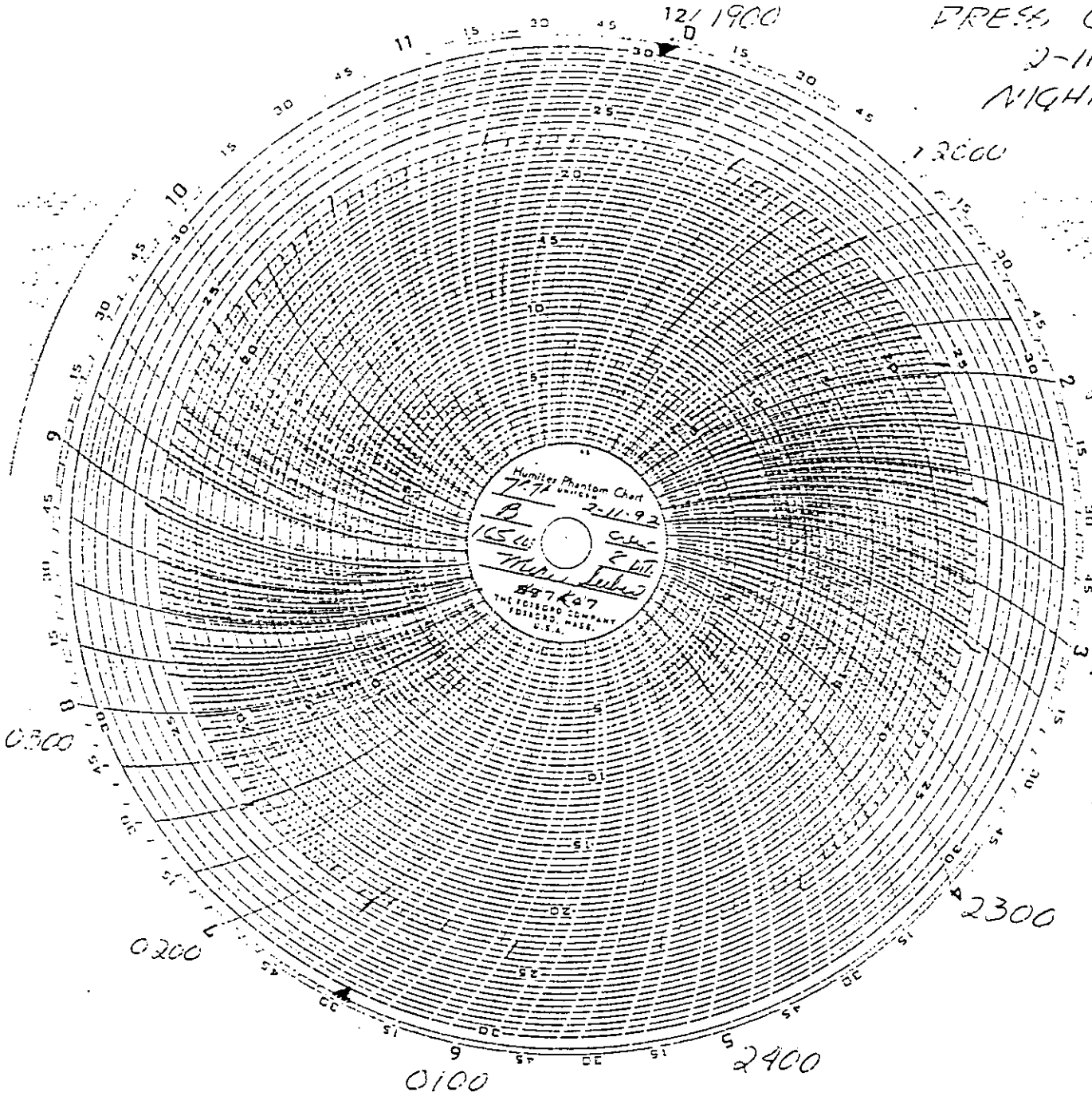
12


TWO HARBORS
DRYER CHART
2-11-92
1500 - 2300
HONEYWELL
OUTLET
OF
INLET
OF

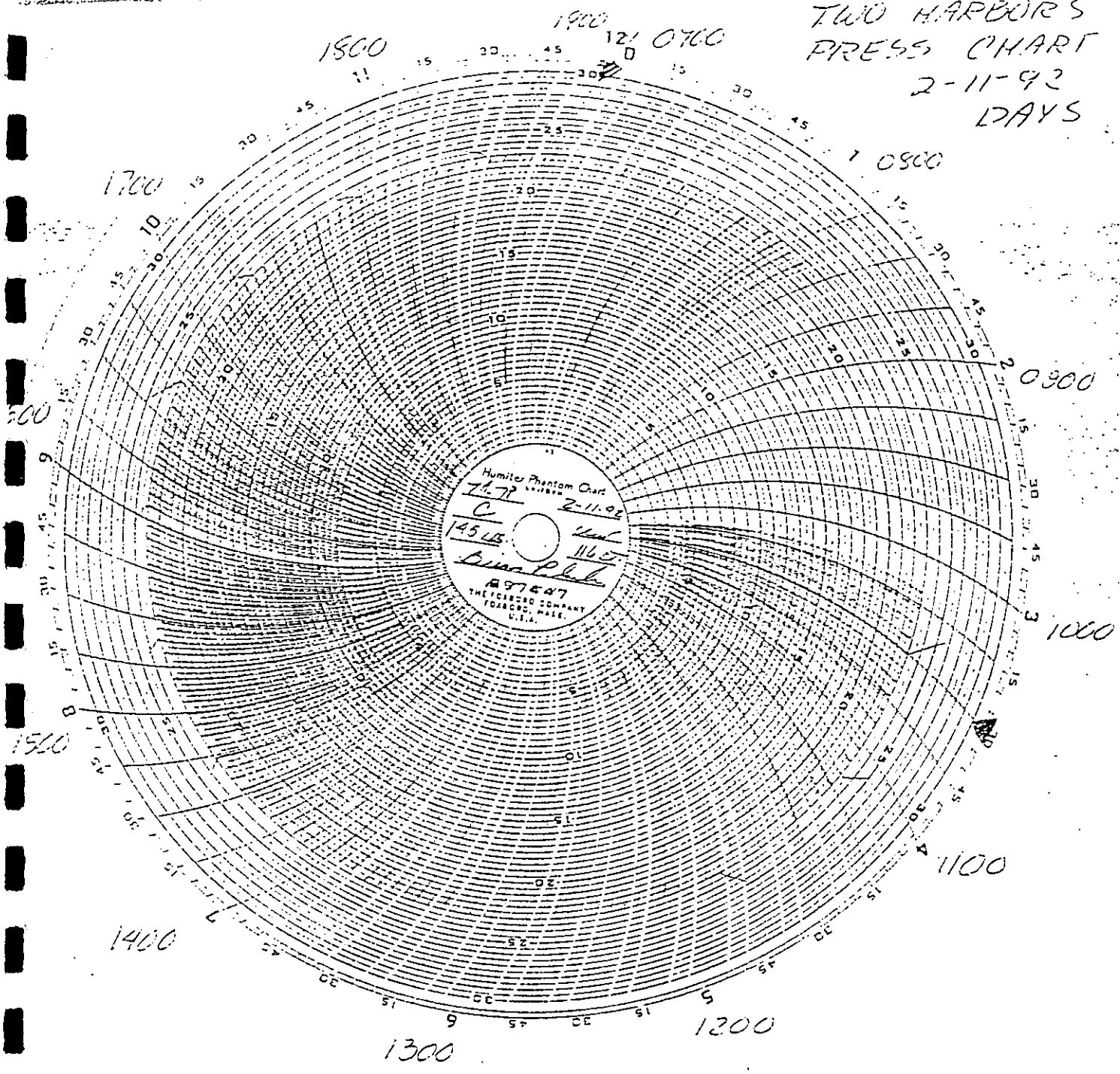
TWO HARBORS
DRYER CHART
2-11-92
2300-0700



TWO HARBORS
PRESS CHARTS
2-11-92
NIGHTS.



PRESSLOADS
1900 - 0130 = 96
7/16" SIDING



PRESSLOADS
1030 - 1900 = 124
7/16" SIDING

ISIANA PACIFIC CORPORATION

PRESS REPORT

Harbors, MN

RATOR Brian Lukaszek SHIFT 7-4-7-1 CREW C DATE 2-11-92

CKNESS 2" 4'X16' PRESS LOADS 145 LPS. 116 DI.

SS TEMP. 205°C TOTAL CAULS REJECTED

LOG COUNT

INE SPEED	FROM	TO
631 - 589	7:14	8:08
~~505~~ 631	~~8:09~~	10:30
673 - 700	10:58	1:21
715 - 720	2:30	2:38
700	5:43	

TIME

Cleaned Blender Shrouds & Tracks

395
401
426

DOWNTIME		MIN	REASONS FOR DOWNTIME
OM	TO		
7:05	7:06	1	#4 STUCK IN PRESS
7:47	7:49	2	CHECKED MAT Reclaim ADJUSTED BELT CONV.
7:54	7:58	4	CORE FORMER WEDGE
8:20	10:05	105	DRYER TROUBLE Plugged Multi-cones
1:21	—		#6 TAKEOVER
3:54	3:55	1	#6
4:04	—		#6
6:38	6:39	1	#6 Limit in Loader Headbar over Trough
6:53	6:55	2	#7 Limit not made in Loader

TIME TO POSITION (Seconds)

1	53	39	41	77	43	115	46	153
2	52	40	43	x78	42	116	[illegible]	154
3	53	41	49	79	43	117	48	155
4	54	42	50	80	42	118	49	156
5	52	x43	48	81	43	119	47	157
6	49	44	51	82	42	120	46	158
7	49	45	51	83	43	121	47	159
8	50	46	49	84	46	122	45	160
9	51	47	51	85	46	123	47	161
10	52	48	51	86	46	124	46	162
11	52	49	53	87	46	125	48	163
12	53	50	51	88	51	126	45	164
13	47	51	49	89	51	127	47	165
14	47	52	49	90	49	128	46	166
15	48	53	48	91	49	x129	45	167
16	51	54	46	92	49	130	44	168
17	62	55	45	93	50	131	45	169
18	51	56	47	94	49	132	47	170
19	50	57	47	95	49	133	44	171
20	50	58	48	96	52	134	45	172
21	51	59	47	97	55	135	46	173
22	51	60	47	98	56	136	48	174
23	52	61	47	99	55	137	48	175
24	52	62	46	100	56	138	49	176
25	49	63	[illegible]	101	59	139	50	177
26	50	64	[illegible]	102	56	140	50	178
27	46	65	46	103	57	141	51	179
28	41	66	46	104	58	142	52	180
29	41	67	45	105	59	143	53	181
30	41	68	44	106	51	144	53	182
31	41	69	42	107	52	145	52	183
32	41	70	45	108	53	146		184
33	40	71	44	109	50	147		185
34	39	72	45	110	51	148		186
35	37	x73	44	111	50	149		187
36	37	74	44	112	51	150		188
37	38	75	43	113	49	151		189
38	41	76	44	114	47	152		190

ISIANA PACIFIC CORPORATION — PRESS REPORT

Harbors, MN

RATOR Mike Sieber SHIFT 7A-7A CREW B DATE 2-11-92

GNESS 7/16" 4' x 16' PRESS LOADS <05. AT

SS TEMP. 215°c TOTAL CAULS REJECTED

LOG COUNT

INE SPEED		FROM	TO
700	673	7PM.	11:02
631	589	3:36	5:11

TIME

Cleaned Blender Shrouds & Tracks

445
427
399

5388.10

3612.22

MNTIME FROM	MNTIME TO	MIN	REASONS FOR DOWNTIME
1:54	1:56	2	Starter in feel
3:22	3:24	2	Fill Farmers
4:06	4:10	4	# seven not made (loader)

TIME TO POSITION (Seconds)

501	39	48 77	46 115	153	49	
502	340	46 78	44 116	154	4	
493	41	46 79	43 117	155	47	
484	342	46 80	45 118	156	48	
505	43	46 81	47 119	157	45	
496	44	47 82	46 120	158	4 -	
507	45	47 83	44 121	159	43	
488	346	47 84	48 122	160	43	
499	347	46 85	46 123	161	45	
510	348	47 86	57 124	162	46	
511	349	49 87	52 125	163	45	
512	350	51 88	52 126	164	45	
513	54 51	50 89	50 127	165	45	
514	52 52	49 90	48 128	166		
515	53	52 91	52 129	167		
516	54	52 92	51 130	168		
517	55	51 93	48 131	169		
518	56	53 94	50 132	170		
519	57	51 95	49 133	171		
520	58	49 96	50 134	172		
521	59	54 97	48 135	173		
522	60	48 98	49 136	174		
523	61	52 99	49 137	175		
524	62	48 100	54 138	176		
525	63	48 101	48 139	177		
526	64	52 102	56 140	178		
527	46 65	48 103	51 141	179		
528	66	61 104	53 142	180		
529	67	46 105	53 143	181		
530	68	46 106	52 144	182		
531	69	45 107	53 145	183		
532	70	47 108	52 146	184		
533	71	47 109	50 147	185		
534	72	50 110	51 148	186		
535	73	46 111	52 149	187		
536	74	49 112	49 150	188		
537	K-19 75	47 113	48 151	189	15	
538	76	114	152	190		

E.F.B. READINGS

DATE: 2-11

PLANT: TWO HARBORS

BY: Dryer Operator

TIME	BED "A" KV	BED "A" A	IONIZER "A" KV	IONIZER "A" A	BED B KV	BED B MA	IONIZER B KV	IONIZER B MA	PRESSURE DROP E.F.B.	PRESSURE DROP BAGHOUSE
1015	7.7	0	29	1	8.6	0	27	1	2.0	2.0
1030	7.6	0	29	1	8.6	0	27	1	2.0	2.0
1045	7.7	0	34	1.5	8.6	0	36	2		
1100	7.8	0	35	1.6	8.6	0	35	2		
1115	7.8	0	35	1.6	8.6	0	37	2		
1130	7.8	0	35	1.6	8.6	0	37	1.9	2.3	2.0
11:45	7.7	0	35	1.6	8.6	0	37	1.9	2.3	2.0
12:00	7.7	0	35	1.6	8.6	0	37	1.9	2.2	2.0
12:15	7.7	0	35	1.6	8.6	0	37	2.0	2.0	2.0
12:30	7.7	0	35	1.5	8.6	0	37	1.9	1.9	2.0
12 45	7.6	0	36	1.5	8.5	0	38	2.0	2.0	2.0
1300	7.7	0	36	1.5	8.6	0	38	2.0	2.0	2.0
1315	7.7	0	36	1.5	8.6	0	38	2.1	1.9	2.1
1330	7.7	0	36	1.5	8.6	0	38	2.0	2.2	2.0
1345	7.7	0	36	1.5	8.6	0	38	2.0	2.1	2.0
1400	7.7	0	36	1.6	8.6	0	38	2.0	2.3	2.0
1415	7.7	0	37	1.4	8.6	0	39	1.9	2.1	2.0
1430	7.8	0	38	1.5	8.6	0	40	2.0	2.2	2.0
1445	7.6	0	37	1.5	8.5	0	41	2.0	2.2	2.0
1500	7.8	0	38	1.5	8.6	0	40	2.0	2.2	2.1
1515	7.7	0	38	1.6	8.6	0	41	2.0	2.0	2.0
1530	7.6	0	38	1.5	8.5	0	40	2.0	2.2	2.0
1545	7.8	0	38	1.5	8.5	0	41	2.0	2.3	2.0
1600	7.6	0	39	1.5	8.5	0	41	2.0	2.3	2.0
1615	7.7	0	39	1.5	8.5	0	41	2.0	2.3	2.0
1630	7.7	0	39	1.5	8.6	0	41	2.0	2.4	2.0
1645	7.8	0	39	1.5	8.6	0	42	2.0	2.4	2.0
1700	7.7	0	39	1.6	8.6	0	42	2.0	2.1	2.1
1715	7.7	0	39	1.5	8.5	0	42	2.0	2.4	2.0
1730	7.7	0	40	1.5	8.6	0	42	2.0	2.4	2.0
1745	7.6	0	40	1.5	8.6	0	42	2.0	2.4	2.1
1800	7.7	0	40	1.5	8.6	0	41	2.0	2.5	2.0
1815	7.6	0	40	1.5	8.5	0	42	2.0	2.3	2.0
1830	7.6	0	41	1.6	8.6	0	42	2.0	2.4	2.1

FILE: 123:\FORMS\ENV\GEN-EFB1.WK1

E.F.B. READINGS

DATE: 2-11-92

PLANT: TWO HARBORS

BY: Dwyn Christen

TIME	BED "A" KV	BED "A" A	IONIZER "A" KV	IONIZER "A" A	BED B KV	BED B MA	IONIZER B KV	IONIZER B MA	PRESSURE DROP E.F.B.	PRESSURE DROP BAGHOUSE
1845	7.6	0	41	1.4	8.5	0	43	2	2.3	2.1
1900	7.6	0	40	1.5	8.6	0	41	2	2.2	2.1
1930	7.8	0	40	1.4	8.6	0	42	2	2.2	2.0
1945	7.6	0	40	1.4	8.6	0	43	2	2.2	2.0
2000	7.7	0	40	1.4	8.6	0	44	2	2.3	2.1
2015	7.8	0	40	1.4	8.6	0	44	2	2.4	2.1
2030	7.8	0	40	1.4	8.6	0	44	2	2.4	2.1
2045	7.8	0	40	1.4	8.6	0	44	2	2.4	2.1
2100	7.8	0	40	1.4	8.6	0	44	2	2.2	2.1
2200	7.8	0	38	1.4	8.6	0	44	2	2.2	2.1
2130	7.8	0	40	1.4	8.6	0	45	2	2.3	2.1
2145	7.7	0	42	1.2	8.6	0	46	2	2.1	2.0
2200	7.7	0	40	1.3	8.6	0	46	2	2.2	2.0
2215	7.6	0	40	1.2	8.6	0	46	2	2.3	2.0
2230	7.8	0	40	1.2	8.6	0	46	2	2.3	2.1
2245	7.7	0	41	1.3	8.6	0	45	2	2.2	2.1
2300	7.7	0	40	1.2	8.6	0	45	2	2.2	2.1
2315	7.7	0	37	1	8.6	0	45	2	2.2	2.1
2330	7.7	0	37	1	8.6	0	45	2	2.2	2.1
2345	7.7	0	37	1	8.6	0	45	2	2.2	2.1
000	7.7	0	38	1	8.6	0	44	1.8	2.2	2.1
015	7.7	0	38	1	8.6	0	44	1.8	2.2	2.1
030	7.7	0	38	1	8.6	0	44	1.8	2.2	2.1
045	7.7	0	38	1	8.6	0	44	1.8	2.2	2.1
100	7.6	0	40	1	8.4	0	45	1.8	2.3	2.1
115	7.8	0	41	1.2	8.6	0	43	1.6	2.3	2.1
130	7.8	0	41	1.2	8.6	0	44	1.6	2.4	2.1

FILE: 120:\FORMS\ENV\GEN-EFB1.WK1

LOUISIANA-PACIFIC CORP
TWO HARBORS, MN

DAILY INVENTORY SHEET

DATE 2-11-92

28 DAYS IN MONTH
10 CURRENT DAY

	DAILY	MTD
RESS LOADS	999	2,821
RODUCTION	369,162	3,270,249
RODUCTION *	452,870.4 (LBS)	4,134,457.0 (LBS)

VENTORY TRACKING...	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE	PRICE PER UNIT	USAGE DOLLARS	END INV DOLLARS
MDI RESIN (LBS)	187,824	0	187,824	171,749	16,075			
	0	0	0	0	0	0.000		
						MTD $ USAGE		

			DAILY	MTD	YTD
MDI USAGE (MTD)	149,756				
% RESIN USED (DAILY)	3.55%	LBS RESIN / MSF (DAILY)	48.54	44.14	194,070
% RESIN USED (MTD)	3.60%	COST PER MSF $			

	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE	PRICE PER UNIT	USAGE DOLLARS	END INV DOLLARS
E-WAX (LBS)	0	0	0	0	0			
	123,705	0	123,705	116,212	7,493			
					7,48	MTD $ USAGE	7	

		(49%)	DAILY	MTD	YTD
E-WAX USAGE (MTD)	61426.00	29,514			
% WAX USED (DAILY)	0.79%	LBS WAX / MSF (DAILY)	20.30	16.24	153,423
% WAX USED (MTD)	0.71%	COST PER MSF $			

* BASED ON TARGET (NOT ACTUAL) BOARD WEIGHTS

TWO HARBORS KONUS & PRESS VENT TESTING FEB 12, 1992

BOARD WEIGHTS - LBS

WEIGHTS OF APPROX. EVERY 50th UNTRIMMED BOARD FROM TAPES 1030 - 2100

203	206	195
203	203	203
197	199	198
201	201	199
209	202	
212	200	
206	205	
201	201	
206	203	
204	199	

AVERAGE WEIGHT UNTRIMMED MAT = 202.3 lb

TRIMMED BOARD (7% TRIM) = 202.3 x 0.93 = 188.1 lb PER FINISHED BOARD 8' x 16' x 7/16"

PRODUCTION RATE

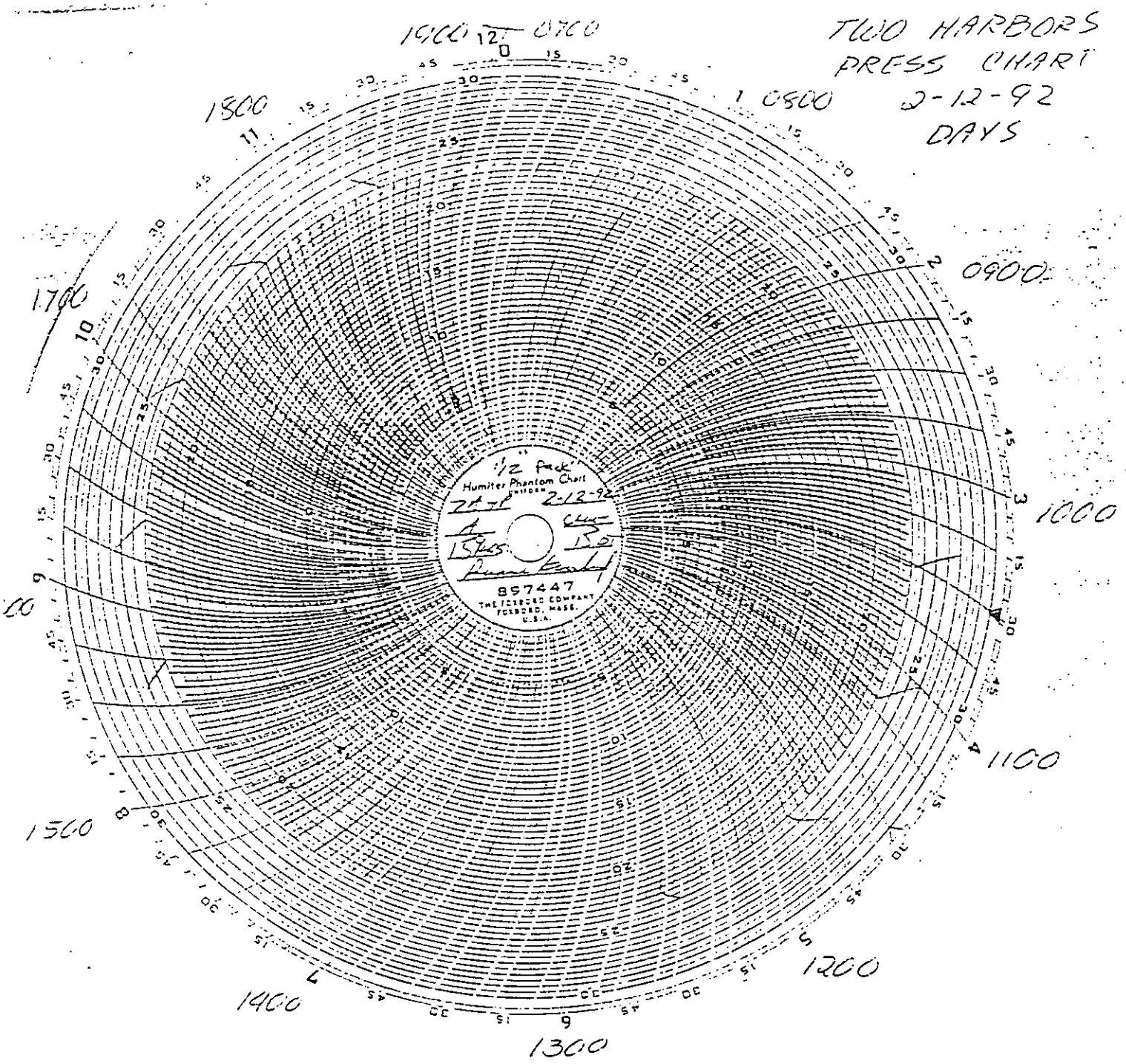
PRESSLOADS FROM 1030 - 2100 = 154
BOARDS (8' x 16') PRODUCED = 154 x 8 = 1,232

LBS FINISHED PRODUCT = 1232 x 188.1 lb = 231,739 lb

LBS F.P. PER HOUR = 231,739 lb / 10.5 HRS = 22,070 lb F.P. PER HOUR

TONS F.P. PER HOOR = 22,070 lb F.P. / 2000 lb = 11.04 TONS FINISHED PRODUCT PER HOUR

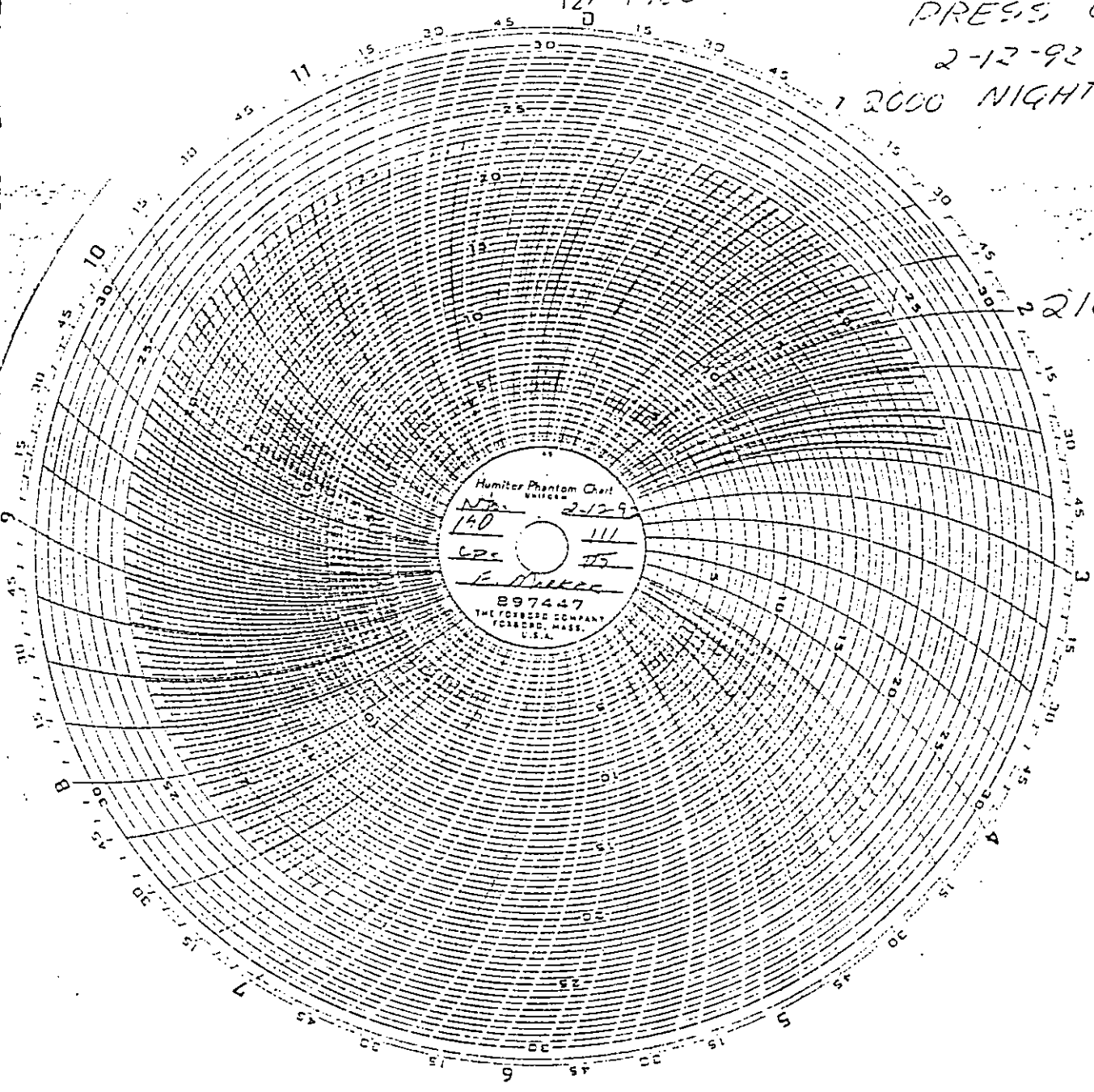
PRESSLOADS / HR = 154 P.L. ÷ 10.5 HRS = 14.67 P.L./HR



TWO HARBORS
PRESS CHART
2-12-92
DAYS

PRESSLOADS
1030-1900 = 125

TWO HARBORS
PRESS CHART
2-12-92
2000 NIGHTS



PRESSLOADS
1900 - 2100 = 29
7/16"

)ISIANA PACIFIC CORPORATION

PRESS REPORT

) Harbors, MN

"12er"

ERATOR Rosemary Kronlund SHIFT 7A-7P CREW A DATE 2-12-92

:CKNESS 7/16" 4'x16' PRESS LOADS 159 cos. 15 OT

ESS TEMP. 205°c TOTAL CAULS REJECTED

LOG COUNT

LINE SPEED	FROM	TO
589	7AM	
631	8:30	
623	1:37	
589	2:35	
623	3:55	

TIME

Cleaned Blender Shrouds & Tracks

436
432
405

DOWNTIME FROM	DOWNTIME TO	MIN	REASONS FOR DOWNTIME
9:04	9:05	1	#6
9:37	9:38	1	#6 loader limit
9:54	~~9:58~~	~~4~~	#7 " limit
—	9:58	4	(head bar pin)
2:29	2:33	4	#4 stuck in pocket
2:56	2:57	1	#2 unloader
4:01	4:03	2	#1 unloader
4:37	4:38	1	#8 loader
4:50	4:51	1	#4 unloader (KS)

TIME TO POSITION (Seconds)

1	40	39	49	77	46	115	40	153	44
2	47	40	45	78	48	116	39	154	44
3	41	41	46	79	41	117	43	155	45
4	49	42	46	80	42	118	45	156	46
5	41	43	47	81	41	119	41	157	42
6	51	44	46	82	41	120	43	158	40
7	47	45	45	83	40	121	45	159	39
8	45	46	45	84	41	122	43	160	
9	45	47	44	85	40	123	44	161	
10	46	48	45	86	39	124	39	162	
11	46	49	45	87	40	125	41	163	
12	44	50	44	88	(38)	126	40	164	
13	45	51	45	89	38	127	42	165	
14	46	52	45	90	(39)	128	39	166	
15	45	53	45	91	38	129	39	167	
16	41	54	43	92	39	130	42	168	
17	(38)	55	40	93	(39)	131	40	169	
18	38	56	41	94	38	132	40	170	
19	42	57	42	95	39	133	41	171	
20	40	58	45	96	40	134	41	172	
21	37	59	44	97	39	135	42	173	
22	32	60	43	98	(38)	136	41	174	
23	51	61	42	99	38	137	42	175	
24	42	62	45	100	37	138	42	176	
25	50	63	45	101	36	139	43	177	
26	52	64	47	102	36	140	43	178	
27	51	65	49	103	37	141	44	179	
28	43	66	50	104	40	142	44	180	
29	46	67	49	105	41	143	44	181	
30	43	68	47	106	41	144	43	182	
31	45	69	47	107	40	145	40	183	
32	46	70	50	108	41	146	43	184	
33	47	71	50	109	41	147	44	185	
34	45	72	48	110	42	148	43	186	
35	49	73	51	111	39	149	44	187	
36	44	74	50	112	38	150	42	188	
37	43	75	52	113	38	151	42	189	
38	48	76	44	114	42	152	42	190	

JISIANA PACIFIC CORPORATION

PRESS REPORT

o Harbors, MN

ERATOR E. MARKER SHIFT Nites CREW D DATE 2-12-92

ICKNESS 7/16" c/l" x 16' PRESS LOADS 140 CDS 111 151

ESS TEMP. 205°C TOTAL CAULS REJECTED

LOG COUNT

LINE SPEED	FROM	TO
673	7PM	
508	9:20	
589	11:33	
673	1:10	

TIME

Cleaned Blender Shrouds & Tracks

425
281
437

DOWNTIME FROM	DOWNTIME TO	MIN	REASONS FOR DOWNTIME
9:15	9:17	2	#3 Limit unloader
9:37	11:05	91	NO Flakes
12:11	12:12	1	#4 unloader
12:17	12:19	2	#4 clamp unloader
12:20	12:27	2	"
1:35	1:38	3	" & #6 Takeaway
1:47	1:49	2	"
1:54	2:02	8	weld #4 clamp
		41	

TIME TO POSITION (Seconds)

1	37	39	48	77	42	115	45	153
2	34	40	42	78	42	116	46	154
3	34	41	43	79	43	117	44	155
4	34	42	45	80	45	118	46	156
5	35	43	42	81	42	119	07	157
6	38	44	40	82	40	120	49	158
7	38	45	37	83	40	121	48	159
8	39	46	38	84	41	122	49	160
9	38	47	39	85	42	123	50	161
10	42	48	36	86	42	124	47	162
11	41	49	38	87	43	125	47	163
12	43	50	39	88	40	126	46	164
13	44	51	41	89	42	127	50	165
14	45	52	47	90	40	128	48	166
15	46	53	42	91	37	129	51	167
16	43	54	46	92	38	130	52	168
17	44	55	47	93	37	131	57	169
18	43	56	45	94	39	132	53	170
19	41	57	47	95	39	133	43	171
20	42	58	41	96	35	134	44	172
21	40	59	42	97	34	135	43	173
22	39	60	43	98	36	136	45	174
23	37	61	44	99	36	137	47	175
24	41	62	43	100	38	138	50	176
25	71	63	41	101	40	139	48	177
26	41	64	44	102	41	140		178
27	73	65	39	103	41	141		179
28	45	66	39	104	40	142		180
29	44	67	39	105	41	143		181
30	44	68	46	106	40	144		182
31	42	69	72	107	40	145		183
32	43	70	46	108	42	146		184
33	44	71	42	109	42	147		185
34	45	72	41	110	41	148		186
35	46	73	41	111	47	149		187
36	50	74	42	112	48	150		188
37	47	75	40	113	47	151		189
38	51	76	41	114	47	152		190

TWO HARBORS KONUS TESTING 2-12-92

BTU INPUT BY FUEL USAGE

FUEL CALIBRATION = 12.38 lb /COUNT LEFT
15.00 lb /COUNT RIGHT

FUEL COUNTS FROM 1000 - 2045, 10.75 HRS
RIGHT = (1808 - 492) + 260 = 1576 COUNTS
LEFT = (1780 - 475) + 250 = 1555 COUNTS

FUEL BURNED = (1576 CTS x 15.00 lb) +
(1555 CTS x 12.38 lb) = 42,891 lb

42,891 lb ÷ 10.75 HRS = 3990 lb WET FUEL BURNED PER HOUR

AVERAGE FUEL MOISTURE CONTENT 1000 - 2100 = 45.6 %

ASSUMED BTU VALUE OF FUEL (DRY) FROM 3-6-1989 ANALYSIS = 8661 BTU/LB *

BTU VALUE WET = 8661 BTU/LB x (1 - 0.456)
= 4712 BTU/LB

HEAT INPUT = 3990 lb WET FUEL/HR x 4712 BTU/LB
= 18.8 mm BTU/HR

HEAT OUTPUT (ASSUMING 80 % EFFICIENCY) w/ECONOMIZER = 18.8 mm BTU/HR x 0.80 = 15.0 mm BTU/HR

TONS OF DRY FUEL/HR =

3990 lb WET FUEL x (1 - 0.456) / 2000 lb =
1.09 TON DRY FUEL PER HOUR

* TO BE VERIFIED BY 1992 ANALYSIS

* FROM POND LOOP ONLY

T-O HEATER LOG

PLANT: Tax Harbor

DATE: 2-13-92

BY: Dryer Operator

FUEL FEED SETTING: AUTO

POND SET POINT: 60°C

BLDG HEAT SET POINT: 80°C

T-O OUTLET SET POINT: 185°F

1. READINGS EVERY 15 MINUTES.
2. BARK MOISTURE ONCE PER HOUR.
3. NOTE IF SET-POINTS ARE CHANGED.

°C.

TIME	°F OIL TEMP IN *	°F OIL TEMP OUT	AIR FLOW (CFM)	FUEL COUNT A C	FUEL COUNT B R	REMOTE FURNACE (TEMP R)	BARK MOISTURE %						Pressure DROP BAGHOUSE
7:15	260	468	320	69	73	700-800							8.8
			X10										
10:00	250	492	320	477	499		417						5.2
10:15	275	488	320	525	547								
10:30	275	482	320	561	585								
10:45	280	486	320	589	606								
11:00	265	430	320	624	654	700	550	40.2					8.6
11:15	275	423	320	681	709								
11:30	300	503	320	709	738	680-720							
11:45	290	473	320	750	772								
12:00	260	443	320	813	843		40.0						9.6
12:15	275	471	320	861	893								
12:30	275	466	320	930	960								
12:45	290	507	320	957	989								
1:00	290	484	320	999	1034		42.8						9.3
1:15	270	481	320	1023	1059								
1:30	275	485	320	1055	1093								
1:45	275	486	320	1095	1134								
2:00	275	489	320	1128	1168		42.6						9.2
2:15	270	487	320	1156	1199								
2:30	280	486	320	1186	1231								
2:45	280	487	320	1021	1066								
3:00	275	478	320	1294	1305		44.7						9.5
3:15	265	470	320	1273	1340								
3:30	270	474	320	1321	1374								
3:45	270	490	320	1369	1424								
4:00	270	495	320	1400	1458		44.2						
4:15	270	486	320	1454	1516								
4:30	260	473	320	1462	1530								

* FROM POND LOOP ONLY

T-O HEATER LOG

DATE: 2-13-92

PLANT: Two Harbors

BY: Dryer Operator

FUEL FEED SETTING: Auto

POND SET POINT: 60°C

BLDG HEAT SET POINT: 30°C

T-O OUTLET SET POINT: 485°F

1. READINGS EVERY 15 MINUTES.
2. BARK MOISTURE ONCE PER HOUR.
3. NOTE IF SET-POINTS ARE CHANGED.

TIME	°F OIL TEMP IN *	°F OIL TEMP OUT	AIR FLOW x10 °C	FUEL COUNT A	FUEL COUNT B	Refinery FURNACE TEMP °C	BARK MOISTURE %	Pressure DROP BAGHOUSE
4:45pm	225	491	330	1531	1595	720-820		
500	265	500		1568	1635		44.0	1.2
515	270	485		1580	1650			
530	270	483		1616	1686			
545	265	491		1645	1717			
600	265	487		1676	1750		43.6	9.8
615	265	481		1699	1789			

K-30

TWO HARBORS PRESS VENT TESTING
FEB 12, 1992

RESIN AND WAX USAGE

USAGE FROM DAILY INVENTORY SHEETS

MDI = 15,200 lbs
WAX = 8118 lbs AT 48% SOLIDS
= 3897 lbs

DAILY PRESSLOADS = 299

PRESSLOADS/HR DURING TESTING = 19.67

MDI USE = 15,200 lb ÷ 299 PRESSLOADS
= 50.8 lb PER PRESSLOAD

WAX USE = 3897 lb ÷ 299 PRESSLOADS
= 13.0 lb PER PRESSLOAD

MDI PER HOUR =
50.8 lb/P.L. x 19.67 P.L./HR =
745 lb MDI
PER HOUR

745 lb MDI ÷ 22070 lb F.P. = 3.4%
MDI

WAX PER HOUR =
13.0 lb/P.L. x 19.67 P.L./HR =
191 lb WAX
PER HOUR

191 lb WAX ÷ 22070 lb F.P. = 0.87%
WAX

30

LOUISIANA-PACIFIC CORP
TWO HARBORS, MN

DAILY INVENTORY SHEET

DATE: 2-12-92

28 DAYS IN MONTH
11 CURRENT DAY

	DAILY	MTD
PRESSLOADS	299	3,129
PRODUCTION	357,215	3,727,464
PRODUCTION *	438,214.4 (LBS)	4,572,672.0 (LBS)

INVENTORY TRACKING...

	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE	PRICE PER UNIT	USAGE DOLLARS	END IN DOLLA
MDI RESIN (LBS)	171,749	0	171,749	156,549	15,200			
	0	0	0	0	0			
						MTD $ USAGE		

				DAILY	MTD	YTD
MDI USAGE (MTD)	163,966					
% RESIN USED (DAILY)	3.47%	LBS RESIN / MSF (DAILY)		42.55	43.99	749,270
% RESIN USED (MTD)	3.59%	COST PER MSF $				

	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE	PRICE PER UNIT	USAGE DOLLARS	END IN DOLLA
E-WAX (LBS)	0	0	0	0	0			
	116,212	0	116,212	108,094	8,118			
					x .48	MTD $ USAGE		

		(48%)		DAILY	MTD	YTD
E-WAX USAGE (MTD)	69536	33,611				
% WAX USED (DAILY)	0.83%	LBS WAX / MSF (DAILY)		22.73	18.67	357,930
% WAX USED (MTD)	0.79%	COST PER MSF $				

* BASED ON TARGET (NOT ACTUAL) BOARD WEIGHTS

TWO HARBORS KONUS TESTING
FEB 12, 1992

ESTIMATION OF AIRFLOW THROUGH KONUS

Q_1 = AIRFLOW FROM KONUS @ 500°F

Q_2 = BLEND AIR @ 15°F

Q_3 = 25034 ACFM AT STACK AT 304°F

$Q_1 + Q_2 = Q_3$ *

$\Delta T_1 = 500°F - 304°F = 196$

$\Delta T_2 = 304°F - 15°F = 289$

$196\ Q_1 = 289\ Q_2$

$Q_1 = \frac{289}{196} = 1.47\ Q_2$

$1.47\ Q_2 + Q_2 = 25034$ ACFM

$2.47\ Q_2 = 25034$ ACFM

$Q_2 = 10135$ ACFM

$Q_1 = 25034$ ACFM $- 10135$ ACFM

$Q_1 = 14,899$ ACFM

* ESTIMATION ASSUMES AN ADIABATIC SYSTEM

TWO HARBORS KONUS & PRESS VENT TESTING FEB. 13, 1992

BOARD WEIGHTS

WEIGHTS OF APPROX. EVERY 50th UNTRIMMED BOARD FROM TAPES 0800 - 1800

203	201	203
195	200	204
201	207	207
199	210	210
200	204	
202	204	AVERAGE UNTRIMMED MAT WEIGHT = 202.5 lb
205	208	TRIMMED BOARD (7% TRIM) =
204	199	202.5 x 0.93 = 188.3 lb PER FINISHED BOARD
196	201	
200	197	

PRODUCTION RATE

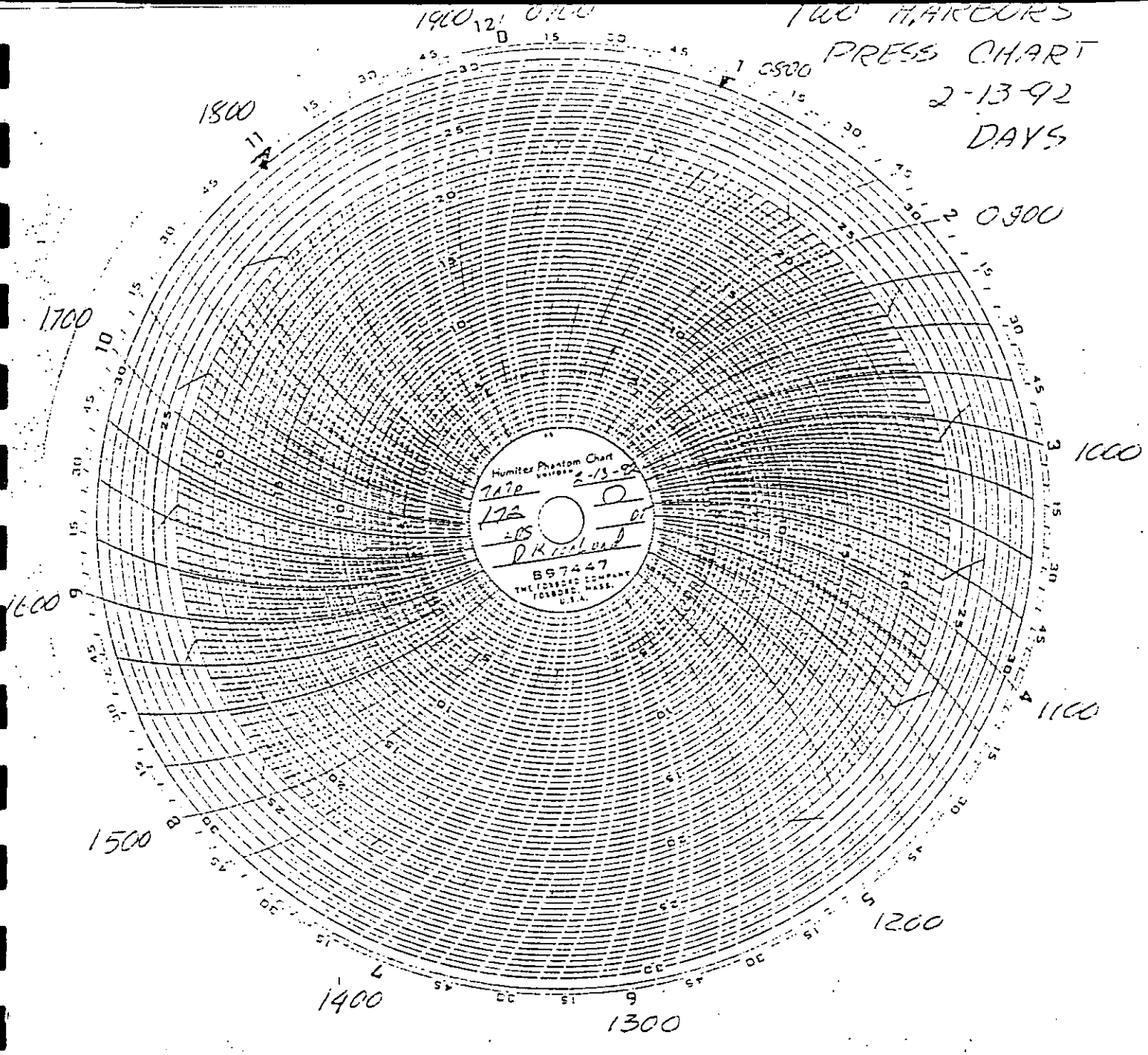
PRESSLOADS FROM 0800 - 1800 = 141
BOARDS (8' X 16') PRODUCED = 141 x 8 = 1128

LBS FINISHED PRODUCT =
1128 x 188.3 lb = 212,402 lb

LBS FINISHED PRODUCT PER HOUR =
212,402 lb / 10 HRS = 21,240 lb F.P. PER HOUR

TONS F.P. PER HOUR
21,240 lb / 2000 lb = 10.62 TONS FINISHED PRODUCT PER HOUR

PRESSLOADS /HR =
141 ÷ 10 = 14.1 P.L. /HR



1900 0800 1000 HARDOORS
PRESS CHART
2-13-92
DAYS

PRESS LOADS
0800 - 18000 =
141

UISIANA PACIFIC CORPORATION

o Harbors, MN

PRESS REPORT

PERATOR D Kronlund SHIFT 7A-7P CREW A DATE 2-13-92

HICKNESS 7/16 4/16 PRESS LOADS 172 LDS ○ OT

RESS TEMP. 205 °C TOTAL CAULS REJECTED

LOG COUNT

LINE SPEED	FROM	TO
673	7 A.M	
631	12:10	
678	2:00	
700	6:15	

TIME

Cleaned Blender Shrouds & Tracks

468
308
421

7/16"

DOWNTIME FROM	DOWNTIME TO	MIN	REASONS FOR DOWNTIME
2:15	—	—	CHECK formees for Beaver tails
5:58	—	—	#6

TIME TO POSITION (Seconds)

1	44	39	41	77	46	115	37	153	45
2	44	40	43	78	43	116	50	154	
3	47	41	42	79	42	117	46	155	49
4	44	42	44	80	38	118	47	156	
5	46	43	44	81	36	119	47	157	47
6	47	44	44	82	39	120	45	158	
7	43	45	44	83	35	121	45	159	
8	45	46	43	84	35	122	45	160	
9	43	47	44	85	35	123	45	161	
10	44	48	45	86	35	124	45	162	
11	45	49	45	87	36	125	45	163	
12	46	50	46	88	37	126	44	164	
13	47	51	40	89	36	127	43	165	
14	46	52	45	90	37	128	40	166	
15	44	53	45	91	38	129	42	167	45
16	47	54	45	92	38	130	42	168	
17	45	55	45	93	40	131	39	169	
18	45	56	42	94	40	132	40	170	
19	45	57	44	95	41	133	41	171	43
20	43	58	42	96	43	134	43	172	
21	43	59	42	97	40	135	42	173	
22	45	60	43	98	43	136	43	174	
23	49	61	40	99	45	137	44	175	
24	52	62	40	100	46	138	43	176	
25	50	63	39	101	45	139	42	177	
26	50	64	41	102	45	140	56	178	
27	49	65	40	103	50	141	38	179	
28	47	66	39	104	50	142	37	180	
29	46	67	39	105	41	143	37	181	
30	47	68	40	106	48	144	38	182	
31	51	69	41	107	49	145	38	183	
32	47	70	43	108	49	146	38	184	
33	48	71	42	109	48	147	37	185	
34	45	72	45	110	48	148	37	186	
35	44	73	42	111	48	149	38	187	
36	46	74	43	112	49	150	41	188	
37	44	75	44	113	48	151	42	189	
38	42	76	45	114	50	152	44	190	

TWO HARBORS KONUS TESTING 2-13-92

BTU INPUT BY FUEL USAGE

FUEL CALIBRATION = 12.38 lb/COUNT LEFT
15.00 lb/COUNT RIGHT

FUEL COUNTS FROM 0715 - 1800, 10.75 HRS
RIGHT = 1750 CTS - 73 CTS = 1677 CTS
LEFT = 1676 CTS - 69 CTS = 1607 CTS

FUEL BURNED = (1677 CTS x 15.00 lb) + (1607 CTS x 12.38 lb) = 45,050 lb

45,050 lb ÷ 10.75 HRS = 4191 lb WET FUEL BURNED PER HOUR

AVERAGE FUEL MOISTURE CONTENT = 43.9 %

ASSUMED BTU VALUE OF FUEL (DRY) FROM 3-6-1989 ANALYSIS = 8661 BTU/LB*

BTU VALUE WET = 8661 BTU/LB x (1-0.439)
= 4859 BTU/LB

HEAT INPUT = 4191 lb WET FUEL/HR x 4859 BTU/LB
= 20.4 mm BTU/HR

HEAT OUTPUT (ASSUMING 80 % EFFICIENCY) W/ECONOMIZER = 20.4 mm BTU/HR x 0.80 = 16.3 mm BTU/HR

TONS OF DRY FUEL/HR =

4191 lb WET FUEL x (1-0.439) / 2000 LB = 1.18 TON DRY FUEL PER HOUR

* TO BE VERIFIED BY 1992 ANALYSIS

TWO HARBORS KCNUS TESTING 2-13-92

BTU INPUT BY FUEL USAGE

FUEL CALIBRATION = 12.38 lb/COUNT LEFT
15.00 lb/COUNT RIGHT

FUEL COUNTS FROM 0715 - 1800, 10.75 HRS
RIGHT = 1750 CTS - 73 CTS = 1677 CTS
LEFT = 1676 CTS - 69 CTS = 1607 CTS

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= 20.4 mm BTU/HR

HEAT OUTPUT (ASSUMING 80 % EFFICIENCY)
W/ECONOMIZER = 20.4 mm BTU/HR x 0.80 = 16.3 mm BTU/HR

TONS OF DRY FUEL/HR =

4191 lb WET FUEL x (1-0.439) / 2000 LB = 1.18 TON DRY FUEL PER HOUR

* TO BE VERIFIED BY 1992 ANALYSIS

Boise Dallas 4 + 4 2-12-92 * FROM POND LOOP ONLY

16 2

T-O HEATER LOG

PLANT: Two Harbors

DATE: 2-12-92

BY: Dryer Operator

FUEL FEED SETTING: AUTO

POND SET POINT: 530° C.

BLDG HEAT SET POINT: 85°C

T-O OUTLET SET POINT: 485° F

15

1. READINGS EVERY 30 MINUTES.
2. BARK MOISTURE ONCE PER HOUR
3. NOTE IF SET-POINTS ARE CHANGED.

OIL FLOW
mb = 0.227 °C
L/HR

TIME	°F OIL TEMP IN *	°F OIL TEMP OUT	AIR FLOW x10 L (AB) R	FUEL COUNT A C	FUEL COUNT B R	REFRACTORY FURNACE TEMP L	REFRACTORY FURNACE TEMP R	BARK MOISTURE % H/HR	PRESSURE DROP H/HR BAGHOUSE
7:00	255	479	320	000	000	700-300		47.8	8.6
7:00	275	481	320	307	307			45.2	8.6
9:00	240	486	320	326	339			47.	9.7
10:00	230	496	320	475	492			47.2	9.0
11:00	305	491	320	614	639			49.	9.2
12:00	300	498	320	775	803	700	300	46.4	5.8
1:00	250	480	320	909	944			43.4	9.0
1:15	290	489	320	957	994			44.6	
1:30	340	491	320	994	1033				
1:45	355	481	320	1627	1663				
2:00	280	483	320	1672	1114			43.6	9.8
2:15	300	491	320	1123	1167				
2:30	360	501	320	1139	1184				
2:45	325	492	320	1172	1219				
3:00	240	471	320	1311	1361			47.0	9.3
3:15	255	491	320	1242	1293				
3:30	325	485	320	1266	1319				
3:45	240	485	320	1297	1353				
4:00	260	479	320	1323	1379			44.6	
4:15	270	490	320	1362	1422				
4:30	225	485	320	1397	1455	700 - 320			
4:45	235	472	320	1435	1493				
5:00	250	488	320	1481	1546			47.4	9.8
5:15	240	490	320	1503	1577				
5:30	230	483	320	1543	1604				
5:45	250	494	320	1577	1645	320-840			
6:00	250	494	320	1615	1684	700-840		46.3	10
6:15	240	478	320	1643	1710				
6:30	260	487	320	1689	1764				
6:45	245	490	320	1701	1776				
7:00	245	489	320	1720	1803				

K-39

37

* FROM POND LOOP ONLY

T-O HEATER LOG

DATE: 2-12-92

PLANT: Tuc Harbor

BY: Dayer Operator

FUEL FEED SETTING: Auto

POND SET POINT: 58 °C

BLDG HEAT SET POINT: 88 °C

T-O OUTLET SET POINT: 485 °F

1. READINGS EVERY 15 MINUTES.
2. BARK MOISTURE ONCE PER HOUR.
3. NOTE IF SET-POINTS ARE CHANGED.

TIME	°F OIL TEMP		AIR FLOW L+R °C	FUEL COUNT		REFRACTORY FURNACE °C	BARK MOISTURE						BAGHOUSE °F
AM	IN *	OUT	L(mb) R	A L	B R	L TEMP R	% / hr						
7:00	315	485	32	0	0	720 / 900	44.2						7
7:15	290	485	320	55	60	720 / 800	[redacted]						7
7:30	270	485	320	101	104	720 / 805	x						7.8
7:45	275	485	320	110	114	720 / 805							8.6
8:00	275	485	320	168	174	720 / 810	46.4						9.3
8:15	275	485	320	195	201	720 / 810	x						9.2
8:30	270	485	320	214	222	720 / 810	x						9.3
8:45	275	485	320	250	260	730 / 820	x						9.4
9:00							47x7						

TWO HARBORS PRESS VENT TESTING
FEB 13, 1992

RESIN AND WAX USAGE

USAGE FROM DAILY INVENTORY SHEETS

MDI = 18258 lbs
WAX = 9227 lbs AT 48% SOLIDS
= 4429 lbs

DAILY PRESSLOADS = 344

PRESSLOADS/HR DURING TESTING = 14.1

MDI USE = 18258 lbs ÷ 344 PRESSLOADS
= 53.1 lb PER PRESSLOAD

WAX USE = 3897 lb ÷ 344 PRESSLOADS
11.3 lb PER PRESSLOAD

MDI PER HOUR =
53.1 lb/P.L. x 14.10 P.L./HR =
749 lb MDI
PER HOUR

749 lb MDI ÷ 21,240 lb FP =
3.5% MDI

WAX PER HOUR =
11.3 lb/P.L. x 14.10 P.L./HR =
159.3 lb
WAX PER HR.

159.3 lb WAX ÷ 21,240 lb FP =
0.75% WAX

39

LOUISIANA-PACIFIC CORP
TWO HARBORS, MN

DAILY INVENTORY SHEET

DATE: 2-13-92

28 DAYS IN MONTH
12 CURRENT DAY

	DAILY	MTD
PRESS LOADS	544	4,464
PRODUCTION	410,977	4,138,441
PRODUCTION *	504,106.4 (LBS)	5,076,838.4 (LBS)

INVENTORY TRACKING...

MDI RESIN (LBS)	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE	PRICE PER UNIT	USAGE DOLLARS	END INV DOLLARS
	156,549	0	156,549	138,291	18,258			
	0	0	0	0	0	0.000		
						MTD $ USAGE		

		DAILY	MTD	YTD
MDI USAGE (MTD)	162,224			
% RESIN USED (DAILY)	3.62%	LBS RESIN / MSF (DAILY)	44.43	44.03	707,526
% RESIN USED (MTD)	3.59%	COST PER MSF $			

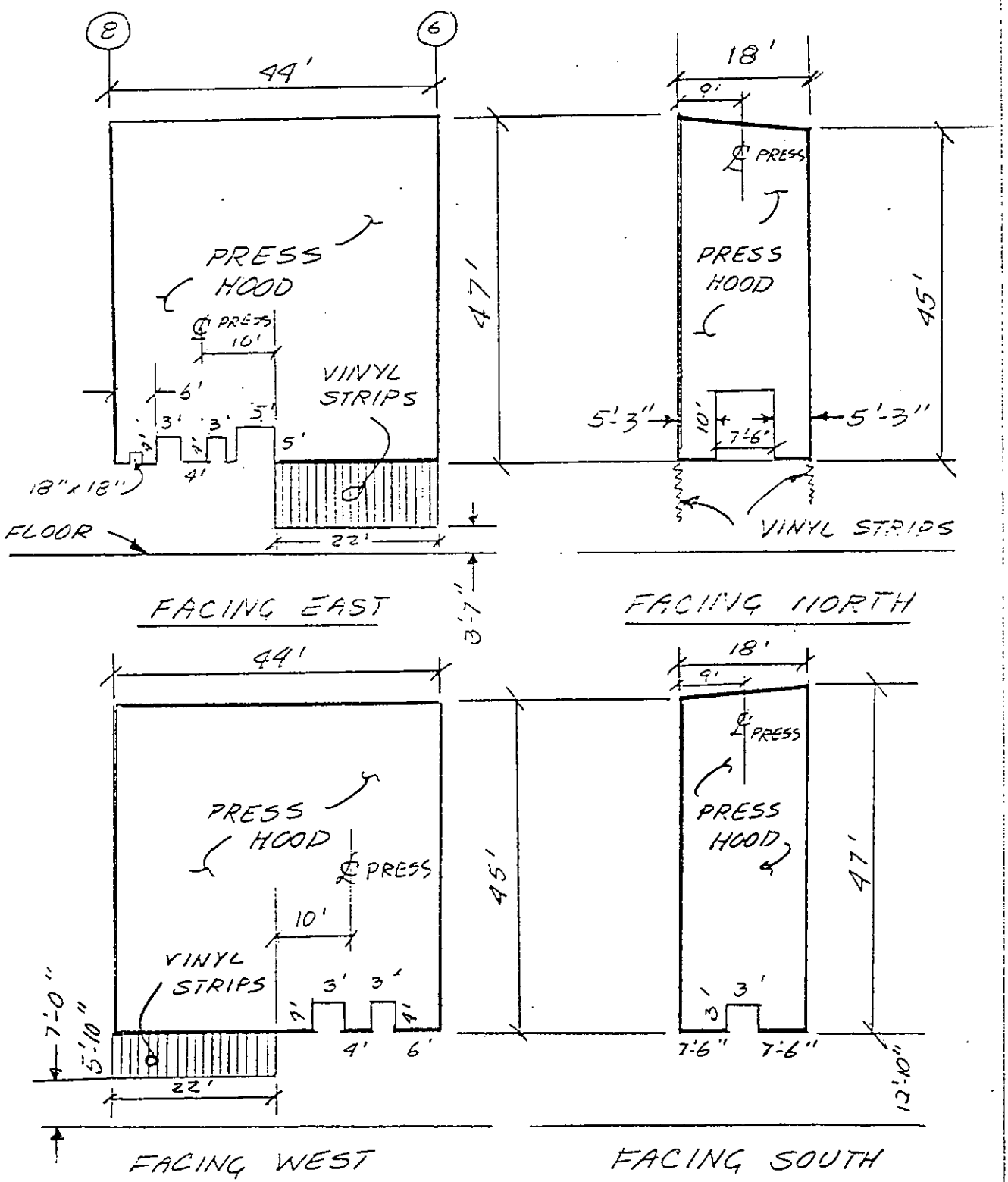
E-WAX (LBS)	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE	PRICE PER UNIT	USAGE DOLLARS	END INV DOLLARS
	0	0	0	0	0			
	108,094	0	108,094	98,867	9,227			
					X .48	MTD $ USAGE		

		(48%)	DAILY	MTD	YTD
E-WAX USAGE (MTD)	78243	37,640			
% WAX USED (DAILY)	0.82%	LBS WAX / MSF (DAILY)	22.45	19.05	161,749
% WAX USED (MTD)	0.75%	COST PER MSF $			

* BASED ON TARGET (NOT ACTUAL) BOARD WEIGHTS

TWO HARBORS TESTING FEB 11-13, 1992

VERIFICATION OF PRESS HOOD DIMENSIONS



DIMENSIONS ± 6"

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.

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 or stainless steel-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.

3a PI(1 & SS-5)

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

3aP2(7)

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 ^{o}F. After the post test leak check, the impinger train is removed and impinger contents poured into a tared all-glass sample bottle and closed with a Teflon-lined cap. The sample bottle is then weighed and the total condensate calculated by subtraction of the bottle tare weight and the

weight of initial water added to the impingers (200 g). A label is affixed and the sample is returned to the laboratory for analysis. The sample should be stored at 4 °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 °F ± 10 °F. The analyst may take an aliquot of the sample, transferring it to a tared beaker and evaporate to dryness at 220 °F ± 10 °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):

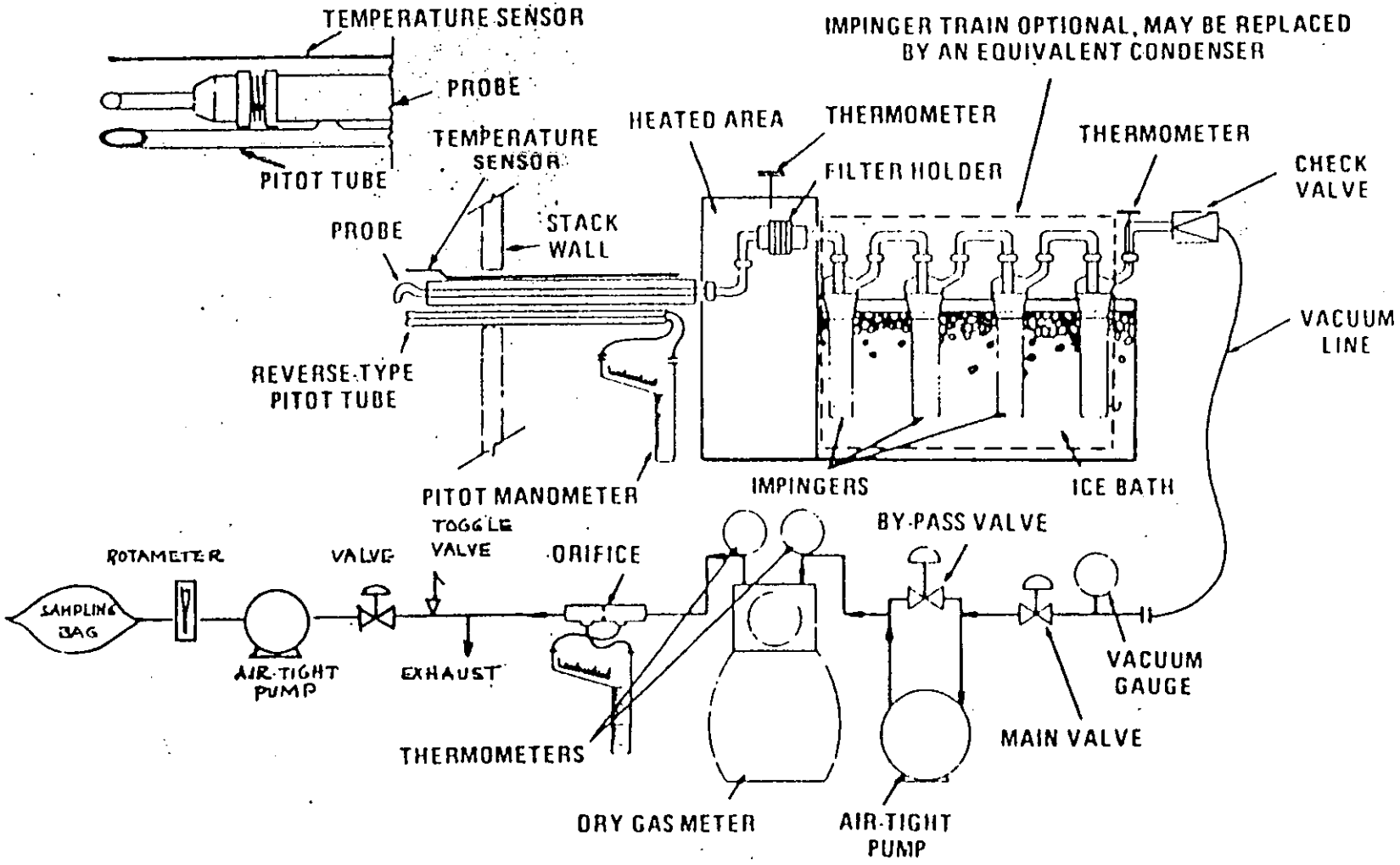
$$\text{grams} = \frac{(\text{grams recovered from aliquot}) \times (\text{total volume (ml) or grams of sample})}{(\text{aliquot volume (ml) or grams used})}$$

   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.



Particulate-sampling train.

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

Current as of 3-26-91

METHOD 201A - DETERMINATION OF PM_{10} EMISSIONS (Constant Sampling Rate Procedure)

(55 FR 14246)

1. Applicability and Principle

1.1 Applicability. This method applies to the in-stack measurement of particulate matter (PM) emissions equal to or less than an aerodynamic diameter of nominally 10 μm (PM_{10}) from stationary sources. The EPA recognizes that condensible emissions not collected by an in-stack method are also PM_{10}, and that emissions that contribute to ambient PM_{10} levels are the sum of condensible emissions and emissions measured by an in-stack PM_{10} method, such as this method or Method 201. Therefore, for establishing source contributions to ambient levels of PM_{10}, such as for emission inventory purposes, EPA suggests that source PM_{10} measurement include both in-stack PM_{10} and condensible emissions. Condensible emissions may be measured by an impinger analysis in combination with this method.

1.2 Principle. A gas sample is extracted at a constant flow rate through an in-stack sizing device, which separates PM greater than PM_{10}. Variations from isokinetic sampling conditions are maintained within well-defined limits. The particulate mass is determined gravimetrically after removal of uncombined water.

2. Apparatus

NOTE: Methods cited in this method are part of 40 CFR Part 60, Appendix A.

2.1 Sampling Train. A schematic of the Method 201A sampling train is shown in Figure 1. With the exception of the PM_{10} sizing device and in-stack filter, this train is the same as an EPA Method 17 train.

2.1.1 Nozzle. Stainless steel (316 or equivalent) with a sharp tapered leading edge. Eleven nozzles that meet the design specifications in Figure 2

This version is a corrected version of (55 FR 14246 Apr 17 1990)

are recommended. A large number of nozzles with small nozzle increments increase the likelihood that a single nozzle can be used for the entire traverse. If the nozzles do not meet the design specifications in Figure 2, then the nozzles must meet the criteria in Section 5.2.

2.1.2 PM_{10} Sizer. Stainless steel (316 or equivalent), capable of determining the PM_{10} fraction. The sizing device shall be either a cyclone that meets the specifications in Section 5.2 or a cascade impactor that has been calibrated using the procedure in Section 5.4.

2.1.3 Filter Holder. 63-mm, stainless steel. An Andersen filter, part number SE274, has been found to be acceptable for the in-stack filter. NOTE: Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

2.1.4 Pitot Tube. Same as in Method 5, Section 2.1.3. The pitot lines shall be made of heat resistant tubing and attached to the probe with stainless steel fittings.

2.1.5 Probe Liner. Optional, same as in Method 5, Section 2.1.2.

2.1.6 Differential Pressure Gauge, Condenser, Metering System, Barometer, and Gas Density Determination Equipment. Same as in Method 5, Sections 2.1.4, and 2.1.7 through 2.1.10, respectively.

2.2 Sample Recovery.

2.2.1 Nozzle, Sizing Device, Probe, and Filter Holder Brushes. Nylon bristle brushes with stainless steel wire shafts and handles, properly sized and shaped for cleaning the nozzle, sizing device, probe or probe liner, and filter holders.

2.2.2 Wash Bottles, Glass Sample Storage Containers, Petri Dishes, Graduated Cylinder and Balance, Plastic Storage Containers, Funnel and Rubber

Policeman, and Funnel. Same as in Method 5, Sections 2.2.2 through 2.2.8, respectively.

2.3 Analysis. Same as in Method 5, Section 2.3.

3. Reagents

The reagents for sampling, sample recovery, and analysis are the same as that specified in Method 5, Sections 3.1, 3.2, and 3.3, respectively.

4. Procedure

4.1 Sampling. The complexity of this method is such that, in order to obtain reliable results, testers should be trained and experienced with the test procedures.

4.1.1 Pretest Preparation. Same as in Method 5, Section 4.1.1.

4.1.2 Preliminary Determinations. Same as in Method 5, Section 4.1.2, except use the directions on nozzle size selection and sampling time in this method. Use of any nozzle less than greater that 0.16 in. in diameter require a sampling port diameter of 6 inches. Also, the required maximum number of traverse points at any location shall be 12.

? See pg 22

4.1.2.1 The sizing device must be in-stack or maintained at stack temperature during sampling. The blockage effect of the CSR sampling assembly will be minimal if the cross-sectional area of the sampling assemble is 3 percent or less of the cross-sectional area of the duct. ie $D_s \geq 17.5$ inches If the cross-sectional area of the assembly is greater than 3 percent of the cross-sectional area of the duct, then either determine the pitot coefficient at sampling conditions or use a standard pitot with a known coefficient in a configuration with the CSR sampling assembly such that flow disturbances are minimized.

* when $D_s \leq 17.5$ inches, blockage exceeds 3%

4.1.2.2 The setup calculations can be performed by using the following procedures.

4.1.2.2.1 In order to maintain a cut size of 10 μm in the sizing device, the flow rate through the sizing device must be maintained at a constant, discrete value during the run. If the sizing device is a cyclone that meets the design specifications in Figure 3, use the equations in Figure 4 to calculate three orifice pressure drops (ΔH): one at the average stack temperature, and the other two at temperatures ±28°C (±50°F) of the average stack temperature. Use the ΔH calculated at the average stack temperature as the orifice pressure head for the sample flow rate as long as the stack temperature during the run is within 28°C (50°F) of the average stack temperature. If the stack temperature varies by more than 28°C (50°F), then use the appropriate ΔH.

4.1.2.2.3 To select a nozzle, use the equations in Figure 5 to calculate Δp_{min} and Δp_{max} for each nozzle at all three temperatures. If the sizing device is a cyclone that does not meet the design specifications in Figure 3, the example worksheets can be used.

4.1.2.2.4 Correct the Method 2 pitot readings to Method 201A pitot readings by multiplying the Method 2 pitot readings by the square of a ratio of the Method 201A pitot coefficient to the Method 2 pitot coefficient. Select the nozzle for which Δp_{min} and Δp_{max} bracket all of the corrected Method 2 pitot readings. If more than one nozzle meets this requirement,

select the nozzle giving the greatest symmetry. Note that if the expected pitot reading for one or more points is near a limit for a chosen nozzle, it may be outside the limits at the time of the run.

4.1.2.2.5 Vary the dwell time, or sampling time, at each traverse point proportionately with the point velocity. Use the equations in Figure 6 to calculate the dwell time at the first point and at each subsequent point. It is recommended that the number of minutes sampled at each point be rounded to the nearest 15 seconds.

4.1.3 Preparation of Collection Train. Same as in Method 5, Section 4.1.3, except omit directions about a glass cyclone.

4.1.4 Leak-Check Procedure. The sizing device is removed before the post-test leak-check to prevent any disturbance of the collected sample prior to analysis.

4.1.4.1 Pretest Leak-Check. A pretest leak-check of the entire sampling train, including the sizing device, is required. Use the leak-check procedure in Method 5, Section 4.1.4.1 to conduct a pretest leak-check.

4.1.4.2 Leak-Checks During Sample Run. Same as in Method 5, Section 4.1.4.1.

4.1.4.3 Post-Test Leak-Check. A leak-check is required at the conclusion of each sampling run. Remove the cyclone before the leak-check to prevent the vacuum created by the cooling of the probe from disturbing the collected sample and use the procedure in Method 5, Section 4.1.4.3 to conduct a post-test leak-check.

4.1.5 Method 201A Train Operation. Same as in Method 5, Section 4.1.5, except use the procedures in this section for isokinetic sampling and flow rate adjustment. Maintain the flow rate calculated in Section 4.1.2.2.1

throughout the run provided the stack temperature is within 28°C (50°F) of the temperature used to calculate ΔH. If stack temperatures vary by more than 28°C (50°F), use the appropriate ΔH value calculated in Section 4.1.2.2.1. Calculate the dwell time at each traverse point as in Figure 6.

4.2 Sample Recovery. If a cascade impactor is used, use the manufacturer's recommended procedures for sample recovery. If a cyclone is used, use the same sample recovery as that in Method 5, Section 4.2, except an increased number of sample recovery containers is required.

4.2.1 Container Number 1 (In-Stack Filter). The recovery shall be the same as that for Container Number I in Method 5, Section 4.2.

4.2.3 Container Number 2 (Cyclone or Large PM Catch). This step is optional. The anisokinetic error for the cyclone PM is theoretically larger than the error for the PM_{10} catch. Therefore, adding all the fractions to get a total PM catch is not as accurate as Method 5 or Method 201. Disassemble the cyclone and remove the nozzle to recover the large PM catch. Quantitatively recover the PM from the interior surfaces of the nozzle and cyclone, excluding the "turn around" cup and the interior surfaces of the exit tube. The recovery shall be the same as that for Container Number 2 in Method 5, Section 4.2.

4.2.4 Container Number 3 (PM_{10}). Quantitatively recover the PM from all of the surfaces from the cyclone exit to the front half of the in-stack filter holder, including the "turn around" cup inside the cyclone and the interior surfaces of the exit tube. The recovery shall be the same as that for Container Number 2 in Method 5, Section 4.2.

4.2.6 Container Number 4 (Silica Gel). The recovery shall be the same as that for Container Number 3 in Method 5, Section 4.2.

4.2.7 Impinger Water. Same as in Method 5, Section 4.2, under "Impinger Water."

4.3 Analysis. Same as in Method 5, Section 4.3, except handle Method 201A Container Number 1 like Container Number 1, Method 201A Container Numbers 2 and 3 like Container Number 2, and Method 201A Container Number 4 like Container Number 3. Use Figure 7 to record the weights of PM collected. Use Figure 5-3 in Method 5, Section 4.3, to record the volume of water collected.

4.4 Quality Control Procedures. Same as in Method 5, Section 4.4.

4.5 PM_{10} Emission Calculation and Acceptability of Results. Use the procedures in Section 6 to calculate PM_{10} emissions and the criteria in Section 6.3.5 to determine the acceptability of the results.

5. Calibration

Maintain an accurate laboratory log of all calibrations.

5.1 Probe Nozzle, Pitot Tube, Metering System, Probe Heater Calibration, Temperature Gauges, Leak-check of Metering System, and Barometer. Same as in Method 5, Section 5.1 through 5.7, respectively.

6. Calculations

Calculations are as specified in Method 5, Sections 6.3 through 6.7, and 6.9 through 6.11, with the addition of the following:

6.1 Nomenclature.

B_{ws} = Moisture fraction of stack, by volume, dimensionless.

C_1 = Viscosity constant, 51.12 micropoise for °K (51.05 micropoise for °R).

C_2 = Viscosity constant, 0.372 micropoise/°K (0.207 micropoise/°R).

C_3 = Viscosity constant, 1.05×10^{-4} micropoise/°K^2 (3.24×10^{-5} micropoise/°R^2).

C_4 = Viscosity constant, 53.147 micropoise/fraction O_2.

C_5 = Viscosity constant, 74.143 micropoise/fraction H_2O.

D_{50} = Diameter of particles having a 50 percent probability of penetration, μm.

f_o = Stack gas fraction O_2, by volume, dry basis.

K_1 = 0.3858 °K/mm Hg (17.64 °R/in. Hg).

M_w = Wet molecular weight of the stack gas, g/g-mole (lb/lb-mole).

M_d = Dry molecular weight of stack gas, g/g-mole (lb/lb-mole).

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

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

Q_s = Total cyclone flow rate at wet cyclone conditions, m^3/min (ft^3/min). YES!

$Q_{s(std)}$ = Total cyclone flow rate at dry standard conditions, dscm/min (dscf/min). DSCFM YES!

T_m = Average absolute temperature of dry meter, °K (°R).

T_s = Average absolute stack gas temperature, °K (°R).

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

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

θ = Total sampling time, min.

μ_s = Viscosity of stack gas, micropoise.

6.2 Analysis of Cascade Impactor Data. Use the manufacturer's recommended procedures to analyze data from cascade impactors.

6.3 Analysis of Cyclone Data. Use the following procedures to analyze data from a single stage cyclone.

6.3.1 PM_{10} Weight. Determine the PM catch in the PM_{10} range from the sum of the weights obtained from Container Numbers 1 and 3 less the acetone blank.

6.3.2 Total PM Weight (optional). Determine the PM catch for greater than PM_{10} from the weight obtained from Container Number 2 less the acetone blank, and add it to the PM_{10} weight.

6.3.3 PM_{10} Fraction. Determine the PM_{10} fraction of the total particulate weight by dividing the PM_{10} particulate weight by the total particulate weight.

6.3.4 Aerodynamic Cut Size. Calculate the stack gas viscosity as follows:

$$\mu_s = C_1 + C_2 T_s + C_3 T_s^2 + C_4 f_{O2} - C_5 B_{ws}$$

No! Use equation on page 24

$V_{w(std)} = .04707 (V_f - V_i)$

6.3.4.1 The PM_{10} flow rate, at actual cyclone conditions, is calculated as follows:

$$Q_s = \frac{T_s}{K_1 P_s} \left[Q_{s(std)} + \frac{V_{w(std)}}{\theta} \right]$$

$T_s = \bar{t}_s + 460$

but $Q_{s(std)} = \frac{V_{m(std)}}{\theta}$

$K_1 = 17.64$

Substituting gives:

$$Q_s = \frac{5.669 \times 10^{-2} (\bar{T}_s + 460)}{\theta P_s} \left[V_{m(std)} + .04707 (V_f - V_i) \right]$$

6.3.4.2 Calculate the molecular weight on a wet basis of the stack gas as follows:

$$M_w = M_d (1 - B_{ws}) + 18.0 (B_{ws})$$

6.3.4.3 Calculate the actual D_{50} of the cyclone for the given conditions as follows:

$$D_{50} = \beta_1 \left[\frac{T_s}{M_w P_s} \right]^{0.2091} \left[\frac{\mu_s}{Q_s} \right]^{0.7091}$$

actual cutpoint achieved during run

where $\beta_1 = 0.027754$ for metric units (0.15625 for English units).

6.3.5 Acceptable Results. The results are acceptable if two conditions are met. The first is that 9.0 $\mu m \leq D_{50} \leq 11.0$ μm. The second is that no sampling points are outside Δp_{min} and Δp_{max}, or that 80 percent $\leq I \leq$ 120 percent and no more than one sampling point is outside Δp_{min} and Δp_{max}. If D_{50} is less than 9.0 μm, reject the results and repeat the test.

7. Bibliography

1. Same as Bibliography in Method 5.

2. McCain, J.D., J.W. Ragland, and A.D. Williamson. Recommended Methodology for the Determination of Particle Size Distributions in Ducted Sources, Final Report. Prepared for the California Air Resources Board by Southern Research Institute. May 1986.

3. Farthing, W.E., S.S. Dawes, A.D. Williamson, J.D. McCain, R.S. Martin, and J.W. Ragland. Development of Sampling Methods for Source PM_{10} Emissions. Southern Research Institute for the Environmental Protection Agency. April 1989. NTIS PB 89 190375, EPA/600/3-88-056.

4. Application Guide for Source PM_{10} Measurement with Constant Sampling Rate, EPA/600/3-88-057.

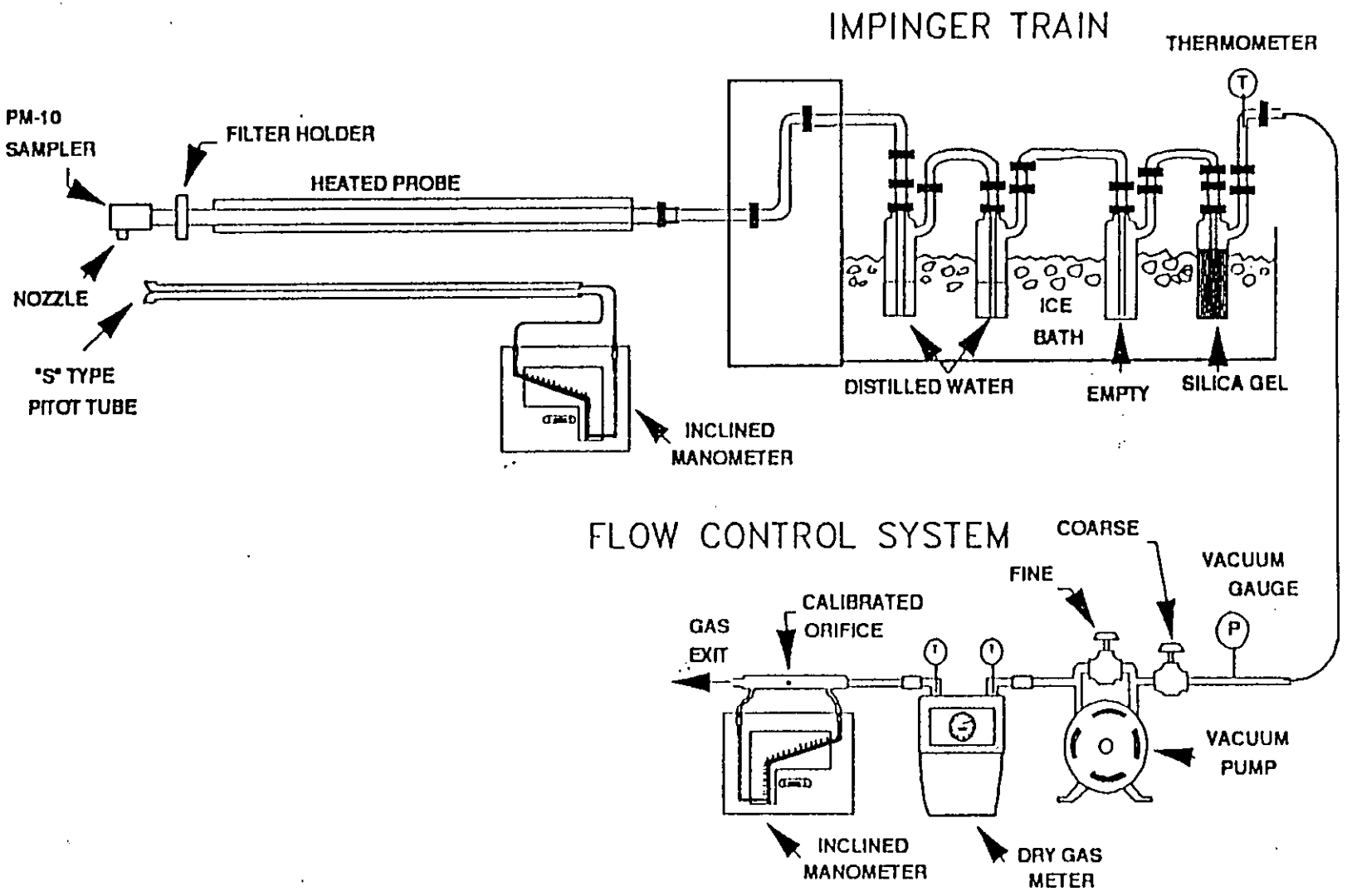
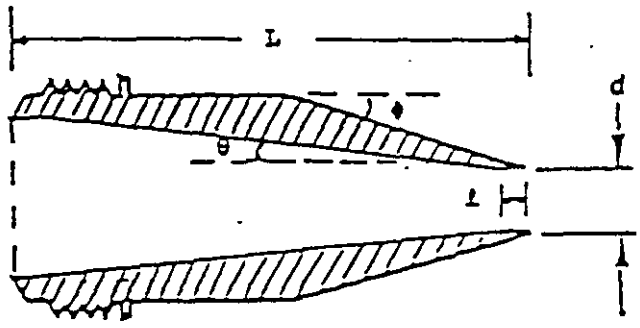


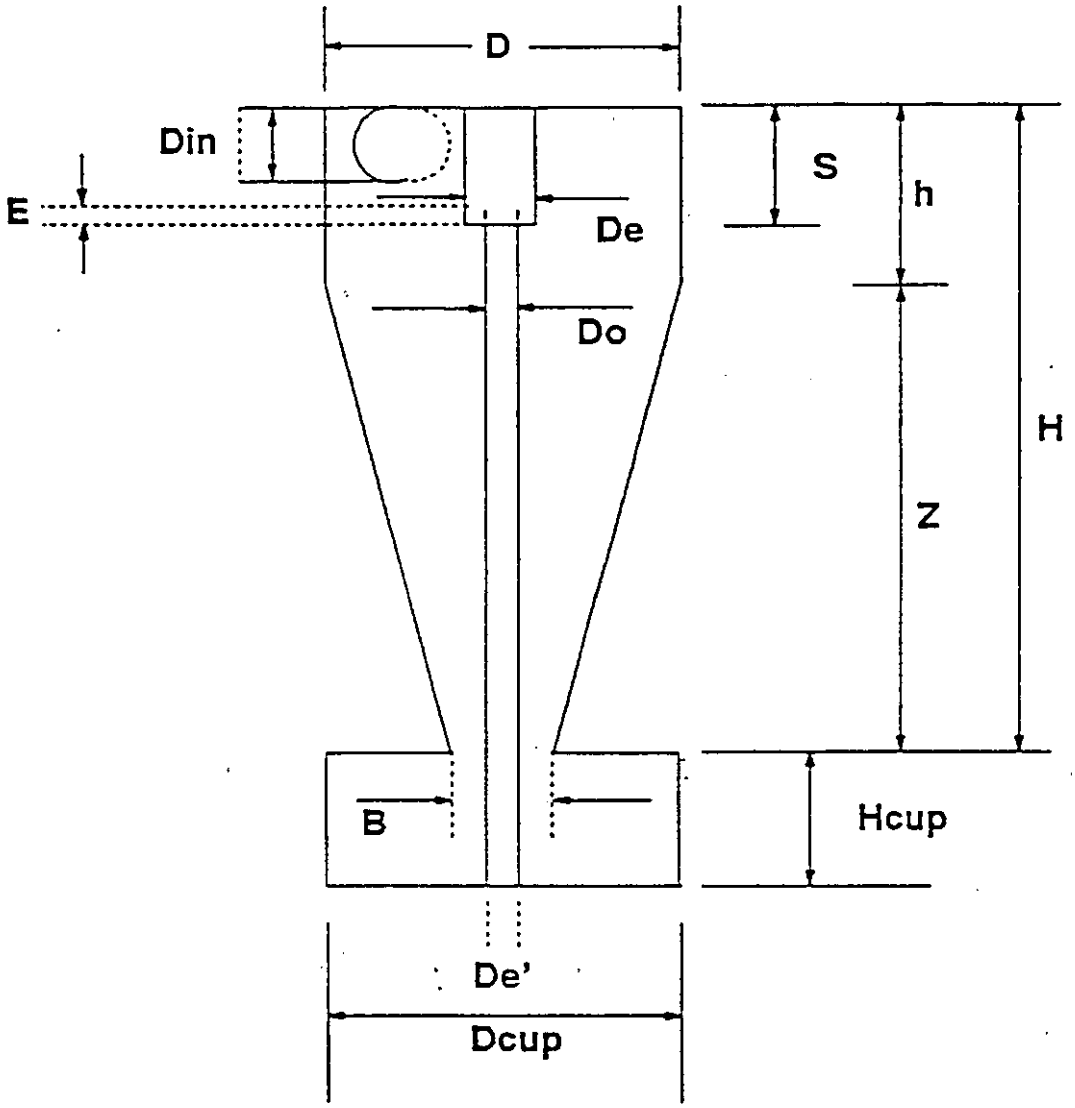
Figure 1. CSR Sampling Train



Nozzle Diameter (inches)	Cone Angle, θ (degrees)	Outside taper, ϕ (degrees)	Straight inlet length, ℓ (inches)	Total Length L (inches)
0.136	4	15	<0.05	2.653±0.05
0.150	4	15	<0.05	2.553±0.05
0.164	5	15	<0.05	1.970±0.05
0.180	6	15	<0.05	1.572±0.05
0.197	6	15	<0.05	1.491±0.05
0.215	6	15	<0.05	1.45 ±0.05
0.233	6	15	<0.05	1.45 ±0.05
0.264	5	15	<0.05	1.45 ±0.05
0.300	4	15	<0.05	1.48 ±0.05
0.342	4	15	<0.05	1.45 ±0.05
0.390	3	15	<0.05	1.45 ±0.05

Figure 2. Nozzle design specifications.

Cyclone Interior Dimensions



	Dimensions (+0.02 cm, +0.01 in.)												
	Din	D	De	B	H	h	Z	S	Hcup	Dcup	De'	Do	E
cm	1.27	4.47	1.50	1.88	6.95	2.24	4.71	1.57	2.25	4.45	1.02	1.24	0.25
in.	0.50	1.76	0.59	0.74	2.74	0.88	1.85	0.62	0.89	1.75	0.40	0.49	0.10

Figure 3. Cyclone design specifications.

Barometric pressure, P_{bar}, in. Hg = _____
Stack static pressure, P_g, in. H_2O = _____
Average stack temperature, t_s, °F = _____
Meter temperature, t_m, °F = _____
Orifice ΔH_a, in. H_2O = _____

Gas analysis:

$\%CO_2$ = _____
$\%O_2$ = _____
$\%N_2 + \%CO$ = _____
Fraction moisture content, B_{ws} = _____

Molecular weight of stack gas, dry basis:

$$M_d = 0.44(\%CO_2) + .32(\%O_2) + 0.28(\%N_2 + \%CO) = \_\_\_\_\_ \text{lb/lb mole}$$

Molecular weight of stack gas, wet basis:

$$M_w = M_d(1 - B_{ws}) + 18(B_{ws}) = \_\_\_\_\_ \text{lb/lb mole}$$

Absolute stack pressure:

$$P_s = P_{bar} + \frac{P_g}{13.6} = \_\_\_\_\_ \text{in. Hg}$$

Viscosity of stack gas:

$$\mu_s = 152.418 + 0.2552\ t_s + 3.2355 \times 10^{-5}\ t_s^2 + 0.53147\ (\%O_2) - 74.143\ B_{ws} = \_\_\_\_ \text{ micropoise}$$

Cyclone flow rate:

$$Q_s = 0.002837\ \mu_s \left[\frac{t_s + 460}{M_w\ P_s}\right]^{0.2949} = \_\_\_ \text{ ft}^3/\text{min}$$

Figure 4. Example worksheet 1 (Page 1 of 2), cyclone flow rate and ΔH.

note

Orifice pressure head (ΔH) needed for cyclone flow rate:

$$\Delta H = \left[\frac{Q_s(1-B_{ws})P_s}{t_s + 460}\right]^2 \frac{(t_a + 460)\ M_d\ (1.083)\ \Delta H_a}{P_{bar}} = \_\_\_\_\_ \text{ in. } H_2O$$

Calculate ΔH for three temperatures:

t_s, °F			
ΔH, in. H_2O			

Figure 4. Example worksheet 1 (Page 2 of 2), cyclone flow rate and ΔH.

Stack viscosity, μ_s, micropoise = _____
Absolute stack pressure, P_s, in. Hg = _____
Average stack temperature, t_s, °F = _____
Meter temperature, t_m, °F = _____
Method 201A pitot coefficient, C_p = _____
Cyclone flow rate, ft^3/min, Q_s = _____
Method 2 pitot coefficient, C_p = _____
Molecular weight of stack gas, wet basis, M_w = _____
Nozzle diameter, D_n, in. = _____

Nozzle velocity

$$v_n = \frac{3.056\ Q_s}{D_n^2} = \_\_\_\_\_ \text{ft/sec}$$

Maximum and minimum velocities:

Calculate R_{min}.

$$R_{min} = 0.2457 + \sqrt{0.3072 - \frac{0.2603\ (\sqrt{Q_s})\ \mu_s}{v_n^{1.5}}} = \_\_\_\_$$

If R_{min} is less than 0.5, or if an imaginary number occurs when calculating R_{min}, use Equation 1 to calculate v_{min}. Otherwise, use Equation 2.

Eq. 1 $v_{min} = v_n\ (0.5) = \_\_\_\_\_$ ft/sec

Eq. 2 $v_{min} = v_n\ R_{min} = \_\_\_\_\_$ ft/sec

Calculate R_{max}.

$$R_{max} = 0.4457 + \sqrt{0.5690 + \frac{0.2603\ (\sqrt{Q_s})\ \mu_s}{v_n^{1.5}}} = \_\_\_\_$$

Figure 5. Example worksheet 2 (page 1 of 2), nozzle selection.

If R_{max} is greater than 1.5, use Equation 3 to calculate v_{max}. Otherwise, use Equation 4.

Eq. 3 $v_{max} = v_n\ (1.5) =$ _____ ft/sec

Eq. 4 $v_{max} = v_n\ R_{max} =$ _____ ft/sec

Maximum and minimum velocity head values:

$$\Delta p_{min} = 1.3686 \times 10^{-4} \frac{P_s\ M_w\ (v_{min})^2}{(t_s + 460)\ C_p^2} = \_\_\_\_\_ \text{ in. } H_2O$$

$$\Delta p_{max} = 1.3686 \times 10^{-4} \frac{P_s\ M_w\ (v_{max})^2}{(t_s + 460)\ C_p^2} = \_\_\_\_\_ \text{in. } H_2O$$

Nozzle Number				
D_n, in.				
v_n, ft/sec				
v_{min}, ft/sec				
v_{max}, ft/sec				
Δp_{min}, in. H_2O				
Δp_{max}, in. H_2O				

Velocity traverse data:

incorrect

$$\Delta p(\text{Method 201A}) = \Delta p(\text{Method 2}) \left[\frac{C_p}{C_p'}\right]^2 = \Delta p^{M2} \left(\frac{C_p^{M2}}{C_p^{201A}}\right)^2$$

4-11-91 PE

Figure 5. Example worksheet 2 (page 2 of 2), nozzle selection.

Total run time, minutes = _____

Number of traverse points = _____

$$t_1 = \left[\frac{\Delta p'_1}{\Delta p'_{avg}} \right] \left(\frac{\text{Total run time}}{\text{Number of points}} \right)$$

where:

t_1 = dwell time at first traverse point, minutes.

$\Delta p'_1$ = the velocity head at the first traverse point (from a previous traverse), in. H_2O.

$\Delta p'_{avg}$ = the square of the average square root of the Δp's (from a previous velocity traverse), in. H_2O.

At subsequent traverse points, measure the velocity Δp and calculate the dwell time by using the following equation:

$$t_n = \frac{t_1}{\sqrt{\Delta p_1}} \sqrt{\Delta p_n}, \text{ where } n = 2,3,....\text{total number of sampling points}$$

where:

t_n = dwell time at traverse point n, minutes.

Δp_n = measured velocity head at point n, in. H_2O.

Δp_1 = measured velocity head at point 1, in. H_2O.

Figure 6. Example worksheet 3 (page 1 of 2), dwell time.

Port No_____ Port No_____ Port No_____ Port No_____

Point Number	Δp	t	Δp	t	Δp	t	Δp	t
1								
2								
3								
4								
5								
6								

Figure 6. Example worksheet 3 (page 2 of 2), dwell time.

Plant _____

Date _____

Run no. _____

Filter no. _____

Amount of liquid lost during transport _____

Acetone blank volume, ml _____

Acetone wash volume, ml (4) _____ (5) _____

Acetone blank conc., mg/mg (Equation 5-4, Method 5) _____

Acetone wash blank, mg (Equation 5-5, Method 5) _____

Container number	Weight of PM_{10} (mg)		
	Final weight	Tare weight	Weight gain
1			
3			
		Total.....	
		Less acetone blank.....	
		Weight of PM10.....	

Figure 7. Method 201A analysis sheet.

TABLE 1. PERFORMANCE SPECIFICATIONS FOR SOURCE PM_{10} CYCLONES AND NOZZLE COMBINATIONS

Parameter	Units	Specification
1. Collection efficiency	Percent	Such that collection efficiency falls within envelope specified by Section 5.2.6 and Figure 8.
2. Cyclone cut size (D_{50})	μm	10 ± 1 μm aerodynamic diameter

TABLE 2. PARTICLE SIZES AND NOMINAL GAS VELOCITIES FOR EFFICIENCY

Particle size (μm)[a]	Target gas velocities (m/sec)		
	7 ± 1.0	15 ± 1.5	25 ± 2.5
5 ± 0.5			
7 ± 0.5			
10 ± 0.5			
14 ± 1.0			
20 ± 1.0			

(a) Mass median aerodynamic diameter.

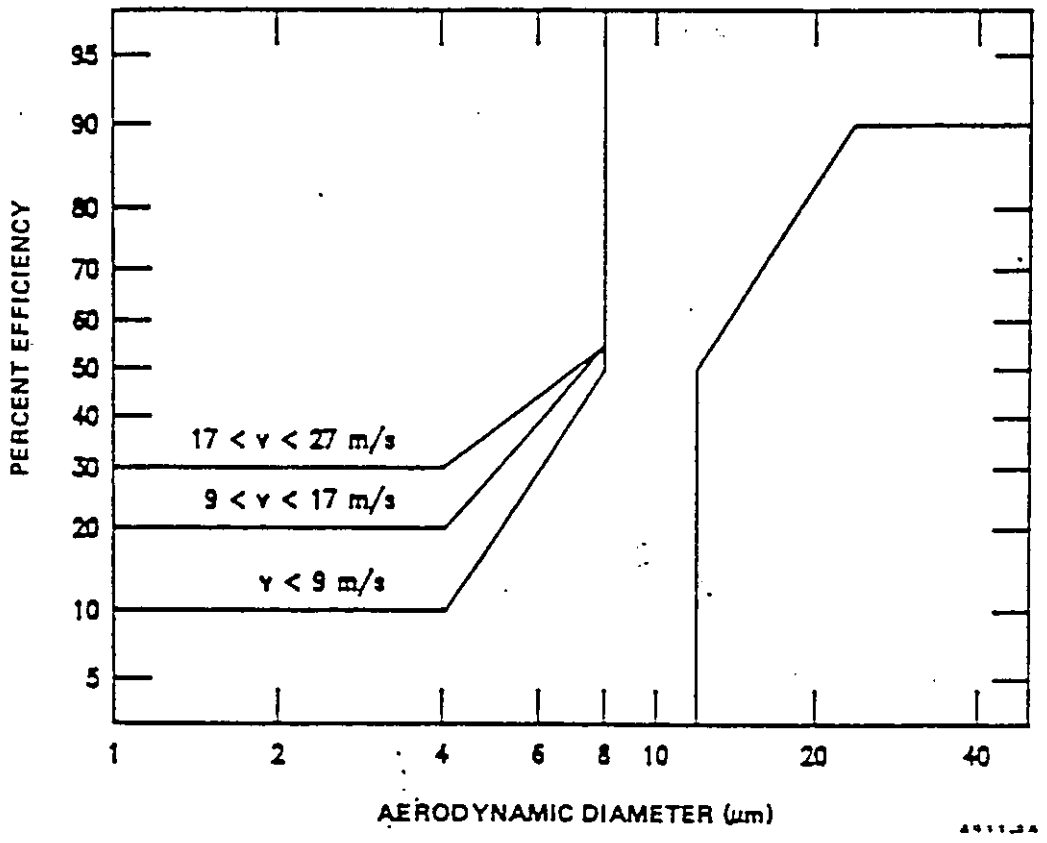


Figure 8. Efficiency envelope for the PM_{10} cyclone.

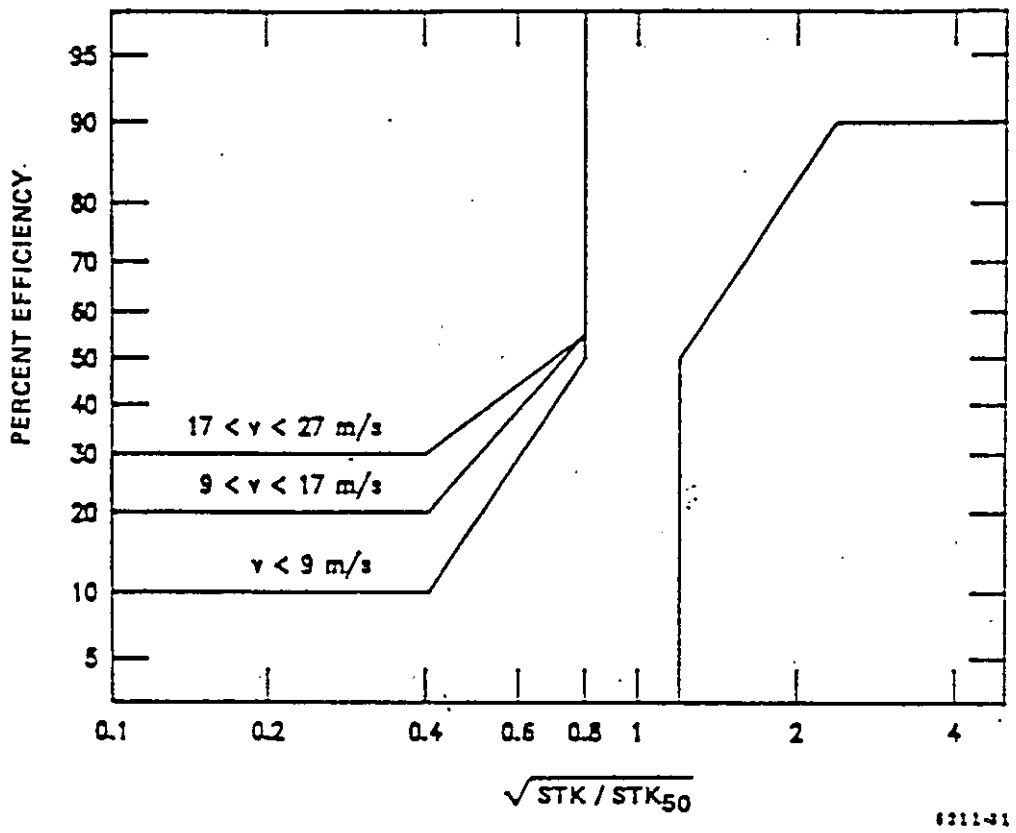


Figure 9. Efficiency envelope for first calibration stage.

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 ± 2% full scale and the noise is less than 0.5 fs. The minimum detectable concentration is 5 ppm. Zero drift is rated at ± 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 ± 0.5% fs on low range and ± 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 gelor 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.

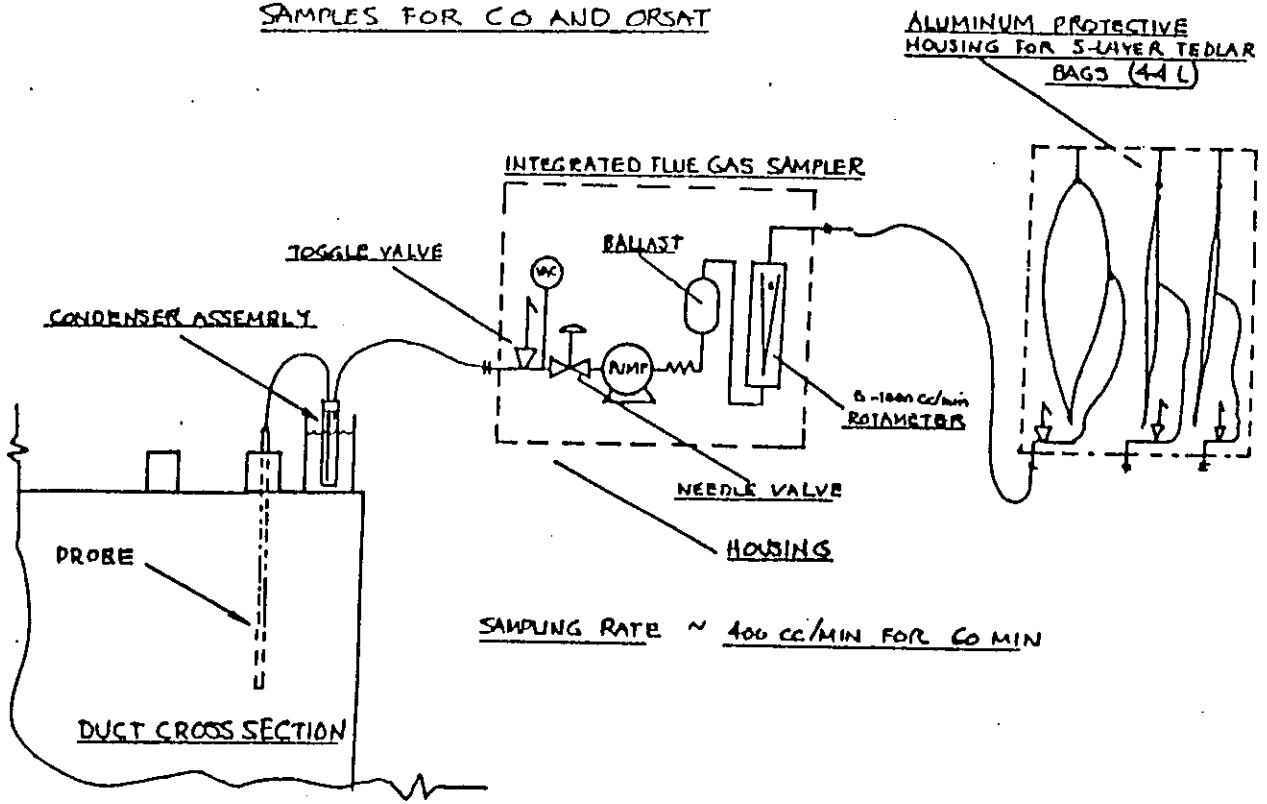
After sampling is complete, the bags are transported to the laboratory for analysis. The bags are analyzed using a flow system whereby any residual moisture and carbon dioxide are quantitatively removed prior to introduction into the NDIR. This is accomplished using two cartridges in series immersed 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, CO_2-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.

SAMPLING SYSTEM TO COLLECT INTEGRATED FLUE GAS SAMPLES FOR CO AND ORSAT



SAMPLING RATE ~ 400 cc/MIN FOR 60 MIN

REVISIONS			EPA METHOD 3 & 10 SAMPLING TRAIN		
NO.	DATE	BY			
1					
2					
3			DRAWN BY LP	SCALE N/A	MATERIAL
4	1		CHK'D	DATE 10/95	DRAWING NO. S-310
5			TRACED	APP'D	

EPA
METHOD 0011

SAMPLING FOR FORMALDEHYDE EMISSIONS FROM STATIONARY SOURCES

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

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 ± 14°C (248 ± 25°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 4 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, µg/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):

$$AIL = 0.1 \times [EAL \times SVOL \times FW/22.4 \times (FW + 180)/FW]/(RVOL \times 1000).$$

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 500µL 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 ft^3 of sample volume is required for the determination of the Destruction and Removal Efficiency (DRE) of formaldehyde from incineration systems (45ft^3 is equivalent to one hour of sampling at 0.75 dscf). Additional sample volume shall be collected as ecessitated 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 m^3/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 m^3/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 m^3/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°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 m^3/min (0.02 cfm). At the end of the run, take the difference of the measured wet-test and dry-gas meter volumes and divide the difference by 10 to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

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 ±2°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 ±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:

Total mg formaldehyde = C_d x V x DF x

([g/mole aldehyde]/[g/mole DNPH derivative]) x

10^{-3} mg/μg

where:

C_d = measured concentration of DNPH-formaldehyde derivative, μg/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_f = K [total formaldehyde, mg] / $V_{m(std)}$

where:

K = 35.31 ft^3/m^3 if $V_{m(std)}$ is expressed in English units

= 1.00 m^3/m^3 if $V_{m(std)}$ is expressed in metric units

$V_{m(std)}$ = 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 $V_{m(std)}$ 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 $FORM_i$ Mass -

$$[\ (WF)\ (FORM_i\ conc)\ (100 - \%DRE)\ ]\ /\ 100$$

where:

WF - mass flow rate of waste feed per h, g/h (lb/h)

$FORM_i$ - 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:

$$\text{Max } FORM_i \text{ conc} = [\text{Max } FORM_i \text{ Mass }] / DV_{eff(std)}$$

where:

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

$FORM_i$ 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.

$$[LDL_{FORM} \times 10] / [FORM_{i\ conc}] = V_{tbc}$$

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 Analysis[1]

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 µL 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.

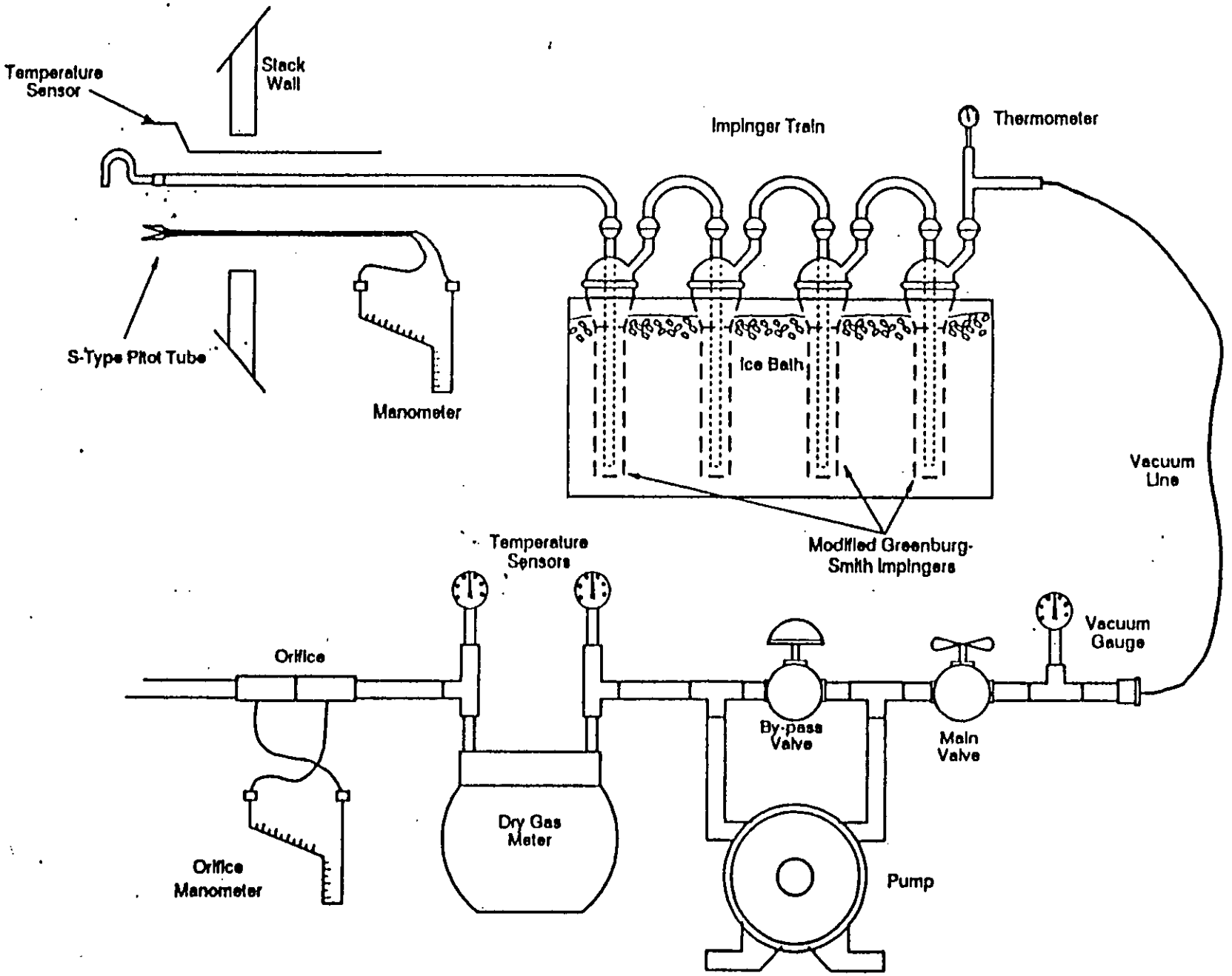
12.0 METHOD PERFORMANCE

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	±15% RPD	±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, m^3/min. (cfm) _____

Probe Liner Material _____

Static Pressure, mm Hg (in. Hg) _____

Filter No. _____

Traverse Point Number	Sampling Time (θ) Min.	Vacuum mm Hg (In. Hg)	Stack Temperature (T_s) °C (°F)	Velocity Head (P_s) mm (In) H_2O	Pressure Differential Across Orifice Meter mm (H_2O) (In H_2O)	Gas Sample Volume m^3 (ft^3)	Gas Sample Temp. at Dry Gas Meter		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

Method 25A—Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

1. *Applicability and Principle*

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

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

2. *Definitions*

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

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

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

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

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

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

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

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

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

3. *Apparatus*

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

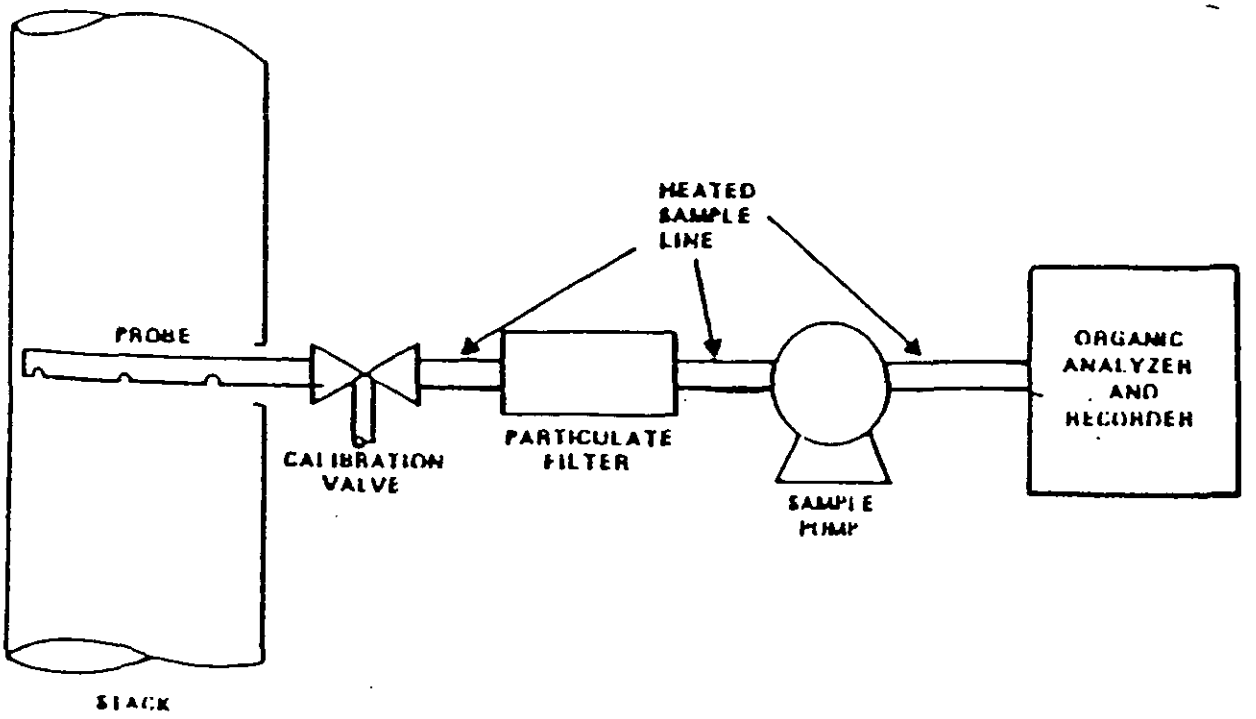


Figure 25A-1. Organic Concentration Measurement System.

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

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

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

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

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

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

4. *Calibration and Other Gases*

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

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

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

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

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

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

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

5. *Measurement System Performance Specifications*

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

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

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

6. *Pretest Preparations*

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

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

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

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

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

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

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

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

7. *Emission Measurement Test Procedure*

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

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

8. *Organic Concentration Calculations*

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

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

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

Where:

C_c = Organic concentration as carbon, ppmv.

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

K = Carbon equivalent correction factor.

K = 2 for ethane.

K = 3 for propane.

K = 4 for butane.

K = Appropriate response factor for other organic calibration gases.

9. *Bibliography*

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

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

APPENDIX M

CALCULATION EQUATIONS

CALCULATION EQUATIONS

METHOD 2

$$\bar{V}_s = 85.48\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,d} = 60(1 - B_{ws})\ \bar{V}_s\ A\ \left(\frac{528}{T_{s(avg)}}\right)\ \left(\frac{P_s}{29.92}\right)$$

$$Q_a = 60\ \bar{V}_s\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,d}\ G_d}{1 - B_{ws}}$$

$$RH^* = 100\ (vp_{twb}\ 0.0003641\ P_s\ (T_{db} - T_{wb}))/vp_{tdb}$$

$$B^*_{ws} = RH(vp_{tdb})/P_s$$

$$= \frac{4.585 \times 10^{-2}\ P_s M_s}{T_{s\ (avg)}}$$

*Alternate equations for calculating moisture content from wet bulb and dry buld 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, ^oF

T_{wb} = Wet bulb temperature of stack gas, ^oF

$T_{m(avg)}$ = Absolute average dry gas meter temperature, ^oR

$T_s(avg)$ = Absolute average stack temperature, ^oF

T_{std} = Standard absolute temperature, 528 ^oF (68 ^oF)

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

$\overline{V}_s$ = Average actual stack gas velocity, FT/SEC

vP_{tdb} = Vapor pressure at T_{db}, IN. HG.

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

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

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

γ = Dry test meter correction coefficient, dimensionless

ρ = Actual gas density, LB/ACF

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

$$V_{m(std)} = 17.65\ V_m\ \gamma\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{Is}$$

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

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1 - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_1 = 8.5714 \times 10^{-3}\ C_s\ Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228 \times 10^{-1}\ M_p\ A}{0\ A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

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, ^{o}F

T_{wb} = Wet bulb temperature of stack gas, ^{o}F

$T_{m(avg)}$ = Absolute average dry gas meter temperature, ^{o}R

$T_s(avg)$ = Absolute average stack temperature, ^{o}F

T_{std} = Standard absolute temperature, 528 ^{o}F (68 ^{o}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

$\overline{V}_s$ = Average actual stack gas velocity, FT/SEC

v_{Ptdb} = Vapor pressure at T_{db}, IN. HG.

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

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

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

γ = Dry test meter correction coefficient, dimensionless

ρ = Actual gas density, LB/ACF

Interpoll Laboratories
PM-10 Equations

Preliminary Run Calculations:

$$M_d = 0.44\,B_{CO_2} + 0.32\,B_{O_2} + 0.28\,(B_{N_2} + B_{CO})$$

$$M_s = M_d\left(1 - \frac{MC}{100}\right) + 0.18\,(MC)$$

$$P_s = P_b + \frac{P_g}{13.6}$$

$$\mu = 152.418 + 0.2552\,t_s + 3.2355x10^{-5}\,t_s^2 + 0.53147\,(B_{O_2}) - 0.74143\,MC$$

$$Q_s = 2.837x10^{-3}\,\mu\left[\frac{(t_s + 460)}{(M_s P_s)}\right]^{0.2949}$$

$$\Delta H = \frac{1.083\,(t_s + 460)\,M_d\,\Delta H_@}{P_b}\left[\frac{Q_s\left(1 - \frac{MC}{100}\right)P_s}{t_s + 460}\right]^2$$

$$\Delta P^{M201A} = \Delta P^{M2}\left(\frac{C_P^{M2}}{C_P^{M201A}}\right)^2$$

Dwell Times:

Firstpoint $\quad \Delta t_1 = \left[\frac{\sqrt{\Delta P_1}}{(\sqrt{\Delta P})_{AVG}}\right]$

OtherPoints $\quad \Delta t_n = \left(\frac{\Delta t_1}{\sqrt{\Delta P_1}}\right)\sqrt{\Delta P_n}$ *where* $n = 2, 3, \ldots, 12$

9-5-91/PL

Post Test Calculations:

$$V_{m(std)} = 17.64\,\gamma\,V_m\left(\frac{P_b + \frac{\Delta\bar{H}}{13.6}}{(\bar{t}_m + 460)}\right)$$

$$Q_s = \frac{5.669 x10^{-2}\,(\bar{t}_s + 460)}{\theta\,P_s}[V_{m(std)} + 0.04707\,(V_f - V_i)]$$

$$\mu = 152.418 + 0.2552\,\bar{t}_s + 3.2355 x10^{-5}\,\bar{t}_s^2 + 0.53147\,B_{O_2} - 0.74143\,MC$$

$$M_s = M_d\left(1 - \frac{MC}{100}\right) + 0.18\,MC$$

$$D_{50} = 0.15625\left(\frac{\bar{t}_s + 460}{M_s P_s}\right)^{0.2091}\left(\frac{\mu}{Q_s}\right)^{0.7091}$$

where

M_d = dry molecular weight of exhaust gas

B_{CO2} = percent volume of CO_2 in exhaust gas on a dry basis

B_{O2} = percent by volume of O_2 in exhaust gas on a dry basis

B_{N2} = percent by volume of N_2 in exhaust gas on a dry basis

B_{CO} = percent by volume of CO in exhaust gas on a dry basis

MC = percent by volume of water vapor in exhaust gas

M_s = actual molecular weight of exhaust gas

P_s = absolute pressure of exhaust gas, IN.HG

P_g = static pressure of exhaust gas, IN.WC

P_b = absolute barometric pressure, IN.HG

t_s = average exhaust gas temperature from preliminary determination or point gas temperature, ^0F

Q_s = cyclone flow rate at actual (or stack) conditions, ACFM

$Q_{s(std)}$ = cyclone flow rate at dry standard conditions, DSCFM

ΔH = pressure drop across calibrated orifice, IN.WC

$\Delta H_{@}$ = orifice coefficient or pressure drop across calibrated orifice @ 0.75 DSCFM, IN.WC

t_m = temperature of dry test meter, ^{o}F

Δp^{M201A} = velocity pressure of gas stream as measured with S-type pitot attached to cyclone, IN.WC

Δp^{M2} = velocity pressure of gas stream as measured with S-type pitot tube as per EPA Method 2 (preliminary traverse), IN.WC

C_p^{M201A} = pitot tube coefficient of S-type pitot tube attached to cyclone, dimensionless

C_p^{M2} = pitot tube coefficient of S-type pitot tube used in preliminary traverse, dimensionless

Δt_n = dwell time at traverse point n, where n = 2, 3, ..., 12, minutes

Δt_1 = dwell time at the first sampling point, minutes

$\bar{t}_s$ = average stack gas temperature during test run, ^{o}F

θ = total run time, minutes

$V_{m(std)}$ = total dry volume of gas sampled, DSCF

V_f = final volume of water in sampling train condenser system, mℓ

V_i = initial volume of water in sampling train condenser system, mℓ

$\bar{t}_m$ = average temperature of dry test meter during run, ^{o}F

γ = dry test meter coefficient, dimensionless

$\overline{\Delta H}$ = average pressure drop across the calibrated orifice in the sampling train during the run, IN.WC

V_m = volume of dry gas sampled as measured by the dry test meter at meter conditions, CF

D_{50} = actual or achieved 50% cutpoint for a given run of the device or cyclone used to remove or skim off those particles with aerodynamic equivalent diameters greater than or equal to 10 microns, microns

CALCULATION EQUATIONS

METHOD 10

$$CO\text{-}PPM\text{-}DRY = CO_{CO_2\text{-free,dry,avg}} \left(1 - CO_{2,d}/100\right)$$

$$CO\text{-}PPM\text{-}WET = CO\text{-}PPM\text{-}DRY \left(1 - MC/100\right)$$

$$GR/DSCF = 5.0885 \times 10^{-4} \left(CO\text{-}PPM\text{-}DRY\right)$$

$$mg/dscm = 1.165 \left(CO\text{-}PPM\text{-}DRY\right)$$

$$\dot{m} = 8.5714 \times 10^{-3} \left(GR/DSCF\right)\left(Q_{s,d}\right)$$

$$E = \frac{2.9857 \times 10^{-3} F_d \left(GR/DSCF\right)}{20.9 - O_{2,d}}$$

Where

$CO_{CO_2\text{-free,dry,avg}}$ = average of two determinations of carbon monoxide on a dry, CO_2-free integrated flue gas sample reported in ppm by volume

$CO_{2,d}$ = 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

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 ^{O}F, 29.92 IN.HG.)
mg/dscm	= concentration of carbon monoxide in flue gas on a milligrams per dry standard cubic meter basis (60 ^{O}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)

CALCULATION EQUATIONS

Chromotropic Acid Method for Formaldehyde

$$m_t = \frac{m_a \times V_{soln}}{V_{aliq}}$$

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

$$PPM\text{-}DRY = \frac{.0283\ m_t}{V_{std}}$$

$$PPM\text{-}WET = PPM\ DRY\ (1\text{-}MC/100)$$

$$GR/DSCF = 5.45 \times 10^{-4}\ (PPM\text{-}DRY)$$

$$mg/dscm = 1.249\ (PPM\text{-}DRY)$$

$$\dot{m} = 8.5714 \times 10^{-3}\ (GR/DSCF)\ (Q_{s,d})$$

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 ($68^{o}F$, 29.92 IN.HG.)

$\dot{m}$ = emission or mass rate of formaldehyde in pounds per hour (LB/HR)

Method 25A

Total Gaseous Organics Calculation Equations

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

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

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

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 per hour

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

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

Interpoll Laboratories, Inc.
(612) 786-6020

Calculation of (LB/KLB FLUE GAS)
Louisiana Pacific - Two Harbors, Minnesota
Dryer Particulate Emission Rate

Parameter	Run 1	Run 2	Run 3
($Q_{s,d}$) DSCFM	31908	30685	31989
m_{fg} (LB/HR)	175813	169074	176259
m_{fg} (10^3LB/HR)	175.8	169.1	176.3
m_p (LB/HR)	39.60	46.40	36.73
E (LB/KLB)	0.23	0.27	0.21

m_{fg} = 174457/31648 ≈ (LB/HR)/(DSCFM) = 5.51 Q_{sd}
From Method 2 Determination

S-412

Interpoll Laboratories, Inc.
(612) 786-6020

Calculation of (LB/KLB FLUE GAS @50% EXCESS AIR)
Louisiana Pacific - Two Harbors, Minnesota
Thermal Oil Heater Particulate Emission Rate

Parameter	Run 1	Run 2	Run 3
($Q_{s,d}$) DSCFM	15432	15120	16779
m_{fg} (LB/HR)	74228	72727	80707
m_{fg} (10^3LB/HR)	74.2	72.7	80.7
m_p (LB/HR)	1.51	1.78	1.81
E (LB/KLB)	0.020	0.024	0.022
B_{02} (% v/v)	15.50	15.60	15.90
E (LB/KLB flue gas adj. to 50% Excess Air)	0.039	0.047	0.046

m_{fg} = 74559/15472 = (LB/HR)/(DSCFM) = 4.81 Q_{sd}
From Method 2 Determination

S-412

APPENDIX N

SAMPLING TRAIN CALIBRATION DATA

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job L.I. / Two Harbors Date 2/12/92

Operator DAH Module No. 2

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

Bar press 29.90 in. Hg. γ = .9951 ^H@ 1.81 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	645.20	[redacted]	
2.5	647.01	37	27
5.0	648.81	42	28
7.5	650.61	46	30
10	652.45	48	31
[redacted]	V_m = 7.25	Avg(t_m) =	36.12 °F

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(.9951)(7.25)}\left[\frac{(36.12 + 460}{(29.9)}\right]^{0.5}$$

$$Y_{cn} = 1.008$$

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-432R

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP/TWO HARBORS Date 2-10-92

Operator E Trowbridge Module No. 7

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

Bar press 29.27 in. Hg. γ = 1.0083 ^H@ 1.86 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	782.00	[redacted]	
2.5	783.90	67	62
5.0	785.75	68	62
7.5	787.60	69	62
10	789.50	70	62
[redacted]	V_m = 7.50	Avg(t_m) = 65.3 °F	

Calculate Y_{en} as follows:

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

$$Y_{en} = \frac{1.786}{(1.0083)(\quad)}\left[\frac{(65.3) + 460}{(29.27)}\right]^{0.5} \quad 4.7363$$

$$Y_{en} = 1.0005$$

If Y_{en} 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-432R

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP/TWO HARBORS Date 2-12-92

Operator [redacted] Module No. 7

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

Bar press 29.90 in. Hg. γ = 1.0083 ΔH@ 1.86 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(937.00)	[redacted]	
2.5	938.87	71	70
5.0	940.75	72	70
7.5	942.63	74	71
10	944.50	75	71
[redacted]	V_m = 7.50	Avg (t_m) = 71.8	°F

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(\quad)(\quad)} \left[\frac{(71.8) + 460}{(29.90)} \right]^{0.5} \quad 4.2173$$

$$Y_{cn} = .9960$$

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-432R

Interpoll Laboratories, Inc.
(612) 786-6060

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP Two Harbors Date 2-10-92

Operator E Crawford Module No. 8

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

Bar press 29.27 in. Hg. γ = .9993 ΔH@ 1.88 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(846.00)	[redacted]	
2.5	847.91	69	62
5.0	849.80	71	63
7.5	851.79	72	63
10	853.70	73	64
[redacted]	V_m = 7.70	Avg(t_m) = 67.1 °F	

Calculate Y_{en} as follows:

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

$$Y_{en} = \frac{1.786}{(7.70)(.9993)}\left[\frac{(\quad) + 460}{(29.27)}\right]^{0.5} \quad 1.2437$$

$$Y_{en} = .9950$$

If Y_{en} 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-432R

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 18, 1992

Meter Box No. : 2 (Rockwell Dry Test Meter Serial No. 964549)

Date of Last Calibration: January 3, 1992
Calibration Technician: D. Brennan
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.)
January 14, 1992	2-3484	682.00	1053.67	371.67	371.67
January 28, 1992	2-3493	1061.00	1401.80	340.80	712.47
February 4, 1992	2-3500	1413.10	1644.18	231.08	943.55
February 12, 1992	2-3501	1645.20	1996.51	351.31	1294.86

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 18, 1992

Meter Box No. : 7 (Rockwell Dry Test Meter Serial No. 964551)

Date of Last Calibration: January 3, 1992
Calibration Technician: D. Brennan
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.)
January 16, 1992	2-3485	892.00	1024.76	132.76	132.76
January 21, 1992	2-3490	1033.06	1172.81	139.75	272.51
January 22, 1992	2-3489	1173.66	1278.51	104.85	377.36
January 31, 1992	2-3496	1281.40	1523.37	241.97	619.33
February 5, 1992	2-3500	1525.00	1773.96	248.96	868.29
February 11, 1992	2-3501	1782.00	2266.64	484.64	1352.93

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-620

Meter Box Calibration and Usage Status

Date of Report: February 18, 1992

Meter Box No. : 8 (Rockwell Dry Test Meter Serial No. 964553)

Date of Last Calibration: January 2, 1992
Calibration Technician: D. Brennan
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.)
January 16, 1992	2-3485	923.00	1122.81	199.81	199.81
January 31, 1992	2-3496	1129.00	1280.85	151.85	351.66
February 5, 1992	2-3500	1287.00	1833.96	546.96	898.62
February 12, 1992	2-3501	1846.00	2144.31	298.31	1196.93

* Total volume through meter since last calibration.

Date 1-3-92

Bar. Press. 29.02 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 2
Serial No. DTM 964549
Wet Test Meter No. AL-20
Technician D. BRENNAN

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index ♦ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
nominal	actual				V_{di}	V_{df}	Wet Test t_w (°F)	Dry Test t_{di} (°F)	Dry Test t_{do} (°F)				
0.6	.5	2	99.85	0.01	674.056	676.080	72	87	75	4/58	.9957	1.77	
1.2	1.2	3	99.91	0.025	669.92	672.980	72	90	71	4/50	.9920	1.78	
2.0	2.0	3	99.93	0.055	651.859	654.950	72	81	60	3/44	.9973	1.81	
3.3	3.3	5	100.00	0.09	656.530	662.960	72	58	66	5/53	.9914	1.83	
4.7	4.7	5	100.02	0.12	663.560	668.570	72	91	69	4/11	.9930	1.88	
	3	5	6	8	6	7	8	9	10	11/12	.9951	1.81	

Positive leak check performed by D. B

Meter was in tolerance ☒

Meter was not in tolerance ☐; readjusted linkage

Meter was not in tolerance ☐; changed dry test meters

Approved by Daniel J. Dwyer Date 1/15/92

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

Date 11/3/92

Bar. Press. 29.62 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 7
Serial No. DTM 965350
Wet Test Meter No. AL-20
Technician D. BOWMAN

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index ♦ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔHθ	C_f
nominal	actual				V_{dI}	V_{df}	Wet Test t_w (°F)	Dry Test t_{dI} (°F)	Dry Test t_{do} (°F)				
0.5	.5	2	99.85	0.01	576.150	578.720	73	89	90	4/54	1.0095	1.77	
1.2	1.2	3	99.91	0.025	580.650	583.690	73	89	90	4/56	1.0092	1.83	
2.0	2.0	3	99.93	0.055	585.160	588.160	73	91	92	5/00	1.0090	1.88	
3.3	3.3	5	100.00	0.09	592.160	597.180	73	89	91	4/54	1.0077	1.87	
4.7	4.7	5	100.02	0.12	597.130	602.160	73	91	91	4/54	1.0061	1.91	
	3	4	5	6	6	7	8	9	10	11/13	1.0083	1.86	

Positive leak check performed by D. B

Meter was in tolerance ☒

Meter was not in tolerance ☐; readjusted linkage

Meter was not in tolerance ☐; changed dry test meters

Approved by Daniel J. Dezan Date 11/5/92

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

6-N

Date 1/2/92

Bar. Press. 29.11 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 8
Serial No. DTM 964 552
Wet Test Meter No. AL-20
Technician D. BRENNAN

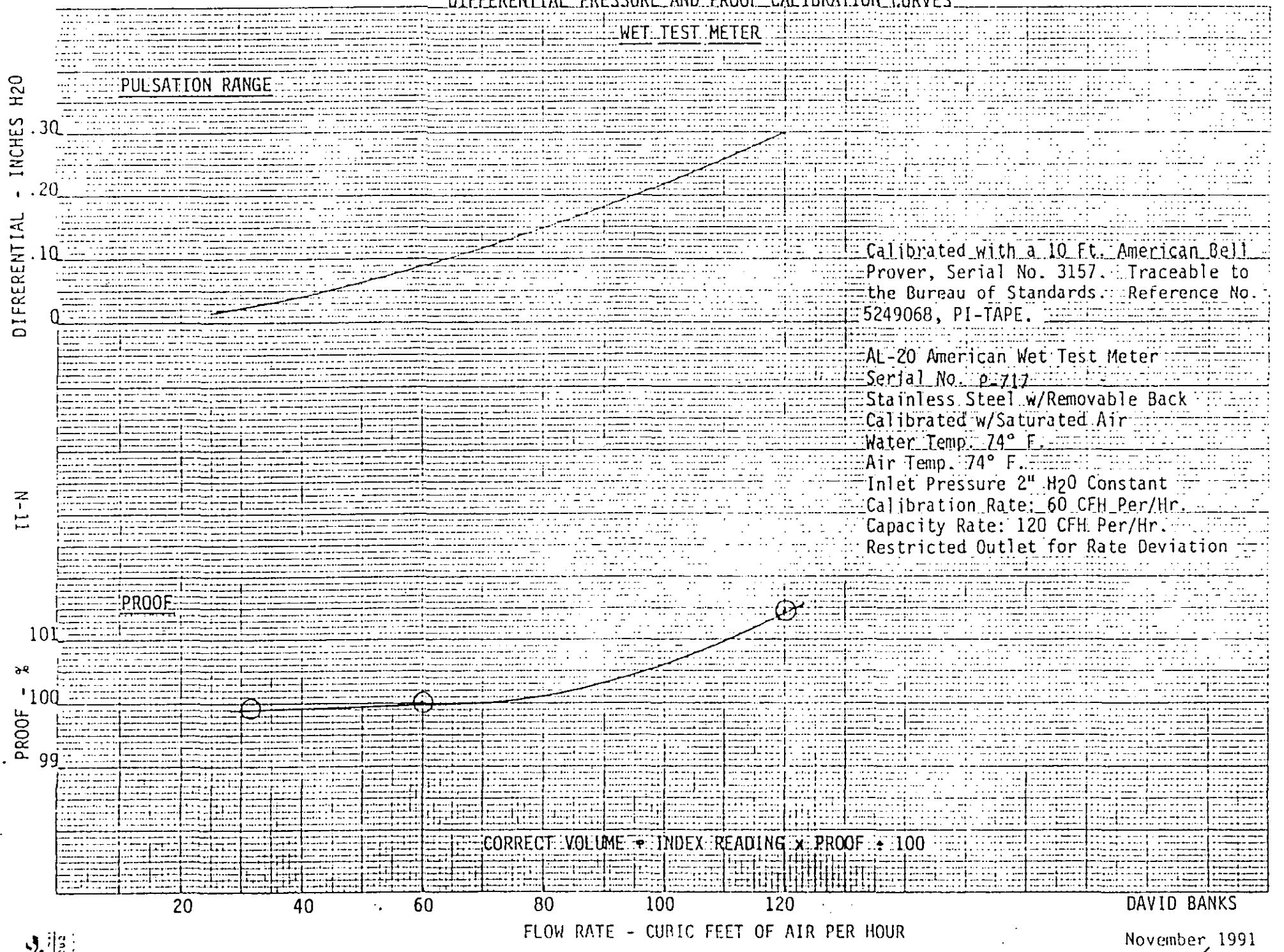
ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index Y (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔHθ	C_f
nominal	actual				V_{dl}	V_{df}	Wet Test t_w (°F)	Dry Test t_{dl} (°F)	Dry Test t_{do} (°F)				
0.5	.50	2	99.85	0.01	920.37	922.44	71°	89	83	5.03	.9907	1.80	
1.2	1.2	3	99.91	0.025	916.23	919.32	71°	91	83	4.57	.9961	1.84	
2.0	2.0	3	99.93	0.055	896.92	899.96	71°	84	80	3.54	1.0008	1.92	
3.3	3.3	5	100.00	0.09	904.02	909.09	71°	91	83	5.03	1.0013	1.89	
4.7	4.7	5	100.02	0.12	910.10	915.20	71°	94	81	4.17	1.0016	1.93	
1	2	3	4	5	6	7	8	9	10	11/12 Avg.	.9993	1.88	

Positive leak check performed by XuH
Meter was in tolerance ☐
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by Daniel J. Dey Date 1/2/91

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

DIFFERENTIAL PRESSURE AND PROOF CALIBRATION CURVES



Calibrated with a 10 Ft. American Bell Prover, Serial No. 3157. Traceable to the Bureau of Standards. Reference No. 5249068, PI-TAPE.

AL-20 American Wet Test Meter
Serial No. P-717
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H_2O Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation

DAVID BANKS

November 1991

II-N

12 202

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 2-11-92 Nozzle Number 4-3
Technician: E. Trowbridge

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	.189
2	.194
3	.190
Average:	.191

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 2-11-92 Nozzle: PM-10
Technician: E. Trowbridge

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	.158
2	.158
3	.158
Average:	.158

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 2-11-92 Nozzle Number 7-4
Technician: D. Van Hoever

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	.241
2	.247
3	.248
Average:	.245

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 2-12-92 Nozzle Number 7-5
Technician: D. Van Hoever

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	.311
2	.310
3	.311
Average:	.311

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 2-13-92 Nozzle: PM-10
Technician: E. Trowbridge

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	.198
2	.198
3	.198
Average:	.198

Interpoll Laboratories, Inc.

(612) 786-6020

Nozzle Calibration

Data Sheet

Date of Calibration: 2-13-92 Nozzle Number 7-4

Technician: D. Van Hoever

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	.250
3	.248
Average:	.249

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test: #12

Vendor Fluke

Model 51 Serial Number 50303375

Range 0-2100 °F Thermocouple Type K

Date of Calibration 1-3-92 Technician E. Trowbridge

Method of Calibration:

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

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

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	1.0	+1.0	.21
100	100	100.6	+.6	.10
200	200	203	+3	.45
300	300	301.8	+1.8	.23
400	400	400.0	—	—
500	500	500.8	+.8	.09
600	600	602.8	+2.8	.24
700	700	700.6	+.6	.05
800	800	802.4	+2.4	.19
900	900	900.8	+.8	.05
1000	1000	1002.2	+2.2	.15
1100	1100	1101.8	+1.8	.11
1200	1200	1203.6	+3.6	.21
1300	1300	1300.8	+.8	.04
1400	1400	1404.0	+4.0	.21
1500	1500	1501.4	+1.4	.07
1600	1600	1602.4	+2.4	.11
1700	1700	1701.4	+1.4	.06
1800	1800	1802.4	+2.4	.10
1900	1900	1900.4	+.4	.01
2000	2000	2001.6	+1.6	.06
2100	2100	2099.0	-1.0	.02
		Averages:	1.67	.12

OF = off scale response by unit under test (°F)

% dev = 100 Δt / (460 + t)

☒ Unit in tolerance

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

Interpoll Laboratories, Inc.

Temperature Measurement Device Calibration Sheet

Unit under test:

Vendor Beckman Industrial

Model HD110T — Serial Number 10507095 (POT #18)

Range -4 to 1999 °F — Thermocouple Type K

Date of Calibration 9/12/91 — Technician DWH

Method of Calibration:

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

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

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0	0	0	0
100	100	96	4	.71
200	200	200	0	0
300	300	298	2	.39
400	400	395	5	.58
500	500	495	5	.32
600	600	598	2	.18
700	700	699	1	.08
800	800	804	4	.32
900	900	906	6	.44
1000	1000	1011	11	.75
1100	1100	1115	15	.96
1200	1200	1221	21	1.26
1300	1300	1322	22	1.25
1400	1400	1426	26	1.39
1500	1500	1524	24	1.22
1600	1600	1626	26	1.26
1700	1700	1721	21	.97
1800	1800	1819	19	.84
1900	1900	1912	12	.51
2000	—	—	—	—
2100	—	—	—	—
		Averages:		.68

OF = off scale response by unit under test (°F)

% dev = 100 Δt / (460 + t)

☒ Unit in tolerance

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

S-433

Interpoll Laboratories
(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 4-22

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .461 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" .01
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) .761 IN.

Date of Inspection: 2-1-91

Inspected by: [signature]

S-348(1)

Interpoll Laboratories
(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 6-22

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .464 IN.
3. Base to Side B opening plane (P_B) .462 IN.

Alignment:

4. α_1 <10° 0
5. α_2 <10° 1

6. B_1 < 5° 1
7. B_2 < 5° 2

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

Distance from Pitot to Probe Components:

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

Date of Inspection: 2-1-91

Inspected by: [signature]

S-348(1)

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 23-4

Pitot tube dimensions:

1. External tubing diameter (D_t) .313 IN.
2. Base to Side A opening plane (P_A) .462 IN.
3. Base to Side B opening plane (P_B) .462 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" .03
9. W <.0625" .04

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .758 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: 2-24-97

Inspected by: [signature]

CFR Title 40 Part 60 Appendix A Method 2

S-348B(1)

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 23-5

Pitot tube dimensions:

1. External tubing diameter (D_t) .313 IN.
2. Base to Side A opening plane (P_A) .457 IN.
3. Base to Side B opening plane (P_B) .458 IN.

Alignment:

4. α_1 <10° C
5. α_2 <10° C

6. B_1 <5° 1
7. B_2 < 5° 2

8. Z <.125" .04
9. W <.0625" .03

Distance from Pitot to Probe Components:

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

☒ 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: 2-14-91

Inspected by: [signature]

CFR Title 40 Part 60 Appendix A Method 2

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 23-6

Pitot tube dimensions:

1. External tubing diameter (D_t) .313 IN.
2. Base to Side A opening plane (P_A) .464 IN.
3. Base to Side B opening plane (P_B) .465 IN.

Alignment:

4. α_1 <10° 0
5. α_2 <10° 0

6. B_1 <5° 2
7. B_2 < 5° 2

8. Z <.125" .03
9. W <.0625" .03

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .758 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .762 IN.

☒ 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: 2-14-91

Inspected by: [signature]

CFR Title 40 Part 60 Appendix A Method 2

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 5-8-91
Technician R. Rosenthal
Mercury Column Barometer No. Nova - 1
Aneroid Barometer No. S/N 560209

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.41	70°F	.111	29.299	29.35	.05
Ladztude		-.001	29.298	29.35	.05

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

Has problem been alleviated? Yes/No. How? N/A

*Note

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

S-312

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

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

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

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

Has problem been alleviated? Yes/No. How?

*Note

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

S-312