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RESULTS OF THE AUGUST 23, 1995 AIR EMISSION COMPLIANCE TESTS AT THE LOUISIANA PACIFIC WAFERBOARD PLANT IN TOMAHAWK, WISCONSIN

Submitted to:

LOUISIANA PACIFIC CORPORATION
P.O. Box 190
Tomahawk, Wisconsin 54487

Attention:

Brion Petts

Approved by:

Daniel J. Despen
Manager
Stationary Source Testing Department

Report Number 5-6375
September 25, 1995
SL/sll

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APPENDICES:

ABBREVIATIONS

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

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

g:\stack\wp\misc\abbrev.frm

1 INTRODUCTION

On August 23, 1995 Interpoll Laboratories personnel conducted air emission compliance tests on the Press Vent at the Louisiana Pacific Corporation (LP) Waferboard Plant located in Tomahawk, Wisconsin. On-site testing was performed by Ed Trowbridge and Steve Kelker. Coordination between testing activities and plant operation was provided by Brion Petts of LP. The test was witnessed by Aaron Rosinski of the Wisconsin DNR.

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

Particulate evaluations on the Press Vent were performed in accordance with EPA Methods 2-5, CFR Title 40, Part 60, Appendix A (revised July 1, 1994). A preliminary determination of the gas linear velocity profile was made before the first particulate determination to allow selection of the appropriate nozzle diameter for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to isokinetically extract particulate samples by means of a heated glass-lined probe. Wet catch samples were collected in the back half of the Method 5 sampling train and analyzed in accordance with Wisconsin DNR Protocol.

Carbon monoxide determinations were performed in accordance with Method 10. A slip stream of sample gas was withdrawn from the exhaust gas stream using a heated stainless steel probe equipped with a filter to remove interfering particulate material. The particulate-free gas was transported to the analyzer by means of a heat-traced probe and filter assembly. After passing through the filter, the gas passed through a chilled condenser-type moisture removal system. The particulate-free dry gas was then transported to the analyzer with the excess exhausted to the atmosphere through a calibrated orifice which was used to ensure that the flow from the stack exceeds the requirements of the analyzer. A three-way valve on the probe was used to introduce standard gas for the "system bias check".

The analog response of the analyzer was recorded with a strip chart recorder as backup. The analyzer was calibrated with standard gases. The instrument was calibrated before and after each run as per EPA Method 10. The sample probe was moved through a

three-point traverse (1/6, 3/6, 5/6 of the stack diameter) to measure carbon monoxide concentrations.

Particulate testing on the Press Vent was conducted from two test ports oriented at 90 degrees on the stack. These test ports are located 3.85 stack diameters downstream of the nearest flow disturbance and 3.85 diameters upstream of the stack exit. A 24-point traverse was used to collect the particulate samples. Each traverse point was sampled 2.5 minutes for a total sampling time of 60 minutes per run.

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

2 SUMMARY AND DISCUSSION

The important results of the air emission compliance tests are summarized in Tables 1 and 2. An overview of the results is presented in the table below:

Parameter	LIMIT	MEASURED
PRESS VENT		
Particulate (LB/HR)		
Press (dry + wet)	6.82	3.51
Press (dry)	-	1.55
Carbon monoxide (LB/TON FP)	0.2	0.18
Carbon monoxide (LB/HR)	2.52	2.22

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 August 23, 1995 Particulate Emission Compliance Test on the Press Vent at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM		Run 1	Run 2	Run 3
Date of test		08-23-95	08-23-95	08-23-95
Time runs were done	(HRS)	815/ 918	1000/1103	1140/1242
Process rate	(LB/TFP)	12.4	12.4	12.4
Volumetric flow				
actual	(ACFM)	109736	110271	110584
standard	(DSCFM)	95976	95584	95659
Gas temperature	(DEG-F)	100	105	105
Moisture content	(%V/V)	2.67	2.77	2.86
Gas composition	(%V/V,dry)			
carbon dioxide		0.20	0.10	0.10
oxygen		20.70	20.70	20.80
nitrogen		79.10	79.20	79.10
Isokinetic variation	(%)	99.8	99.8	99.9
Particulate concentration				
actual	(GR/ACF)	.004039	.003992	.003117
standard	(GR/DSCF)	.004620	.004607	.003605
Part. emission rate	(LB/HR)	3.80	3.77	2.96

NOTE: Dry + Organic/Inorganic Wet Catch

Table 1b Summary of the August 23, 1995 Particulate Emission Compliance Test on the Press Vent at the Louisiana Pacific Plant in Tomahawk, Wisconsin.

ITEM		Run 1	Run 2	Run 3
Date of test		08-23-95	08-23-95	08-23-95
Time runs were done	(HRS)	815/ 918	1000/1103	1140/1242
Process rate	(LB/TFP)	12.4	12.4	12.4
Volumetric flow				
actual	(ACFM)	109736	110271	110584
standard	(DSCFM)	95976	95584	95659
Gas temperature	(DEG-F)	100	105	105
Moisture content	(%V/V)	2.67	2.77	2.86
Gas composition	(%V/V,dry)			
carbon dioxide		0.20	0.10	0.10
oxygen		20.70	20.70	20.80
nitrogen		79.10	79.20	79.10
Isokinetic variation	(%)	99.8	99.8	99.9
Particulate concentration				
actual	(GR/ACF)	.000705	.002508	.001720
standard	(GR/DSCF)	.000806	.002895	.001989
Part. emission rate	(LB/HR)	0.663	2.37	1.63

NOTE: Dry Catch Only

Table 2. Summary of the **Carbon Monoxide** Emission Determinations at the Louisiana Pacific Waferboard Plant in Tomahawk, Wisconsin.

Date	Time (HRS)	Concentration (ppm,d)	Emission Rate (LB/HR)	(LB/TFP)
(Press Vent)				
8-23-95	0815-0918	4	1.67	0.135
8-23-95	1000-1103	6	2.50	0.202
8-23-95	1140-1242	6	2.50	0.202
Average		5	2.22	0.180

Note: LB/TFP = Pounds per Ton of Finished Product.

3 AIR EMISSION RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition and moisture are presented first followed by the computer printout of the particulate and carbon monoxide 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
Press Vent

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

	Run 1	Run 2	Run 3
Date of run	08-23-95	08-23-95	08-23-95
Dry basis (orsat)			
carbon dioxide.....	0.20	0.10	0.10
oxygen.....	20.70	20.70	20.80
nitrogen.....	79.10	79.20	79.10
Wet basis (orsat)			
carbon dioxide.....	0.19	0.10	0.10
oxygen.....	20.15	20.13	20.21
nitrogen.....	76.98	77.00	76.84
water vapor.....	2.67	2.77	2.86
Dry molecular weight.....	28.86	28.84	28.85
Wet molecular weight.....	28.57	28.54	28.54
Specific gravity.....	0.987	0.986	0.986
Water mass flow.....(LB/HR)	7398	7651	7899
FO	1.000	2.000	1.000

3.2 Results of Particulate Determinations

Test No. 1
Press Vent

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

	Run 1	Run 2	Run 3
Date of run	08-23-95	08-23-95	08-23-95
Time run start/end.....(HRS)	815/ 918	1000/1103	1140/1242
Static pressure.....(IN.WC)	-0.80	-0.80	-0.80
Cross sectional area (SQ.FT)	21.31	21.31	21.31
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	10.0	14.0	16.0
desiccant.....(GRAMS)	19.0	16.0	15.0
total.....(GRAMS)	29.0	30.0	31.0
Total particulate material..			
.....collected(grams)	0.0149	0.0148	0.0116
Gas meter coefficient.....	0.9989	0.9989	0.9989
Barometric pressure..(IN.HG)	28.58	28.58	28.58
Avg. orif.pres.drop..(IN.WC)	2.48	2.50	2.51
Avg. gas meter temp..(DEF-F)	84.9	94.7	93.3
Volume through gas meter....			
at meter conditions...(CF)	53.50	54.25	54.20
standard conditions.(DSCF)	49.76	49.57	49.65
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.184	.184	.184
Avg.stack gas temp ..(DEG-F)	100	105	105
Volumetric flow rate.....			
actual.....(ACFM)	109736	110271	110584
dry standard.....(DSCFM)	95976	95584	95659
Isokinetic variation.....(%)	99.8	99.8	99.9
Particulate concentration...			
actual.....(GR/ACF)	0.00404	0.00399	0.00312
dry standard.....(GR/DSCF)	0.00462	0.00461	0.00361
Particle mass rate...(LB/HR)	3.801	3.774	2.956

3.3 Results of Carbon Monoxide Determinations

Test No. 1
Press Vent

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

	Run 1	Run 2	Run 3
Date of run	08-23-95	08-23-95	08-23-95
Time run start/end.....(HRS)	0815/0918	1000/1103	1140/1242
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	2.67	2.77	2.86
O2 Concentration.....(%V/V)	20.70	20.70	20.80
Volumetric flow rate (DSCFM)	95976	95584	95659
CO concentration.....			
(GR/DSCF).....	0.0020	0.0031	0.0031
(MG/DSCM).....	4.66	6.99	6.99
(PPM-WET).....	3.89	5.83	5.83
(PPM-DRY).....	4.00	6.00	6.00
CO emission rate.....(LB/HR)	1.674	2.501	2.503
.....(LB/TFP)	0.135	0.202	0.202

CO = Carbon monoxide

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

APPENDIX A

PRELIMINARY VOLUMETRIC FLOW RATE DETERMINATION

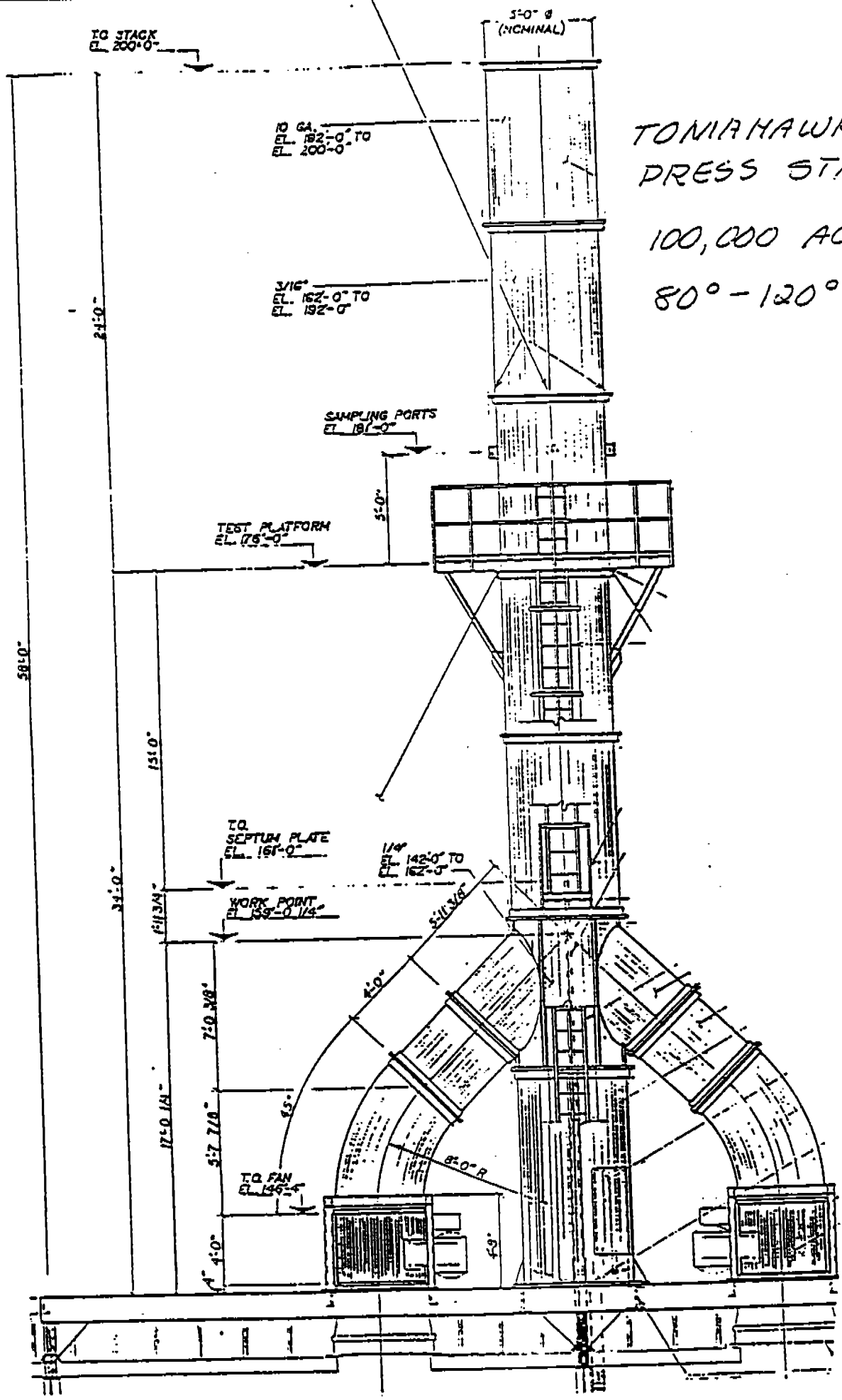
Test No. 1
Press Vent

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

Date of Determination.....	08-23-95
Time of Determination.....(HRS)	730
Barometric pressure.....(IN.HG)	28.58
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	62.5
Duct area.....(SQ.FT)	21.31
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.8
Avg. gas temp.....(DEG-F)	97
Moisture content.....(% V/V)	2.67
Avg. linear velocity.....(FT/SEC)	83.3
Gas density.....(LB/ACF)	.06704
Molecular weight.....(LB/LBMOLE)	28.86
Mass flow of gas.....(LB/HR)	428458
Volumetric flow rate.....	
actual.....(ACFM)	106516
dry standard.....(DSCFM)	93676

APPENDIX B

LOCATION OF TEST PORTS



TOMAHAWK, W
PRESS STACK

100,000 ACFM

80° - 120° F

FLOOR EL = 100'

APPENDIX C

FIELD DATA SHEETS

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP/TOMAHAWK
Source PRESS VENT STACK
Test 1 Run 0 Date 5-23-95
Stack Dimen. 62.5 IN.
Dry Bulb ____ °F Wet bulb ____ °F
Manometer ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure ≈ 5.58 IN.HG
Static Pressure -1.8 IN.WC
Operators E. TROWBRIDGE - S. KELLY
Pitot No. 31V-6 C_p .840

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 3 IN.		Time Start: 0750 HRS	
A 1	.021	1.31	4.31	1.2	
2	.067	4.19	7.19	2.1	
3	.118	7.37	10.37	2.1	97
4	.177	11.06	14.06	2.0	
5	.250	15.62	18.62	2.0	
6	.356	22.25	25.25	1.9	
7	.644	40.25	43.25	2.1	
8	.750	46.87	49.87	2.5	
9	.823	51.44	54.44	2.4	
10	.882	55.12	58.12	2.2	
11	.933	58.31	61.31	1.6	
12	.979	61.18	64.18	1.5	
B 1				.90	
2				2.70	
3				2.60	
4				2.40	
5				2.20	
6				1.90	
7				1.80	
8				2.1	
9				2.4	
10				2.4	
11				1.5	
12				1.6	

Temp. Meas. Device & S/N: RDT-34
Time End: 0748 HRS

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LPI TOMAHAWK Date 8-23-95 Test 1 Run 1
Source PRESS VENT STACK No. of traverse points 24
Method ✓ Filter holder: 4" GLASS Filter type: 4" GF

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 13 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: 7936

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	210	100	10
Impinger No. 3		0	
Condenser			
Desiccant	1368	1349	19
Total			29

Integrated Gas Sampling Data:

Bag Pump No. 6A Box No. 19 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: C cc/min at 15 IN.HG
Time start: 0910 (HRS) Time end: 1917 (HRS)
Sampling rate: 4.0 cc/min Operator: ET

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

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INTERPOLL LABO[illegible]TORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: CA Tomahawk
Source: Press Vent Stack
Date: 8-25-94 Test 1 Run 1

Operators: ET-SK
Meter Box No.: 12 ΔH@ 1.88 in.WC
Gasmeter Coeff.: .9989

Nozzle No.: 1-3
Nozzle Dia.: .194 in.
Bar. Press.: 28.58 in.Hg

Pitot No.: 24V-6
C_p: .840
H_2O: ____ %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Stack (°F)	Probe (°F)	Oven (°F)	Imp. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (% v/v)
	0815	865.80											
A 12	2.5	867.40	1.50	1.78	7.68	7	96	235	230	52	77	74	
11	5	869.60	1.60	1.88	9.61	7	96				79	74	
10	7.5	871.85	2.3	2.70	1.93	10	97	225	237	50	82	74	
9	10	874.20	2.4	2.81	4.29	11	100				83	74	
8	12.5	876.50	2.2	2.58	6.56	11	100	225	257	40	84	74	
7	15	878.70	1.90	2.24	8.67	9.0	99				87	75	
6	17.5	880.55	1.90	2.24	0.79	9.0	101	227	240	46	88	75	
5	20	883.02	2.0	2.37	2.97	9.0	98				89	75	
4	22.5	885.20	2.0	2.34	5.15	9.0	94	230	258	46	91	76	
3	25	887.37	2.1	2.52	7.40	9.5	94				92	76	
2	27.5	889.40	2.1	2.57	9.65	9.5	96	227	236	43	93	77	
1	30	891.74	1.90	2.28	1.79	9.0	96				94	78	
B 12	32.5	894.10	2.2	2.63	4.09	10.5	97	228	237	45	94	78	
11	35	896.32	2.2	2.40	6.38	10.5	105				94	79	
10	37.5	898.65	2.3	2.75		11	98	231	235	45	95	80	
9	40	901.00	2.2	2.6	1.04	11	98				95	81	
8	42.5	903.15	1.90	2.27	3.18	10	101	225	251	46	96	81	
7	45	905.25	1.70	2.05	5.22	9	97				96	81	
6	47.5	907.40	1.90	2.26	7.36	9	103	227	252	47	97	81	
5	50	909.70	2.00	2.61	9.66	10.5	106				98	82	
4	52.5	912.07	2.40	2.83	2.06	11	110	228	230	47	98	83	
3	55	914.50	2.60	3.07	4.55	12	108				99	83	
2	57.5	916.94	2.4	2.85	6.96	11.5	106	229	252	47	99	84	
1	60	919.30	2.2	2.60	9.27	11	106				99	84	
	(0919)												
	θ = 60	V_m = 53.50		ΔH 2.48							Avg. 84.9		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job 2P TOMAHAWK
Source PRESS VENT STACK
Method √ Filter holder: 4" GLASS

Date 6-23-95 Test 1 Run 2
No. of traverse points 24
Filter type: 4" GF

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 13 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used:

7938

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	214	100	14
Impinger No. 3		0	
Condenser			
Desiccant	1336	1320	16
Total			30

Integrated Gas Sampling Data:

Bag Pump No. 36A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: ?
Time start: 1001
Sampling rate: 1.01

Box No. 19 Bag No. √
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1102 (HRS)
cc/min Operator: ET

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

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INTERPOLL LABORATORIES, INC.
(612) 786-5020

EPA Method 5 Field Data Sheet

Job: LP Hoyt Shawk
Source: PRESS VENT STACK
Date: 8-23-95 Test: 1 Run: 2

Operators: ET-SK
Meter Box No.: 12 ΔH@ 1.88 in.WC
Gasmeter Coeff.: .9989

Nozzle No.: 1-3
Nozzle Dia.: .1187 in.
Bar. Press.: 29.58 in.Hg

Pitot No.: 241-4
C_p: .484
H_2O: %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1000	918.60											
B 12	2.5	921.80	2.0	2.35	1.77	8	107	225	237	46	92	86	
11	5	904.00	2.0	2.39	3.97	6	101				93	87	
10	7.5	926.24	2.2	2.63	6.28	10	102	225	237	44	95	87	
9	10	928.59	2.2	2.62	8.59	10	105				96	87	
8	12.5	930.72	1.80	2.15	0.69	8	104	225	238	46	98	87	
7	15	932.70	1.60	1.91	2.66	7	105				99	87	
6	17.5	934.66	1.90	2.27		8	106	226	237	46	100	87	
5	20	937.13	2.2	2.61	7.13	10	110				101	88	
4	22.5	939.51	2.4	2.85	9.54	11	109	228	238	47	101	88	
3	25	942.01	2.6	3.09	2.06	12	109				101	89	
2	27.5	944.44	2.4	2.84	4.47	12	112	230	236	47	101	89	
1	30	946.88	2.4	2.88	6.89	12	104				101	89	
A 12	32.5	949.04	1.80	2.16	9.00	8	105	226	235	46	100	89	
11	35	951.14	1.80	2.16	1.10	8	105				100	89	
10	37.5	953.42	2.2	2.65	3.43	9	102	229	232	46	102	89	
9	40	955.88	2.4	2.89	5.87	10	104				103	90	
8	42.5	958.21	2.2	2.65	8.20	9.5	105	231	235	47	103	90	
7	45	960.38	1.90	2.28	0.36	9	107				103	90	
6	47.5	962.61	2.00	2.41	2.59	9	105	232	235	48	104	90	
5	50	964.84	2.00	2.42	4.82	9	102				104	90	
4	52.5	967.12	2.10	2.54	7.10	9.5	103	230	231	48	105	91	
3	55	969.42	2.10	2.56	9.40	9.5	99				105	91	
2	57.5	971.60	1.90	2.31	1.58	9	100	229	230	48	104	91	
1	60	973.85	2.00	2.44	3.83	9	98				104	91	
	(1103)												
	0 - 10	V_m = 54.25		ΔH = 2.50							Avg. = 94.7		

C-5

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP TOMAHAWK
Source PASS VENT STACK
Method 5 Filter holder: 4" GLASS

Date 8-23-95 Test 1 Run 3
No. of traverse points 24
Filter type: 4" GF

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 13 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: 7931

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	16
Impinger No. 3		0	
Condenser			
Desiccant	1383	1368	15
Total			31

Integrated Gas Sampling Data:

Bag Pump No. 36A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1141
Sampling rate: 1/100

Box No. 19 Bag No. 5
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1211 (HRS)
cc/min Operator: ET

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

052394-G:\STACK\WP\FORMS\S-0046RR

INTERPOLL LAB' ATORIES, INC.

(612) 7..-6020

EPA Method 5 Field Data Sheet

Job: SP/TOMAHAWK
Source: PRESS VENT STACK
Date: 8-23-95 Test 1 Run 3

Operators: ET-SK
Meter Box No. 12 ΔH@ 1.85 in.WC
Gasmeter Coeff. .9959

Nozzle No. 1-3
Nozzle Dia. .184 in.
Bar. Press. 28.59 in.Hg

Pitot No. 24V-6
C_p .84
H_2O ____ %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Stack (°F)	Probe (°F)	Oven (°F)	Imp. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (% v/v)
	1140	974.20					106	228	233	46	90	88	
A 12	2.5	976.32	1.80	2.16	6.30	7.5	108				92	88	
11	5	978.36	1.80	2.13	8.38	7.5	108	232	235	48	95	88	
10	7.5	980.58	2.10	2.48	0.62	8.5	105				96	88	
9	10	983.00	2.40	2.86	3.03	10	106	230	236	48	97	88	
8	12.5	985.50	2.40	2.86	5.45	10	106				97	88	
7	15	987.70	2.00	2.38	7.65	9	110	232	255	48	97	88	
6	17.5	989.90	2.00	2.38	9.86	9	102				98	88	
5	20	992.16	2.10	2.52	2.13	9.5	101	233	237	48	98	88	
4	22.5	994.44	2.10	2.53	4.40	9.5	102				98	88	
3	25	996.75	2.20	2.64	6.72	10	99	230	234	47	99	88	
2	27.5	998.91	1.90	2.30	8.89	9	99				99	88	
1	30	1001.12	2.00	2.42	1.11	9.5	100	233	234	47	99	88	
B 12	32.5	1003.30	1.90	2.29	3.28	9.4	100				99	88	
11	35	1005.45	2.00	2.39	5.45	9.5	107	234	237	45	100	88	
10	37.5	1007.85	2.40	2.86	7.90	11	108				100	88	
9	40	1010.15	2.10	2.50	0.16	10	105	234	235	45	100	88	
8	42.5	1012.30	1.80	2.16	2.26	9	106				101	89	
7	45	1014.32	1.70	2.03	4.30	8	107	256	235	48	102	89	
6	47.5	1016.55	2.00	2.39	6.52	9	108				102	89	
5	50	1018.84	2.20	2.63	8.54	9.5	108	232	236	48	102	89	
4	52.5	1021.24	2.40	2.86	1.26	11	109				102	89	
3	55	1023.73	2.6	3.10	3.78	12	110	231	234	48	101	90	
2	57.5	1025.98	2.3	2.74		11	103				101	90	
1	60	1028.40	2.10	2.53	9.43	6.5							
	(1242)												
	0 - 60	V_m = 54.20		ΔH = 2.51							Avg. = 93.3		

C-7

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL DATA

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. TOMAHAWK
Team Leader E.T.
Date Submitted 8-25-95
Test No. 1
Date of Analysis 8-28-95

Source PRESS VENT
Test Site STACK
Date of Test 8-25-95
No. of Runs Completed 3
Technician SCB

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
1/0		1	0.00	0.00	20.9	0.00	20.9	—
		2	0.00	0.00	20.9	0.00	20.9	—
	☐ B ☐ F	Avg				0.00	20.9	
1/1	6375-05	1	0.00	0.2	20.9	0.2	20.7	1.00
		2	0.00	0.2	20.5	0.2	20.7	1.00
	☒ B ☐ F	Avg				0.2	20.7	
1/2	6375-06	1	0.00	0.1	20.8	0.1	20.7	2.00
		2	0.00	0.1	20.8	0.1	20.7	2.00
	☒ B ☐ F	Avg				0.1	20.7	
1/3	6375-07	1	0.00	0.1	20.7	0.1	20.8	1.00
		2	0.00	0.1	20.9	0.1	20.8	1.00
	☒ B ☐ F	Avg				0.1	20.8	
		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

LSC-04-BR

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Impinger Catch Data Reporting Sheet

Protocol: ☐Minnesota ☒Wisconsin ☐Iowa ☐EPA Method 202 ☐Other

Job: LP/Tomahawk
Date Submitted: 8-28-95
Date of Analysis: 9-7-95
Source/Site: Press Vent / Stack
Test No.: 1
Technician: M. Rust

	Solvent Phase	Aqueous Phase
Test: 1 Run: 0	Dish No: 817	Dish No: 601
Log No: 6375-01I	Dish + Sample Wt: 46.6373 g	Dish + Sample Wt: 47.6672 g
Color & Appearance:	Dish Tare Wt: 46.6372 g	Dish Tare Wt: 47.6672 g
	Fraction Wt: .0001 g	Fraction Wt: .0000 g
Comments: Field Blank	Smpl Vol: 200 ml, Aliq: 200 ml, Factor: 1.000	Smpl Vol: 200 ml, Aliq: 200 ml, Factor: 2.000
	Sample Wt: .0001 g	Sample Wt: .0000 g
Test: 1 Run: 1	Dish No: 893	Dish No: 605
Log No: -02I	Dish + Sample Wt: 40.4223 g	Dish + Sample Wt: 49.6875 g
Color & Appearance:	Dish Tare Wt: 40.4145 g	Dish Tare Wt: 49.6853 g
	Fraction Wt: .0078 g	Fraction Wt: .0021 g
Comments:	Smpl Vol: 220 ml, Aliq: 220 ml, Factor: 1.000	Smpl Vol: 220 ml, Aliq: 100 ml, Factor 2.200
	Sample Wt: .0078 g	Sample Wt: .0046 g
Test: 1 Run: 2	Dish No: 894	Dish No: 718
Log No: -03I	Dish + Sample Wt: 36.2150 g	Dish + Sample Wt: 41.3925 g
Color & Appearance:	Dish Tare Wt: 36.2130 g	Dish Tare Wt: 41.3909 mod 9-7-95 g
	Fraction Wt: .0020 g	Fraction Wt: .0016 g
Comments:	Smpl Vol: 225 ml, Aliq: 220 ml, Factor 1.000	Smpl Vol: 225 ml, Aliq: 100 ml, Factor 2.250
	Sample Wt: .0020 g	Sample Wt: .0036 g
Test: 1 Run: 3	Dish No: 901	Dish No: 721
Log No: -04I	Dish + Sample Wt: 35.9906 g	Dish + Sample Wt: 46.9112 g
Color & Appearance:	Dish Tare Wt: 35.9888 g	Dish Tare Wt: 46.9096 g
	Fraction Wt: .0018 g	Fraction Wt: .0016 g
Comments:	Smpl Vol: 220 ml, Aliq: 220 ml, Factor 1.000	Smpl Vol: 220 ml, Aliq: 100 ml, Factor 2.200
	Sample Wt: .0018 g	Sample Wt: .0035 g

Note: Factor = Sample Volume/Aliquot Volume

Blank Solvent Wt. .0001 g

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Phase g	.0001	.0077	.0019	.0017
Results of Aqueous Phase g	.0000	.0046	.0036	.0035

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Solvent Rinse Data Reporting Sheet

☑ EPA Method 5 Probe Wash ☐ EPA Method 29 Probe Wash ☐EPA Method 202 Cup & Tube Wash

Job	LP / Tomahawk	Source/Site	Press Vent / Stack
Date Submitted	8-28-95	Test No.	1
Date of Analysis	8-30-95	Technician	B.D.
Transport Leakage☐	None☒ ml	Solvent	Acetone

Test: 1	Run: 0	Dish No:	100
Log No: 6375-01P		Dish + Sample Wt:	45.9707 g
Volume of Solvent	100 ml	Dish Tare Wt:	45.9706 g
*Solvent Residue	1.0 ug/ml	Sample Wt:	0.0001 g
Test: 1	Run: 1	Dish No:	102
Vol. of Solvent	80 ml	Dish + Sample Wt:	36.7167 g
Log Number -02P		Dish Tare Wt:	36.7145 g
Comments		Sample Wt:	0.0022 g
Test: 1	Run: 2	Dish No:	103
Vol. of Solvent	80 ml	Dish + Sample Wt:	47.4703 g
Log Number -03P		Dish Tare Wt:	47.4632 g
Comments		Sample Wt:	0.0071 g
Test: 1	Run: 3	Dish No:	104
Vol. of Solvent	100ml	Dish + Sample Wt:	44.7623 g
Log Number -04P		Dish Tare Wt:	44.7561 g
Comments		Sample Wt:	0.0062 g

*Solvent Residue 1.0 ug/ml = [(Sample Wt. 0.0001g) (10^6)]/Vol. of Sol. 100 ml

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

	RUN	RUN 1	RUN 2	RUN 3
Results of Solvent Rinse g	D-3	0.0021	0.0070	0.0061

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Filter Gravimetrics Reporting Sheet

Fiter Type: ☒ EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other_____

Job	LP/Tomahawk	Source/Site	Press Vent / Stack
Date Submitted	5-28-95	Test No.	1
Date of Analysis	5-29-95	Technician	B.D.

Test: 1	Run: 0	Filter No:	7932	
Field Blank:		Filter Type:	4"GF	
Log No: 6375-01F		Filter + Sample Wt:	.9490	g
Color:		Filter Tare Wt:	.9490	g
		Sample Wt:	0.0000	g
Test: 1	Run: 1	Filter No:	7936	
Log No: -02F		Filter Type:	4"GF	
Color:		Filter + Sample Wt:	.9562	g
		Filter Tare Wt:	.9557	g
		Sample Wt:	0.0005	g
Test: 1	Run: 2	Filter No:	7938	
Log No: -03F		Filter Type:	4"GF	
Color:		Filter + Sample Wt:	.9446	g
		Filter Tare Wt:	.9423	g
		Sample Wt:	0.0023	g
Test: 1	Run: 3	Filter No:	7931	
Log No: -04F		Filter Type:	4"GF	
Color:		Filter + Sample Wt:	.9506	g
		Filter Tare Wt:	.9503	g
		Sample Wt:	0.0003	g

		RUN	RUN 1	RUN 2	RUN 3
Results of Filter Analysis	g		0.0005	0.0023	0.0003

		RUN	RUN 1	RUN 2	RUN 3
Total Mass	g		0.0149	0.0148	0.0116

INTERPOLL LABORATORIES
(612) 786-6020

S-305RR
(9/90)

EPA Method 10 NDIR Analysis

Job Name L.P. TOMAHAWK
Source PRESS VENT STACK
Date of Analysis 8-28-95
Technician S.L.B.

NDIR Analyzer: [X] Fuji ACS Model 3300
[ ] Mon. Lab Model 8310
[ ] Dasibi Model 3003
Range: 0 - 500 ppm
Flow rate: 1000 cc/min

Pretest Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	N_2 ppm	0 ppm	T.C.O.	3AL2214
Upscale gas:	157 ppm	159 ppm	A.P.	SG9148314DAL
Upscale gas:	299 ppm	306 ppm	A.P.	SG9120705DAL
Upscale gas:	600 ppm	600 ppm	NAT.	#143980

Post-test Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	N_2 ppm	0 ppm	T.C.O	
Upscale gas:	157 ppm	154 ppm	A.P.	
Upscale gas:	299 ppm	300 ppm	A.P.	
Upscale gas:	600 ppm	600 ppm	NAT.	

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry)		
		Dilution Factor	Reading	Actual ppm
1-1	6375-05	0	4	4
1-2	6375-06	0	6	6
1-3	6275-07	0	6	6

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

Note 1: If sample dilution is requried 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.
(612) 786-6020

Sample Chain of Custody

Job: L Plowshawk   Source: Duck Vent   Site: Stack   Log No.: 6375
Field Engineer: [illegible signature]   Date of Test: 8-23-95   Test No.: 1   No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
4	Probe Wash: ☒ Acetone ☐ MeCl$_2$	☐ DI Water ☐ ____	☒ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☐ ____		
4	Filter: ☒ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☒ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
4	Impingers: ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ ____	☐ MN Protocol ☒ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ ____		
3	Integrated Gas: ☒ Tedlar Bag	☐ ____	☐ EPA M-3 ☐ ____	☒ EPA M-10		
	Oxides of Nitrogen:		☐ EPA M-7A ☐ ____			
	Fuel Lab: ☐ Fuel Sample	☐ Aggregate	☐ Per S-0163			
	Particle Sizing:		☐ X-Ray Sdgraph ☐ ____	☐ Cascade Imp		
	Miscellaneous:	☐ ____	☐ ____			

Fuel Type: Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite   Wood: ☐ Wood Waste ☐ Dust ☐ Bark   Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6   Misc: ☐ Natural Gas ☐ RDF ☐ ____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
[illegible signature] / Interpoll	[illegible signature], Interpoll (lore)	8/28/95

033094-G:\STACK\WP\FORMS\S-278.2

APPENDIX E

PROCESS RATE INFORMATION

BOARD WEIGHTS IN TONS

TOMAHAWK WI

PRESS AUGUST 23, 1995

1	Hours during testing (military)	4.41
2	Pressloads during testing	76
3	Mats per Pressload	8
4	Finished Product Boards per Pressload	32
5	Weight of Mats (untrimmed)*	117952
6	Weight of Finished Product (trimmed)**	109211
7	Trim Percentage	7.41%
8	Thickness Average **	0.428
9	Pounds per cubic foot (average)**	39.33
10	*TFP per hour (Avg. from 8:15am to 12:40pm .)*	12.4

* Taken from conveyor scale tapes using every ninth board for an average weight of the mats.

** "Unit Information Sheet" (attached)

Percentage of fines (taken from last stack test) is 8.0%

PRESS TESTING

TOMAHAWK WI				Testing Date 08/23/95
Test Time: Start	8.15 **Stop**	9.15 **Total Hrs.**		1.00
Test Time: Start	10.00 **Stop**	11.00 **Total Hrs.**		1.00
Test Time: Start	11.40 **Stop**	12.40 **Total Hrs.**		1.00
Pollutants Testing For: CO, PM		***Total Test Hours:***		3.00

1	lbs. of Dryer Production per Hour	29071
2	Weight of Finished Product (trimmed)	109211

PLANT PRODUCTION RATE

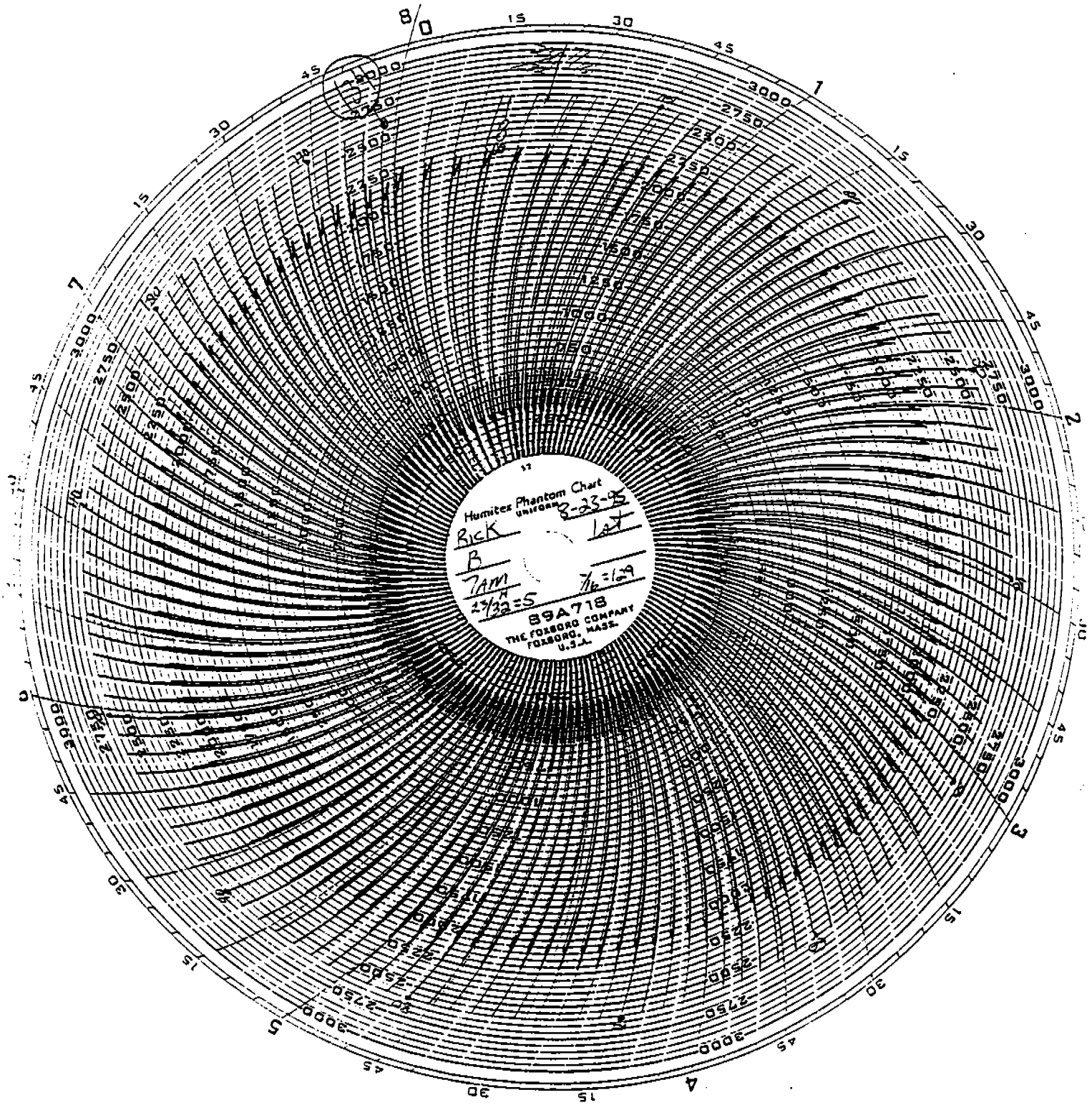
1	Data Hours (From 8:15am to 12:40pm)	4.41
2	Pressloads	76
3	No. of Boards Produced (Pressloads x 8 boards per load).	608
4	Pounds of Finished Product	109,211
5	Pounds of Finished Product per Hour (No. 4 / No. 1)	24,764
6	Tons of Finished Product per Hour (No. 5 / 2000)	12.38

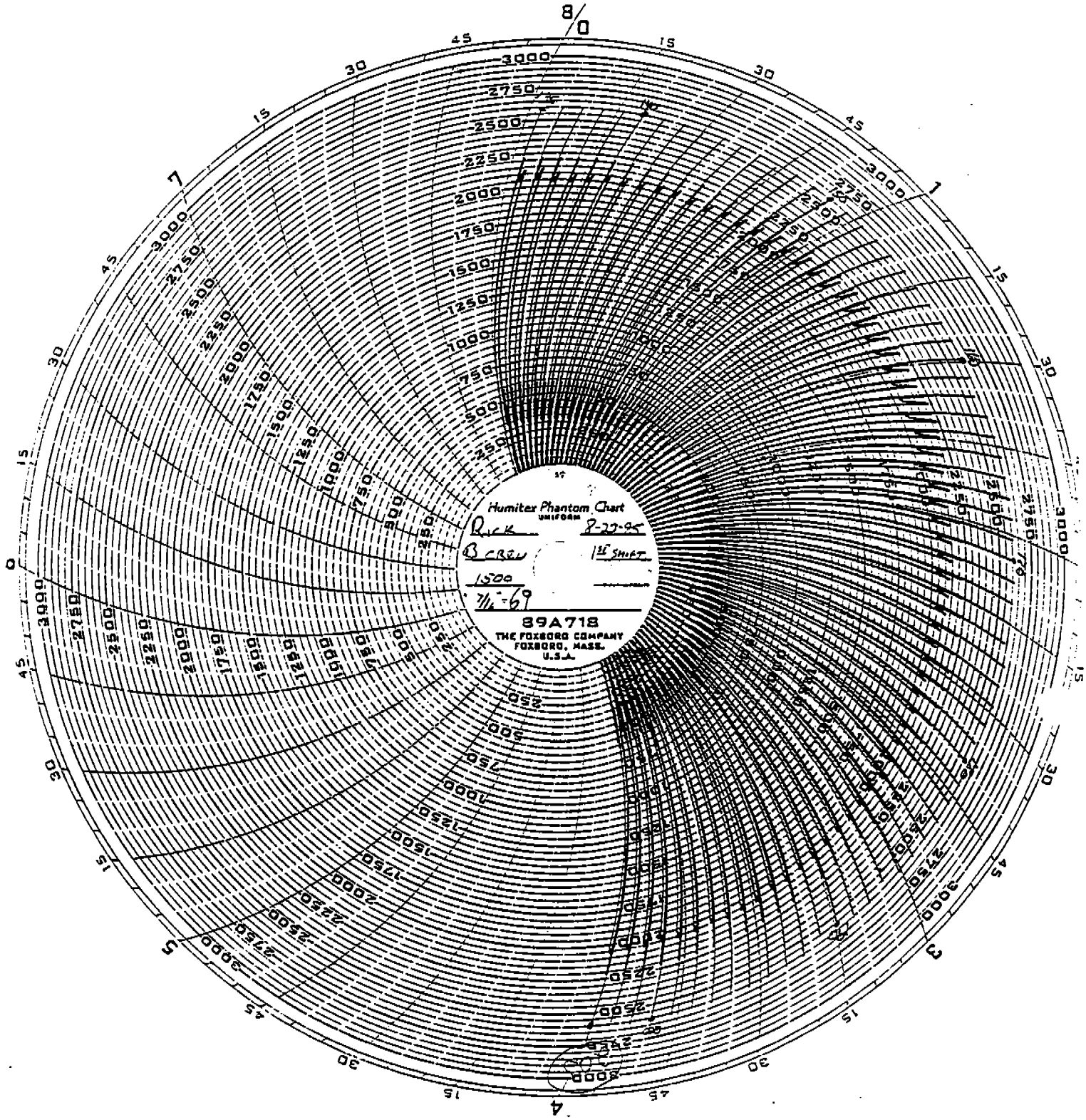
RESIN & WAX USAGE

1	Data Hours (From 8:15am to 12:40pm)	4.41	
2	Pressloads	76	
3	Pounds of MDI resin used during testing	1204	237 /hr
4	Pounds of Liquid Phenolic Resin used during testing (100% Solids)	2715	615
5	Pounds of wax used during testing (100% Solids)	970	220

RESIN & WAX USAGE AS PERCENTAGE OF FINISHED PRODUCT

1	Percentage of MDI resin used during testing	1.10%
2	Percentage of Liquid Phenolic Resin used during testing (100% Solids)	2.49%
3	Percentage of wax used during testing (100% Solids)	0.89%


Humiter Phantom Chart
Universal
8-23-85
Rick
Lat
B
7AM
7/16=69
23/32=5
89A718
THE FOXBORO COMPANY
FOXBORO, MASS.
U.S.A.


Humiter Phantom Chart
UNIFORM
Rick
8-27-69
B CREW
1st SHIFT
1500
11/4-69
89A718
THE FOXBORO COMPANY
FOXBORO, MASS.
U.S.A.

LOUISIANA-PACIFIC
TOMAHAWK WI

PRESS REPORT

Date: 8-23-95
Operator: RICK
Crew: B
Shift: 1ST

PRODUCTION EFFICIENCY

LINE SPEED	SIZE	TIME FROM	TIME TO	Total Time	Down Time	Production Efficiency In Percent	PRODUCTION FOOTAGE
492 H	23/32	0700	0719	19	Ø	100%	5 = 9,814
800	7/16	0719	1900	701	Ø	100%	198 = 236,551
						TOTAL	203 = 246,365

DOWNTIME

FROM	TO	TOTAL	REASON

PERMIT PRESSLOAD LIMITATIONS

	SIZE	PRESSLOADS ALLOWED PER HOUR	LINE SPEED SET	LINE PRESSLOADS PER HOUR
H	23/32	10.88	492	10.5
	7/16	17.42	800	17.1

HAMMERMILL DUMPED	ANCILLARY	
0028-0048 - 20	Press Temp.	218° c
1097-1107-20	Blow Down	1700
1213-1243 - 30	Former	1630
1813-0313 - 30	FCOS	1730
1807-1937 - 30	Spin flush	—
(130 hrs.)		

E-Tubes Shutdown
FACE
FACE
CORE
CORE

UNIT INFORMATION SHEET

PAPER FILTERS	
OK?	Y
CHANGED	N
INITIALS	CK

DATE:	8-28
SHIFT:	1st
CREW:	B
FOREMAN:	TW

#	Time	# PCS	AVG HGT	LBS	LBS/ FT CU	AVG THICK	#	Time	# PCS	AVG HGT	LBS	LBS/ FT CU	AVG THICK
1	710	55	39.5	4024	38.32	718	46	1442	90	38.25	4153	40.71	.425
2	718	"	39.25	3973	39.90	711	47	1455	90	39.25	4178	39.79	.430
3	725		39.125	3936	37.94	711	48	1502		39.125	4220	40.58	.435
4	740	37	—	—	—	—	49	1512		39	4176	40.15	.433
5	747	90	39.375	3974	37.85	.437	50	1523		39.75	4130	39.02	.442
6	757	"	38.5	4027	39.09	429	51	1533		39.00	4092	39.35	.433
7	808	"	38.5	4036	39.18	.428	52	1543		39.5	4115	39.19	.439
8	821		38.5	4027	39.10	.428	53	1549		38.875	4106	39.48	.432
9	827		38.75	4101	39.82	430	54	1559		39.5	4097	39.02	.439
10	835		39.5	4154	39.56	.439	55	1612		39.5	4136	39.39	.439
11	845		38.75	4103	39.83	430	56	1620		39.125	4162	40.02	.435
12	856		38.875	4155	39.95	.432	57	1631		38.875	4172	39.73	.437
13	906		39.00	4209	40.47	.433	58	1640		39.125	4170	40.09	.435
14	915		38.1025	4139	40.18	.429	59	1648		39.25	4183	39.93	.437
15	928		38.5	4044	39.26	.428	60	1700		39.00	4155	39.95	.433
16	936		38.25	4108	40.27	.425	61	1709		39	4125	39.66	.433
17	953		38.25	4600	40.20	.425	62	1720		39	4088	39.30	.433
18	954		38.625	4073	39.54	.429	63	1728		38.875	4069	39.12	.432
19	1006		38.75	4175	40.53	.430	64	1739		38.75	4038	39.20	.430
20	1017		38.5	4181	40.59	.428	65	1750		38.25	4057	39.38	.425
21	1026		38.875	4138	39.79	.432	66	1757		38.00	3869	38.31	.422
22	1037		38.75	4151	40.33	.430	67	1759		38.25	4001	39.22	.425
23	1050		38.5	4103	39.96	.428	68	1812		38.5	4027	39.10	.428
24	1055		38.5	4106	39.59	.428	69	1819		38.25	4025	39.46	.425
25	1105		38.5	3972	38.68	.428	70	1827		38.5	4017	39.13	.428
26	1117		38.125	3999	38.42	423	71	1837		39.375	4043	39.64	.426
27	1124		38.50	3926	38.12	.428	72	1859		38.5	4016	38.99	.428
28	1135		38.00	3910	38.71	.428	73						
29	1144		38.25	3869	37.93	.425	74						
30	1202		38.00	3855	38.17	.422	75						
31	1214		38.00	3845	38.06	422	76						
32	1222		38.375	3935	38.58	.426	77						
33	1234	91	38.5	3964	38.48	.428	78			(66)	33/32 H	32.89	.717
34	1243		38.5	3907	37.93	.428	79			(72)	7/16	39.38	.429
35	1251		38.125	3946	3869	.424	80						
36	1302		38.125	3971	3893	.424	81						
37	1315		38.25	3943	38.66	.425	82						
38	1324		38.25	3957	38.79	.425	83			TTL WEIGHT	109,211	39.33	.428
39	1331		38.00	3932	38.93	.422	84						
40	1345		38.25	3941	38.64	.425	85						
41	1352		38.125	4005	39.39	.424	86						
42	1401		38.75	4092	39.73	.430	87						
43	1412		39.00	4137	39.78	.433	88						
44	1421		39.125	4134	39.75	.435	89						
45	1432		39.25	4164	39.66	.436	90						

NOMINAL = 38.48

Louisiana-Pacific
Tomahawk WI

Press stack testing August 23, 1995

WAX

	FACE	CORE	PHENOL	MDI
08:00	209	147	985	257
08:30	326	224	1541	395
09:00	444	302	2104	534
09:30	553	374	2615	664
10:00	663	446	3133	796
10:30	775	521	3665	932
11:00	893	599	4223	1074
11:30	1010	674	4798	1217
12:00	1122	748	5292	1346
12:30	1235	821	5822	1481
12:45 ~~13:00~~	1297	861	6113	1554
~~13:00~~				
TOTAL ~~14:00~~	1088	714	5128	1297
÷ Hrs. @ 4.75 psi/hr ~~14:30~~	229	150	1080	273
X 4.41 hr. (8:15-12:40) ~~15:00~~	1010	662	4763	1208*
15:30	586	384	*	
16:00			2715*	
16:30				
17:00				
17:30				
18:00				
18:30				
19:00				
19:30				
20:00				
20:30				

* - Wax @ 58% Solids
- Phenol @ 57% Solids

APPENDIX F

PROCEDURES

Particulate Loading and Emission Rates

The particulate emission rates were determined per EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). 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. The sampling module also houses the impinger case and a Drierite filled column. The sampling module is connected by means of an umbilical cord to the control module. The control module houses the dry test gas meter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples are collected as follows: The sample gas is drawn through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter where particulates are removed. The sample gas is then passed through an ice-cooled impinger train and a desiccant-packed column which absorbs remaining moisture. The sample gas then passes through a vacuum pump followed by a dry test gas meter. The gas meter integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides real time 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 test point maintaining isokinetic sampling conditions. Nomographs are used for rapid determination of the sampling rate.

Particulate Loading and Emission Rates

After sampling is complete, the filter is removed and placed in a clean container. The nozzle and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 °F. This temperature is used to prevent condensation of atmospheric moisture due to the cooling effect induced by the evaporation of acetone. The acetone-free sample is then transferred to an oven and dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and then weighed to the nearest .01 mg. The filter sample is quantitatively transferred to a 6-inch watch glass and dried in an oven at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest .01 mg. All weighings are performed in a balance room where the relative humidity is hydrostatted to less than 50% relative humidity. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse is corrected for the acetone blank. The Drierite column is weighed on-site and the water collected by Drierite is added to the condensate so that the total amount of absorbed water may be ascertained.

Integrated flue gas samples for Orsat analysis were collected simultaneously with each pollutant sample. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

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 wool plug

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

Reagents: Methylene chloride

Sodium sulfate - (ACS) granular anhydrous (purified by heating for four hours in a shallow tray)

SAMPLING

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

ANALYSIS

1. Sample bottles are removed from storage and the contents quantitatively transferred to a clean 500 cc separatory funnel equipped with a Teflon stopcock.

2. Rinse the sample container with distilled water and add to separatory funnel.

3. Then rinse the sample container with acetone and pour through sodium sulfate into a tare beaker marked A.

4. The sample is then extracted consecutively with three 50 cc aliquots of methylene chloride. The extraction is performed according to normal laboratory practice observing the customary safety precaution of releasing excess pressure after each shaking.

5. After each of the three extractions are completed, the organic solvent should be dried by passing it through a funnel containing anhydrous sodium sulfate and collecting it and two 50 cc rinses in the tared beaker marked A (the same one used to catch the acetone container rinse).

6. Evaporate to dryness in a hood at 70°F or less. Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point otherwise water will be condensed in the container.

7. Desiccate for two hours in a sealed desiccator and final weigh. Report all results in grams. All weighings should be made to nearest 0.1 mg (four places).

8. The remaining liquid in the separatory funnel is then transferred to a tared beaker marked B and is evaporated to dryness at 220°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.

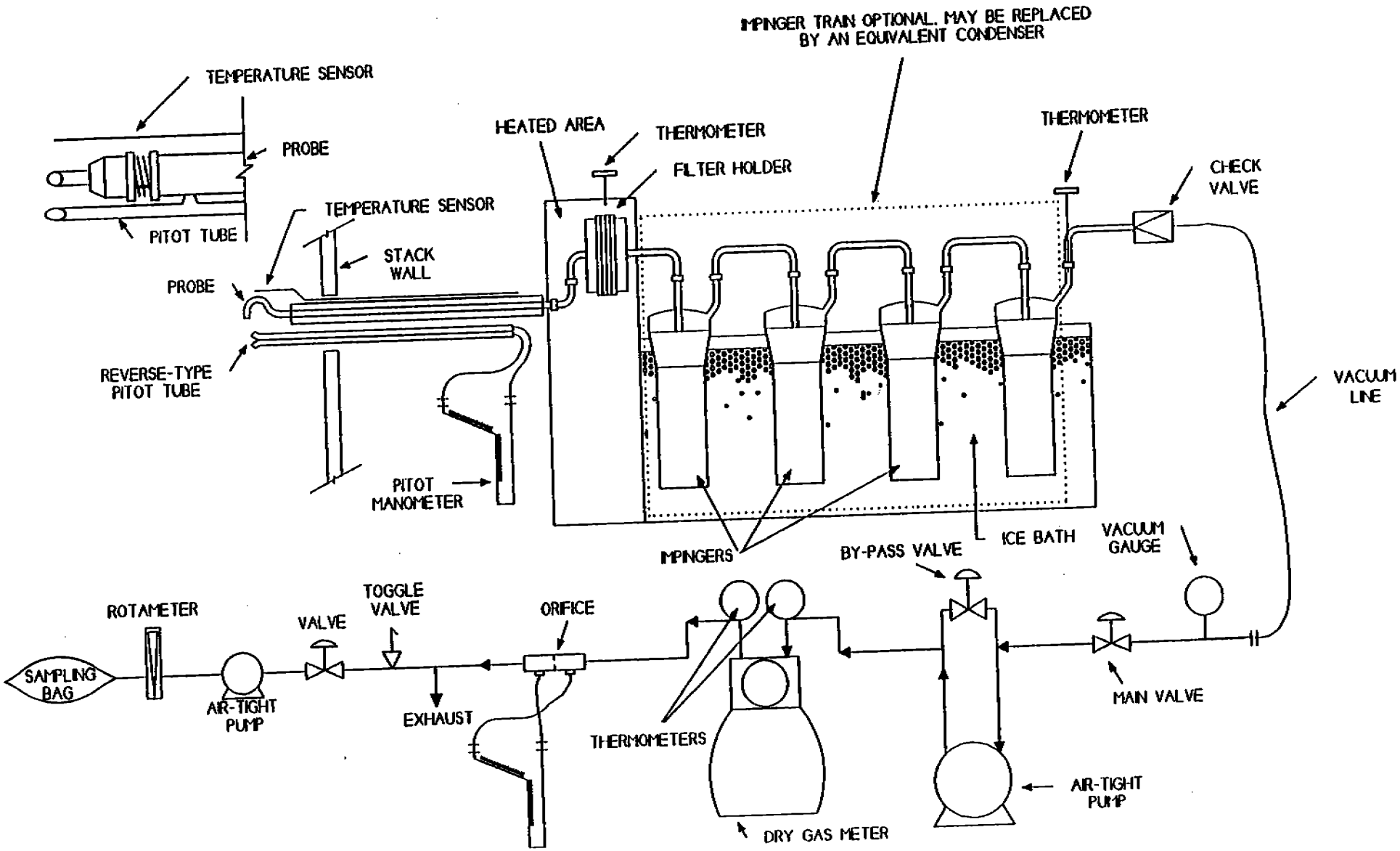
10. A field blank should be analyzed in an identical manner. If a field blank is not submitted, take an aliquot of Class I water equal in volume to the samples and analyze in a similar manner.

11. The results for container A are to be marked in the organic section of Interpoll Form #LSC-03G.

12. The results for container B are to be marked in the inorganic section of Interpoll Form #LSC-03G.

Interpoll Laboratories
(612) 786-6020

PARTICULATE SAMPLING TRAIN



Method 10—Determination of Carbon Monoxide Emissions From Stationary Sources

1. Principle and Applicability

1.1 **Principle.** An integrated or continuous gas sample is extracted from a sampling point and analyzed for carbon monoxide (CO) content using a Luft-type nondispersive infrared analyzer (NDIR) or equivalent.

1.2 **Applicability.** This method is applicable for the determination of carbon monoxide emissions from stationary sources only when specified by the test procedures for determining compliance with new source performance standards. The test procedure will indicate whether a continuous or an integrated sample is to be used.

2. Range and Sensitivity

2.1 **Range.** 0 to 1,000 PPM.

2.2 **Sensitivity.** Minimum detectable concentration is 20 PPM for a 0 to 1,000 PPM span.

3. Interferences

Any substance having a strong absorption of infrared energy will interfere to some extent. For example, discrimination ratios for water (H_2O) and carbon dioxide (CO_2) are 3.5 percent H_2O per 7 PPM CO and 10 percent CO_2 per 10 PPM CO, respectively, for devices measuring in the 1,500 to 3,000 PPM range. For devices measuring in the 0 to 100 PPM range, interference ratios can be as high as 3.5 percent H_2O per 25 PPM CO and 10 percent CO_2 per 50 PPM CO. The use of silica gel and ascarite traps will alleviate the major interference problems. The measured gas volume must be corrected if these traps are used.

4. Precision and Accuracy

4.1 **Precision.** The precision of most NDIR analyzers is approximately ± 2 percent of span.

4.2 **Accuracy.** The accuracy of most NDIR analyzers is approximately ± 5 percent of span after calibration.

5. Apparatus

5.1 **Continuous Sample** (Figure 10-1).

5.1.1 **Probe.** Stainless steel or sheathed Pyrex\1\ glass, equipped with a filter to remove particulate matter.

5.1.2 **Air-Cooled Condenser or Equivalent.** To remove any excess moisture.

5.2 **Integrated Sample** (Figure 10-2).

5.2.1 **Probe.** Stainless steel or sheathed Pyrex glass, equipped with a filter to remove particulate matter.

5.2.2 **Air-Cooled Condenser or Equivalent.** To remove any excess moisture.

5.2.3 **Valve.** Needle valve, or equivalent, to adjust flow rate.

5.2.4 **Pump.** Leak-free diaphragm type, or equivalent, to transport gas.

5.2.5 **Rate Meter.** Rotameter, or equivalent, to measure a flow range from 0 to 1.0 liter per min (0.035 cfm).

5.2.6 **Flexible Bag.** Tedlar, or equivalent, with a capacity of 60 to 90 liters (2 to 3 ft^3). Leak-test the bag in the laboratory before using by evacuating bag with a pump followed by a dry gas meter. When evacuation is complete, there should be no flow through the meter.

5.2.7 **Pitot Tube.** Type S, or equivalent, attached to the probe so that the sampling rate can be regulated proportional to the stack gas velocity when velocity is varying with the time or a sample traverse is conducted.

5.3 **Analysis** (Figure 10-3).

5.3.1 **Carbon Monoxide Analyzer.** Nondispersive infrared spectrometer, or equivalent. This instrument should be demonstrated, preferably by the manufacturer, to meet or exceed manufacturer's specifications and those described in this method.

5.3.2 **Drying Tube.** To contain approximately 200 g of silica gel.

5.3.3 **Calibration Gas.** Refer to section 6.1.

5.3.4 **Filter.** As recommended by NDIR manufacturer.

|_See_CFR_paper_publication_for_illustration_18A

5.3.5 CO_2 **Removal Tube.** To contain approximately 500 g of ascarite.

5.3.6 **Ice Water Bath.** For ascarite and silica gel tubes.

5.3.7 **Valve.** Needle valve, or equivalent, to adjust flow rate

5.3.8 **Rate Meter.** Rotameter or equivalent to measure gas flow rate of 0 to 1.0 liter per min (0.035 cfm) through NDIR.

5.3.9 **Recorder** (optional). To provide permanent record of NDIR readings.

6. Reagents

6.1 **Calibration Gases.** Known concentration of CO in nitrogen (N_2) for instrument span, prepurified grade of N_2 for zero, and two additional concentrations corresponding approximately to 60 percent and 30 percent span. The span concentration shall not exceed 1.5 times the applicable source performance standard. The calibration gases shall be certified by the manufacturer to be within ± 2 percent of the specified concentration.

| See_CFR_paper_publication_for_illustration_19A

6.2 **Silica Gel.** Indicating type, 6 to 16 mesh, dried at 175°C (347°F) for 2 hours.

6.3 **Ascarite.** Commercially available.

7. Procedure

7.1 **Sampling.**

7.1.1 **Continuous Sampling.** Set up the equipment as shown in Figure 10-1 making sure all connections are leak free. Place the probe in the stack at a sampling point and purge the sampling line. Connect the analyzer and begin drawing sample into the analyzer. Allow 5 minutes for the system to stabilize, then record the analyzer reading as required by the test procedure. (See section 7.2 and 8). CO_2 content of the gas may be determined by using the Method 3 integrated sample procedure, or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.1.2 **Integrated Sampling.** Evacuate the flexible bag. Set up the equipment as shown in Figure 10-2 with the bag disconnected. Place the probe in the stack and purge the sampling line. Connect the bag, making sure that all connections are leak free. Sample at a rate proportional to the stack velocity. CO_2 content of the gas may be determined by using the Method 3 integrated sample procedures, or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.2 **CO Analysis.** Assemble the apparatus as shown in Figure 10-3, calibrate the instrument, and perform other required operations as described in section 8. Purge analyzer with N_2 prior to introduction of each sample. Direct the sample stream through the instrument for the test period, recording the readings. Check the zero and span again after the test to assure that any drift or malfunction is detected. Record the sample data on Table 10-1.

8. Calibration

Assemble the apparatus according to Figure 10-3. Generally an instrument requires a warm-up period before stability is obtained. Follow the manufacturer's instructions for specific procedure. Allow a minimum time of 1 hour for warm-up. During this time check the sample conditioning apparatus, i.e., filter, condenser, drying tube, and CO_2 removal tube, to ensure that each component is in good operating condition. Zero and calibrate the instrument according to the manufacturer's procedures using, respectively, nitrogen and the calibration gases.

Table 10-1—Field data

Comments

Location

Test

Date

Operator

Clock time	Rotameter setting, liters per minute (cubic feet per minute)

9. Calculation

Calculate the concentration of carbon monoxide in the stack using Equation 10-1.

CCO stack = CCO NDIR(1-Fco2) Eq. 10-1

Where:

CCO stack = Concentration of CO in stack, PPM by volume (dry basis).
CCO NDIR = Concentration of CO measured by NDIR analyzer, PPM by volume (dry basis).
FCO 2 = Volume fraction of CO_2 in sample, i.e., percent CO_2 from Orsat analysis divided by 100.

10. Alternative Procedures

10.1 **Interference Trap.** The sample conditioning system described in Method 10A, sections 2.1.2 and 4.2, may be used as an alternative to the silica gel and ascarite traps.

11. Bibliography

1. McElroy, Frank, The Intertech NDIR-CO Analyzer, Presented at 11th Methods Conference on Air Pollution, University of California, Berkeley, CA. April 1, 1970.

2. Jacobs, M. B., et al., Continuous Determination of Carbon Monoxide and Hydrocarbons in Air by a Modified Infrared Analyzer, J. Air Pollution Control Association, 9(2): 110-114. August 1959.

3. MSA LIRA Infrared Gas and Liquid Analyzer Instruction Book, Mine Safety Appliances Co., Technical Products Division, Pittsburgh, PA.

4. Models 215A, 315A, and 415A Infrared Analyzers, Beckman Instruments, Inc., Beckman Instructions 1635-B, Fullerton, CA. October 1967.

5. Continuous CO Monitoring System, Model A5611, Intertech Corp., Princeton, NJ.

6. UNOR Infrared Gas Analyzers, Bendix Corp., Ronceverte, WV

Agenda

A. Performance Specifications for NDIR Carbon Monoxide Analyzers

Range (minimum)	0—1000 PPM.
Output (minimum)	0—10mV.
Minimum detectable sensitivity	20 PPM.
Rise time, 90 percent (maximum)	30 seconds.
Fall time, 90 percent (maximum)	30 seconds.
Zero drift (maximum)	10% in 8 hours.
Span drift (maximum)	10% in 8 hours.
Precision (minimum)	± 2% of full scale.
Noise (maximum)	± 1% of full scale.
Linearity (maximum deviation)	2% of full scale.
Interference rejection ratio	CO_2—1000 to 1, H_2O—500 to 1.

B. Definitions of Performance Specifications.

Range——The minimum and maximum measurement limits.

Output——Electrical signal which is proportional to the measurement; intended for connection to readout or data processing devices. Usually expressed as millivolts or milliamps full scale at a given impedance.

Full scale——The maximum measuring limit for a given range.

Minimum detectable sensitivity——The smallest amount of input concentration that can be detected as the concentration approaches zero.

Accuracy——The degree of agreement between a measured value and the true value; usually expressed as ± percent of full scale.
Time to 90 percent response——The time interval from a step change in the input concentration at the instrument inlet to a reading of 90 percent of the ultimate recorded concentration.
Rise Time (90 percent)——The interval between initial response time and time to 90 percent response after a step increase in the inlet concentration.
Fall Time (90 percent)——The interval between initial response time and time to 90 percent response after a step decrease in the inlet concentration.
Zero Drift——The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is zero; usually expressed as percent full scale.
Span Drift——The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is a stated upscale value; usually expressed as percent full scale.
Precision——The degree of agreement between repeated measurements of the same concentration, expressed as the average deviation of the single results from the mean.
Noise——Spontaneous deviations from a mean output not caused by input concentration changes.
Linearity——The maximum deviation between an actual instrument reading and the reading predicted by a straight line drawn between upper and lower calibration points.

Method 10A—Determination of Carbon Monoxide Emissions in Certifying Continuous Emission Monitoring Systems at Petroleum Refineries

1. Applicability and Principle

1.1 **Applicability.** This method applies to the measurement of carbon monoxide (CO) at petroleum refineries. This method serves as the reference method in the relative accuracy test for nondispersive infrared (NDIR) CO continuous emission monitoring systems (CEMS's) that are required to be installed in petroleum refineries on fluid catalytic cracking unit catalyst regenerators [40 CFR Part 60.105(a)(2)].

1.2 **Principle.** An integrated gas sample is extracted from the stack, passed through an alkaline permanganate solution to remove sulfur and nitrogen oxides, and collected in a Tedlar bag. The CO concentration in the sample is measured spectrophotometrically using the reaction of CO with p-sulfaminobenzoic acid.

1.3. **Range and Sensitivity.**

1.3.1 **Range.** Approximately 3 to 1800 PPM CO. Samples having concentrations below 400 PPM are analyzed at 425 nm, and samples having concentrations above 400 PPM are analyzed at 600 nm.

1.3.2 **Sensitivity.** The detection limit is 3 PPM based on three times the standard deviation of the mean reagent blank values.

APPENDIX G

CALCULATION EQUATIONS

METHOD 2
CALCULATION EQUATIONS

$$\overline{V_s} = 85.49\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,d} = 60\ (1 - B_{ws})\ \overline{V_s}\ A\ (\frac{528}{T_{s\ (avg)}})\ (\frac{P_s}{29.92})$$

$$Q_a = 60\ \overline{V_s}\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,d}\ G_d}{1 - B_{ws}}$$

$$RH^* = 100\ (vp_{twb} - 0.0003641\ P_s\ (T_{db} - T_{wb}))/vp_{tdb}$$

$$B^*_{ws} = RH(vp_{tdb})/P_s$$

$$\rho = \frac{4.585\ x\ 10^{-2}\ P_s M_s}{T_s\ (avg)}$$

*Alternate equations for calculating moisture content from wet bulb and dry bulb data.

SYMBOLS

A	=	Cross Sectional area of stack, SQ. FT.
A_n	=	Cross sectional area of nozzle, SQ. FT.
B_{ws}	=	Water vapor in gas stream, proportion by volume
C_p	=	Pitot tube coefficient, dimensionless
C_a	=	Concentration of particulate matter in stack gas, wet basis, GR/ACF
C_s	=	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF
EA	=	Excess air, percent by volume
γ	=	Dry test meter correction factor, dimensionless
G_d	=	Specific gravity (relative to air), dimensionless
I	=	Isokinetic variation, percent by volume
M_d	=	Molecular weight of stack gas, dry basis, g/g - mole.
$\dot{m}_g$	=	Mass flow of wet flue gas, LB/HR
$\dot{m}_p$	=	Particulate mass flow, LB/HR
M_s	=	Molecular weight of stack gas, wet basis, g/g mole.
M_p	=	Total amount of particulate matter collected, g
P_{bar}	=	Atmospheric pressure, IN. HG. (uncompensated)
P_g	=	Stack static gas pressure, IN. WC.
P_s	=	Absolute pressure of stack gas, IN. HG.
P_{std}	=	Standard absolute pressure, 29.92 IN. HG.
A_s	=	Actual volumetric stack gas flow rate, ACFM
$Q_{s,d}$	=	Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM
RH	=	Relative humidity, %

T_{db}	=	Dry bulb temperature of stack gas, °F
T_{wb}	=	Wet bulb temperature of stack gas, °F
$T_{m(avg)}$	=	Absolute average dry gas meter temperature, °R
$T_{s(avg)}$	=	Absolute average stack temperature, °R
T_{std}	=	Standard absolute temperature, 528 °R (68 °F)
θ	=	Total sampling time, min.
V_{lc}	=	Total volume of liquid collected in impingers and silica gel, ml
V_m	=	Volume of gas sample as measured by dry gas meter, CF
$V_{m(std)}$	=	Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF
$V_{w(std)}$	=	Volume of water vapor in the gas sample corrected to standard conditions, SCF
$\bar{V}_s$	=	Average actual stack gas velocity, FT/SEC
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

METHOD 3
CALCULATION EQUATIONS

$$\%EA = \frac{100(\%O_2 - 0.5\%\ CO)}{0.264\%\ N_2 - \%O_2 + 0.5\%\ CO}$$

$$M_d = 0.44(\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$M_s = M_d\ (I - B_{ws}) + 0.18\ B_{ws}$$

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

METHOD 5
CALCULATION EQUATIONS

$$V_{m(std)} = 17.65\ V_m\ \gamma\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{lc}$$

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

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (I - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_i = 8.5714\ x\ 10^{-3}\ C_s\ Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228 \times 10^{-1} \, M_p \, A}{\theta \, A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

CALCULATION EQUATIONS

METHOD 10

$$CO\text{·}PPM\text{·}DRY = CO_{CO_2} - free,\ dry,\ avg\ (1 - CO_2,\ d/100)$$

$$CO\text{·}PPM\text{·}WET = CO\text{·}PPM\text{·}DRY\ (1 - MC/100)$$

$$GR/DSCF = 5.0885\ X\ 10^{-4}\ (CO\text{·}PPM\text{·}DRY)$$

$$mg/dscm = 1.165\ (CO\text{·}PPM\text{·}DRY)$$

$$\dot{m} = 8.5714\ x\ 10^{-3}\ (GR/DSCF)\ (Q_{s,d})$$

$$E = \frac{2.9857\ x\ 10^{-3}\ F_d\ (GR/DSCF)}{20.9 - O_{2,\,d}}$$

where:

CO_{CO_2} - *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

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MC	=	moisture content of flue gas on a percent by volume basis
CO·PPM·DRY	=	carbon monoxide concentration in ppm by volume on a dry basis
CO·PPM·WET	=	carbon monoxide concentration in ppm by volume on a wet or actual basis
GR/DSCF	=	concentration of carbon monoxide in flue gas on a grains per dry standard cubic foot basis (68 °F, 29.92 IN. HG.)
mg/dscm	=	concentration of carbon monoxide in flue gas on a milligrams per dry standard cubic meter basis (60 °F, 29.92 IN. HG.)
$\dot{m}$	=	emissions 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)

APPENDIX H

SAMPLING TRAIN CALIBRATION DATA

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP / TOMAHAWK Date 9-23-95

Operator [signature] Module No. 12

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 29.58 in.Hg θ = .9989 ΔH@ 1.98 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	558.00		
2.5	559.90	73	68
5.0	561.80	76	70
7.5	563.74	78	71
10	565.62	80	71
	V_m = 7.62	Avg(t_m) =	73.4 °F

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(\quad)(\quad)} \left[\frac{(\quad) + 460}{(\quad)}\right]^{0.5} \quad 4.3201$$

$$Y_{cn} = 1.0136$$

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

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

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Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: August 28, 1995

Meter Box No. : 12 (Rockwell Dry Test Meter Serial No. 1334116)

Date of Last Calibration: July 28, 1995
Calibration Technician: D. Van Hoever
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
August 16, 1995	5-6318	740.80	855.35	114.55	114.55
August 23, 1995	5-6375	865.80	1028.40	162.60	277.15

* Total volume through meter since last calibration.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 7/28/95
Bar. Press. 28.95 IN.HG
Wet Test Meter No. AL-20

Control Module No. 12
Serial No. DTM 1334116
Technician Dean Hoover

ΔH (IN.WC)		Gas Volume Wet Test Meter	* Cal. Index φ	* Diff. Wet Test Meter ΔP_w	Gas Volume Dry Test Meter (ft^3)		Gas Temperatures			Time θ	Meter Coeff.	Orifice Const.	C_f
							Wet Test	Dry Test					
Nominal	Actual	(ft^3)	(%)	(IN.WC.)	V_w	V_d	t_w (°F)	t_{di} (°F)	t_{do} (°F)	(Min/Sec)	Y	ΔH@	
0.5	.5	2	99.85	0.01	720.08	722.175	64.3	90	76	4:59.37	1.0005	1.76	
1.2	1.2	2	99.91	0.025	717.505	719.56	69.2	92	76	3:21.84	.9964	1.92	
2.0	2.0	3	99.93	0.055	704.79	707.85	69	86	74	3:53.06	.9948	1.90	
3.3	3.3	3.5	100.00	0.09	708.36	711.905	69	91	75	3:32.14	1.0048	1.90	
4.7	4.7	5	100.02	0.12	712.93	716.50	69	95	75	2:58.90	.9980	1.92	
1	2	3	4	5	6	7	8	9	10	Avg	.9989	1.88	

Positive leak check performed by
Meter was in tolerance
Approved by

Meter was not in tolerance
Meter was not in tolerance
Date 8/2/95

☐: readjusted linkage
☐: changed dry test meter

*Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

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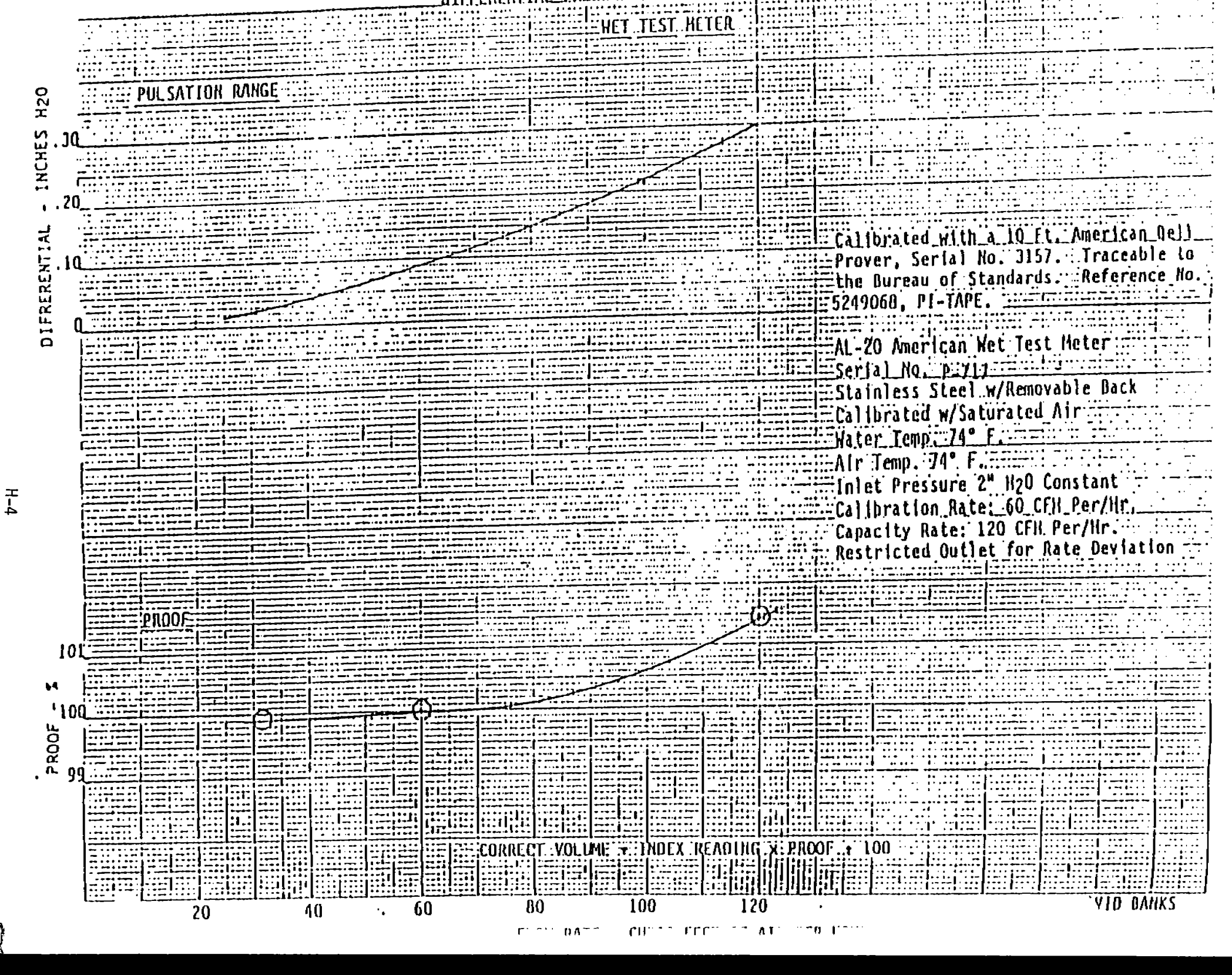
H-3


WET TEST METER
PULSATION RANGE
DIFFERENTIAL - INCHES H20
.30
.20
.10
0
Calibrated with a 10 Ft. American Dell Prover, Serial No. 3157. Traceable to the Bureau of Standards. Reference No. 5249068, PI-TAPE.
AL-20 American Wet Test Meter
Serial No. P-711
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H2O Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation
PROOF
101
100
99
PROOF - %
CORRECT VOLUME = INDEX READING X PROOF ÷ 100
20
40
60
80
100
120
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Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 08-23-95 Nozzle Number 1-3
Technician: Ed 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	.184
2	.184
3	.185
Average:	.184

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test: #34

Vendor: OMEGA
Model: HHSI
Range: 0 - 2000 °F
Date of Calibration: 6-12-95
Method of Calibration:

Serial Number: THTX0343
Thermocouple Type: K
Technician: E Thomas KD
PDT No. 34

☐ 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	
			at (°F)	(%)
0	0	-2	-2	.45
100	100	98	-2	.36
200	200	200	0	0
300	300	299	1	.13
400	400	398	2	.23
500	500	499	1	.10
600	600	600	0	0
700	700	699	1	.08
800	800	802	2	.16
900	900	900	0	0
1000	1000	1001	1	.07
1100	1100	1100	0	0
1200	1200	1201	1	.06
1300	1300	1300	0	0
1400	1400	1402	2	.11
1500	1500	1501	1	.05
1600	1600	1604	4	.19
1700	1700	1702	2	.09
1800	1800	1804	4	.18
1900	1900	1901	1	.04
2000	2000	2003	3	.12
2100	2100	2100	0	0
		Averages:	1.363	.117

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

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

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Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 31-6

Pitot tube dimensions:

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

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

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

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle ,750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) ,750 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection: 4-7-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

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INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 6-23-95

Technician E Trowbridge

Mercury Column Barometer No. ALTimeter Model 12

Aneroid Barometer No. SN -01002005

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.170	70	.130	29.040	29.060	.020

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 columr 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.

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