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RESULTS OF THE MAY 21 & 22, 1996 AIR EMISSION COMPLIANCE TESTING AT THE LOUISIANA PACIFIC OSB PLANT IN TWO HARBORS, MINNESOTA

Submitted to:

LOUISIANA-PACIFIC CORPORATION
Route 8, Box 8263
Hayward, Wisconsin 54843

Attention:

Sue Somers

Reviewed by:

Daniel J. Despen
Manager
Stationary Source Testing Department

Report Number 6-7712
June 10, 1996
SL/sll

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ABBREVIATIONS

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

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certifications Required For Performance Test Reports

Note: All performance test reports must contain a certification by the responsible parties that the test results have been reported accurately, that the field data is a true representation of the sampling procedures, and that the process data is a true indicator of the operating parameters of the emissions unit at the time of the performance test. (Ref. Minn. Rules pt. 7017.2040). Performance test results will not be accepted without certification of the report.

1. **Certification of sampling procedures by the team leader of the personnel conducting the sampling procedures:**

"I certify under penalty of law that the sampling procedures were performed in accordance with the approved test plan and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: Mark Kaehler Printed Name of Person Signing: Mark Kaehler
Title: Field Engineer Date: 5-22-96

2. **Certification of analytical procedures by the person responsible for the laboratory analysis of field samples:**

"I certify under penalty of law that the analytical procedures were performed in accordance with the requirements of the test methods and that the data presented for use in the test report were, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: David Schneider Printed Name of Person Signing: David Schneider
Title: Manager Chemistry Dept Date: 6/28/96

3. **Certification of test report by the senior staff person at the testing company who is responsible for compiling and checking the test report:**

"I certify under penalty of law that this test report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed sampling and analysis relating to the performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: [signature] Printed Name of Person Signing: Daniel J. Despen
Title: Mgr. Stationary Source Date: 6/28/96

4. **Certification of test report by owner or operator of the emission facility:**

"I certify under penalty of law that the information submitted in this test report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on process and control equipment during the month prior to the performance test. Based on my inquiry of the person or persons who performed the operational and maintenance activities, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: S M Somers Printed Name of Person Signing: SUSAN SOMERS
Title: VP - ENVIRONMETAL MANAGER Date: 7-2-96

1-3-94-G:\STACK\WP\FORMS\S-480

1 INTRODUCTION

On March 21 & 22, 1996, Interpoll Laboratories conducted Air Emission Compliance tests at the Louisiana Pacific OSB Plant in Two Harbors, Minnesota on the following sources:

Source	Parameters
Dryer RTO Stack	PM,PM-10,NO_x,VE,CO,CH_2O,THC's
Primary Cyclone Outlet	THC's
E-Tube Outlet	THC's
RTO Inlet	THC's
Press Vent Stack	PM,NO_x,VE,CO,THC's

The testing was conducted to satisfy Air Emission Permit No. 0750019-006 and USEPA Clean Air Act Consent Decree entered into with Louisiana-Pacific Corporation on September 30, 1993. The Decree requires RTO Outlet testing for PM and efficiency testing for VOC. On-site testing was performed by Duane Van Hoever, Mark Kaehler, Bob Aschenbach, Steve Kelker, Mark Petersen, Jamie Bainville, Dan Hulleman, and Ken Nuessmeier. Coordination between testing activities and plant operation was provided by Sue Somers of Louisiana-Pacific. The tests were not witnessed by a member of the Minnesota Pollution Control Agency.

Particulate determinations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1995). Preliminary volumetric flow rate determinations were used to select the appropriate nozzle diameter for isokinetic sample withdrawal. Interpoll Labs Model 3 M5 sampling trains which meet or exceed specifications in the above-cited reference were used to extract particulate samples by means of heated stainless steel probe. Wet catch samples were collected in the back half of the Method 5 sampling train and analyzed in accordance with EPA Method 202.

PM-10 sampling was conducted in accordance with EPA Method 201A (CFR Title 40, 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

Louisiana-Pacific Corporation

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July 11, 1996 Via Federal Express

Director, Air Enforcement Division
U.S. EPA
Ariel Rios Building, Room 1119
Mail Code 2242A
12th Street and Pennsylvania Ave., N.W.
Washington, D.C. 20004

Mr. Laxmi Kesari
Multi-Media Enforcement & Strategic
Planning Division
U.S. EPA
Ariel Rios Bldg. 1200 Pennsylvania NW Room 3121
Washington, DC 20004

re: Clean Air Enforcement Action - United States v. Louisiana-Pacific Corporation No. CV93-0869 (W.D. LA)

Subject: **Two Harbors OSB - Dryer RTO Acceptance Testing**

Gentlemen:

Attached for your review is the *Results of the May 21&22, 1996 Air Emission Compliance Testing at the Louisiana-Pacific OSB Plant in Two Harbors, Minnesota.* This report contains acceptance testing information as required by the First Amendment to the Consent Decree.

The test results indicate the pollution control equipment on the dryer system at Two Harbors OSB is effectively controlling particulate and VOC emissions as required in the First Amendment to the Consent Decree.

Particulate emissions from the dryer RTO, measured at 0.0043 and 0.0038 gr/dscf (for dry+wet catch and dry catch respectfully), are well below the 0.015 gr/dscf limit.

The test results of outlet VOC concentrations from the dryer RTO indicated emissions were below the detection limit of the test method (less than 5 ppm or 0.48 lbs/hr). This made exact calculation of destruction efficiency for VOCs infeasible due to the limitations of test equipment.

Please note that the enclosure is provided to Mr. Laxmi Kesari only.

Sincerely,

Elizabeth T. Smith

Elizabeth T. Smith, Director
Environmental Affairs

ETS:mhb

Encls.

cc w/enc: Julie Domike, U.S. EPA, Air Toxics, New Source Review and Permit Branch

cc w/o enc Regional Administrator, U.S. EPA Region 5
Norm Radford Jr., - Vinson & Elkins, Dallas TX
Mark Suwyn - Corporate
Pete Wainer - Two Harbors, MN
Tony Cavadeas - Hayward
Sue Somers - Hayward
Dick Hanson - Two Harbors, MN
Mike Anderson - Two Harbors, MN
Stuart Arkley - MPCA

or exceeds the specifications of Method 201A. Velocity pressure measurements were made prior to, and during, each run to determine the proper dwell times at each traverse point.

Oxides of nitrogen, carbon monoxide, oxygen, and carbon dioxide concentrations were determined in accordance with Methods 7E, 10, and 3A (Ibid). 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 analyzers 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 analyzers 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 analyzers. A three-way valve on the probe was used to introduce standard gas for the "system bias check".

The analog response of each analyzer was recorded with a computer datalogger and backed up with a strip chart recorder. The NO_x, CO, O_2 and CO_2 analyzers were calibrated with National Specialty Gases and Air Products and Chemicals standard gases. The instrument was calibrated before and after each run as per EPA Method 7E, 10, and 3A. The sample probe was moved through a three-point traverse (1/6, 3/6, 5/6 of the stack diameter) to measure oxides of nitrogen and carbon monoxide concentrations.

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

Total gaseous hydrocarbon concentrations were determined instrumentally using a Ratfisch Model RS 55 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 simultaneously with each of the above-referenced sample trains from the sampling train exhaust ports using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags. 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. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis.

Testing on the Dryer RTO Stack was conducted from two test ports oriented at 90 degrees on the stack. These test ports are located 6.2 diameters downstream and 6.2 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate and formaldehyde samples. Each traverse point was sampled for 2.5 minutes to give a total sampling time of 60 minutes per run. A 12-point traverse was used to collect representative PM-10 samples. The PM-10 run times ranged from 90 to 98 minutes.

Testing on the Press Vent Stack was conducted from 2 sets of 4 test ports situated horizontally on each respective stack. These test ports are located 0.59 equivalent diameters downstream and 0.59 equivalent diameters upstream of the nearest flow disturbances. A 3-point traverse was used collect representative particulate samples. Each traverse point was sampled for 10 minutes to give a total sampling time of 60 minutes per run.

Testing on the Primary Cyclone Outlet was conducted from two test ports oriented at 90 degrees on the duct. These test ports are located 7.4 diameters downstream and 3.4 diameters upstream of the nearest flow disturbances. A 12-point traverse was used to conduct volumetric flow rate determinations.

Testing on the E-Tube Outlet was conducted from two test ports oriented at 90 degrees on the duct. These test ports are located 1.95 diameters downstream and 2 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to conduct volumetric flow rate determinations.

Testing on the RTO Inlet was conducted from two test ports oriented at 90 degrees on the duct. These test ports are located 4.1 diameters downstream and 14.4 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to conduct volumetric flow rate determinations.

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

2 SUMMARY AND DISCUSSION

The results of the air emission compliance tests are presented in Tables 1 - 7. An overview of the results is presented in the table below:

PARAMETER		MEASURED	
DRYER RTO STACK			
Particulate			
DRY + WET CATCH	(GR/DSCF)	0.0043	
	(LB/HR)	1.5	← includes paint drying ovens
DRY CATCH ONLY	(GR/DSCF)	0.0038	
	(LB/HR)	1.3	
PM-10			
DRY + WET CATCH	(GR/DSCF)	0.0052	
	(LB/HR)	1.9	
DRY CATCH ONLY	(GR/DSCF)	0.0031	
	(LB/HR)	1.2	
Oxides of Nitrogen			
	(ppm,d)	17	
	(LB/HR)	4.9	
Opacity	(%)	0	
Carbon Monoxide			
	(ppm,d)	60	
	(LB/HR)	10.6	
Formaldehyde			
	(ppm,d)	0.40	
	(LB/HR)	0.080	
THC's			
	(ppmC,w)	< 5	
	(LB/HR)	< 0.48	
PRIMARY CYCLONE OUTLET			
THC's			
	(ppmC,w)	121	
	(LB/HR)	8.3	
E-TUBE OUTLET			
THC's			
	(ppmC,w)	183	
	(LB/HR)	14.3	
RTO INLET			
THC's			
	(ppmC,w)	135	← includes paint drying ovens
	(LB/HR)	13.3	

PARAMETER		MEASURED
PRESS VENT STACK		
Particulate		
DRY + WET CATCH	(GR/DSCF)	0.0046
	(LB/HR)	1.5
DRY CATCH ONLY	(GR/DSCF)	0.0040
	(LB/HR)	1.3
Oxides of Nitrogen		
	(ppm,d)	< 1
	(LB/HR)	< 0.28
Opacity	(%)	*N/A
Carbon Monoxide		
	(ppm,d)	7.3
	(LB/HR)	1.2
THC's		
	(ppmC,w)	45
	(LB/HR)	3.4

* Note: Visible emissions observations were unable to be performed due to inclement weather conditions.

No difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the concentrations and emission rates reported herein are accurate and closely reflect the actual values which existed at the time the tests were performed.

Table 1a Summary of the Results of the May 21, 1996 Particulate Emission Compliance Test of the Dryer RTO Stack at the Louisiana Pacific Plant in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		05-21-96	05-21-96	05-21-96
Time runs were done	(HRS)	945/1050	1155/1345	1535/1640
Dryer Production Rate	(LB/HR)	27279	27279	27279
Volumetric flow				
actual	(ACFM)	75769	75634	75241
standard	(DSCFM)	41387	39164	40862
Gas temperature	(DEG-F)	287	292	280
Moisture content	(%V/V)	19.69	23.45	20.90
Gas composition	(%V/V,dry)			
carbon dioxide		3.10	3.10	3.00
oxygen		17.30	17.20	17.10
nitrogen		79.60	79.70	79.90
Isokinetic variation	(%)	99.4	103.4	98.3
Particulate concentration				
actual	(GR/ACF)	.001973	.001943	.002965
standard	(GR/DSCF)	.003613	.003753	.005462
Part. emission rate	(LB/HR)	1.28	1.26	1.91

Note: Dry + Organic Wet Catch

Table 1b Summary of the Results of the May 21, 1996 Particulate Emission Compliance Test of the Dryer RTO Stack at the Louisiana Pacific Plant in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		05-21-96	05-21-96	05-21-96
Time runs were done	(HRS)	945/1050	1155/1345	1535/1640
Volumetric flow				
actual	(ACFM)	75769	75634	75241
standard	(DSCFM)	41387	39164	40862
Gas temperature	(DEG-F)	287	292	280
Moisture content	(%V/V)	19.69	23.45	20.90
Gas composition	(%V/V,dry)			
carbon dioxide		3.10	3.10	3.00
oxygen		17.30	17.20	17.10
nitrogen		79.60	79.70	79.90
Isokinetic variation	(%)	99.4	103.4	98.3
Particulate concentration				
actual	(GR/ACF)	.001628	.001589	.002895
standard	(GR/DSCF)	.002983	.003071	.005333
Part. emission rate	(LB/HR)	1.06	1.03	1.87

Note: Dry Catch Only

Table 2a Summary of the Results of the May 22, 1996 PM-10 Determinations of the Dryer RTO Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		05-22-96	05-22-96	05-22-96
Time runs were done	(HRS)	902/1044	1135/1403	1500/1631
Dryer Production Rate	(LB/HR)	27425	27425	27425
Volumetric flow				
actual	(ACFM)	79708	79637	77993
standard	(DSCFM)	43665	43994	42361
Gas temperature	(DEG-F)	280	280	282
Moisture content	(%V/V)	20.60	19.93	21.00
Gas composition	(%V/V,dry)			
carbon dioxide		3.00	3.00	3.00
oxygen		16.50	16.60	16.70
nitrogen		80.50	80.40	80.30
Isokinetic variation	(%)	82.9	92.9	98.7
PM-10 Concentration				
actual	(GR/ACF)	.004001	.002744	.001812
standard	(GR/DSCF)	.007306	.004968	.003338
PM-10 Emission Rate	(LB/HR)	2.73	1.87	1.21

Note: Dry + Method 202 Condensible Particulate Material

Table 2b Summary of the Results of the May 22, 1996 PM-10 Determinations of the Dryer RTO Stack at the Louisiana Pacific Plant Located in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		05-22-96	05-22-96	05-22-96
Time runs were done	(HRS)	902/1044	1135/1403	1500/1631
Volumetric flow				
actual	(ACFM)	79708	79637	77993
standard	(DSCFM)	43665	43994	42361
Gas temperature	(DEG-F)	280	280	282
Moisture content	(%V/V)	20.60	19.93	21.00
Gas composition	(%V/V,dry)			
carbon dioxide		3.00	3.00	3.00
oxygen		16.50	16.60	16.70
nitrogen		80.50	80.40	80.30
Isokinetic variation	(%)	82.9	92.9	98.7
PM-10 Concentration				
actual	(GR/ACF)	.001974	.002085	.001043
standard	(GR/DSCF)	.003606	.003776	.001922
PM-10 Emission Rate	(LB/HR)	1.35	1.42	0.698

Note: Dry Catch Only

Table 3a Summary of the Results of the May 22, 1996 Particulate Emission Compliance Test of the Press Vent Stack at the Louisiana Pacific Plant in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		05-22-96	05-22-96	05-22-96
Time runs were done	(HRS)	950/1133	1221/1340	1425/1600
Process rate	(TON/HR)	12.33	12.33	12.33
Volumetric flow				
actual	(ACFM)	44085	43586	42309
standard	(DSCFM)	39647	38946	37841
Gas temperature	(DEG-F)	95	99	99
Moisture content	(%V/V)	2.14	2.17	2.00
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	(%)	100.1	100.4	100.1
Particulate concentration				
actual	(GR/ACF)	.003446	.004364	.004577
standard	(GR/DSCF)	.003833	.004886	.005119
Part. emission rate	(LB/HR)	1.30	1.63	1.66

Note: Dry + Organic Wet Catch

Table 3b Summary of the Results of the May 22, 1996 Particulate Emission Compliance Test of the Press Vent Stack at the Louisiana Pacific Plant in Two Harbors, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		05-22-96	05-22-96	05-22-96
Time runs were done	(HRS)	950/1133	1221/1340	1425/1600
Volumetric flow				
actual	(ACFM)	44085	43586	42309
standard	(DSCFM)	39647	38946	37841
Gas temperature	(DEG-F)	95	99	99
Moisture content	(%V/V)	2.14	2.17	2.00
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	(%)	100.1	100.4	100.1
Particulate concentration				
actual	(GR/ACF)	.002872	.003853	.004119
standard	(GR/DSCF)	.003194	.004314	.004607
Part. emission rate	(LB/HR)	1.09	1.44	1.49

Note: Dry Catch Only

Table 4. Summary of the Results of the May 21 & 22, 1996 **Oxides of Nitrogen Determinations** at the Louisiana Pacific Plant in Two Harbors, Minnesota.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(Dryer RTO Stack)			
5-21-96	0945-1050	20	6.0
5-21-96	1155-1343	16	4.6
5-21-96	1600-1700	14	4.2
Avg		17	4.9
(Press Vent Stack)			
5-22-96	0950-1051	< 1	< 0.28
5-22-96	1232-1333	< 1	< 0.28
5-22-96	1425-1543	≤ 1	≤ 0.27
Avg		< 1	< 0.28

Table 5. Summary of the Results of the May 21 & 22, 1996 **Carbon Monoxide Determinations** at the Louisiana Pacific Plant in Two Harbors, Minnesota.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(Dryer RTO Stack)			
5-21-96	0945-1050	84	15.2
5-21-96	1155-1343	44	7.5
5-21-96	1600-1700	52	9.2
Avg		60	10.6
(Press Vent Stack)			
5-22-96	0950-1051	9.4	1.6
5-22-96	1232-1333	7.9	1.3
5-22-96	1425-1543	4.7	0.8
Avg		7.3	1.2

Table 6. Summary of the Results of the May 21 & 22, 1996 **Total Hydrocarbons Determinations** at the Louisiana Pacific Plant in Two Harbors, Minnesota.

Date	Time	Concentration (ppmC,w)	Emission Rate (LB/HR)
(Dryer RTO Stack)			
5-21-96	0945-1050	< 5	< 0.48
5-21-96	1155-1343	< 5	< 0.48
5-21-96	1600-1700	< 5	< 0.48
Avg		< 5	< 0.48
(Primary Cyclone Outlet)			
5-21-96	0948-1048	75	5.1
5-21-96	1155-1344	150	10.3
5-21-96	1535-1637	138	9.5
Avg		121	8.3
(E-Tube Outlet)			
5-21-96	0945-1045	141	10.0
5-21-96	1156-1344	249	18.3
5-21-96	1600-1700	159	14.6
Avg		183	14.3
(RTO Inlet)			
5-21-96	0945-1045	120	12.0
5-21-96	1156-1344	141	13.9
5-21-96	1600-1700	144	14.0
Avg		135	13.3
(Press Vent Stack)			
5-22-96	0950-1051	75	5.7
5-22-96	1232-1333	33	2.5
5-22-96	1425-1543	27	2.0
Avg		45	3.4

Table 7. Summary of the Results of the May 22, 1996 **Formaldehyde Determinations** at the Louisiana Pacific Plant in Two Harbors, Minnesota.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(Dryer RTO Stack)			
5-22-96	0910-1026	0.49	0.096
5-22-96	1135-1348	0.33	0.067
5-22-96	1500-1618	0.39	0.076
Avg		0.40	0.080

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition results (Orsat and moisture) are presented first followed by the computer printout of the gas composition, particulate, PM-10, oxides of nitrogen, opacity, carbon monoxide, total hydrocarbons, and formaldehyde determinations. Preliminary measurements including test port locations are given in the appendices.

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

3.1 Results of Orsat and Moisture Analyses

Test No. 1
Dryer RTO Stack

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

	Run 1	Run 2	Run 3
Date of run	05-21-96	05-21-96	05-21-96
Dry basis (orsat)			
carbon dioxide............	3.10	3.10	3.00
oxygen....................	17.30	17.20	17.10
nitrogen..................	79.60	79.70	79.90
Wet basis (orsat)			
carbon dioxide............	2.49	2.37	2.37
oxygen....................	13.89	13.17	13.53
nitrogen..................	63.93	61.01	63.20
water vapor...............	19.69	23.45	20.90
Dry molecular weight........	29.19	29.18	29.16
Wet molecular weight........	26.99	26.56	26.83
Specific gravity............	0.932	0.918	0.927
Water mass flow......(LB/HR)	28463	33644	30277
FO	1.161	1.194	1.267

Test No. 2
Dryer RTO Stack

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

Date of run	Run 1 05-22-96	Run 2 05-22-96	Run 3 05-22-96
Dry basis (orsat)			
carbon dioxide............	3.00	3.00	3.00
oxygen....................	16.50	16.60	16.70
nitrogen..................	80.50	80.40	80.30
Wet basis (orsat)			
carbon dioxide............	2.35	2.36	2.38
oxygen....................	12.92	13.06	13.23
nitrogen..................	63.04	63.27	63.61
water vapor...............	21.69	21.30	20.78
Dry molecular weight........	29.14	29.14	29.15
Wet molecular weight........	26.72	26.77	26.83
Specific gravity............	0.923	0.925	0.927
Water mass flow......(LB/HR)	0.00	0.00	0.00
FO	1.467	1.433	1.400

Test No. 3
Dryer RTO Stack

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

	Run 1	Run 2	Run 3
Date of run	05-22-96	05-22-96	05-22-96
Dry basis (orsat)			
carbon dioxide...........	3.00	3.00	3.00
oxygen..................	16.50	16.60	16.70
nitrogen................	80.50	80.40	80.30
Wet basis (orsat)			
carbon dioxide...........	2.38	2.40	2.37
oxygen..................	13.10	13.29	13.19
nitrogen................	63.91	64.37	63.44
water vapor..............	20.60	19.93	21.00
Dry molecular weight........	29.14	29.14	29.15
Wet molecular weight........	26.84	26.92	26.81
Specific gravity...........	0.927	0.930	0.926
Water mass flow......(LB/HR)	31785	30725	31584
FO	1.467	1.433	1.400

Test No. 5
Press Vent Stack

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

	Run 1	Run 2	Run 3
Date of run	05-22-96	05-22-96	05-22-96
Dry basis (orsat)			
carbon dioxide............	0.03	0.03	0.03
oxygen....................	20.90	20.90	20.90
nitrogen..................	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide............	0.03	0.03	0.03
oxygen....................	20.45	20.45	20.48
nitrogen..................	77.38	77.36	77.48
water vapor...............	2.14	2.17	2.00
Dry molecular weight........	28.84	28.84	28.84
Wet molecular weight........	28.61	28.61	28.62
Specific gravity............	0.988	0.988	0.989
Water mass flow......(LB/HR)	2427	2421	2171

3.2 Results of Particulate Determinations

Test No. 1
Dryer RTO Stack

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

	Run 1	Run 2	Run 3
Date of run	05-21-96	05-21-96	05-21-96
Time run start/end.....(HRS)	945/1050	1155/1345	1535/1640
Static pressure......(IN.WC)	-0.45	-0.45	-0.45
Cross sectional area (SQ.FT)	22.34	22.34	22.34
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	185.0	218.0	186.0
desiccant..........(GRAMS)	6.0	17.0	15.0
total..............(GRAMS)	191.0	235.0	201.0
Total particulate material.. ....collected(grams)	0.0086	0.0088	0.0127
Gas meter coefficient.......	0.9967	0.9967	0.9967
Barometric pressure..(IN.HG)	28.84	28.84	28.84
Avg. orif.pres.drop..(IN.WC)	1.34	1.31	1.30
Avg. gas meter temp..(DEF-F)	75.5	84.2	87.9
Volume through gas meter....			
at meter conditions...(CF)	38.66	38.70	38.64
standard conditions.(DSCF)	36.73	36.18	35.88
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.........(IN)	.247	.247	.247
Avg.stack gas temp ..(DEG-F)	287	292	280
Volumetric flow rate........			
actual..............(ACFM)	75769	75634	75241
dry standard.......(DSCFM)	41387	39164	40862
Isokinetic variation.....(%)	99.4	103.4	98.3
Particulate concentration...			
actual............(GR/ACF)	0.00197	0.00194	0.00297
dry standard.....(GR/DSCF)	0.00361	0.00375	0.00546
Particle mass rate...(LB/HR)	1.282	1.260	1.913

Test No. 5
Press Vent Stack

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

	Run 1	Run 2	Run 3
Date of run	05-22-96	05-22-96	05-22-96
Time run start/end.....(HRS)	950/1133	1221/1340	1425/1600
Static pressure......(IN.WC)	-0.45	-0.45	-0.45
Cross sectional area (SQ.FT)	20.25	20.25	20.25
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	1.0	5.0	7.0
desiccant..........(GRAMS)	18.0	14.0	10.0
total..............(GRAMS)	19.0	19.0	17.0
Total particulate material.. ....collected(grams)	0.0102	0.0128	0.0130
Gas meter coefficient.......	0.9990	0.9990	0.9990
Barometric pressure..(IN.HG)	28.95	28.95	28.95
Avg. orif.pres.drop..(IN.WC)	1.43	1.39	1.33
Avg. gas meter temp..(DEF-F)	67.9	74.9	77.6
Volume through gas meter....			
at meter conditions...(CF)	42.33	42.23	41.15
standard conditions.(DSCF)	41.06	40.42	39.18
Total sampling time....(MIN)	64.00	64.00	64.00
Nozzle diameter.........(IN)	.245	.245	.245
Avg.stack gas temp ..(DEG-F)	95	99	99
Volumetric flow rate........			
actual..............(ACFM)	44085	43586	42309
dry standard.......(DSCFM)	39647	38946	37841
Isokinetic variation.....(%)	100.1	100.4	100.1
Particulate concentration...			
actual...........(GR/ACF)	0.00345	0.00436	0.00458
dry standard.....(GR/DSCF)	0.00383	0.00489	0.00512
Particle mass rate...(LB/HR)	1.303	1.631	1.660

3.3 Results of PM-10 Determinations

Test No. 3
Dryer RTO Stack

Results of PM-10 Determinations ----------------------------

	Run 1	Run 2	Run 3
Date of run	05-22-96	05-22-96	05-22-96
Time run start/end.....(HRS)	902/1044	1135/1403	1500/1631
Static pressure......(IN.WC)	-0.45	-0.45	-0.45
Cross sectional area (SQ.FT)	22.34	22.34	22.34
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	174.0	160.0	167.0
desiccant..........(GRAMS)	5.0	4.0	5.0
total..............(GRAMS)	179.0	164.0	172.0
Total PM-10 material........ ....collected(grams)	0.0154	0.0100	0.0066
Gas meter coefficient.......	0.9909	0.9909	0.9909
Barometric pressure..(IN.HG)	28.95	28.95	28.95
Avg. orif.pres.drop..(IN.WC)	0.35	0.36	0.37
Avg. gas meter temp..(DEF-F)	63.8	71.0	74.4
Volume through gas meter....			
at meter conditions...(CF)	33.64	32.56	32.19
standard conditions.(DSCF)	32.52	31.06	30.51
Total sampling time....(MIN)	98.85	93.98	90.32
Nozzle diameter.........(IN)	.193	.182	.182
Avg.stack gas temp ..(DEG-F)	280	280	282
Volumetric flow rate........			
actual..............(ACFM)	79708	79637	77993
dry standard.......(DSCFM)	43665	43994	42361
Isokinetic variation.....(%)	82.9	92.9	98.7
PM-10 cutpoint..........(um)	10.26	10.29	10.02
PM-10 concentration.........			
actual............(GR/ACF)	0.00400	0.00274	0.00181
dry standard.....(GR/DSCF)	0.00731	0.00497	0.00334
PM-10 mass rate......(LB/HR)	2.735	1.873	1.212

3.4 Results of Oxides of Nitrogen Determinations

Interpoll Labs Report No. 6-7712
Louisiana Pacific Corporation
Two Harbors, Minnesota

Test No. 4
Dryer RTO Stack

Results of Oxides of Nitrogen Determinations————————————Method7E

	Run 1	Run 2	Run 3
Date of run	5-21-96	5-21-96	5-21-96
Time run start/end (HRS)	0945-1050	1155-1343	1600-1700
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	19.69	23.45	20.90
Oxygen content (%V/V)	17.3	17.2	17.1
Volumetric flow rate (DSCFM)	41390	39160	40860
NO_x concentration (ppm,d)	20	16	14
NO_x emission rate (LB/HR)	6.02	4.55	4.16

Test No. 6
Press Vent Stack

Results of Oxides of Nitrogen Determinations——Method7E

	Run 1	Run 2	Run 3
Date of run	5-22-96	5-22-96	5-22-96
Time run start/end (HRS)	0950-1051	1232-1333	1425-1543
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	2.14	2.17	2.00
Oxygen content (%V/V)	20.9	20.9	20.9
Volumetric flow rate (DSCFM)	39650	38950	37840
NO_x concentration (ppm,d)	< 1	< 1	< 1
NO_x emission rate (LB/HR)	< 0.28	< 0.28	< 0.27

3.5 Results of Opacity Observations

Test No. 1
Dryer RTO Stack

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

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

Observer: Mark Petersen
Cert. Date: 04-03-96
Date of Observation: 05-21-96
Time of Observation: 0945/1045

Test No. 5
Press Vent Stack

Results of the Opacity Observations————————————EPA Method 9

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

* Note: Opacity observations were unable to be performed due to inclement weather conditions.

Observer: Mark Petersen
Cert. Date: 04-03-96
Date of Observation: 05-22-96
Time of Observation: –

3.6 Results of Carbon Monoxide Determinations

Test No. 4
Dryer RTO Stack

Results of Carbon Monoxide Determinations——————————Method10

	Run 1	Run 2	Run 3
Date of run	5-21-96	5-21-96	5-21-96
Time run start/end (HRS)	0945-1050	1155-1343	1600-1700
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	19.69	23.45	20.90
Oxygen content (%V/V)	17.3	17.2	17.1
Volumetric flow rate (DSCFM)	41390	39160	40860
CO concentration (ppm,d)	84	44	52
CO emission rate (LB/HR)	15.2	7.5	9.2

Test No. 6
Press Vent Stack

Results of Carbon Monoxide Determinations——————————Method10

	Run 1	Run 2	Run 3
Date of run	5-22-96	5-22-96	5-22-96
Time run start/end (HRS)	0950-1051	1232-1333	1425-1543
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	2.14	2.17	2.00
Oxygen content (%V/V)	20.9	20.9	20.9
Volumetric flow rate (DSCFM)	39650	38950	37840
CO concentration (ppm,d)	9.4	7.9	4.7
CO emission rate (LB/HR)	1.6	1.3	0.8

3.7 Results of Total Hydrocarbons Determinations

Test No. 4
Dryer RTO Stack

Results of Total Hydrocarbons Determinations——————————Method25A

	Run 1	Run 2	Run 3
Date of run	5-21-96	5-21-96	5-21-96
Time run start/end (HRS)	0945-1050	1155-1343	1600-1700
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	19.7	23.5	20.9
Oxygen content (%V/V)	17.3	17.2	17.1
Volumetric flow rate (DSCFM)	41390	39160	40860
THC concentration (ppmC,w)	< 5	< 5	< 5
THC emission rate (LB/HR)	< 0.48	< 0.48	< 0.48

Test No. 4
Primary Cyclone Outlet

Results of Total Hydrocarbons Determinations——————————————Method25A

	Run 1	Run 2	Run 3
Date of run	5-20-96	5-20-96	5-20-96
Time run start/end (HRS)	0830-1017	1100-1210	1245-1354
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	25.3	30.4	25.1
Oxygen content (%V/V)	16.0	15.3	16.0
Volumetric flow rate (DSCFM)	27140	25565	27455
THC concentration (ppmC,w)	75	150	138
THC emission rate (LB/HR)	5.1	10.3	9.5

Test No. 4
RTO Inlet

Results of Total Hydrocarbons Determinations——————————Method25A

	Run 1	Run 2	Run 3
Date of run	5-21-96	5-21-96	5-21-96
Time run start/end (HRS)	0945-1045	1156-1344	1600-1700
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	18.0	21.0	20.0
Oxygen content (%V/V)	17.6	17.0	17.0
Volumetric flow rate (DSCFM)	43980	41700	41700
THC concentration (ppmC,w)	120	141	144
THC emission rate (LB/HR)	12.0	13.9	14.0

Test No. 4
E-Tube Outlet

Results of Total Hydrocarbons Determinations——————————Method25A

	Run 1	Run 2	Run 3
Date of run	5-21-96	5-21-96	5-21-96
Time run start/end (HRS)	0945-1045	1156-1344	1600-1700
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	23.5	23.4	25.0
Oxygen content (%V/V)	16.4	16.4	16.4
Volumetric flow rate (DSCFM)	28975	30060	36900
THC concentration (ppmC,w)	141	249	159
THC emission rate (LB/HR)	10.0	18.3	14.6

Test No. 6
Press Vent Stack

Results of Total Hydrocarbons Determinations—————————Method25A

	Run 1	Run 2	Run 3
Date of run	5-22-96	5-22-96	5-22-96
Time run start/end (HRS)	0950-1051	1232-1333	1425-1543
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	2.14	2.17	2.00
Oxygen content (%V/V)	20.9	20.9	20.9
Volumetric flow rate (DSCFM)	39650	38950	37840
THC concentration (ppmC,w)	75	33	27
THC emission rate (LB/HR)	5.7	2.5	2.0

3.8 Results of Formaldehyde Determinations

Test No. 2
Dryer RTO Stack

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

	Run 1	Run 2	Run 3
Date of run	05-22-96	05-22-96	05-22-96
Time run start/end.....(HRS)	910/1026	1135/1348	1500/1618
Static pressure......(IN.WC)	-0.45	-0.45	-0.45
Cross sectional area (SQ.FT)	22.34	22.34	22.34
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	271.0	253.0	238.0
desiccant..........(GRAMS)	15.0	22.0	25.0
total..............(GRAMS)	286.0	275.0	263.0
Formaldehyde in sample..(uG)	830	560	640
Gas meter coefficient.......	0.9967	0.9967	0.9967
Barometric pressure..(IN.HG)	28.95	28.95	28.95
Avg. orif.pres.drop..(IN.WC)	2.31	2.24	2.20
Avg. gas meter temp..(DEF-F)	70.3	73.3	77.8
Volume through gas meter....			
at meter conditions...(CF)	50.44	49.90	49.67
standard conditions.(DSCF)	48.70	47.90	47.27
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.........(IN)	.278	.278	.278
Avg.stack gas temp ..(DEG-F)	280	281	282
Volumetric flow rate........			
actual.............(ACFM)	78562	78967	77079
dry standard.......(DSCFM)	42415	42777	41975
Isokinetic variation.....(%)	101.5	99.0	99.5
CH2O concentration..........			
(GR/DSCF)................	0.0003	0.0002	0.0002
(MG/DSCM)................	0.61	0.42	0.48
(PPM-DRY)................	0.49	0.33	0.39
(PPM-WET)................	0.38	0.26	0.31
CH2O emission rate...(LB/HR)	0.09613	0.06650	0.07555

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

Date:	8/5/93
Client:	LOUISIANA-PACIFIC, TWO HARBORS
Laboratory Log Number:	7712-16-0166
Sample Collected:	5/22/96
Source:	DRYER RTO STACK
Sample Identification:	TEST 2, WOOD COMPOSITE

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			4.55
Ash		0.90	0.86
Carbon	51.95	51.48	49.14
Hydrogen	6.22	6.16	5.88
Nitrogen	0.86	0.85	0.81
Oxygen (calculated)	38.51	38.16	36.43
Sulfur	2.47	2.45	2.43
Heating Value, BTU/LB	8492	8416	8033

Respectfully submitted,

David J. Schneider

David J. Schneider, Manager
Chemistry Department

10125

Test No. 1
Dryer RTO Stack

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

Date of Determination............	05-21-96
Time of Determination.......(HRS)	729
Barometric pressure.......(IN.HG)	28.84
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	24
Shape of duct....................	Round
Stack diameter...............(IN)	64
Duct area.................(SQ.FT)	22.34
Direction of flow................	UP
Static pressure...........(IN.WC)	-.45
Avg. gas temp.............(DEG-F)	276
Moisture content..........(% V/V)	19.69
Avg. linear velocity.....(FT/SEC)	55.3
Gas density..............(LB/ACF)	.04840
Molecular weight......(LB/LBMOLE)	29.19
Mass flow of gas..........(LB/HR)	215101
Volumetric flow rate.............	
actual...................(ACFM)	74067
dry standard............(DSCFM)	41085

Test No. 3
Dryer RTO Stack

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

Date of Determination............	05-22-96
Time of Determination.......(HRS)	755
Barometric pressure.......(IN.HG)	28.95
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	12
Shape of duct....................	Round
Stack diameter...............(IN)	64
Duct area.................(SQ.FT)	22.34
Direction of flow................	UP
Static pressure...........(IN.WC)	-.45
Avg. gas temp.............(DEG-F)	269
Moisture content..........(% V/V)	20.60
Avg. linear velocity.....(FT/SEC)	56.6
Gas density..............(LB/ACF)	.04880
Molecular weight......(LB/LBMOLE)	29.14
Mass flow of gas..........(LB/HR)	222296
Volumetric flow rate.............	
actual...................(ACFM)	75923
dry standard............(DSCFM)	42196

Test No. 4
Primary Cyclone Outlet

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

Date of Determination............	05-21-96
Time of Determination.......(HRS)	945
Barometric pressure.......(IN.HG)	28.84
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	12
Shape of duct....................	Round
Stack diameter..............(IN)	42
Duct area................(SQ.FT)	9.62
Direction of flow................	UP
Static pressure...........(IN.WC)	-9.8
Avg. gas temp............(DEG-F)	230
Moisture content..........(% V/V)	25.34
Avg. linear velocity.....(FT/SEC)	87.5
Gas density.............(LB/ACF)	.04933
Molecular weight......(LB/LBMOLE)	29.26
Mass flow of gas..........(LB/HR)	149561
Volumetric flow rate.............	
actual..................(ACFM)	50532
dry standard............(DSCFM)	27136

Test No. 4
Primary Cyclone Outlet

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

Date of Determination............	05-21-96
Time of Determination.......(HRS)	1155
Barometric pressure.......(IN.HG)	28.84
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	12
Shape of duct....................	Round
Stack diameter...............(IN)	42
Duct area.................(SQ.FT)	9.62
Direction of flow................	UP
Static pressure...........(IN.WC)	-9.8
Avg. gas temp.............(DEG-F)	228
Moisture content..........(% V/V)	30.42
Avg. linear velocity.....(FT/SEC)	88.2
Gas density.............(LB/ACF)	.04848
Molecular weight......(LB/LBMOLE)	29.32
Mass flow of gas..........(LB/HR)	148130
Volumetric flow rate.............	
actual...................(ACFM)	50925
dry standard............(DSCFM)	25566

Test No. 4
Primary Cyclone Outlet

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

Date of Determination............	05-21-96
Time of Determination.......(HRS)	1535
Barometric pressure.......(IN.HG)	28.84
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	12
Shape of duct....................	Round
Stack diameter..............(IN)	42
Duct area................(SQ.FT)	9.62
Direction of flow................	UP
Static pressure...........(IN.WC)	-9.8
Avg. gas temp.............(DEG-F)	231
Moisture content..........(% V/V)	25.05
Avg. linear velocity.....(FT/SEC)	88.4
Gas density.............(LB/ACF)	.04930
Molecular weight......(LB/LBMOLE)	29.25
Mass flow of gas..........(LB/HR)	150851
Volumetric flow rate.............	
actual...................(ACFM)	51002
dry standard............(DSCFM)	27455

Test No. 4
E - Tube Outlet

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

Date of Determination............	05-21-96
Time of Determination.......(HRS)	923
Barometric pressure.......(IN.HG)	28.84
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	16
Shape of duct....................	Round
Stack diameter...............(IN)	47.25
Duct area................(SQ.FT)	12.18
Direction of flow................	UP
Static pressure..........(IN.WC)	-1.9
Avg. gas temp............(DEG-F)	157
Moisture content..........(% V/V)	23.48
Avg. linear velocity.....(FT/SEC)	63.1
Gas density.............(LB/ACF)	.05667
Molecular weight......(LB/LBMOLE)	29.22
Mass flow of gas..........(LB/HR)	156839
Volumetric flow rate............	
actual..................(ACFM)	46130
dry standard...........(DSCFM)	28975

Test No. 4
E - Tube Outlet

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

Date of Determination............	05-21-96
Time of Determination.......(HRS)	1200
Barometric pressure.......(IN.HG)	28.84
Pitot tube coefficient..........	.84
Number of sampling ports.........	1
Total number of points..........	12
Shape of duct....................	Round
Stack diameter...............(IN)	47.25
Duct area................(SQ.FT)	12.18
Direction of flow................	UP
Static pressure...........(IN.WC)	-1.83
Avg. gas temp............(DEG-F)	159
Moisture content.........(% V/V)	23.40
Avg. linear velocity.....(FT/SEC)	65.6
Gas density.............(LB/ACF)	.05649
Molecular weight......(LB/LBMOLE)	29.20
Mass flow of gas..........(LB/HR)	162527
Volumetric flow rate.............	
actual..................(ACFM)	47956
dry standard...........(DSCFM)	30061

Test No. 4
E-Tube Outlet

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

Date of Determination............	05-21-96
Time of Determination.......(HRS)	1535
Barometric pressure.......(IN.HG)	28.84
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	24
Shape of duct....................	Round
Stack diameter...............(IN)	54
Duct area.................(SQ.FT)	15.90
Direction of flow................	UP
Static pressure...........(IN.WC)	-1.35
Avg. gas temp.............(DEG-F)	162
Moisture content..........(% V/V)	25.00
Avg. linear velocity.....(FT/SEC)	63.4
Gas density..............(LB/ACF)	.05594
Molecular weight......(LB/LBMOLE)	29.22
Mass flow of gas..........(LB/HR)	203077
Volumetric flow rate............	
actual.....................(ACFM)	60505
dry standard..............(DSCFM)	37010

Test No. 5
Press Vent Stack

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

Date of Determination............	05-22-96
Time of Determination.......(HRS)	900
Barometric pressure.......(IN.HG)	28.95
Pitot tube coefficient...........	.84
Number of sampling ports.........	8
Total number of points...........	32
Shape of duct....................	Rectangular
Duct width..................(IN)	54
Duct length.................(IN)	54
Duct area................(SQ.FT)	20.25
Direction of flow................	UP
Static pressure...........(IN.WC)	-.45
Avg. gas temp............(DEG-F)	84
Moisture content..........(% V/V)	2.14
Avg. linear velocity.....(FT/SEC)	34.3
Gas density.............(LB/ACF)	.06969
Molecular weight......(LB/LBMOLE)	28.84
Mass flow of gas..........(LB/HR)	174406
Volumetric flow rate.............	
actual..................(ACFM)	41709
dry standard...........(DSCFM)	38289

Test No. 9
RTO Inlet

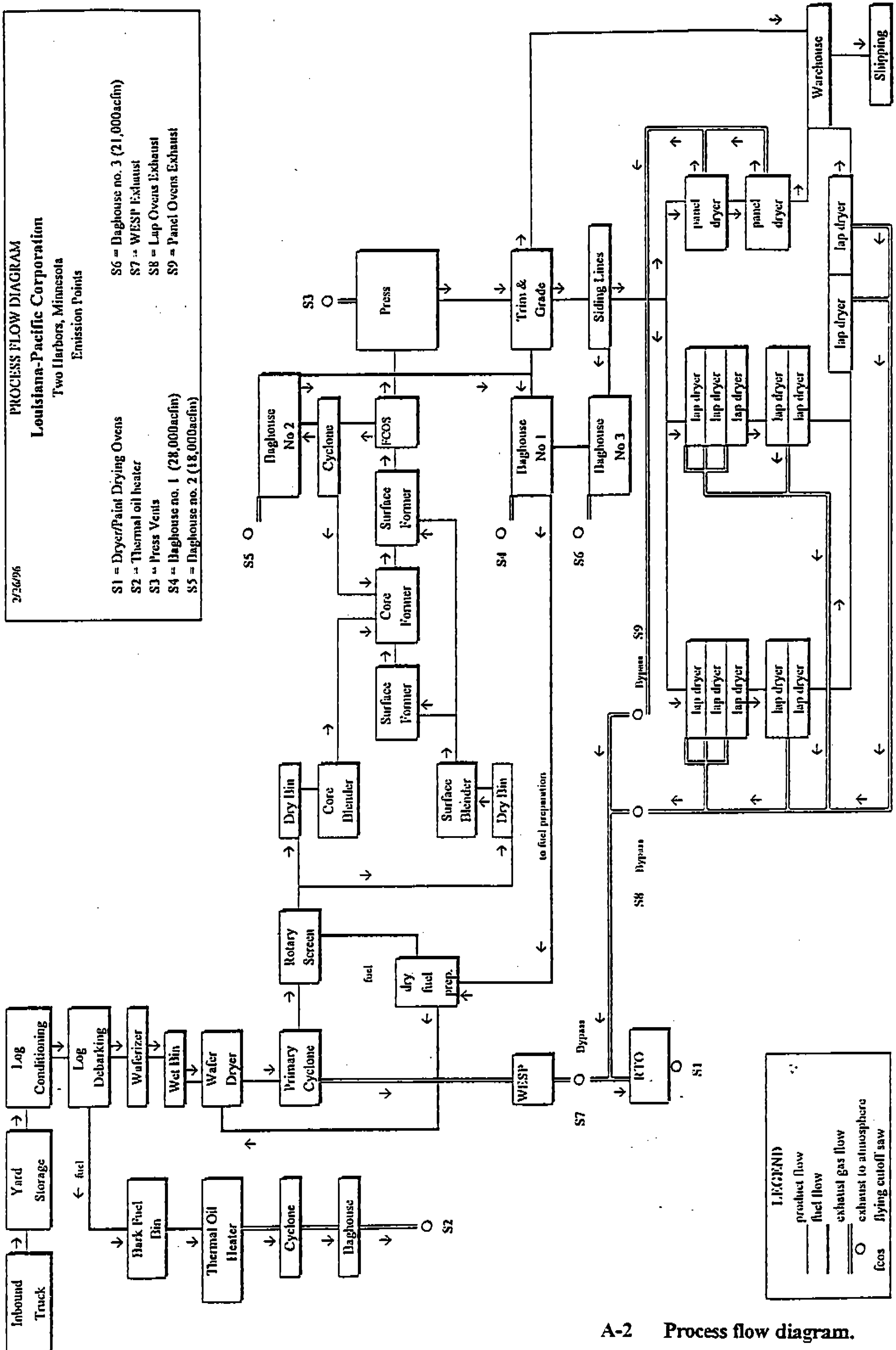
Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination............	05-22-96
Time of Determination.......(HRS)	945
Barometric pressure.......(IN.HG)	28.84
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	24
Shape of duct....................	Round
Stack diameter...............(IN)	54
Duct area.................(SQ.FT)	15.90
Direction of flow................	UP
Static pressure...........(IN.WC)	-1.35
Avg. gas temp.............(DEG-F)	163
Moisture content..........(% V/V)	18.00
Avg. linear velocity.....(FT/SEC)	68.9
Gas density..............(LB/ACF)	.05722
Molecular weight......(LB/LBMOLE)	29.06
Mass flow of gas..........(LB/HR)	225752
Volumetric flow rate.............	
actual...................(ACFM)	65759
dry standard............(DSCFM)	43895

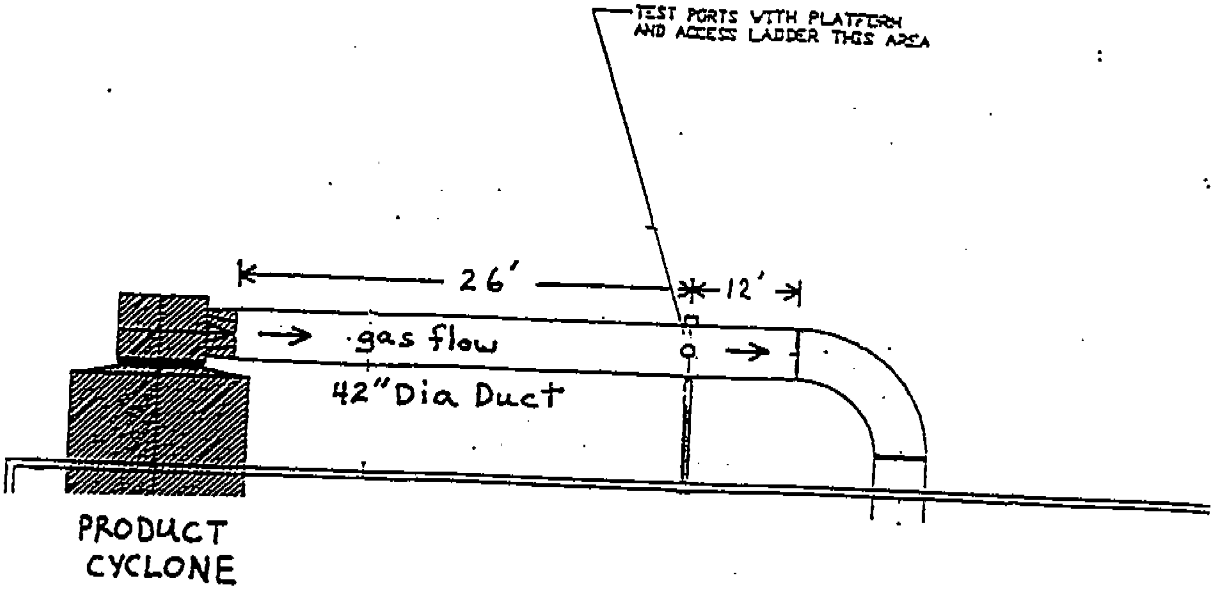
Test No. 9
RTO Inlet

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

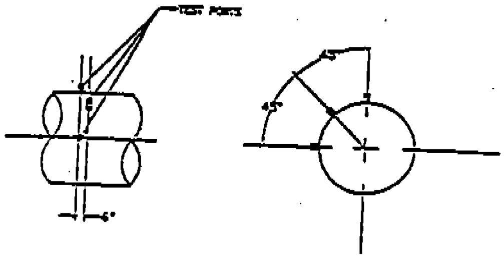
Date of Determination............	05-22-96
Time of Determination.......(HRS)	1155
Barometric pressure.......(IN.HG)	28.84
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	24
Shape of duct....................	Round
Stack diameter..............(IN)	54
Duct area................(SQ.FT)	15.90
Direction of flow................	UP
Static pressure...........(IN.WC)	-1.35
Avg. gas temp............(DEG-F)	167
Moisture content..........(% V/V)	21.00
Avg. linear velocity.....(FT/SEC)	68.7
Gas density.............(LB/ACF)	.05629
Molecular weight......(LB/LBMOLE)	29.14
Mass flow of gas..........(LB/HR)	221327
Volumetric flow rate.............	
actual...................(ACFM)	65536
dry standard............(DSCFM)	41866



A-2 Process flow diagram.

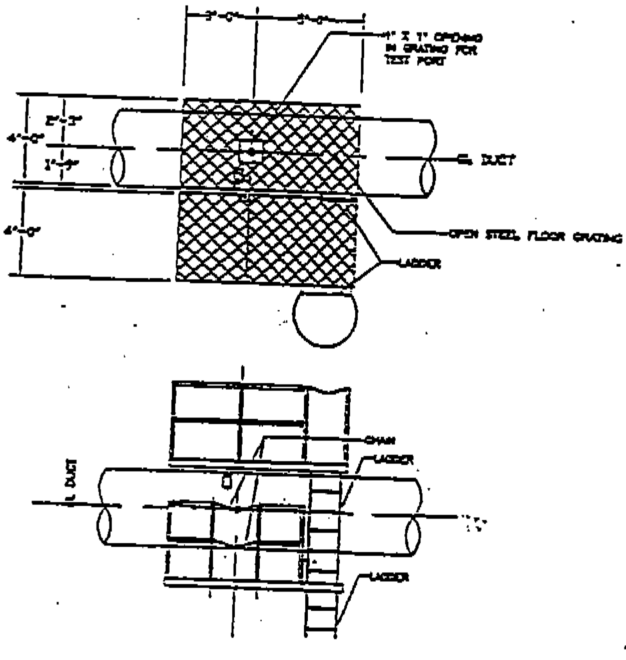


Test port location after
product cyclone.
Three 4" test ports,
two ports in line at 90°,
one port offset 6" at 45°.
42" Dia Duct.



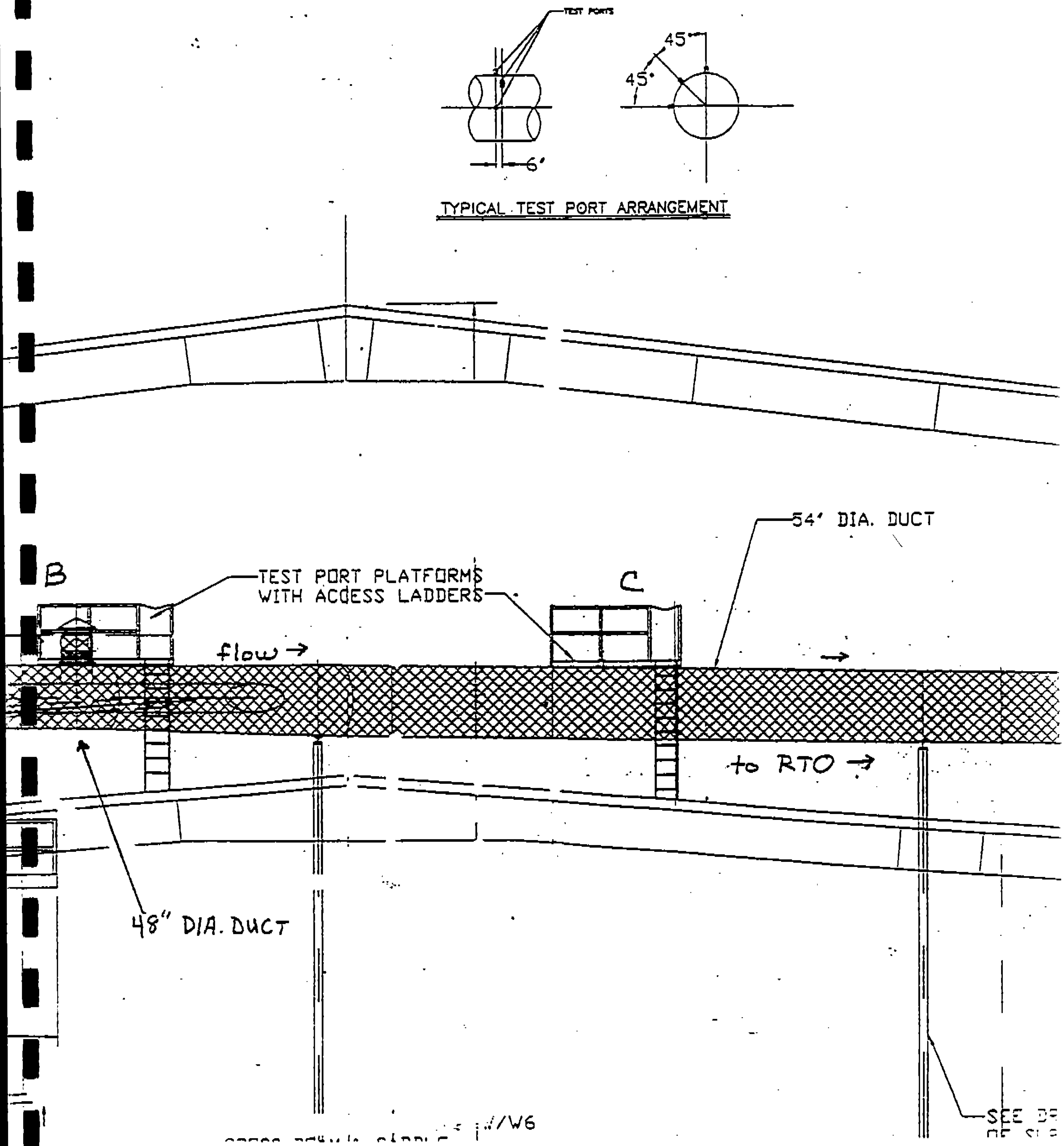
TYPICAL TEST PORT ARRANGEMENT

TWO HARBORS, MN
3/11/96

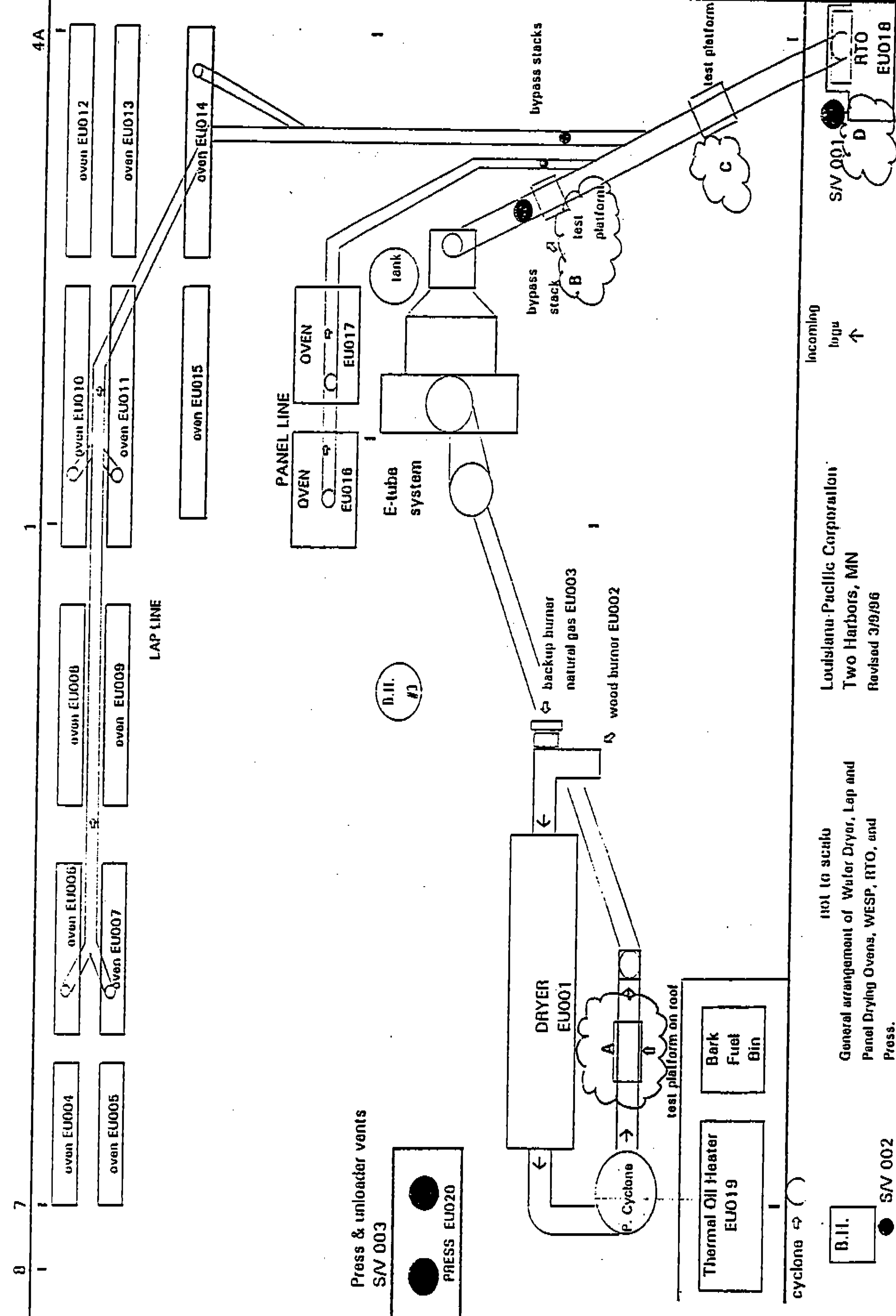


TYPICAL TEST PORT PLATFORM

A-4 Detail of port location A - Primary outlet



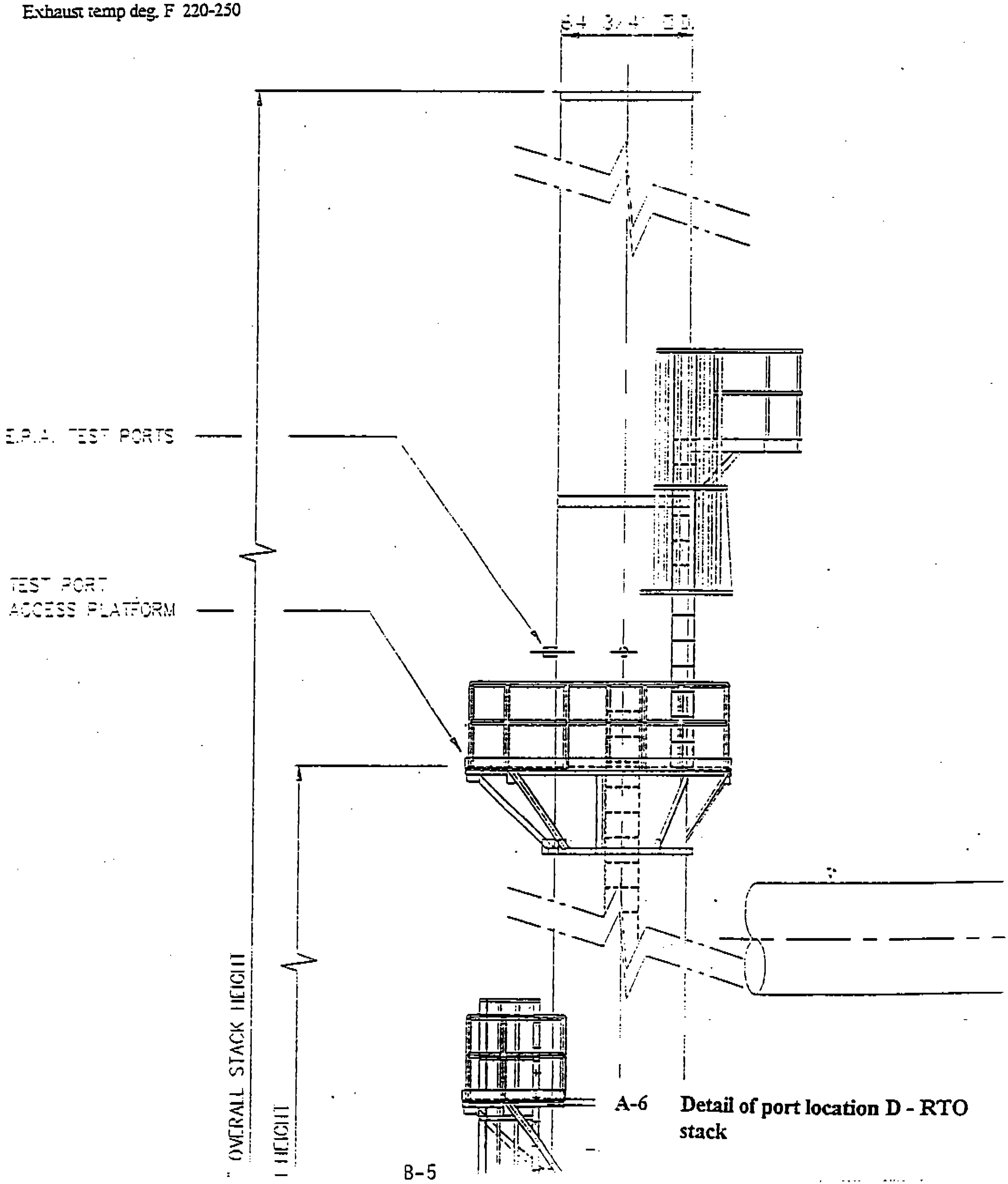
A-5 **Detail of port locations B - E-tube outlet, and C - paint dryer outlet**



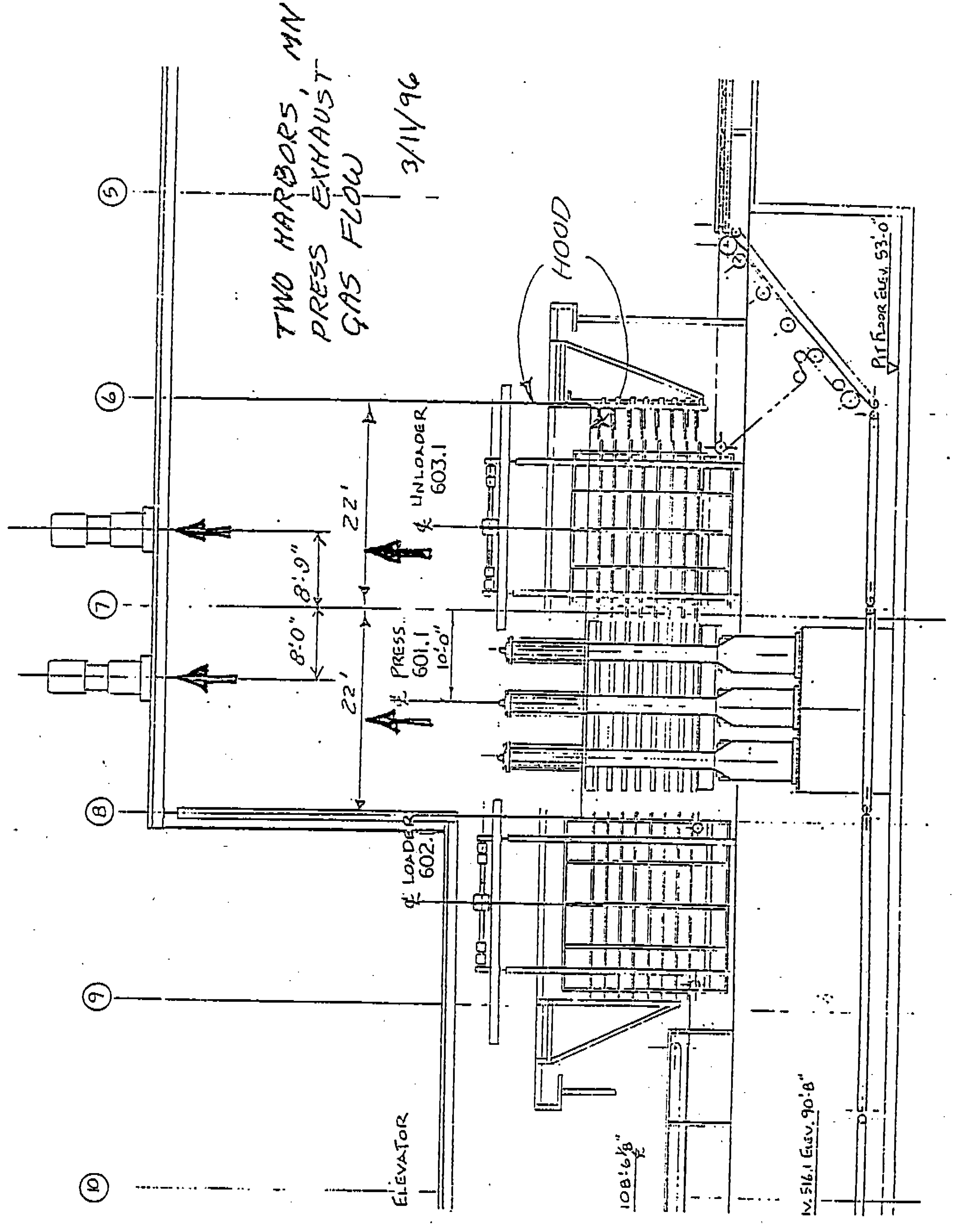
A-3 **Plan view of dryer, paint ovens, control equipment and test port locations**

RTO STACK S/V 001
(Wafer Dryer and paint drying ovens)
Stack height: 100'
Stack Diam.: 64" (ID)
Two 4" test ports at 90°
test ports 35' from flow disturbance
Exhaust temp deg. F 220-250

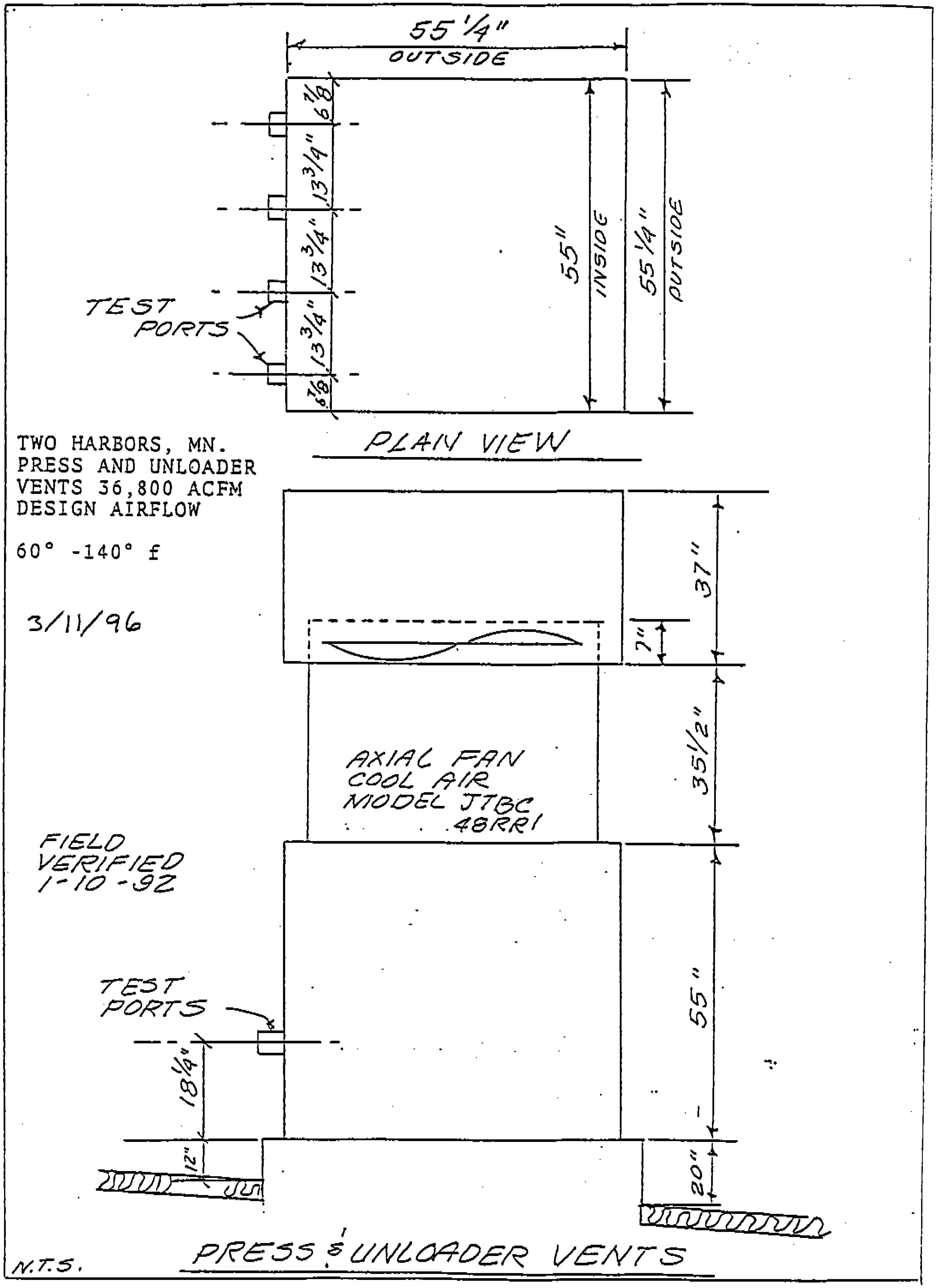
TWO HARBORS, MN
3/11/96



A-6 **Detail of port location D - RTO stack**



A-7 Press Elevation



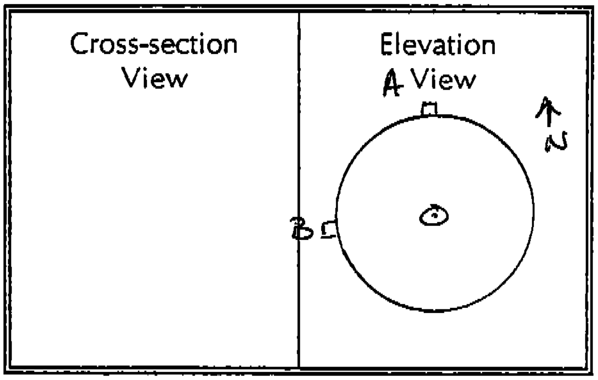
A-8 Press Vent detail

INTERPOLL LABORATORIES, INC.

(612) 786-6020

EPA Method 2 Field Data Sheet

Drawing of Test Site



Job: L.P. / Two Harbors

Source: RTO DRYER STACK

Test 1 Run ___ Date 5/21/96

Stack Dimen. 64 IN.

Dry Bulb ______ °F Wet bulb ______ °F

Manometer ☐ Reg. ☐Exp ☐Elec.

Barometric Pressure 28.84 IN.HG

Static Pressure -.45 IN.WC

Operators D. Van Hoeven & M. Petersen

Pitot No. V23-6 C_p .84

* Particulate *

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas
		Port Length: 6.5 IN.		Time Start: 0729 HRS	
A 1	.021	1.34	7.84	.42	
2	.067	4.28	10.78	.57	
3	.118	7.55	14.05	.59	
4	.177	11.33	17.82	.64	
5	.25	16	22.5	.66	
6	.356	22.78	29.28	.68	276
7	.644	41.22	47.72	.70	
8	.750	48	54.5	.68	
9	.823	52.67	59.17	.72	
10	.882	56.45	62.94	.72	
11	.933	59.71	66.21	.75	
12	.979	62.66	69.15	.65	
B 1				.40	
2				.54	
3				.62	
4				.62	
5				.68	
6				.71	
7				.71	
8			Δp Avg = .62	.66	
9			ACFM = 73660	.65	
10				.62	
11				.59	
12				.51	
Temp. Meas. Device & S/N: PDT #35				Time End: 0734 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 L.P. Two Harbors Date 5/21/96 Test 1 Run 1

Source RTO DRYER STACK No. of traverse points 24

Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒

Post test: 0 cfm at 6 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: 1

8554

Recovery solvent(s)

☒acetone

☐other(s)

No. of probe wash bottles: 1

Sample recovered by: Duit

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	385	200	185
Impinger No. 3			
Condenser			
Desiccant	1390	1384	6
Total			191

Integrated Gas Sampling Data:

Bag Pump No. 23 A Box No. 19 Bag No. 1

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

Pretest leak check: 0 cc/min at 14 IN.HG

Time start: 0950 (HRS) Time end: 1050 (HRS)

Sampling rate: 400 cc/min Operator: [illegible]

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

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

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: L.P. Two Harbor
Source: RTO DRYER STACK
Date: 5/21/96 Test 1 Run 1

Operators: DUH + DH + MP
Meter Box No. 6 ΔH@ 1.90 in.WC
Gasmeter Coeff. .9967

Nozzle No. 7-4
Nozzle Dia. .247 in.
Bar. Press. 28.84 in.Hg

Pitot No. 023-6
C_p .84
H_2O 20 %

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)
	0945	359.24											
B 12	2.5	360.77	.54	1.06	0.66	2.5	287	254	253	41	61	61	16.2
11	5	361.99	.42	.84	1.92	2	291				64	61	16.2
10	7.5	363.41	.56	1.10	3.38	2.5	304	256	258	42	65	61	16.7
9	10	364.98	.64	1.28	4.94	2.5	296				71	61	16.9
8	12.5	366.54	.62	1.25	6.49	2.5	291	256	258	42	74	61	16.6
7	15	368.11	.67	1.36	8.10	3	291				77	62	16.6
6	17.5	369.71	.72	1.46	9.79	3	290				80	63	17.1
5	20	371.54	.73	1.50	1.50	3	283	256	258	43	81	63	17.3
4	22.5	373.09	.72	1.47	3.19	3	289				83	64	17.0
3	25	374.72	.65	1.34	4.81	3	284	258	263	44	84	64	16.8
2	27.5	376.32	.58	1.20	6.34	3	284				86	65	17.0
1	30	377.90	.65	1.35	7.96	3	284	262	260	45	87	66	17.7
A 12	32.5	379.77	.71	1.47	9.66	4	284				83	68	17.0
11	35	381.31	.70	1.45	1.34	4	287	264	262	44	87	70	17.0
10	37.5	383.02	.75	1.56	3.09	4	288				90	70	17.3
9	40	384.76	.74	1.55	4.84	4	282	257	260	45	91	71	17.6
8	42.5	386.61	.75	1.56	6.60	4	287				93	71	17.4
7	45	388.27	.74	1.55	8.35	4	287	262	260	45	94	72	17.2
6	47.5	390.10	.68	1.42	0.03	4	287				94	72	17.5
5	50	391.77	.70	1.47	1.73	4	286	261	263	46	93	72	17.6
4	52.5	393.44	.68	1.43	3.42	4	285				94	73	17.7
3	55	395.25	.61	1.28	5.01	4	287	263	264	46	94	73	17.5
2	57.5	396.56	.55	1.16	6.53	4	282				94	74	17.7
1	60	397.90	.44	.93	7.89		282				94	74	17.6
	1050												
	0 - 60	V_m = 38.66		ΔH = 1.34							Avg. = 75.5		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Two Harbors Date 5/21/96 Test 1 Run 2

Source DRYER RTO STACK No. of traverse points 24

Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒

Post test: 0 cfm at 7 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: 8555

Recovery solvent(s)

☒ acetone

☐ other(s)

No. of probe wash bottles: 1

Sample recovered by: DLH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	418	200	218
Impinger No. 3			
Condenser			
Desiccant	1516	1499	17
Total			235

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 19 Bag No. 2

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

Pretest leak check: 0 cc/min at 14 IN.HG

Time start: 1200 (HRS) Time end: 1345 (HRS)

Sampling rate: 400 cc/min Operator: DLH

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

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

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job L.P., Two Harbors
Source Dryer RTO Stack
Date 5/21/96 Test 1 Run 2

Operators DJH & DH & MP
Meter Box No. 6 ΔH@ 1.90 in.WC
Gasmeter Coeff. .9967

Nozzle No. 7-4
Nozzle Dia. ~~.28~~ .247 in.
Bar. Press. 28.84 in.Hg

Pitot No. U23-6
C_p .84
H_2O 20 %

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)
	1155	398.10											
A 12	2.5	399.61	.58	1.19	9.62	4	289	253	262	44	71	71	17.0
11	5	401.18	.60	1.16	1.13	4	289				77	73	16.3
10	7.5	402.80	.70	1.44	2.81	5	287	260	261	45	79	73	16.2
9	10	404.52	.68	1.40	4.47	4	288				82	73	16.3
8	12.5	406.16	.70	1.45	6.15	4	289	258	264	45	86	73	16.9
7	15	407.86	.69	1.43	7.83	4	289				73	73	17.2
6	17.5	409.60	.72	1.46	9.52	7	295	263	262	46	80	73	17.2
5	20	411.34	.71	1.45	1.21	4	295				82	74	17.2
4	22.5	412.97	.67	1.39	2.86	4	289	264	263	46	87	74	17.0
3	25	414.50	.62	1.28	4.45	4	292				92	75	16.7
2	27.5	416.11	.60	1.25	6.03	4	292				80	79	16.8
1	30	417.60	.60	1.24	7.59	4	289	263	257	41	91	80	17.9
B 12	32.5	418.97	.42	.88	8.92	3	291				91	80	16.6
11	35	420.53	.53	1.11	0.41	4	291	265	260	42	93	80	16.7
10	37.5	422.07	.60	1.25	1.99	4	295				95	80	17.1
9	40	423.69	.64	1.33	3.62	4	297	264	263	42	97	81	16.8
8	42.5	425.24	.63	1.32	5.25	4	295				99	81	16.7
7	45	426.89	.68	1.43	6.94	4	294	263	264	43	99	81	16.8
6	47.5	428.60	.68	1.42	8.63	4	299				101	81	17.0
5	50	430.30	.67	1.43	0.34	4	292	260	262	44	101	81	17.0
4	52.5	432.00	.67	1.41	2.02	4	292				101	83	16.7
3	55	433.61	.67	1.42	3.71	4	292	263	263	45	101	83	17.0
2	57.5	435.31	.60	1.27	5.31	4	292				103	83	17.2
1	60	436.80	.48	1.03	6.75	4	285				103	84	17.0
	(1345)												
	θ = 60	V_m = 38.70		ΔH = 1.31							Avg. = 84.2		

start 1357

C-5

081194-G:\STACK\WP\FORMS\S-518

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP, Two Harbors Date 5/21/96 Test 1 Run 3

Source DRYER RTO STACK No. of traverse points 24

Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☐

Post test: 0 cfm at 7 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: 8505

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	386	200	186
Impinger No. 3			
Condenser			
Desiccant	1405	1390	15
Total			201

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 19 Bag No. 3

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

Pretest leak check: 0 cc/min at 14 IN.HG

Time start: 1540 (HRS) Time end: 1640 (HRS)

Sampling rate: 400 cc/min Operator: [illegible]

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

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

INTERPOLL LABORATORIES, INC.
(612) [illegible]-60[illegible]

EPA Method 5 Field Data Sheet

Job: L.P. Two Harbors
Source: DRYER RTO STACK
Date: 5/21/96 Test 1 Run 3

Operators: Dvit & M.P
Meter Box No.: 6 ΔH@ 1.90 in.WC
Gasmeter Coeff.: .9967

Nozzle No.: 7-4
Nozzle Dia.: .247 in.
Bar. Press.: 28.84 in.Hg

Pitot No.: U23-6
C_p: .84
H_2O: 12 %

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)
	1535	437.70											
B 12	2.5	439.32	.68	1.36	9.34	4	291	261	259	43	78	78	16.9
11	5	440.87	.58	1.17	0.86	4	276				80	79	17.4
10	7.5	442.43	.61	1.23	2.41	4	281	264	258	44	84	79	17.0
9	10	444.04	.67	1.35	4.05	4	281				86	79	16.5
8	12.5	445.68	.65	1.32	5.66	4	280	263	259	44	89	79	17.0
7	15	447.24	.64	1.30	7.27	4	280				92	79	17.0
6	17.5	448.93	.66	1.35	8.91	4	278	263	260	45	93	79	16.5
5	20	450.56	.70	1.42	0.60	4	282				94	80	16.9
4	22.5	452.31	.71	1.44	2.29	4	283	264	263	44	96	80	17.2
3	25	453.94	.67	1.38	3.95	4	276				96	80	17.1
2	27.5	455.56	.63	1.29	5.56	4	278	263	258	45	97	80	16.9
1	30	456.96	.46	.94	6.94	3	279				98	81	16.9
A 12	32.5	458.50	.58	1.19	8.49	4	279	265	263	45	87	81	17.0
11	35	460.10	.58	1.18	0.02	4	279				96	81	16.8
10	37.5	461.57	.58	1.18	1.56	4	283	264	263	46	99	81	16.8
9	40	463.33	.72	1.49	3.29	4	275				100	81	16.5
8	42.5	464.94	.74	1.3	4.93	4	283	260	257	46	101	81	16.4
7	45	466.63	.71	1.45	6.64	4	283				102	82	17.1
6	47.5	468.40	.68	1.40	8.32	4	281	263	261	48	102	82	16.9
5	50	470.11	.69	1.47	0.01	4	281				103	82	16.6
4	52.5	471.72	.65	1.34	1.65	4	281	261	263	49	103	83	16.8
3	55	473.40	.66	1.36	3.31	4	281				104	82	16.8
2	57.5	474.91	.58	1.20	4.87	4	280	261	260	50	103	82	16.6
1	60	476.34	.52	1.07	6.34		280				103	83	16.8
	1640												
	θ = 60	V_m = 38.64		ΔH = 1.31							Avg. = 87.9		

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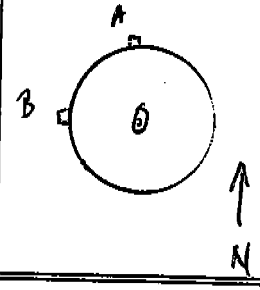
INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job L.P. Two Harbors
Source Dryer RTO Stack
Test 2 Run ___ Date 5/22/96
Stack Dimen. 64 IN.
Dry Bulb ______ °F Wet bulb ______ °F
Manometer ☐ Reg. ☐Exp ☐Elec.
Barometric Pressure 28.95 IN.HG
Static Pressure -.45 IN.WC
Operators D. VanHoever + M. Petersen
Pitot No. (V23-6 C_p .84
* formaldehyde *

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
		Port Length: 6.5 IN.		Time Start: HRS	
A 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
B 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Temp. Meas. Device & S/N: PDT #35 — Time End: 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 L.P. Two Harbors Date 5/22/96 Test 2 Run 1

Source DRYER RTO Stack No. of traverse points 24

Method 0011 Filter holder: NA Filter type: NA

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒

Post test: 0 cfm at 12 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: ____ ____

Recovery solvent(s)

☐acetone ____

☒other(s) MeCl2 + DI H_2O

No. of probe wash bottles: 1

Sample recovered by: DWH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	471	200	271
Impinger No. 3			
Condenser			
Desiccant	1556	1541	15
Total			286

Integrated Gas Sampling Data:

Bag Pump No. 23A 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: 0915 (HRS) Time end: 1026 (HRS)

Sampling rate: 400 cc/min Operator: DWH

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

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INTERPOLL LABORATORIES, INC.

(612) 786-6020

EPA Method 5 Field Data Sheet

glass

Job: LP, Two Harbor
Source: Dryer RTO Stack
Date: 5/22/96 Test: 2 Run: 1

Operators: DVH & MP
Meter Box No.: 6 ΔH@: 1.90 in.WC
Gasmeter Coeff.: .9967

Nozzle No.: .278
Nozzle Dia.: 28.45 in.
Bar. Press.: — in.Hg

Pitot No.: U23-6
C_p: .84
H_2O: 20 %

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)
	0910	477.70											
A 12	2.5	479.75	.68	2.20	9.73	9	281	253	261	41	57	56	16.2
11	5	481.78	.71	2.29	1.81	9	279				63	58	16.3
10	7.5	483.86	.72	2.34	3.91	9	281	257	261	42	67	58	16.2
9	10	486.05	.78	2.53	6.10	10	283				71	59	16.2
8	12.5	488.16	.76	2.50	8.27	10	278	261	258	42	76	60	16.2
7	15	490.31	.74	2.44	0.44	10	280				77	60	16.7
6	17.5	492.47	.75	2.48	2.61	10	279	264	258	42	79	60	16.8
5	20	494.68	.75	2.49	4.80	10	277				80	61	16.6
4	22.5	496.72	.68	2.25	6.88	10	281	260	259	42	82	61	16.4
3	25	498.96	.65	2.17	8.92	9	276				83	62	16.3
2	27.5	500.84	.57	1.90	0.84	8	278	265	260	42	83	62	16.3
1	30	502.61	.47	1.56	2.58	7	280				84	63	16.1
B 12	32.5	504.81	.78	2.60	4.82	10	280	263	262	42	69	63	16.0
11	35	507.01	.80	2.61	7.05	10	284				73	64	16.1
10	37.5	509.18	.80	2.62	9.29	10	284	263	261	43	75	64	16.2
9	40	511.57	.80	2.64	1.54	10	281				79	64	16.0
8	42.5	513.67	.78	2.59	3.78	10	278	263	264	43	81	64	16.1
7	45	516.01	.80	2.66	6.04	10	280				83	65	16.4
6	47.5	518.15	.75	2.50	8.24	10	279	260	261	44	84	65	16.2
5	50	520.40	.69	2.30	0.35	10	279				84	66	16.2
4	52.5	522.44	.69	2.30	2.47	10	282				86	65	16.2
3	55	524.47	.62	2.07	4.47	9	280	261	263	45	86	66	16.2
2	57.5	526.34	.52	1.74	6.31	8.5	281				87	66	16.5
1	60	528.14	.49	1.63	8.10	8	284				87	67	16.4
	(1026)												
	θ = 60	V_m = 50.44		ΔH = 2.31							Avg. = 70.3		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Two Harbors
Date 5/22/96 Test 2 Run 2
Source Dryer RTO Stack
No. of traverse points 24
Method 0011 Filter holder: NA
Filter type: NA

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 12 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☐ acetone
☒ other(s) MeCl₂ + DI H_2O

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	453	200	253
Impinger No. 3			
Condenser			
Desiccant	1410	1388	22
Total			275

Integrated Gas Sampling Data:

Bag Pump No. 23A
Box No. 30 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar
Size: 44 L
Pretest leak check: 0 cc/min at 14 IN.HG
Time start: 1139 (HRS) Time end: 1348 (HRS)
Sampling rate: 400 cc/min Operator: DRH

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: L.P. Two Harbor
Source: Dryer RTO Stack
Date: 5/22/96 Test 2 Run 2

Operators: DW & MP
Meter Box No. 6 ΔH@ 1.90 in.WC
Gasmeter Coeff. .9967

Nozzle No. glass
Nozzle Dia. .278 in.
Bar. Press. 28.95 in.Hg

Pitot No. U23-6
C_p .84
H_2O 22 %

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)
	1135	529.10											
B 12	2.5	531.19	.77	2.44	1.26	9	280	257	241	43	64	64	16.4
11	5	533.32	.76	2.38	3.39	9	282				68	64	15.9
10	7.5	535.50	.77	2.42	5.53	10	281	261	246	43	75	64	16.1
9	10	537.55	.75	2.37	7.67	10	283				79	65	16.1
8	12.5	539.79	.75	2.38	9.81	10	283	263	254	43	81	66	16.6
7	15	541.94	.73	2.33	1.93	10	28[illegible]				84	65	16.3
6	17.5	543.95	.69	2.20	3.99	8.5	284	261	263	43	86	66	16.0
5	20	546.03	.69	2.21	6.07	8.5	281				87	66	15.9
4	22.5	548.14	.64	2.04	8.06	8.5	284	263	261	43	88	67	16.2
3	25	550.02	.60	1.92	0.00	8.5	284				89	67	16.2
2	27.5	551.87	.56	1.80	1.88	8	280	264	263	44	66	65	16.6
1	30	553.71	.53	1.67	3.66	8	280				69	65	16.3
A 12	32.5	555.77	.67	2.13	5.68	10	275	264	260	45	66	65	16.6
11	35	557.84	.73	2.28	7.76	10	285				73	65	16.8
10	37.5	559.91	.71	2.25	9.84	10	278	261	262	46	74	65	17.0
9	40	561.97	.73	2.32	1.95	10	279				80	66	16.8
8	42.5	564.14	.78	2.48	4.17	10	282	264	263	47	83	67	16.5
7	45	566.30	.76	2.44	6.31	10	279				84	67	16.7
6	47.5	568.55	.80	2.54	8.53	10	285	263	261	45	87	68	16.8
5	50	570.68	.77	2.48	0.73	10	280				87	68	17.0
4	52.5	572.85	.72	2.31	2.85	10	283	260	262	45	89	68	16.8
3	55	574.94	.69	2.22	4.94	10	280				90	69	16.8
2	57.5	577.06	.69	2.22	7.02	9	283				91	69	17.0
1	60	579.00	.62	2.0	9.00	8	281				92	69	17.0
	(1348)												
	θ = 60	V_m = 49.90		ΔH = 2.24							Avg. = 73.3		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Two Harbors Date 5/22/96 Test 2 Run 3

Source Dryer RTO Stack No. of traverse points 24

Method 0011 Filter holder: NA Filter type: NA

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒

Post test: 0 cfm at 11 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☐acetone ______

☒other(s) ______

No. of probe wash bottles: 1

Sample recovered by: [initials]

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	438	200	238
Impinger No. 3			
Condenser			
Desiccant	1435	1410	25
Total	░░░░		263

Integrated Gas Sampling Data:

Bag Pump No. 234 Box No. 30 Bag No. 3

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

Pretest leak check: 0 cc/min at 14 IN.HG

Time start: 1505 (HRS) Time end: 1618 (HRS)

Sampling rate: 400 cc/min Operator: [initials]

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

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

INTERPOLL LABORATORIES, INC.

(612) 786-6020

EPA Method 5 Field Data Sheet

Job: L.P. Two Harbors — Source: Dryer RTO Stack — Date: 5/22/96 Test 2 Run 3

Operators: DNH & MP — Meter Box No. 6 ΔH@ 1.90 in.WC — Gasmeter Coeff. .9967

Nozzle No. glass — Nozzle Dia. .278 in. — Bar. Press. 28.95 in.Hg

Pitot No. 023-6 — C_p .84 — H_2O 21 %

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)
	1500	579.40											
B 12	2.5	581.45	.66	2.15	1.43	7	282	254	261	43	66	66	16.2
11	5	583.40	.67	2.14	3.46	7	284				69	67	16.5
10	7.5	585.31	.67	2.17	5.49	7	278	257	264	44	75	68	16.2
9	10	587.40	.70	2.27	7.59	7	280				78	66	16.2
8	12.5	589.57	.67	2.18	9.64	8	280	263	264	45	83	67	16.5
7	15	591.70	.70	2.30	1.75	8	278				85	67	16.4
6	17.5	593.89	.74	2.41	3.91	8	285	260	261	45	87	68	16.4
5	20	596.01	.71	2.33	6.04	8	280				90	68	16.5
4	22.5	598.20	.73	2.39	8.21	8	284	264	263	46	89	69	16.2
3	25	600.30	.74	2.43	0.39	9	281				91	69	16.4
2	27.5	602.36	.65	2.15	2.44	8	279	260	262	46	92	70	16.5
1	30	604.45	.61	2.01	4.42	8	284				92	70	16.4
A 12	32.5	606.41	.51	1.68	6.24	7	284	262	257	43	74	69	16.0
11	35	608.35	.54	1.74	8.08	7	285				77	69	15.9
10	37.5	610.31	.79	2.56	0.30	7	285	261	258	44	82	70	16.1
9	40	612.66	.77	2.50	2.50	7	285				87	70	16.2
8	42.5	614.77	.78	2.56	4.74	7	281	261	257	45	89	70	16.4
7	45	617.02	.78	2.57	6.98	7	279				92	71	16.3
6	47.5	619.21	.74	2.43	9.17	7	286	262	260	44	93	72	16.3
5	50	621.26	.68	2.25	1.27	7	280				94	72	16.5
4	52.5	623.51	.67	2.21	3.36	7	285	257	261	44	85	72	16.3
3	55	625.50	.60	1.99	5.34	7	281				85	73	16.2
2	57.5	627.26	.54	1.78	7.22	7	285	258	262	45	96	73	16.3
1	60	629.07	.50	1.65	9.03	7	285				97	73	16.6
	C 1618												
	θ - 60	V_m = 49.67		ΔH = 2.20							Avg. = 77.8		

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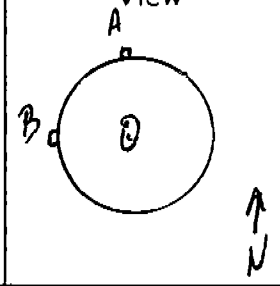
INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. Two Harbors
Source: Dryer RTO Stack
Test: 3 Run ___ Date 5/21/96
Stack Dimen.: 64 IN.
Dry Bulb ______ °F Wet bulb ______ °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.95 IN.HG
Static Pressure: -.45 IN.WC
Operators: D. VanHoever & M. Petersen
Pitot No.: V23-5 C_p .84
PM-10

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
		Port Length: 6.5	IN.	Time Start: 0755 HRS	
A 1	.044	2.82	9.32	.52	
2	.146	9.34	15.84	.64	
3	.296	18.94	25.44	.72	
4	.704	45.06	51.56	.70	
5	854	54.66	61.16	.65	269
6	.956	61.18	67.68	.57	
B 1				.47	
2				.63	
3				.71	
4				.80	
5				.81	
6				.78	
Temp. Meas. Device & S/N: POT #35				Time End: 0758 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 L.P. Two Harbors Date 5/22/96 Test 3 Run 1

Source Dryer RTO Stack No. of traverse points 12

Method 201A Filter holder: SS Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒

Post test: 0 cfm at 6 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☒acetone

☐other(s)

No. of probe wash bottles: 1

Sample recovered by: DWJ

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	424	250	174
Impinger No. 3			
Condenser			
Desiccant	1410	1405	5
Total			179

Integrated Gas Sampling Data:

Bag Pump No. 2313 Box No. 28 Bag No. 1

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

Pretest leak check: 0 cc/min at 15 IN.HG

Time start: 0905 (HRS) Time end: 1044 (HRS)

Sampling rate: 300 cc/min Operator: DWJ

S/N of O_2 Analyzer used to monitor train outlet: 005

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: L.P. Two Harbors
Source: DRYER RTO STACK
Date: 5/22/96 Test: 3 Run: 1

Operators: D.V.H + MD
Meter Box No.: 10 ΔH@ 1.94 in.WC
Gasmeter Coeff.: .9909

Nozzle No.: 5
Nozzle Dia.: .193 in.
Bar. Press.: 28.95 in.Hg

Pitot No.: U23-5
C_p: .84
H_2O: 21 %

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)
	0902	202.84											
B 1	8.55	205.72	.73	.35	8.55	2	281	249	254	43	55	55	005
2	17.10	208.60	.78	.35	8.55	2	278				59	55	
3	25.76	211.56	.80	.35	8.66	2	278	251	256	42	63	56	
4	34.20	214.42	.76	.35	8.44	2	277				66	57	
5	42.58	217.13	.75	.35	8.38	2	278	258	261	43	68	58	
6	50.57	219.78	.68	.35	7.98	2	277				69	59	
A 1	57.94	222.29	.58	.35	7.37	2	277	259	262	43	68	60	
2	65.99	225.05	.69	.36	8.04	2	280				72	61	
3	74.69	227.89	.70	.36	8.10	2	279	261	263	44	73	63	
4	82.53	230.84	.76	.36	8.44	2	285				74	64	
5	90.74	233.69	.72	.36	8.21	2	281	263	261	45	74	64	
6	98.85	236.475	.70	.36	8.10		284				75	65	
	(1044)												
	θ = 98.85	V_m = 33.635		ΔH = .35							Avg. = 63.8		

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INTERPOLL LABORATORIES, INC
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Two Harbors Date 5/22/96 Test 3 Run 2

Source Dryer RTO Stack No. of traverse points 12

Method 201A Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒

Post test: 0 cfm at 5 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: ____

Recovery solvent(s)

☒ acetone ____

☐ other(s) ____

No. of probe wash bottles: 1

Sample recovered by: DWH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	410	250	160
Impinger No. 3			
Condenser			
Desiccant	1400	1396	4
Total			164

Integrated Gas Sampling Data:

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

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

Pretest leak check: 0 cc/min at 15 IN.HG

Time start: 1140 (HRS) Time end: 1402 (HRS)

Sampling rate: 250 cc/min Operator: DWH

S/N of O_2 Analyzer used to monitor train outlet: 005

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

INTERPOLL LABORATORIES, INC.
(612[redacted]6-6[redacted]

EPA Method 5 Field Data Sheet

Job: L.P. Two Harbors
Source: Dryer RTO Stack
Date: 5/22/96 Test 3 Run 2

Operators: Dull + MP
Meter Box No.: 10 ΔH@ 1.94 in.WC
Gasmeter Coeff.: .9909

Nozzle No.: #4
Nozzle Dia.: .182 in.
Bar. Press.: 28.95 in.Hg

Pitot No.: 023-5
C_p: .84
H_2O: 21 %

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)
	1235	236.60											
A 6	7.38	239.07	.64	.36	7.38	2	280	257	253	41	67	67	0.05
5	14.93	241.69	.67	.36	7.55	2	283				68	66	,
4	22.59	244.35	.69	.36	7.66	2	284	258	260	42	71	66	
3	30.58	247.12	.75	.36	7.99	2	281				73	66	
2	38.63	249.92	.76	.36	8.04	2	280	261	263	43	69	68	
1	45.95	252.43	.63	.36	7.32	2	275				72	68	
B 6	54.05	255.12	.77	.36	8.09	2	275	260	261	44	73	68	
5	62.14	258.00	.77	.36	8.09	2	278				76	69	
4	70.39	260.93	.80	.36	8.25	2	285	262	264	45	78	69	
3	78.54	263.78	.78	.36	8.14	2	278				77	70	
2	86.48	266.56	.74	.36	7.93	2	278				79	71	
1	93.98	269.16	.66		7.49		278				80	71	
	(1403)												
	θ = 93.98	V_m = 32.56		ΔH = .36							Avg. = 71		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Two Harbors
Date 5/22/96 Test 3 Run 3
Source Dryer RTO Stack
No. of traverse points 12
Method 201A Filter holder: SS
Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: 0 cfm at 6 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☑ acetone
☐ other(s)

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	417	250	167
Impinger No. 3			
Condenser			
Desiccant	1406	1401	5
Total			172

Integrated Gas Sampling Data:

Bag Pump No. 23B
Box No. 28 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar
Size: 44 L
Pretest leak check: 0 cc/min at 15 IN.HG
Time start: 1504 (HRS) Time end: 1631 (HRS)
Sampling rate: 250 cc/min Operator: DWH

S/N of O_2 Analyzer used to monitor train outlet: 0.0.5

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

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: L.P. Two Harbors
Source: Dryer RTO Stack
Date: 5/22/96 Test: 3 Run: 3

Operators: Dust & mp
Meter Box No.: 10 ΔH@ 1.90 in.WC
Gasmeter Coeff.: .9907

Nozzle No.: .4
Nozzle Dia.: .182 in.
Bar. Press.: 28.85 in.Hg

Pitot No.: VL3-5
C_p: .84
H_2O: 21 %

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)
	1900	269.26											
A 6	7.87	271.91	.75	.37	7.87	2	282	257	266	45	72	72	005
5	15.58	274.71	.72	.31	7.71	2	280				68	71	
4	23.56	277.53	.77	.37	7.97	2	285	261	263	46	74	69	
3	31.27	280.22	.72	.37	7.71	2	282				77	69	
2	38.66	282.81	.66	.37	7.38	2	281	260	264	45	78	69	
1	45.64	285.33	.59	.37	6.98	2	278				79	70	
B 6	52.80	287.85	.62	.37	7.15	2	278	260	248	41	79	71	
5	59.95	290.39	.62	.37	7.15	2	285				80	71	
4	67.51	293.15	.69	.38	7.55	2	285	262	254	42	80	71	
3	75.06	295.89	.69	.38	7.55	2	285				82	72	
2	82.77	298.66	.72	.38	7.71	2	285	261	257	43	83	73	
1	90.32	301.45	.69	.38	7.55	2	281				83	73	
	(7631)												
	θ = 90.32	V_m = 32.19		ΔH = .37							Avg. = 74.4		

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EPA

VISIBLE EMISSION OBSERVATION FORM 1

Form Number	Page 1 Of 2
Continued on VEO Form Number	

Method Used (Circle One): (Method 9) 203A 203B Other: ______

Company Name: Louisiana-Pacific Corporation
Facility Name: LP / Two Harbors
Street Address: Industrial Park North, Highway 2
City: Two Harbors State: MN Zip: 55616

Process: Dryer Unit #: NA Operating Mode: 90% of max
Control Equipment: RTO, E-Tube Operating Mode: Automatic

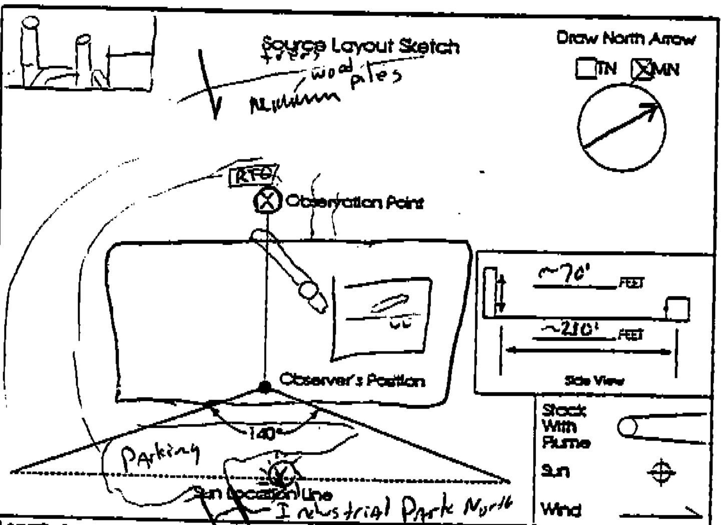
Describe Emission Point: Farthest south stack, silver, by RTO

Height of Emiss. Pt.: Start ~100' End same
Height of Emiss. Pt. Rel. to Observer: Start ~70' End same
Distance to Emiss. Pt.: Start ~230' End same
Direction to Emiss. Pt. (Degrees): Start 275° End same

Vertical Angle to Obs. Pt.: Start ~18° End same
Direction to Obs. Pt. (Degrees): Start ~275° End same
Distance and Direction to Observation Point from Emission Point: Start 5' East End same

Describe Emissions: Start Non Visable (Clear) End same
Emission Color: Start NA End same
Water Droplet Plume: Attached ☐ Detached ☐ None ☒

Describe Plume Background: Start Blue Sky End Dark Grey Cloud
Background Color: Start Blue Sky End Grey Clouds
Sky Conditions: Start Partly Cloudy End Partly Sunny
Wind Speed: Start ~5-10 mph End 5-10 mph
Wind Direction: Start East End East
Ambient Temp.: Start 61 End same
Wet Bulb Temp.: 54
RH Percent: 64%



Longitude: | Latitude: | Declination:

Additional Information:

Observation Date: 5/21/96 Time Zone: CDST Start Time: 0945 End Time: 1015

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	clouds moving over obs. pt.
16	0	0	0	0	↓
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): Mark T. Petersen
Observer's Signature: [signature] Date: 5/21/96
Organization: Interpoll Laboratories, Inc.
Certified By: Eastern Technical Associates Date: 4/3/96

VEOF1.1

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Form Number	Page 2 of 2
Continued on VEO Form Number	

Method Used (Circle One): (Method 9) 203A 203B Other: ______

Company Name: Louisiana-Pacific Corporation

Facility Name: LP / Two Harbors

Street Address: Industrial Park North, Highway 2

City: Two Harbors **State:** MN **Zip:** 55616

Process: Dryer ~~R.T.O.~~ mp **Unit #:** NA **Operating Mode:** (90% of max)

Control Equipment: RTO, E-Tube **Operating Mode:** Automatic

Describe Emission Point: Silver Stack, farthest south by RTO

Height of Emiss. Pt.: Start ~100' End same **Height of Emiss. Pt. Rel. to Observer:** Start ~70' End same

Distance to Emiss. Pt.: Start ~220' End same **Direction to Emiss. Pt. (Degrees):** Start 275° End same

Vertical Angle to Obs. Pt.: Start ~18° End same **Direction to Obs. Pt. (Degrees):** Start ~275° End same

Distance and Direction to Observation Point from Emission Point: Start 5 ~~85~~ East End same

Describe Emissions: Start No visible emissions End same

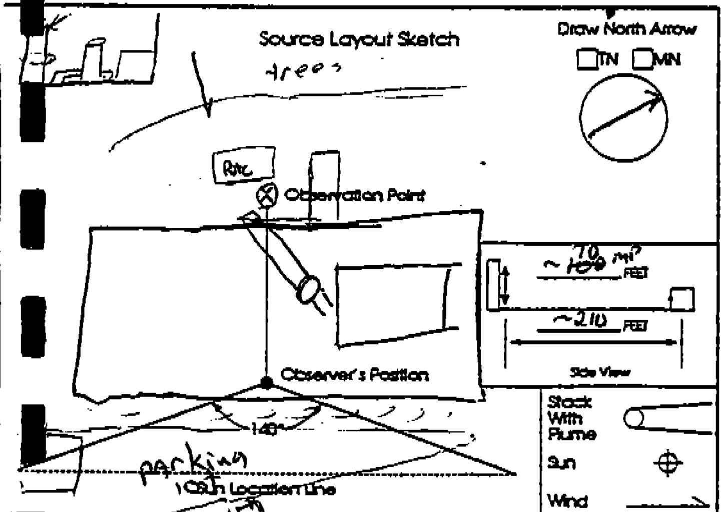
Emission Color: Start Clear End same **Water Droplet Plume:** Attached ☐ Detached ☐ None ☒

Describe Plume Background: Start Dark Grey Clouds End same

Background Color: Start Grey Clouds End same **Sky Conditions:** Start Partly Sunny End same

Wind Speed: Start ~5-10 mph End same **Wind Direction:** Start East End same

Ambient Temp.: Start 61 End **Wet Bulb Temp.:** 54 **RH Percent:** 64%



Longitude | Latitude | Declination

Additional Information

Observation Date	Time Zone	Start Time	End Time
5-21-96	CDST	1015	1045

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	Blue sky
8	0	0	0	0	↓
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	Clouds moving over
22	0	0	0	0	↓
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): Mark T. Petersen

Observer's Signature: [signature] **Date:** 5/21/96

Organization: Interpoll Laboratories, Inc

Certified By: Eastern Technical Associates **Date:** 4/3/96

VEOF1.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

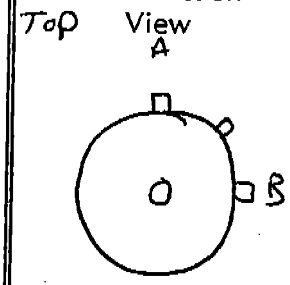
EPA Method 2 Field Data Sheet

Job: LPI Two Harbors
Source: Primary Cyclone Outlet
Test: 7 Run: 0 Date: 5-21-96
Stack Dimen.: 42 IN.
Dry Bulb: 226 °F Wet bulb: 154 °F
Manometer: ☒ Reg. ☐Exp ☐Elec.
Barometric Pressure: 28.84 IN.HG
Static Pressure: -9.8 IN.WC
Operators: B Aschenbach S Kelley
Pitot No.: 40v-6 C_p: .84

* Particulate *

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
		Port Length: 9.0 IN.		Time Start:	HRS
A - 1	.044	1.85	10.85	.89	
2	.146	6.13	15.13	1.35	
3	.296	12.43	21.43	1.65	
4	.704	29.57	38.57	1.95	
5	.854	35.87	44.87	1.70	
6	.956	40.15	49.15	.85	
B - 1				1.20	
2				1.50	
3				1.70	
4				1.70	
5				1.65	
6				1.25	
				Avg 1.45	
				FT/SEC	82.66
				ACFM	47718
				DSCFM	25002

Temp. Meas. Device & S/N:

Time End: HRS

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

.192

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/ Two Harbors Date 5-21-96 Test 7 Run 1

Source Primary Cyclone Outlet No. of traverse points

Method 5 Filter holder: Teflon Filter type: 4" GFF

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒

Post test: 0.0 cfm at 14 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: Recovery solvent(s)

(1) 7686

☒ acetone

☐ other(s)

No. of probe wash bottles:

Sample recovered by: BA

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	694	483	211
Impinger No. 2	310	300	10
Impinger No. 3			
Condenser			
Desiccant	1492	1475	17
Total			238

Integrated Gas Sampling Data:

Bag Pump No.	TR	Box No.	1 Bag No. 1
Bag Material:	5-layer Aluminized Tedlar	Size:	44 L
Pretest leak check:	0.0	cc/min at	22 IN.HG
Time start:	0945	(HRS) Time end:	1050 (HRS)
Sampling rate:	400	cc/min Operator:	BA

S/N of O_2 Analyzer used to monitor train outlet: 5

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

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: CPI Two Harbors
Source: Primary Cyclone Outlet
Date: 5-21-86 Test 7 Run 1
Operators: SA
Meter Box No. 8 ΔH@ 1.77 in.WC
Gasmeter Coeff. 1.0019
Nozzle No. 9-3
Nozzle Dia. .192 in.
Bar. Press. 28.84 in.Hg
Pitot No. 4ev-6
C_p .84
H_2O 28 %

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)
	(0945)	(791.70)											
B-1	5	794.40	1.40	.85	4.34	3	230	230	235	35	62	58	16.0
2	10	797.23	1.70	1.03	7.22	4	227	232	240	36	67	58	15.7
3	15	800.10	1.75	1.06	0.16	5	230	230	235	37	72	59	16.4
4	20	803.02	1.80	1.10	3.16	6	229	245	260	39	75	59	15.7
5	25	805.88	1.60	.98	6.00	6	230	253	262	38	78	61	16.4
6	30	808.65	1.30	.80	8.57	7	229	253	261	40	79	63	16.1
A-1	35	811.34	1.35	.83	1.19	6	230	255	258	39	78	65	17.0
2	40	814.01	1.70	1.05	4.14	7	229	237	265	42	82	66	16.7
3	45	817.12	1.85	1.14	7.22	9	232	236	268	45	85	66	17.3
4	50	820.20	1.65	1.02	0.14	10	233	240	265	43	85	67	17.0
5	55	823.18	1.65	1.03	3.06	10	230	255	259	45	84	68	17.2
6	60	826.02	1.50	.93	5.85	10	230	248	255	45	85	68	17.2
	(1050)												
	θ - 60	V_m - 34.32		ΔH - .99							Avg. - 70.4		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP / Two Harbors Date 5-21-96 Test 7 Run 2
Source Primary Cyclone Outlet No. of traverse points 12
Method 5 Filter holder: Teflon Filter type: 4" GFF

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: 0.0 cfm at 15 IN. HG (vac) ☑

Particulate Catch Data:

No. of filters used: (3) 7687, 7688, 8372

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

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	694	490	204
Impinger No. 2	389	296	93
Impinger No. 3			
Condenser			
Desiccant	1360	1344	16
Total			313

Integrated Gas Sampling Data:

Bag Pump No. TR Box No. 1 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0.0 cc/min at 22 IN.HG
Time start: 1155 (HRS) Time end: 1345 (HRS)
Sampling rate: 400 cc/min Operator: SA

S/N of O_2 Analyzer used to monitor train outlet: 5

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

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: (P) Two Harbors
Source: Primary Cyclone Outlet
Date: 5-21-96 Test 7 Run 2

Operators: GA SK
Meter Box No.: 8 ΔH@ 1.77 in.WC
Gasmeter Coeff.: 1.0019

Nozzle No.: 9-3
Nozzle Dia.: .192 in.
Bar. Press.: 28.84 in.Hg

Pitot No.: 40-6
C_p: .84
H_2O: 26 %

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)
	(1155)	(827.40)											
A-1	5	830.22	1.40	.90	0.13	3	230	247	255	41	70	69	17.0
2	10	833.05	1.25	1.13	3.17	4	230	231	250	37	76	69	15.5
3	15	836.16	1.26	1.10	6.19	8.5	230	235	251	38	82	69	15.7
4	20	839.12	1.70	1.11	9.23	4	228	231	230	37	78	71	16.8
5	25	842.01	1.65	1.08	2.23	4.5	227	235	227	40	86	71	16.4
6	30	844.95	1.30	.85	4.90	4	230	240	265	40	81	72	16.1
B-1	35	847.77	1.40	.91	7.66	3.5	229	238	270	43	85	73	16.2
2	40	850.63	1.60	1.06	0.64	4	224	240	268	41	92	74	15.7
3	45	853.72	1.70	1.13	3.73	5	224	238	271	38	95	75	15.9
4	50	856.89	1.75	1.17	6.88	5	227	240	268	40	97	75	16.1
5	55	860.00	1.70	1.13	9.98	6	227	237	268	37	97	77	16.0
6	60	863.03	1.55	1.04	2.95	6	227	240	270	37	98	77	16.1
	(1345)												
	θ - 66	V_m - 35.63		ΔH - 1.05							Avg. 79.5		

C-28

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LPI Two Harbors
Date 5-21-96 Test 7 Run 3
Source Primary Cyclone Outlet
No. of traverse points 12
Method 5 Filter holder: Glass
Filter type: 4" GFP

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0.0 cfm at 10 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: (1)

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

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	712		216
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1506	1492	14
Total			230

Integrated Gas Sampling Data:

Bag Pump No. TR
Box No. 1 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar
Size: 44 L
Pretest leak check: 0.0 cc/min at 22 IN.HG
Time start: 1535 (HRS) Time end: (HRS)
Sampling rate: 400 cc/min Operator: GA

S/N of O_2 Analyzer used to monitor train outlet: 5

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INTERPOLL LABORATORIES, INC.

(612) 786-6020

EPA Method 5 Field Data Sheet

Job CP/Two Harbors
Source Primary Cyclone Outlet
Date 5-21-96 Test 2 Run 3

Operators GA
Meter Box No. 8 ΔH@ 1.77 in.WC
Gasmeter Coeff. 1.0019

Nozzle No. 9-3
Nozzle Dia. .192 in.
Bar. Press. 28.84 in.Hg

Pitot No. 40ec6
C_p .84
H_2O 30 %

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)
	(1535)	(864.00)											
B - 1	5	866.80	1.50	.90	6.74	3	230	235	268	46	74	74	17.1
2	10	869.66	1.70	1.01	9.63	3	229	232	263	44	82	74	16.9
3	15	872.68	1.80	1.07	2.63	4	230	234	263	44	87	74	17.1
4	20	875.67	1.75	1.04	5.59	4	232	241	267	42	90	75	16.3
5	25	878.69	1.80	1.08	8.61	4	232	240	263	42	92	75	17.4
6	30	881.42	1.50	.90	1.37	4	232	235	259	41	93	76	17.0
A - 1	35	884.36	1.65	.99	4.27	4.5	230	242	264	43	92	76	17.2
2	40	887.45	1.90	1.14	7.38	5.5	230	241	263	41	92	76	16.6
3	45	890.51	2.00	1.20	0.57	6	232	250	270	39	94	76	16.2
4	50	893.40	1.75	1.05	3.56	6	232	247	265	39	94	76	17.2
5	55	896.14	1.45	.87	6.28	6	232	251	267	38	94	76	16.0
6	60	898.45	.90	.54	8.43	6	230	247	261	39	93	77	16.2
	(1637)												
	0-60	V_m = 34.45		ΔH = .98							Avg. = 82.6		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP / Two Harbors, MN
Source E-Tube / Outlet
Test 4 Run 1 Date 5-21-96
Stack Dimen. 47.25 IN.
Dry Bulb 157 °F Wet bulb 146 °F
Manometer ☐ Reg. ☐Exp ☐Elec.
Barometric Pressure 28.94 IN.HG
Static Pressure -1.90 IN.WC
Operators M. Kaehler + L. Nuessmeier
Pitot No. 31V-6 C_p .84

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
		Port Length:	9 IN.	Time Start: 0923 HRS	
A-1	.032	1.51	10.51	.77	
2	.105	4.96	13.96	.80	
3	.194	9.17	18.17	.91	
4	.323	15.26	24.26	.96	
5	.677	31.99	40.99	.87	
6	.806	38.08	47.08	1.03	
7	.895	42.29	51.29	1.05	↑
8	.968	45.74	54.74	1.20	
B-1				1.41	157
2				.59	
3		62.04 ft/sec		.90	↓
4		45330 ACFM		1.00	
5		29768 DSCFM		1.15	
6				1.35	
7				1.50	
8				1.11	

Temp. Meas. Device & S/N: PDT-31 /TC — Time End: 0930 HRS

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

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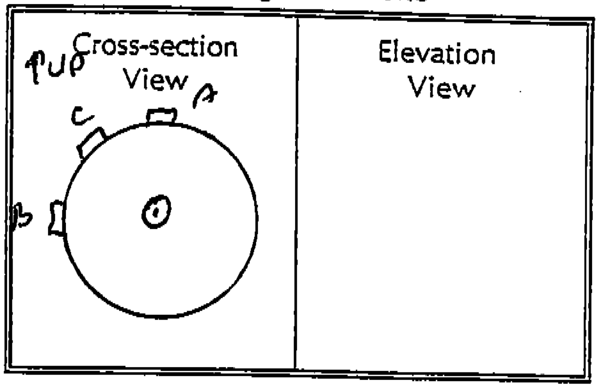
INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. / Two Harbors, MN
Source: E-Tube / Outlet
Test: 4 Run 2 Date 5-21-96
Stack Dimen.: 47.25 IN.
Dry Bulb: 159 °F Wet bulb: 116 °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.84 IN.HG
Static Pressure: -1.03 IN.WC
Operators: M. Koehler + K. Nuessmeier
Pitot No.: 31V-5 C_p .84

Drawing of Test Site



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas
		Port Length: * 9 IN.		Time Start: 1200 HRS	
A-1	.021	1.00	10.00	.78	
2	.067	3.17	12.17	.93	
3	.118	5.58	14.58	.95	
4	.177	8.36	17.36	.94	
5	.250	11.81	20.81	.98	
6	.356	16.82	25.82	1.10	
7	.644	30.43	39.43	1.15	
8	.750	35.44	44.44	1.13	
9	.823	38.89	47.89	1.10	
10	.882	41.67	50.67	1.25	
11	.933	44.08	53.08	1.05	
12	.979	46.26	55.26	1.04	
B-1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Temp. Meas. Device & S/N:		PDT-31 / TC		Time End: 1206 HRS	

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

* Includes Vertical Port clamps

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P./Two Harbors, MN Date 5-21-96 Test 9 Run 3
Source E-Tube/Outlet No. of traverse points 24
Method 5 Filter holder: Glass Filter type: 4" G.F.

Dia. = 54"
Pb = 28.84
Pg = -1.35

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: <0.02 cfm at 10 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: Recovery solvent(s)

0360 ☒ acetone

☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Koehler + K. Nuessmeier

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	673	498	175
Impinger No. 2	355	192	163
Impinger No. 3			
Condenser			
Desiccant	1392	1376	16
Total			354

Integrated Gas Sampling Data:

Bag Pump No. 31 B Box No. 26 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 IN.HG
Time start: 1535 (HRS) Time end: 1637 (HRS)
Sampling rate: 400 cc/min Operator: M. Koehler

S/N of O_2 Analyzer used to monitor train outlet: 31A

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

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: LP/Two Harbors, MN — Operators: M. Kaehler + K. Niessmaier — Nozzle No.: 1-4 — Pitot No.: 31U-6
Source: E-Tube / Outlet — Meter Box No.: 18 ΔH@ 1.61 in.WC — Nozzle Dia.: .250 in. — C_p: .84
Date: 5-21-96 Test 9 Run 3 — Gasmeter Coeff.: 1.0051 — Bar. Press.: 28.84 in.Hg — H_2O: 21.3 %

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)
▒	1535	93.30	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒
B-12	2.5	95.55	.98	2.41	5.52	5	162	237	244	47	83	83	17.6
11	5	97.70	.93	2.26	7.67	5	167	241	248	46	86	83	12.4
10	7.5	99.80	.93	2.27	9.83	5	165	243	253	46	88	83	12.5
9	10	92.11	.98	2.39	2.04	5	166	247	250	45	89	83	17.6
8	12.5	94.23	.97	2.38	4.25	5	164	240	257	44	90	84	17.6
7	15	96.34	.97	2.39	6.47	5	162	241	250	41	92	84	12.4
6	17.5	98.57	.98	2.43	8.70	6	160	232	247	42	93	84	12.1
5	20	100.84	.96	2.37	0.91	5	162	244	242	41	94	84	12.3
4	22.5 ~~22.5~~	103.22	.94	2.33	3.11	5	161	241	240	41	95	85	12.5
3	25 ~~20.5~~	105.40	.95	2.36	5.31	5	161	237	248	40	96	85	12.4
2	27.5 ~~30~~	107.53	.90	2.24	7.47	5	161	234	253	42	96	85	12.7
1	30	109.66	.91	2.26	9.63	5	161	233	251	42	97	85	17.2
4-12	32.5	112.32	1.29	3.20	2.20	7	161	232	250	43	95	86	12.2
11	35	114.05	1.31	3.25	4.79	7	161	240	245	43	98	86	12.0
10	37.5	117.21	1.05	2.61	7.11	6	163	241	241	44	99	87	16.9
9	40	119.58	1.13	2.82	9.53	6.5	161	235	240	44	100	87	16.9
8	42.5	121.92	1.05	2.63	1.87	6	160	240	244	45	100	86	16.7
7	45	124.27	1.04	2.60	4.19	6	159	242	241	45	100	87	12.3
6	47.5	126.49	.92	2.30	6.38	6	161	245	237	45	100	87	17.6
5	50	128.53	.79	1.97	8.41	5	161	241	243	46	100	88	12.1
4	52.5	130.47	.77	1.93	0.41	5	161	240	241	46	100	87	17.0
3	55	132.48	.75	1.88	2.39	5	160	237	245	46	100	88	16.8
2	57.5	134.51	.80	2.00	4.43	5	160	234	240	47	101	88	16.8
1	60	136.36	.67	1.68	6.31	5	160	231	240	47	101	88	16.9
	(1637)												
▒	θ - 60	V_m - 53.06	▒	ΔH - 2.37	▒	▒	▒	▒	▒	▒	Avg. -	90.5	▒

OF[redacted]GAS[redacted]WPA[redacted]SIS-5[redacted]

INTERPOLL LABORATORIES, INC.
(612) 786-6020

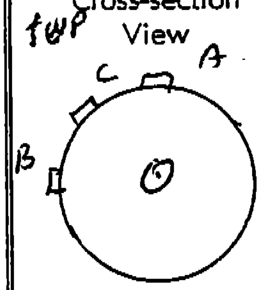
EPA Method 2 Field Data Sheet

Job: L.P. / Two Harbors, MN
Source: RTO / Inlet
Test: 9 Run: 0 Date: 5-22-96
Stack Dimen.: 54 IN.
Dry Bulb: 164 °F Wet bulb: 140 °F
Manometer: ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.84 IN.HG
Static Pressure: -1.35 IN.WC
Operators: M. Kuehler + K. Nuessmeier
Pitot No.: 31V-6 C_p: .84

Particulate

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: *9 IN.		Time Start: 0903 HRS	
A-1	.021	1.13	10.13	.84	
2	.067	3.62	12.62	.86	
3	.118	6.37	15.37	.88	
4	.177	9.56	18.56	.90	
5	.250	13.50	22.50	.96	
6	.356	19.22	28.22	1.02	
7	.644	34.78	43.78	1.17	
8	.750	40.50	49.50	1.20	
9	.823	44.44	53.44	1.03	
10	.882	47.63	56.63	.97	↑
11	.933	50.38	59.38	.91	
12	.979	52.87	61.87	.85	164
				.61	↓
				.91	
				.90	
				1.03	
		61.98 ft/sec		1.04	
		59153 ACFM		1.20	
		28463 DSCFM		1.15	
				1.03	
				.98	
				.96	
				.97	
				.65	
Temp. Meas. Device & S/N:		PDT-31 / TC		Time End: 0909 HRS	

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

* Includes Vertical Portclamp

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Two Harbors, MN Date 5-21-96 Test 9 Run 1
Source RTO / Inlet No. of traverse points 24
Method 5 Filter holder: Glass Filter type: 4" G.F.

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: <0.02 cfm at 10 IN. HG (vac) ☑

Particulate Catch Data:
No. of filters used: 8357
Recovery solvent(s)
☑ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Koehler + K. Nessmeier

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	726	494	232
Impinger No. 3			
Condenser			
Desiccant	1376	1357	21
Total			253

Integrated Gas Sampling Data:

Bag Pump No. 31B Box No. 26 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 IN.HG
Time start: 0945 (HRS) Time end: 1049 (HRS)
Sampling rate: 400 cc/min Operator: M. Koehler

S/N of O_2 Analyzer used to monitor train outlet: 31A

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INTERPOLL LABORATORIES, INC.
(612)[redacted]-60[redacted]

EPA Method 5 Field Data Sheet

Job G.P. / Two Harbors, MN Operators M. Kuehler & K. Wessmeier Nozzle No. 1-Y Pitot No. 31V-6
Source RTO / Inlet Meter Box No. 18 ΔH@ 1.81 in.WC Nozzle Dia. .250 in. C_p .84
Date 5-22-96 Test 9 Run 1 Gasmeter Coeff. 1.0051 Bar. Press. 28.84 in.Hg H_2O 20 %

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)
	0945	963.30											
B-12	2.5	965.80	1.28	3.11	5.79	6	160	233	240	40	78	74	12.9
11	5	968.99	1.20	2.97	8.24	6	163	240	232	39	79	75	18.2
10	7.5	970.70	1.20	2.98	0.68	6	163	239	237	43	83	73	19.2
9	10	973.10	1.15	2.85	3.09	6	165	241	240	43	83	74	12.8
8	12.5	975.61	1.23	3.05	5.56	6	165	243	244	44	87	74	18.0
7	15	977.95	1.10	2.74	7.92	6.5	165	240	245	44	89	74	18.0
6	17.5	980.44	1.17	2.93	0.36	6	162	237	247	45	90	75	18.3
5	20	982.76	1.11	2.76	2.73	6	167	241	243	43	91	75	18.1
4	22.5	985.07	1.15	2.87	5.15	6.5	167	245	240	42	92	76	18.2
3	25	987.47	1.15	2.88	7.57	6.5	166	240	245	42	92	76	18.0
2	27.5	990.03	1.23	3.07	0.07	7	166	237	245	43	94	77	18.1
1	30	992.55	1.27	3.19	2.63	7.5	164	244	240	43	95	78	18.1
4-12	32.5	995.03	1.17	2.95	5.09	7.5	164	240	243	44	93	79	12.5
11	35	997.65	1.30	3.27	7.67	8	165	237	248	44	95	79	17.7
10	37.5	1000.19	1.31	3.31	0.28	8	163	240	244	42	96	80	18.1
9	40	1002.55	1.10	2.79	2.67	7	162	239	247	42	96	81	18.2
8	42.5	1005.10	1.29	3.28	5.27	8	161	237	244	45	97	81	18.4
7	45	1007.60	1.20	3.05	7.77	7.5	161	240	249	45	98	82	18.5
6	47.5	1010.07	1.08	2.75	0.16	7	161	242	250	45	98	83	18.7
5	50	1012.50	1.09	2.78	2.55	7	161	245	246	45	98	83	18.8
4	52.5	1014.87	1.06	2.71	4.92	7	161	241	249	46	99	83	19.0
3	55	1017.25	1.05	2.68	7.27	7	161	240	252	46	99	84	19.0
2	57.5	1019.47	.87	2.23	9.42	6	160	237	255	46	99	84	19.2
1	60	1021.65	.90	2.31	1.61	6	160	235	251	46	99	85	19.2
	(1049)												
	0-60	V_m - 58.35		ΔH - 2.90							Avg. - 85.5		

C-37

081194 GASTACK\WP\FORMS\5 518

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Two Harbors, MN Date 5-21-96 Test 9 Run 2
Source RTO / Inlet No. of traverse points 24
Method 5 Filter holder: Glass Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: <0.02 cfm at 10 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: 8358

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Kuehler + K. Nessmeier

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	796	495	301
Impinger No. 3			
Condenser			
Desiccant	1490	1471	19
Total			220

Integrated Gas Sampling Data:

Bag Pump No. 31B Box No. 26 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 IN.HG
Time start: 1155 (HRS) Time end: 1344 (HRS)
Sampling rate: 400 cc/min Operator: M. Kuehler

S/N of O_2 Analyzer used to monitor train outlet: 31A

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

EPA Method 5 Field Data Sheet

Job: L.P. / Two Harbors, MN
Source: RTO / Inlet
Date: 5-21-96 Test 9 Run 2

Operators: M. Koehler + K. Nuessmeier
Meter Box No. 18 ΔH@ 1.81 in.WC
Gasmeter Coeff. 1.0051

Nozzle No. 1-4
Nozzle Dia. .250 in.
Bar. Press. 28.84 in.Hg

Pitot No. 31 V-6
C_p .84
H_2O 17.8 %

Down 1207 Restart 1235

Down 1249 Restart 1308

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)
	1155	23.30											
A-12	2.5	25.84	1.20	3.16	5.04	7	163	238	232	45	82	82	16.9
11	5	28.13	1.18	3.09	8.34	7	163	241	249	47	86	82	17.0
10	7.5	30.78	1.11	2.91	0.78	6.5	164	245	243	47	88	82	16.7
9	10	33.07	.98	2.50	3.04	6	165	249	245	47	91	82	17.1
8	12.5	35.61	1.20	3.15	5.58	7	166	244	241	48	93	83	17.2
7	15	38.10	1.20	3.17	8.13	7	165	240	244	48	82	82	17.2
6	17.5	40.61	1.10	2.09	0.55	6.5	162	237	248	45	86	82	17.5
5	20	43.11	1.18	3.10	3.07	7	164	240	240	45	92	83	17.6
4	22.5	45.52	1.04	2.74	5.44	6	167	247	244	43	92	83	17.8
3	25	47.98	1.15	3.02	7.93	7	167	240	238	43	92	83	17.7
2	27.5	50.41	1.07	2.81	0.33	6.5	167	237	241	43	95	83	17.5
1	30	52.77	1.10	2.91	2.78	6.5	166	241	237	44	96	83	17.4
B-12	32.5	55.25	1.07	2.83	5.19	6.5	165	240	243	45	98	84	17.2
11	35	57.77	1.20	3.15	7.23	7	166	245	240	44	94	84	17.9
10	37.5	60.29	1.16	3.04	0.24	7	170	243	247	45	96	85	17.8
9	40	62.71	1.19	3.12	2.77	7	171	240	240	45	97	85	17.4
8	42.5	65.17	1.20	3.15	5.33	7	171	237	244	44	98	85	17.5
7	45	67.73	1.12	2.95	7.79	7	171	234	241	44	100	86	17.4
6	47.5	70.35	1.15	3.03	0.30	7	171	240	235	46	101	86	17.3
5	50	72.75	1.21	3.19	2.88	8	171	247	241	46	102	87	17.3
4	52.5	75.30	1.10	2.91	5.34	7.5	170	243	245	46	102	87	17.2
3	55	77.85	1.10	2.91	7.80	7.5	170	240	248	45	103	87	17.1
2	57.5	80.10	1.05	2.79	0.21	7	169	239	244	45	102	88	17.1
1	60	82.47	.93	2.48	2.48	6.5	167	235	244	45	102	99	16.9
	(1344)												
	0 - 60	V_m - 59.17		ΔH - 2.96							Avg. - 89.2		

081194 G:\STACK\WP\FORMS\5-518

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. / Two Harbors, MN
Source: RTO / Inlet
Test: 9 Run 3 Date 5-21-96
Stack Dimen. 54 IN.
Dry Bulb 160 °F Wet bulb 147 °F
Manometer ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 28.81 IN.HG
Static Pressure -1.35 IN.WC
Operators M. Koehler + R. Woessmann
Pitot No. 31V-6 C_p .84

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: 9 IN.		Time Start: 1547 HRS	
A-1				1.10	
2				1.05	
3				1.15	
4				1.12	
5		Refer to Run #2		1.21	
6				1.09	
7		for pts used		1.20	
8				1.23	
9				1.05	↑
10				1.21	
11				1.25	160
12				1.15	
B-1				1.07	↓
2				1.13	
3		MC ≅ 23		1.12	
4				1.12	
5		69.33 ft/sec		1.17	
6		66,163 ACFM		1.16	
7		41,675 DSCFM		1.11	
8				1.21	
9				1.17	
10				1.18	
11				1.20	
12				1.17	

Temp. Meas. Device & S/N: PDT-31 / TC — Time End: 1553 HRS

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

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP/ Two Harbors
Source Press Vents Stacks
Test 5 Run 6 Date 5-22-95
Stack Dimen. 54 x 54 2 EA IN.
Dry Bulb 84 °F Wet bulb ______ °F
Manometer ☒ Reg. ☒ Exp ☐ Elec.
Barometric Pressure 28.55 IN.HG
Static Pressure -.45 IN.WC
Operators S. Aschenbach D. Wellemen
Pitot No. 40L-5 C_p .84

* Particulate *

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
		Port Length: 4.0 IN.		Time Start: HRS	
A 1				.07	
2				.36	
3				.30	
4				.15	
B 1				.48	
2				.55	
3				.64	
4				.67	
C 1				.31	
2				.27	
3				.56	
4				.43	
D 1				.15	
2				.10	
3				.43	
4				.10	
E 1				.20	
2				.48	
3				.18	
4				.38	
F 1				.21	
2				.51	
3				.49	
4				.51	
Temp. Meas. Device & S/N:				Time End: HRS	

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

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP / Two Harbors
Source Press Vents Stack
Test ____ Run ____ Date ____
Stack Dimen. 54×54 2ea IN.
Dry Bulb ____ °F Wet bulb ____ °F
Manometer ☐ Reg. ☐Exp ☐Elec.
Barometric Pressure 28.95 IN.HG
Static Pressure ____ IN.WC
Operators B Aschenbach D Helleman
Pitot No. 40J-6 C_p .84

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
		Port Length: IN.		Time Start: HRS	
G-1				.40	
2				.51	
3				.49	
4				.50	
H 1				.15	
2				.46	
3				.24	
4				.42	
				.37	
				FT/SEC	34.35
				ACFM	41735
				DSCFM	38296
Temp. Meas. Device & S/N:				Time End: HRS	

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

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP / Two Harbors Date 5-22-95 Test 5 Run 1
Source Press Vents Stack No. of traverse points 32
Method 5 Filter holder: Glass Filter type: 4" GFF

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: .01 cfm at 9 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: (1) 7573

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

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	498	497	1
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1518	1500	18
Total			19

Integrated Gas Sampling Data:

TR1

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: ______

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

EPA Method 5 Field Data Sheet

Job: LP/Two Harbors
Source: Press Vents Stacks
Date: ____ Test 5 Run 1

Operators: BA DH
Meter Box No. 11 ΔH@ 1.80 in.WC
Gasmeter Coeff. .5990

Nozzle No. 9-4
Nozzle Dia. .245 in.
Bar. Press. 28.95 in.Hg

Pitot No. 40v-5
C_p .84
H_2O 2 %

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)
		(0950)	(526.10)											
A	1	2	526.93	.15	.52	6.91	3	97	225	247	47	57	56	20.9
	2	4	528.05	.27	.93	8.00	4	100				59	56	20.9
	3	6	529.33	.35	1.22	9.25	4	96	226	251	45	62	57	20.9
	4	8	530.10	.15	.52	0.06	3	97				64	57	20.9
B	1	10	531.92	.64	2.25	1.75	6	94	230	247	45	64	58	20.9
	2	12	533.55	.60	2.10	3.39	6	95				69	58	20.9
	3	14	535.10	.55	1.94	4.96	5.5	97	227	247	43	70	58	20.9
	4	16	536.00	.17	.60	5.84	3.5	97				71	57	20.9
C	1	18	537.37	.70	2.48	7.62	6.5	95	231	252	44	70	59	20.9
	2	20	539.55	.70	2.47	9.40	7	97				73	61	20.9
	3	22	541.25	.58	2.07	1.03	6	93	235	251	42	73	60	20.9
	4	24	542.40	.42	1.49	2.41	5	96				74	62	20.9
D	1	26	543.30	.10	.35	3.09	3	95	237	248	40	73	62	20.9
	2	28	544.66	.55	1.95	4.68	5	96				71	61	20.9
	3	30	546.36	.60	2.14	6.34	6	93	241	237	42	75	61	20.9
	4	32	547.42	.22	.78	7.34	3.5	96				74	62	20.9
E	1	34	548.86	.42	1.49	8.73	5	97	237	241	40	75	62	20.9
	2	36	550.17	.38	1.36	0.06	4.5	94				74	62	20.9
	3	38	551.54	.39	1.39	1.40	4.5	97	241	252	38	77	63	20.9
	4	40	552.32	.12	.43	2.15	3	94				78	63	20.9
F	1	42	553.72	.47	1.68	3.62	5	96	236	255	39	76	63	20.9
	2	44	555.20	.48	1.71	5.11	5	96				78	63	20.9
	3	46	556.75	.56	1.80	6.64	5.5	91	232	251	42	79	64	20.9
	4	48	557.77	.20	.71	7.61	3	96				80	64	20.9
		θ =	V_m =		ΔH =							Avg. =		

081194-G:\STACK\WP\FORMS\S-518

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: LD / Two Harbors
Source: Press Vents Stack
Date: 5-22-96 Test 5 Run 1

Operators: SA DH
Meter Box No. 11 ΔH@ 1.80 in.WC
Gasmeter Coeff. .9990

Nozzle No. 9-4
Nozzle Dia. .245 in.
Bar. Press. 28.95 in.Hg

Pitot No. 4W-6
C_p .84
H_2O 2 %

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)
B 1	50	559.30	.52	1.37	9.16	5	95	237	252	43	74	65	20.9
2	52	560.82	.54	1.94	0.75	5	93				80	66	20.9
3	54	562.29	.48	1.73	2.25	5	93	241	255	40	79	67	20.9
4	56	563.58	.35	1.26	3.53	4.5	93				80	68	20.9
A 1	58	564.99	.40	1.45	4.91	5	93	245	251	39	79	68	20.9
2	60	566.14	.25	.90	5.89	4	96				81	69	20.9
3	62	567.43	.45	1.63	7.45	5	93	239	253	41	81	69	20.9
4	64	568.43	.18	.65	8.38	3	96				81	68	20.9
	(1133)												
	θ = 64	V_m = 42.33		ΔH = 1.43							Avg. = 67.9		

C-45

08119 4-G:\STACK\WP\FORMS\S-518

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/ Two Harbors Date 5-22-94 Test 5 Run 2
Source Press Vents Stack No. of traverse points 32
Method 5 Filter holder: Glass Filter type: 4" OFF

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: 0.0 cfm at 10 IN. HG (vac) ☑

Particulate Catch Data:

No. of filters used: (1) ~~7484~~ 7974

Recovery solvent(s)

☑acetone
☐other(s)

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	504	499	5
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1424	1410	14
Total	░░░░░░		19

Integrated Gas Sampling Data:

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: ______

052394-G:\STACK\WP\FORMS\5-0046RR

EPA Method 5 Field Data Sheet

Job: IP / Two Harbors
Source: Press Vent Stack
Date: 5-22-95 Test 5 Run 2

Operators: SA DN
Meter Box No. 11 ΔH@ 1.80 in.WC
Gasmeter Coeff. .9990

Nozzle No. 9-4
Nozzle Dia. .245 in.
Bar. Press. 28.55 in.Hg

Pitot No. 40U-5
C_p .84
H_2O 2 %

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)
	(1021)	(568.80)											
H 1	2	570.26	.42	1.50	0.19	5	95	237	252	46	67	66	20.9
2	4	571.42	.28	.99	1.32	4	95				68	66	20.9
3	6	572.79	.45	1.59	2.75	5	97	241	255	45	73	67	20.9
4	8	573.64	.15	.53	3.57	3	96				75	66	20.9
G-1	10	575.14	.48	1.72	5.08	5	96	237	257	45	75	67	20.9
2	12	576.63	.49	1.75	6.59	5	97				78	67	20.9
3	14	578.06	.42	1.51	7.99	5	96	242	251	43	79	67	20.9
4	16	579.41	.41	1.47	9.37	5	97				79	68	20.9
F-1	18	580.85	.45	1.61	0.82	5	96	243	253	42	78	69	20.9
2	20	582.37	.48	1.72	2.32	5.5	99				81	69	20.9
3	22	583.92	.51	1.83	3.87	5.5	97	241	256	42	81	65	20.9
4	24	585.35	.45	1.63	5.33	5	94				79	69	20.9
E-1	26	586.66	.33	1.19	6.57	4	95	245	253	41	81	69	20.9
2	28	587.84	.23	.82	7.61	4	101				82	70	20.9
3	30	589.04	.38	1.37	8.55	5	98	245	257	43	82	70	20.9
4	32	589.82	.15	.53	9.79	3	102				83	70	20.9
D-1	34	590.60	.10	.36	0.48	3	100	243	251	42	81	70	20.9
2	36	592.00	.52	1.87	2.05	5.5	97				80	71	20.9
3	38	593.47	.45	1.66	3.49	5	103	246	256	40	83	70	20.9
4	40	594.38	.15	.54	4.34	3	99				83	70	20.9
C-1	42	595.98	.54	1.94	5.93	6	99	245	260	42	82	70	20.9
2	44	597.67	.60	2.14	7.61	6	102				84	70	20.9
3	46	599.29	.53	1.91	9.19	6	98	243	255	40	84	70	20.9
4	48	600.44	.25	.89	0.27	4	103				84	70	20.9
	θ =	V_m =		ΔH = 1.39							Avg. = 74.9		

08119-G:\STACK\WP\FORMS\S-518

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: LP/ Two Harbors
Source: Press Unit Stack
Date: 5-22-96 Test 5 Run 2

Operators: SA DH
Meter Box No.: 11 ΔH@ 1.80 in.WC
Gasmeter Coeff.: .9990

Nozzle No.: 9-4
Nozzle Dia.: .245 in.
Bar. Press.: 28.95 in.Hg

Pitot No.: 40U-5
C_p: .84
H_2O: 2 %

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)
B-1	56	602.18	.63	2.24	2.06	6.5	100	243	251	42	82	71	20.9
2	52	603.92	.65	2.33	3.74	6.5	99				85	71	20.9
3	54	605.35	.50	1.80	5.28	6	101	245	247	41	85	72	20.9
4	56	606.62	.35	1.26	6.57	5	101				84	71	20.9
A-1	58	607.63	.20	.72	7.54	3.5	100	243	251	40	84	72	20.9
2	60	608.80	.28	1.01	8.69	4	100				83	72	20.9
3	62	610.17	.40	1.43	0.07	5	102	250	254	42	85	72	20.9
4	64	611.03	.15	.53	0.91	3	104				85	72	20.9
	(1340)												
	θ = 64	V_m = 42.23		ΔH = 1.39							Avg. = 74.9		

C-48

081194-G:\STACK\WP\FORMS\S-518

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/ Two Harbors Date 5-22-96 Test 5 Run 2
Source Press Vents Stack No. of traverse points 32
Method 5 Filter holder: Glass Filter type: 4" GFF

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0.0 cfm at 10 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: (1) ~~7994~~ 7181
Recovery solvent(s)
☒ acetone
☐ other(s)

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	505	498	7
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1528	1518	10
Total			17

Integrated Gas Sampling Data:

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: ______

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

INTERPOLL LABORATORIES, INC.

(612) 786-6020

EPA Method 5 Field Data Sheet

Job CP / Two Harbors
Source Press Vent Stack
Date 5-22-96 Test 5 Run 3

Operators BA BH
Meter Box No. 11 ΔH@ 1.86 in.WC
Gasmeter Coeff. .9990

Nozzle No. 9-4
Nozzle Dia. .245 in.
Bar. Press. 28.95 in.Hg

Pitot No. 10u-5
C_p .84
H_2O 2 %

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)
	(1425)	(611.30)											
A-1	2	612.40	.23	.82	2.33	3	100	250	248	35	75	72	20.9
2	4	613.45	.21	.75	3.32	3	101				77	72	20.9
3	6	614.76	.39	1.40	4.68	4	95	248	250	36	79	72	20.9
4	8	615.82	.10	.35	5.36	3	103				80	72	20.9
B-1	10	617.30	.74	2.36	7.06	3	89	251	247	38	72	71	20.9
2	12	618.97	.70	2.48	9.04	5	101				74	71	20.9
3	14	620.40	.50	1.78	0.56	5	100	247	251	39	81	72	20.9
4	16	621.80	.35	1.26	1.85	4.5	100				81	72	20.9
C-1	18	622.87	.20	.72	2.82	3	100	247	253	42	80	72	20.9
2	20	624.51	.60	2.16	4.50	6	98				80	72	20.9
3	22	626.20	.55	1.97	6.10	6	100	251	255	41	83	73	20.9
4	24	627.60	.35	1.25	7.39	4.5	102				84	73	20.9
D-1	26	628.13	.10	.36	8.08	3	100	249	253	40	81	72	20.9
2	28	629.38	.34	1.22	9.35	4	101				81	73	20.9
3	30	630.50	.25	.90	0.43	3.5	100	247	256	42	83	73	20.9
4	32	631.29	.13	.46	1.22	3	102				83	73	20.9
E-1	34	632.70	.40	1.44	2.59	4	101	250	261	41	82	72	20.9
2	36	633.76	.24	.86	3.66	3	102				84	72	20.9
3	38	635.17	.45	1.63	5.12	4.5	98	246	256	43	84	72	20.9
4	40	636.24	.22	.79	6.14	3	104				85	73	20.9
F-1	42	637.67	.45	1.62	7.60	5	102	248	255	41	85	73	20.9
2	44	639.18	.48	1.75	9.12	5	95				85	73	20.9
3	46	640.70	.50	1.82	0.66	5	96	247	253	42	86	73	20.9
4	48	641.99	.30	1.09	1.86	4	96				86	74	20.9
	θ =	V_m =		ΔH =							Avg. =		

08119-I-G:\STACK\WP\FORMS\S-518

INTERPOLL LABORATORIES, INC.
(61[redacted]6-60[redacted]

EPA Method 5 Field Data Sheet

Job: LP/ Two Harbors
Source: Press Vent STACK
Date: 5-22-9C Test 5 Run 3

Operators: SA DH
Meter Box No.: 11 ΔH@ 1.80 in.WC
Gasmeter Coeff.: .9990

Nozzle No.: 9-4
Nozzle Dia.: .245 in.
Bar. Press.: 28.55 in.Hg

Pitot No.: 40-5
C_p: .84
H_2O: ~~3~~ 2 %

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)
G-1	50	643.45	.48	1.73	3.37	5	101	247	256	43	84	74	20.9
2	52	644.97	.50	1.81	4.92	5	99				86	74	20.9
3	54	646.50	.49	1.79	6.45	5	95	253	260	41	86	75	20.9
4	56	647.98	.45	1.63	2.92	5	88				86	74	20.9
H-1	58	649.17	.27	.97	9.06	4	100	247	256	40	84	75	20.9
2	60	650.30	.25	.91	0.15	3.5	85				86	75	20.9
3	62	651.17	.15	.54	1.01	3	97	247	253	42	86	75	20.9
4	64	652.45	.40	1.45	2.39	4	97				85	75	20.9
	(1600)												
	0-64	V_m = 41.15		ΔH = 1.33							Avg. = 77.6		

08119-GASTACK\WP\FORMS\S-518

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Method Used (Circle One): (Method 9 circled) 203A 203B Other: ____

Form Number	Page 1 Of 1
Continued on VEO Form Number	

Company Name: Louisiana-Pacific

Facility Name: Two Harbors

Street Address:

City: Two Harbors | State: MN | Zip:

Process: Press vent Stack	Unit #	Operating Mode
Control Equipment		Operating Mode

Describe Emission Point:

Height of Emiss. Pt. Start End	Height of Emiss. Pt. Rel. to Observer Start End
Distance to Emiss. Pt. Start End	Direction to Emiss. Pt. (Degrees) Start End

Vertical Angle to Obs. Pt. Start End	Direction to Obs. Pt. (Degrees) Start End

Distance and Direction to Observation Point from Emission Point: Start End

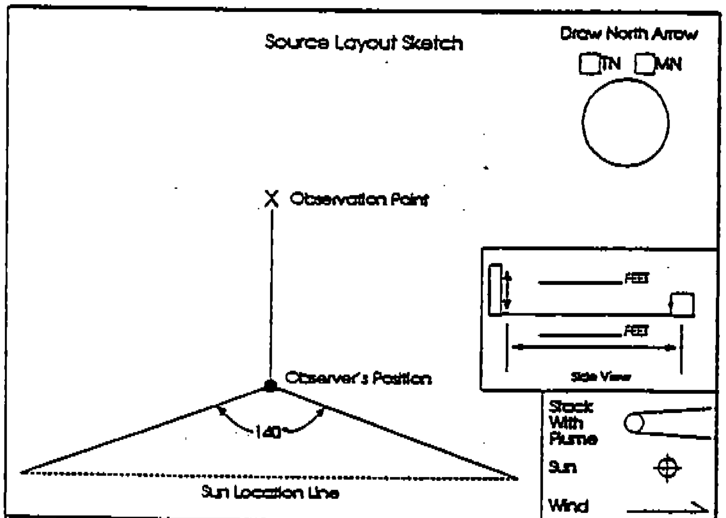
Describe Emissions: Start End

Emission Color Start End	Water Droplet Plume Attached ☐ Detached ☐ None ☐

Describe Plume Background: Start End

Background Color Start End	Sky Conditions Start End	
Wind Speed Start End	Wind Direction Start End	
Ambient Temp. Start End	Wet Bulb Temp.	RH Percent

Source Layout Sketch



Longitude	Latitude	Declination

Additional Information: Unable to do V.E. readings because of the overcast weather.

VEOF1.1

Observation Date	Time Zone	Start Time	End Time
5-22-96			

Min \ Sec	0	15	30	45	Comments
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

Observer's Name (Print): Mark Petersen

Observer's Signature: [signature] | Date: 5/22/96

Organization: Interpoll Laboratories, Inc.

Certified By: Eastern Technical Associates | Date: 4-3-96

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Mark Petersen

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

President	252753 **Certificate Number**
Vice President	Minneapolis, Minnesota **Location**
Program Manager	April 3, 1996 **Date of Issue**

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP TWO HARBORS
Team Leader: DVH
Date Submitted: 5-22-96
Test No.: 3
Date of Analysis: 6-4-96
Source: DRYER RTO
Test Site: STACK
Date of Test: 5/22/96
No. of Runs Completed: 3
Technician: SB

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After 0_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_0
3/1	7712-21	1	0	3.0	19.5	3.0	16.5	1.47
		2	0	3.0	19.5	3.0	16.5	1.47
	☐B☐F	Avg				3.0	16.5	
3/2	7712-22	1	0	3.0	19.6	3.0	16.6	1.43
		2	0	3.0	19.6	3.0	16.6	1.43
	☐B☐F	Avg				3.0	16.6	
3/3	7712-23	1	0	3.0	19.7	3.0	16.7	1.40
		2	0	3.0	19.7	3.0	16.7	1.40
	☐B☐F	Avg				3.0	16.7	
		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: CP TWO HARBORS
Team Leader: BA
Date Submitted: 5-21-96
Test No.: 7
Date of Analysis: 6-4-96

Source: PRIMARY CYCLONE
Test Site: OUTLET
Date of Test: 5-21-96
No. of Runs Completed: 3
Technician: SB

Test/ Run	Sample Log No. 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
7/1	7712	1	0	3.9	19.9	3.9	16.0	1.26
	32	2	0	3.9	19.9	3.9	16.0	1.26
	☐B☐F	Avg				3.9	16.0	
7/2	7712	1	0	4.4	19.7	4.4	15.3	1.27
	33	2	0	4.4	19.7	4.4	15.3	1.27
	☐B☐F	Avg				4.4	15.3	
7/3	7712	1	0	3.8	19.8	3.8	16.0	1.29
	34	2	0	3.8	19.8	3.8	16.0	1.29
	☐B☐F	Avg				3.8	16.0	
		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: MK
Date Submitted: 5-21-96
Test No.: 9
Date of Analysis: 6-4-96

Source: RTO
Test Site: INLET
Date of Test: 5-21-96
No. of Runs Completed: 3
Technician: SB

Test/ Run	Sample Log No. 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
9/1	7712 47	1	0	2.2	19.8	2.2	17.6	1.5
		2	0	2.2	19.8	2.2	17.6	1.5
	☐B☐F	Avg				2.2	17.6	
9/2	7712 48	1	0	2.9	19.9	2.9	17.0	1.34
		2	0	2.9	19.9	2.9	17.0	1.34
	☐B☐F	Avg				2.9	17.0	
9/3	7712 49	1	0	3.4	19.9	3.4	16.5	1.29
		2	0	3.4	19.9	3.4	16.5	1.29
	☐B☐F	Avg				3.4	16.5	
		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: M K
Date Submitted: 5-22-96
Test No.: 10
Date of Analysis: 6-4-96

Source: ETUBE
Test Site: OUTLET
Date of Test: 5-22-96
No. of Runs Completed: 3
Technician: SS

Test/ Run	Sample Log No. 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_0
10/1	7712	1	0	3.6	19.8	3.6	16.2	1.31
		2	0	3.6	19.8	3.6	16.2	1.31
	☐B☐F	Avg				3.6	16.2	
10/2	7712	1	0	3.4	19.8	3.4	16.4	1.32
		2	0	3.4	19.8	3.4	16.4	1.32
	☐B☐F	Avg				3.4	16.4	
10/3	7712	1	0	3.4	19.9	3.4	16.5	1.29
		2	0	3.4	19.9	3.4	16.5	1.29
	☐B☐F	Avg				3.4	16.5	
		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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INTERPOLL LABORATORIES, INC.

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Impinger Catch Data Reporting Sheet

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

Job	LP / Two Harbors	Source/Site	RTO Dryer / Stack
Date Submitted	5-21-96	Test No.	1
Date of Analysis	5-30-96	Technician	B.J.

	Solvent Phase	Aqueous Phase
Test: 1 Run: 0	Dish No: 100	Dish No:
Log No: 7712-01I	Dish + Sample Wt: 45.9694 g	Dish + Sample Wt: g
Color & Appearance:	Dish Tare Wt: 45.9694 g	Dish Tare Wt: g
	Fraction Wt: 0.0000 g	Fraction Wt: g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor 1.000	Smpl Vol: ml, Alqt: ml, Factor:
	Sample Wt: 0.0000 g	Sample Wt: g
Test: 1 Run: 1	Dish No: 209	Dish No:
Log No: -02 I	Dish + Sample Wt: 43.2130 g	Dish + Sample Wt: g
Color & Appearance:	Dish Tare Wt: 43.2115 g	Dish Tare Wt: g
	Fraction Wt: 0.0015 g	Fraction Wt: g
Comments:	Smpl Vol: 390 ml, Alqt: 390 ml, Factor 1.000	Smpl Vol: ml, Alqt: ml, Factor
	Sample Wt: 0.0015 g	Sample Wt: g
Test: 1 Run: 2	Dish No: 407	Dish No:
Log No: -03 I	Dish + Sample Wt: 47.9958 g	Dish + Sample Wt: g
Color & Appearance:	Dish Tare Wt: 47.9942 g	Dish Tare Wt: g
	Fraction Wt: 0.0016 g	Fraction Wt: g
Comments:	Smpl Vol: 420 ml, Alqt: 420 ml, Factor 1.000	Smpl Vol: ml, Alqt: ml, Factor
	Sample Wt: 0.0016 g	Sample Wt: g
Test: 1 Run: 3	Dish No: 520	Dish No:
Log No: -04 I	Dish + Sample Wt: 48.5303 g	Dish + Sample Wt: g
Color & Appearance:	Dish Tare Wt: 48.5300 g	Dish Tare Wt: g
—	Fraction Wt: 0.0003 g	Fraction Wt: g
Comments:	Smpl Vol: 400 ml, Alqt: 400 ml, Factor 1.000	Smpl Vol: ml, Alqt: ml, Factor
	Sample Wt: 0.0003 g	Sample Wt: g

Note: Factor = Sample Volume/Aliquot Volume

Blank Solvent Wt. 0.0000 g

✓SAB

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Phase g	0.0000	0.0015	0.0016	0.0003
Results of Aqueous Phase g				

INTERPOLL LABORATORIES, INC.
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Solvent Rinse Data Reporting Sheet

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

Job: L.P. TWO HARBORS
Source/Site: DRYER RTO STACK
Date Submitted:
Test No.: 1
Date of Analysis: 6-3-96
Technician: SLB

Transport Leakage ☐ None ☑ ______ ml
Solvent: ______

Test: 1	Run: 0	Dish No: 793	
Log No: 7712 - 01P		Dish + Sample Wt: 45.9584	g
Volume of Solvent	160 ml	Dish Tare Wt: 45.9581	g
*Solvent Residue	ug/ml	Sample Wt: .0003	g
Test: 1	Run: 1	Dish No: 879	
Vol. of Solvent	80 ml	Dish + Sample Wt: 38.6612	g
Log Number -027		Dish Tare Wt: 38.6585	g
Comments		Sample Wt: .0027	g
Test: 1	Run: 2	Dish No: 825	
Vol. of Solvent	70 ml	Dish + Sample Wt: 38.9955	g
Log Number -037		Dish Tare Wt: 38.9898	g
Comments		Sample Wt: .0057	g
Test: 1	Run: 3	Dish No: 103	
Vol. of Solvent	60 ml	Dish + Sample Wt: 46.8815	g
Log Number -047		Dish Tare Wt: 46.8709	g
Comments		Sample Wt: .0106	g

*Solvent Residue 1.88 ug/ml = [(Sample Wt. .0003 g) (10^6)]/Vol. of Sol. 160 ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

√SLV

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Rinse g	.0003	.0026	.0056	.0105

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Filter Gravimetrics Reporting Sheet

Fiter Type: ☒ EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other ____________

Job	LP/TWO HARBORS	Source/Site	DRYER RTO STACK
Date Submitted		Test No.	1
Date of Analysis	6-3-96	Technician	SLR

Test: 1	Run: 0	Filter No:	8556
Field Blank:		Filter Type:	4" G.F.
Log No: 7712 - 01F		Filter + Sample Wt:	.9638 g
Color: WHITE		Filter Tare Wt:	.9634 g
		Sample Wt:	.0004 g
Test: 1	Run: 1	Filter No:	8554
Log No: -02F		Filter Type:	4" G.F.
Color: LT TAN		Filter + Sample Wt:	.9734 g
		Filter Tare Wt:	.9689 g
		Sample Wt:	.0045 g
Test: 1	Run: 2	Filter No:	8555
Log No: -03F		Filter Type:	4" G.F.
Color: LT TAN		Filter + Sample Wt:	~~.908~~ .9715 g
		Filter Tare Wt:	.9699 g
		Sample Wt:	.0016 g
Test: 1	Run: 3	Filter No:	8505
Log No: -04F		Filter Type:	4" G.F.
Color: LT TAN		Filter + Sample Wt:	.9627 g
		Filter Tare Wt:	.9608 g
		Sample Wt:	.0019 g

VSW

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Filter Analysis g	.0004	.0045	.0016	.0019

	RUN	RUN	RUN	RUN
Total Mass g				

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Impinger Catch Data Reporting Sheet

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

Job: LP/Two Harbors
Source/Site: Press Vent / Stack
Date Submitted: 5-23-96
Test No.: 5
Date of Analysis: 5-30-96
Technician: B.O.

	Solvent Phase	Aqueous Phase
Test: 5 Run: 0	Dish No: 306	Dish No:
Log No: 7712-24I	Dish + Sample Wt: 42.8360 g	Dish + Sample Wt: g
Color & Appearance:	Dish Tare Wt: 42.8360 g	Dish Tare Wt: g
	Fraction Wt: 0.0000 g	Fraction Wt: g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor: 1.000	Smpl Vol: ml, Alqt: ml, Factor:
	Sample Wt: 0.0000 g	Sample Wt: g
Test: 5 Run: 1	Dish No: 310	Dish No:
Log No: -25I	Dish + Sample Wt: 45.0660 g	Dish + Sample Wt: g
Color & Appearance:	Dish Tare Wt: 45.0643 g	Dish Tare Wt: g
	Fraction Wt: 0.0017 g	Fraction Wt: g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor 1.000	Smpl Vol: ml, Alqt: ml, Factor
	Sample Wt: 0.0017 g	Sample Wt: g
Test: 5 Run: 2	Dish No: 311	Dish No:
Log No: -26I	Dish + Sample Wt: 43.8143 g	Dish + Sample Wt: g
Color & Appearance:	Dish Tare Wt: 43.8128 g	Dish Tare Wt: g
	Fraction Wt: 0.0015 g	Fraction Wt: g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor 1.000	Smpl Vol: ml, Alqt: ml, Factor
	Sample Wt: 0.0015 g	Sample Wt: g
Test: 5 Run: 3	Dish No: 374	Dish No:
Log No: -27I	Dish + Sample Wt: 46.1676 g	Dish + Sample Wt: g
Color & Appearance:	Dish Tare Wt: 46.1663 g	Dish Tare Wt: g
	Fraction Wt: 0.0013 g	Fraction Wt: g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor 1.000	Smpl Vol: ml, Alqt: ml, Factor
	Sample Wt: 0.0013 g	Sample Wt: g

Note: Factor = Sample Volume/Aliquot Volume

Blank Solvent Wt. 0.0000 g

Vgb

		RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Phase	g	0.0000	0.0017	0.0015	0.0013
Results of Aqueous Phase	g				

INTERPOLL LABORATORIES, INC.
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Solvent Rinse Data Reporting Sheet

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

Job: LP TWO HARBORS
Date Submitted:
Date of Analysis: 6-3-96
Source/Site: PRESS VENT STACK
Test No.: 5
Technician: SLB

Transport Leakage ☐ None ☑ ____ ml
Solvent: ACETONE

Test: 5 Run: 0	Dish No: 803
Log No: 7712-247	Dish + Sample Wt: 41.4455 g
Volume of Solvent 90 ml	Dish Tare Wt: 41.4450 g
*Solvent Residue ug/ml	Sample Wt: .0005 g
Test: 5 Run: 1	Dish No: 6
Vol. of Solvent 80 ml	Dish + Sample Wt: 37.6110 g
Log Number -257	Dish Tare Wt: 37.6066 g
Comments	Sample Wt: .0044 g
Test: 5 Run: 2	Dish No: 849
Vol. of Solvent 90 ml	Dish + Sample Wt: 46.5400 g
Log Number -267	Dish Tare Wt: 46.5312 g
Comments	Sample Wt: .0088 g
Test: 5 Run: 3	Dish No: 767
Vol. of Solvent 70 ml	Dish + Sample Wt: 42.4168 g
Log Number -277	Dish Tare Wt: 42.4098 g
Comments	Sample Wt: .0070 g

*Solvent Residue 5.56 ug/ml = [(Sample Wt. .0005 g) (10^6)]/Vol. of Sol. 90 ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

√SV

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Rinse	0.0005	.0040	.0083	.0066

INTERPOLL LABORATORIES, INC.
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Filter Gravimetrics Reporting Sheet

Fiter Type: ☑ EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other ________

Job	LP/TWO HARBORS	Source/Site	PRESS VENT STACK
Date Submitted		Test No.	5
Date of Analysis	6-3-96	Technician	SLB

Test: 5	Run: 0	Filter No: 7180
Field Blank:		Filter Type: 4" G.F.
Log No: 7712-24F		Filter + Sample Wt: .9380 g
Color: WHITE		Filter Tare Wt: .9376 g
		Sample Wt: .0004 g
Test: 5	Run: 1	Filter No: 7973
Log No: -25F		Filter Type: 4" G.F.
Color: LT. TAN		Filter + Sample Wt: .9644 g
		Filter Tare Wt: .9599 g
		Sample Wt: .0045 g
Test: 5	Run: 2	Filter No: 7974
Log No: -26F		Filter Type: 4" G.F.
Color: LT TAN		Filter + Sample Wt: .9651 g
		Filter Tare Wt: .9621 g
		Sample Wt: .0030 g
Test: 5	Run: 3	Filter No: 7181
Log No: -27F		Filter Type: 4" G.F.
Color: LT TAN		Filter + Sample Wt: .9363 g
		Filter Tare Wt: .9312 g
		Sample Wt: .0051 g

V SLB

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Filter Analysis g	.0004	.0045	.0030	.0051

	RUN	RUN	RUN	RUN
Total Mass g				

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INTERPOLL LABORATORIES, INC.

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Impinger Catch Data Reporting Sheet

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

Job: LP/Two Harbors
Source/Site: Dryer RTO / Stack
Date Submitted: 5-23-96
Test No.: 3
Date of Analysis: 5-30-96
Technician: B.L.

	Solvent Phase	Aqueous Phase
Test: 3 Run: 0	Dish No: 328	Dish No: 777
Log No: 9712-17I	Dish + Sample Wt: 41.9686 g	Dish + Sample Wt: 44.9752 g
Color & Appearance:	Dish Tare Wt: 41.9686 g	Dish Tare Wt: 44.9750 g
	Fraction Wt: 0.0000 g	Fraction Wt: 0.0002 g
Comments:	Smpl Vol: 200 ml, Alqt: 150 ml, Factor: 1.333	Smpl Vol: 200 ml, Alqt: 150 ml, Factor: 1.333
	Sample Wt: 0.0000 g	Sample Wt: 0.0003 g
Test: 3 Run: 1	Dish No: 618	Dish No: 850
Log No: -18I	Dish + Sample Wt: 46.5727 g	Dish + Sample Wt: 44.5695 g
Color & Appearance:	Dish Tare Wt: 46.5702 g	Dish Tare Wt: 44.5650 g
	Fraction Wt: 0.0025 g	Fraction Wt: 0.0045 g
Comments:	Smpl Vol: 360 ml, Alqt: 310 ml, Factor 1.161	Smpl Vol: 360 ml, Alqt: 310 ml, Factor 1.161
	Sample Wt: 0.0029 g	Sample Wt: 0.0052 g
Test: 3 Run: 2	Dish No: 871	Dish No: 860
Log No: -19I	Dish + Sample Wt: 48.7999 g	Dish + Sample Wt: 47.1645 g
Color & Appearance:	Dish Tare Wt: 48.7994 g	Dish Tare Wt: 47.1627 g
	Fraction Wt: 0.0005 g	Fraction Wt: 0.0018 g
Comments:	Smpl Vol: 365 ml, Alqt: 315 ml, Factor 1.159	Smpl Vol: 365 ml, Alqt: 315 ml, Factor 1.159
	Sample Wt: 0.0006 g	Sample Wt: 0.0021 g
Test: 3 Run: 3	Dish No: 900	Dish No: 862
Log No: -20I	Dish + Sample Wt: 40.3401 g	Dish + Sample Wt: 47.9462 g
Color & Appearance:	Dish Tare Wt: 40.3391 g	Dish Tare Wt: 47.9446 g
	Fraction Wt: 0.0010 g	Fraction Wt: 0.0016 g
Comments:	Smpl Vol: 360 ml, Alqt: 310 ml, Factor 1.161	Smpl Vol: 360 ml, Alqt: 310 ml, Factor 1.161
	Sample Wt: 0.0012 g	Sample Wt: 0.0019 g

Note: Factor = Sample Volume/Aliquot Volume

Blank Solvent Wt. 0.0000 g

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Phase g	0.0000	0.0029	0.0006	0.0012
Results of Aqueous Phase g	0.0003	0.0049	0.0018	0.0016

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Solvent Rinse Data Reporting Sheet

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

Job	LP-TWO HARBORS	Source/Site	DRYER RTO STACK
Date Submitted		Test No.	3
Date of Analysis	6-3-96	Technician	SCB
Transport Leakage☐	None☒ ____ ml	Solvent	ACETONE

Test: 3	Run: 0	Dish No: 13	
Log No: 7712-17P		Dish + Sample Wt: 45.9362	g
Volume of Solvent	100 ml	Dish Tare Wt: 45.9360	g
*Solvent Residue	ug/ml	Sample Wt: .0002	g
Test: 3	Run: 1	Dish No: 323	
Vol. of Solvent	45 ml	Dish + Sample Wt: 49.8187	g
Log Number -18P		Dish Tare Wt: 49.8115	g
Comments		Sample Wt: .0072	g
Test: 3	Run: 2	Dish No: 321	
Vol. of Solvent	30 ml	Dish + Sample Wt: 42.5006	g
Log Number -19P		Dish Tare Wt: 42.4943	g
Comments		Sample Wt: .0063	g
Test: 3	Run: 3	Dish No: 320	
Vol. of Solvent	30 ml	Dish + Sample Wt: 44.3945	g
Log Number -20P		Dish Tare Wt: 44.~~50~~ 3912	g
Comments		Sample Wt: .0033	g

*Solvent Residue 2.00 ug/ml = [(Sample Wt. .0002 g) (10^6)]/Vol. of Sol. 100 ml

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

VSLV

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Rinse g	.0002	.0071	.0062	.0032

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(612) 786-6020

Filter Gravimetrics Reporting Sheet

Fiter Type: ☑ EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other ______

Job	LP/TWO HARBORS	Source/Site	DRYER RTO STACK
Date Submitted		Test No.	3
Date of Analysis	6-3-96	Technician	SCB

Test: 3	Run: 0	Filter No: 6548	
Field Blank:		Filter Type: 2.5" G.F	
Log No: 7712-17F		Filter + Sample Wt: .2643	g
Color:		Filter Tare Wt: .2637	g
		Sample Wt: .0006	g
Test: 3	Run: 1	Filter No: 6545	
Log No: -18F		Filter Type: 2.5" G.F.	
Color:		Filter + Sample Wt: .2535	g
		Filter Tare Wt: .2530	g
		Sample Wt: .0005	g
Test: 3	Run: 1	Filter No: 6540	
Log No: -19F		Filter Type: 2.5" GF.	
Color:		Filter + Sample Wt: .2630	g
		Filter Tare Wt: .2616	g
		Sample Wt: .0014	g
Test: 3	Run: 2	Filter No: 6546	
Log No: -20F		Filter Type: 2.5" G.F.	
Color:		Filter + Sample Wt: .2591	g
		Filter Tare Wt: .2585	g
		Sample Wt: .0006	g

VSW

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Filter Analysis g	.0006	.0005	.0014	.0006

	RUN	RUN	RUN	RUN
Total Mass g		.0154	.0100	.0066

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: TPW   Date of Analysis: 5/31/96

Job: IDavo/LP Two Harbors   Source: Dryer RTO   Site: STACK

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	ml/min	12.5 mM Sulfuric Acid
✓	AS4A	2 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH		Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
Imp. Catch T3R0	7712-17	200	1	0.040	8.0	1.7×10^{-4}
↓ T3R1	↓ 18	360	1	0.288	104	2.2×10^{-3}
T3R2	19	365	1	0.036	13	2.7×10^{-4}
T3R3	20	360	1	<0.025	<9.0	$<1.9 \times 10^{-4}$

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

REVIEWED
JUN - 4 1996
Gregg W. Holm LEC-08RR

	A	B	C	D	E	F	G	H	I	J
1	EPA Method 202 Calculations						Report No. 6-7712			
2	Job:	**Louisiana Pacific Corporation-Two Harbors**								
3	Date:	22-May-96								
4										**ENTER IN**
5		Vic	Sulfate	Mc	Mr	Mi	Mo	Mb	CPM	**COMPUTER**
6	RUN	(ml)	(mg/ml)	(mg)	(mg)	(mg)	(mg)	(mg)	(mg)	**(g)**
7	1	360	2.88E-04	0.019	5.2	5.18	2.9	0.3	7.78	0.0078
8	2	365	3.60E-05	0.002	2.1	2.10	0.6	0.3	2.40	0.0024
9	3	260	0.00E+00	0.000	1.9	1.90	1.2	0.3	2.80	0.0028
10										
11										
12	**EPA Method 201A/202 Totals**									
13										
14		Probe	Filter	CPM	Total					
15	RUN	(mg)	(mg)	(mg)	(mg)					
16	1	7.1	0.5	7.78	15.38092					
17	2	6.2	1.4	2.40	9.997582					
18	3	3.2	0.6	2.80	6.6					

INTERPOLL LABORATORIES INC.

Formaldehyde Results Using EPA Method 0011
For Dept. 20/LP Two Harbors
Collected 5/22/96

	Field Spike #1			Test: 2		Source: Dryer RTO Stack	
	Actual	Found	% Recovery	Run 0	Run 1	Run 2	Run 3
Log #		(7712-09)		(7712-08)	(7712-10)	(7712-11)	(7712-12)
Mass (ug)*	750	670	89.3	11	830	560	640

Reviewed by:

David J. Schneider, Manager
Chemistry Department

INTERPOLL LABORATORIES INC.

Methane Result By EPA Method 25
For Dept. 20/ LP Two Harbors
Collected 5/21/96

	Test 1			Dryer RTO Stack
	Run 0	Run 1	Run 2	Run 3
Log #		7712-05	7712-06	7712-07
Test Date		5/21/96	5/21/96	5/21/96
Methane		**< 1**	**< 1**	**< 1**

Reviewed by:

David J. Schneider

David J. Schneider, Manager
Chemistry Department

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L.P. Two Harbors Source: RTO DRYER Site: STACK Log No.: 7712
Field Engineer: Dort Date of Test: 5/21/96 Test No.: 1 No. of Runs: 3

No. Items	Sample Type	Analysis	Sequence No.	Comments
4	**Probe Wash:** ☑ Acetone ☐ DI Water ☐ $MeCl_2$ ☐ ______	☑ EPA M-5 ☐ EPA M-201A ☐ EPA M-29 ☐ ______		
4	**Filter:** ☑ 4" Glass ☐ Pallflex ☐ SS Thimble ☐ 2.5" Glass	☑ EPA M-5 ☐ EPA M-17 ☐ EPA M-29 ☐ EPA M-201A		
4	**Impingers:** ☑ DI Water ☐ H_2SO_4 ☐ 3% H_2O_2 ☐ HNO_3/H_2O_2 ☐ 1N NaOH ☐ $KMnO_4/H_2SO_4$ ☐ 2,4-DNPH ☐ ______	☑ MN Protocol ☐ IA Protocol ☐ WI Protocol ☐ Formaldehyde ☐ EPA M-202 ☐ EPA M-29 ☐ EPA M6,8 ☐ EPA M-26 ☐ Acid Gases ☐ ______		
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
Duane Van Hoven (signature)	Chad (signature) / Interpoll 1000	5/21/96

D-18

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L.P. Two Harbors
Field Engineer: Dust
Source: DRYER RTO
Date of Test: 5/22/96
Site: Stack
Test No.: 2
Log No.: 7712
No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
3	**Probe Wash:** ☐ Acetone ☒ $MeCl_2$	☒ DI Water ☐ ___	☐ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☒ 0011		
	Filter: ☐ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☐ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
5	**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 ☒ 0011		1 Blank 1 Spike 3 Runs
3	**Integrated Gas:** ☒ Tedlar Bag	☐ ___	☒ EPA M-3 ☒ Methane	☐ 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
Duane Van Hoever	[signature] / Interpoll 1000	5/23/96

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L.P Two Harbors Source: DRYER RTO Site: STACK Log No.: 7712
Field Engineer: D. VAN HOEVEN Date of Test: 5/22/96 Test No.: 3 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 ☐ ____			ULTIMATE
1	**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
Duane Van Hoever (signature)	(signature) / Interpoll	1000	5/23/96

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: cPl Two Harbors
Source: Press Vent
Site: Stack
Log No.: 7712
Field Engineer: B-S
Date of Test: 5-22-96
Test No.: 5
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 ☐ ____		
[illegible]	**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
[signature] / Interpoll	[signature] / Interpoll	5/23/96 0830

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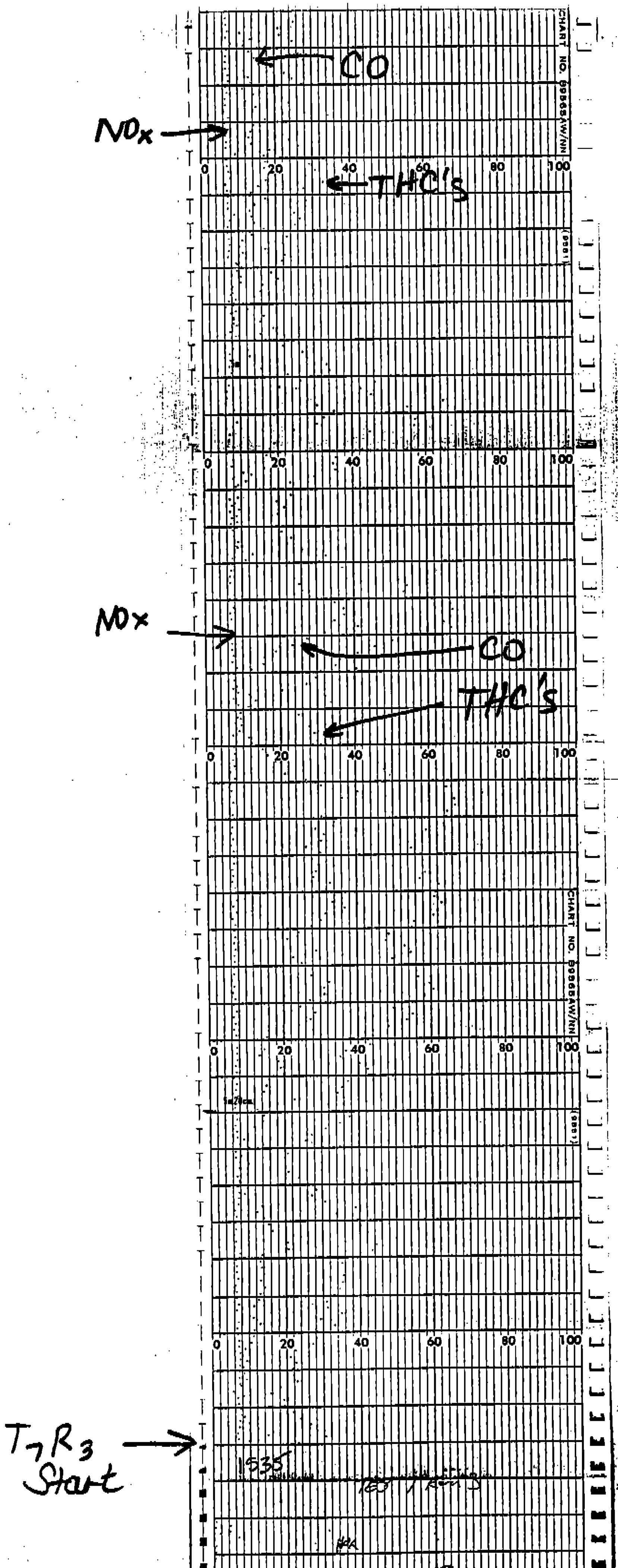


LP-Two Harbors
5-21-96
Primary cyclone outlet

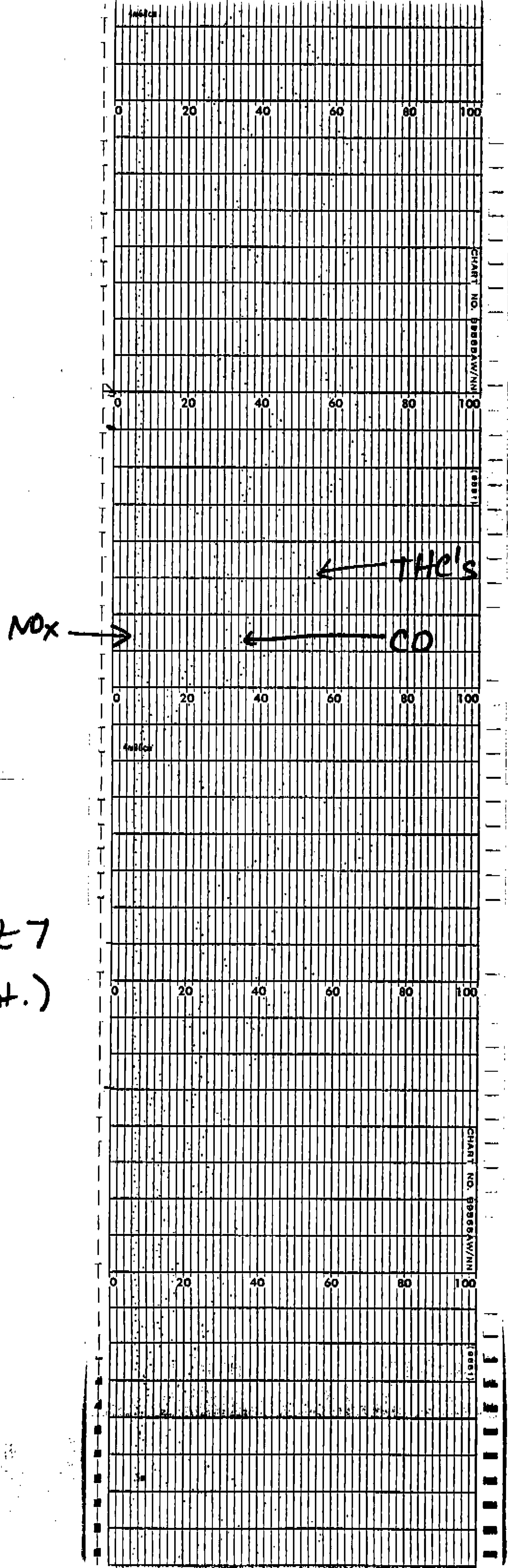
THC's
Scale 0-100

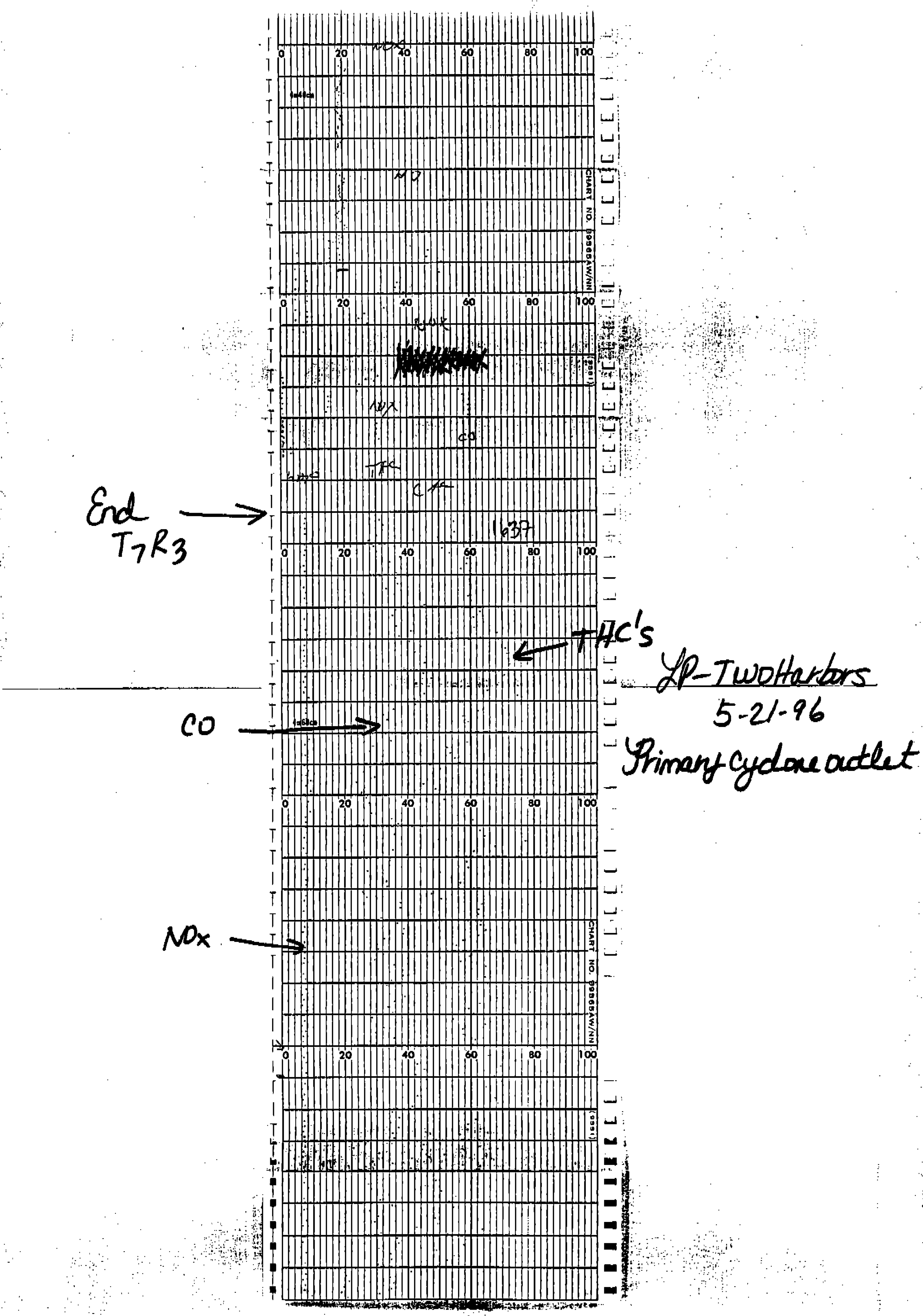
CO
Scale 0-1000

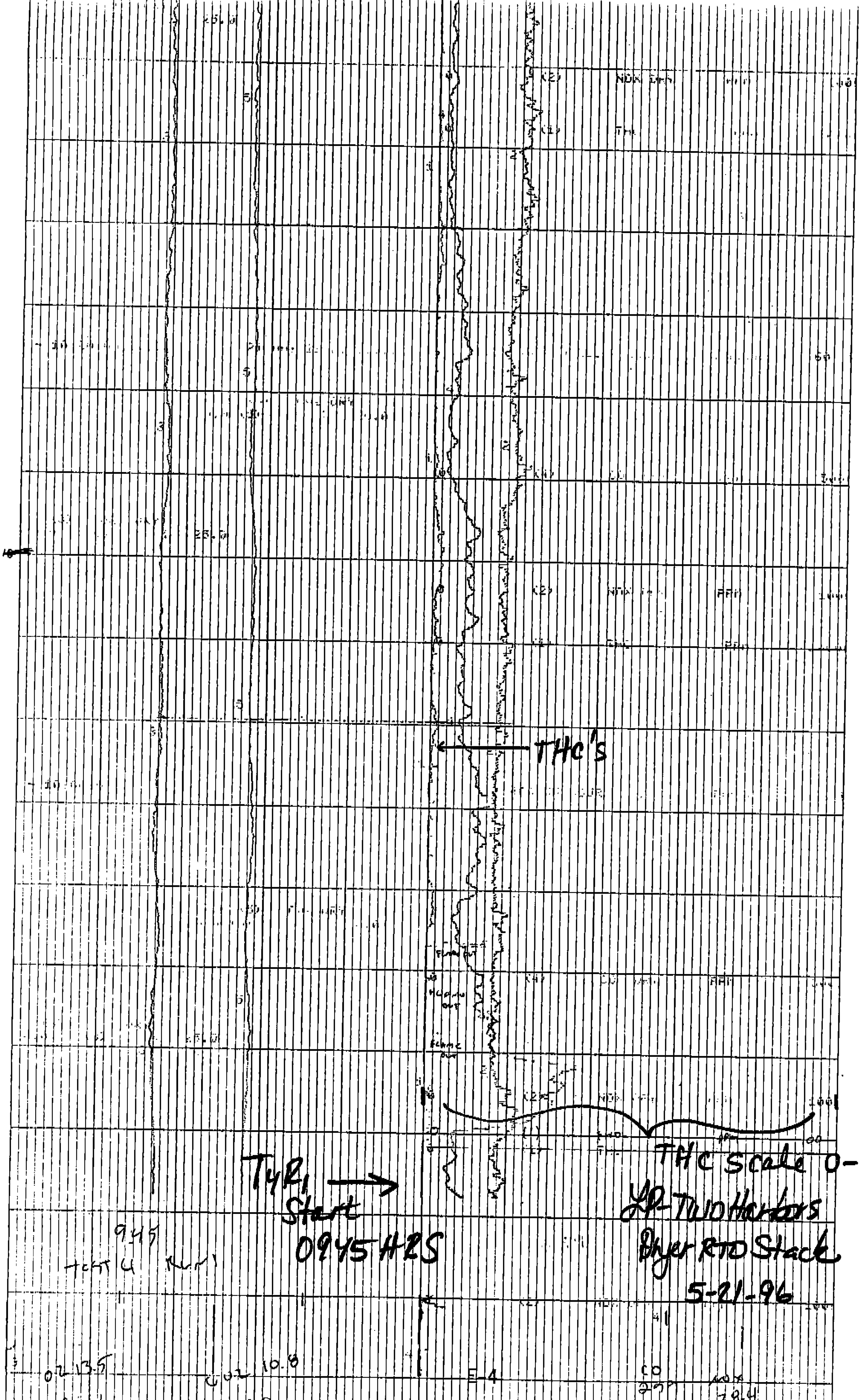
NOx
Scale 0-250

LP-TwoHarbors
5-21-96
Primary cyclone outlet

Test 7
(Cont.)



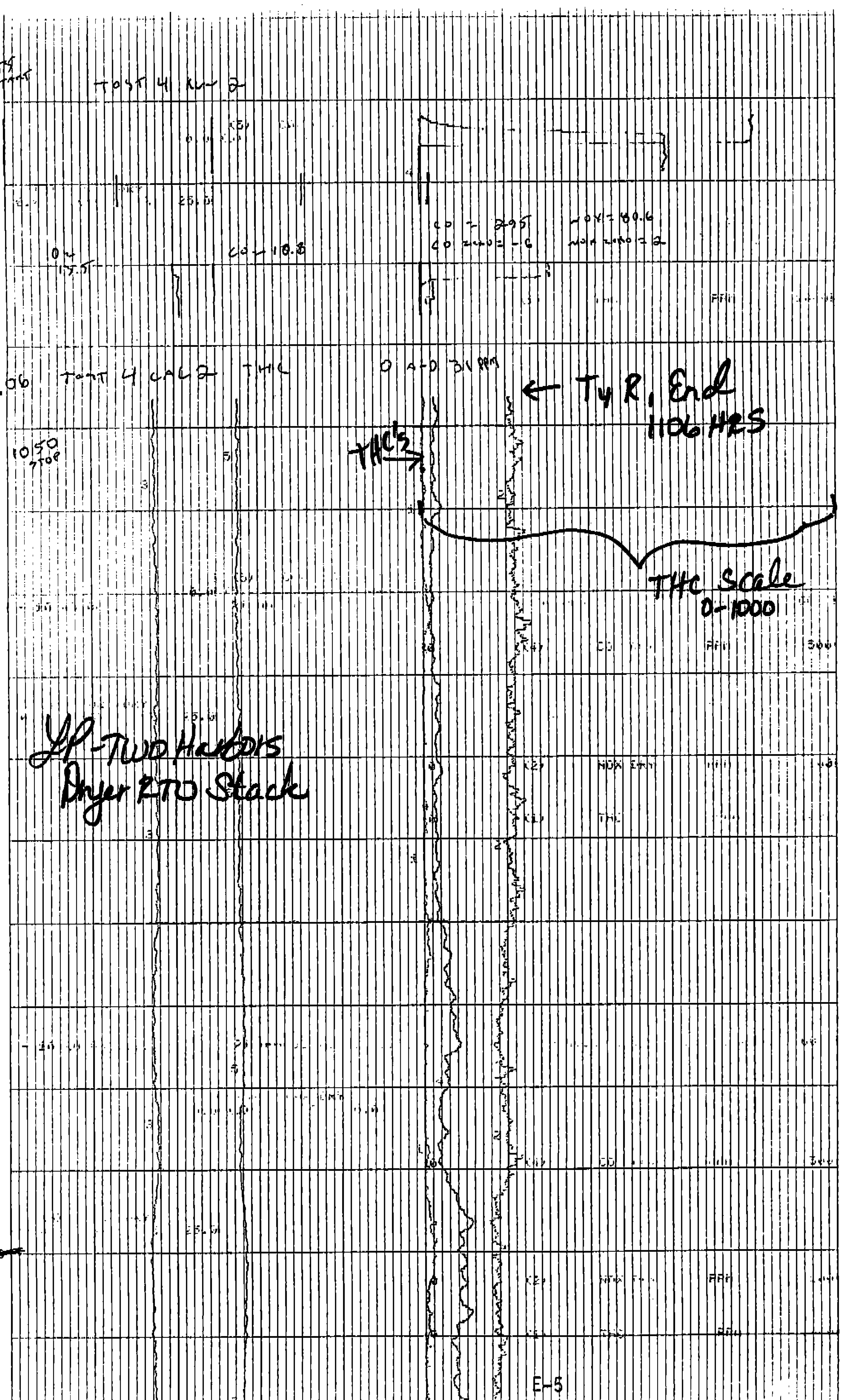

End T7R3
THC's
CO
NOx
LP-TwoHarbors
5-21-96
Primary cyclone outlet

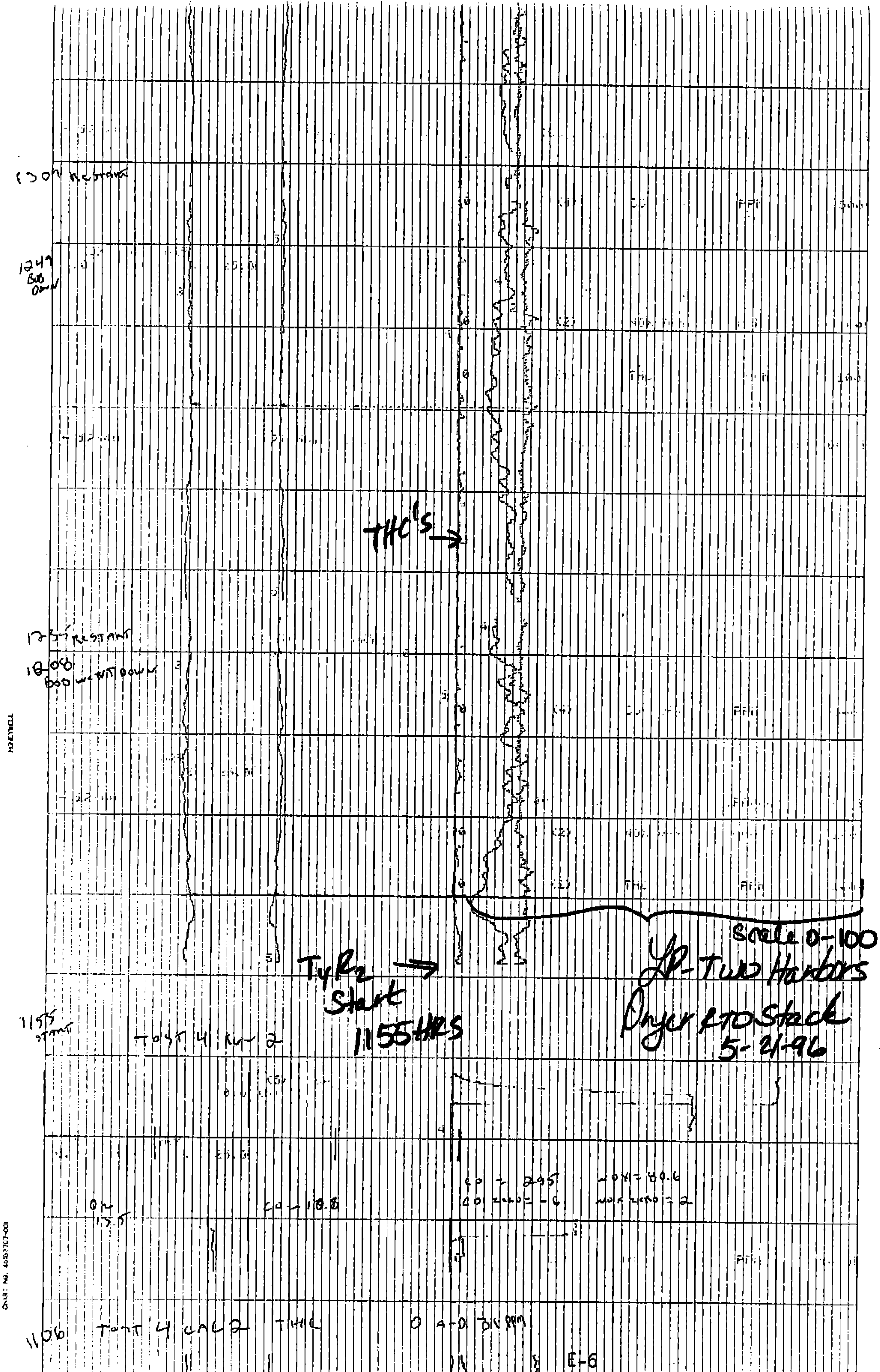


THC's
THC Scale 0-1000
T4R1 Start 0945 HRS
LP-Two Harbors
Dryer RTO Stack
5-21-96
945

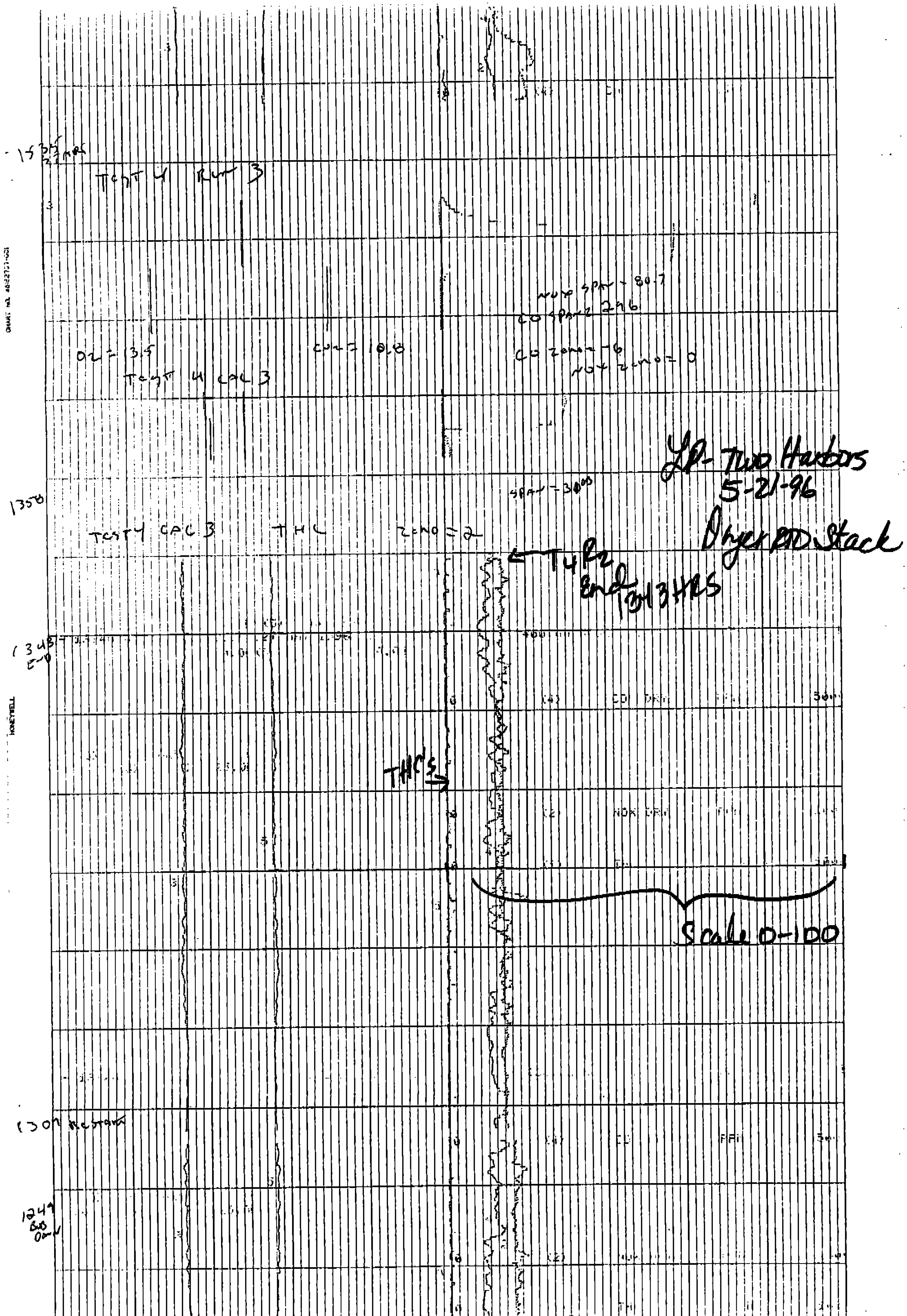
CHART NO. 4082707-C01

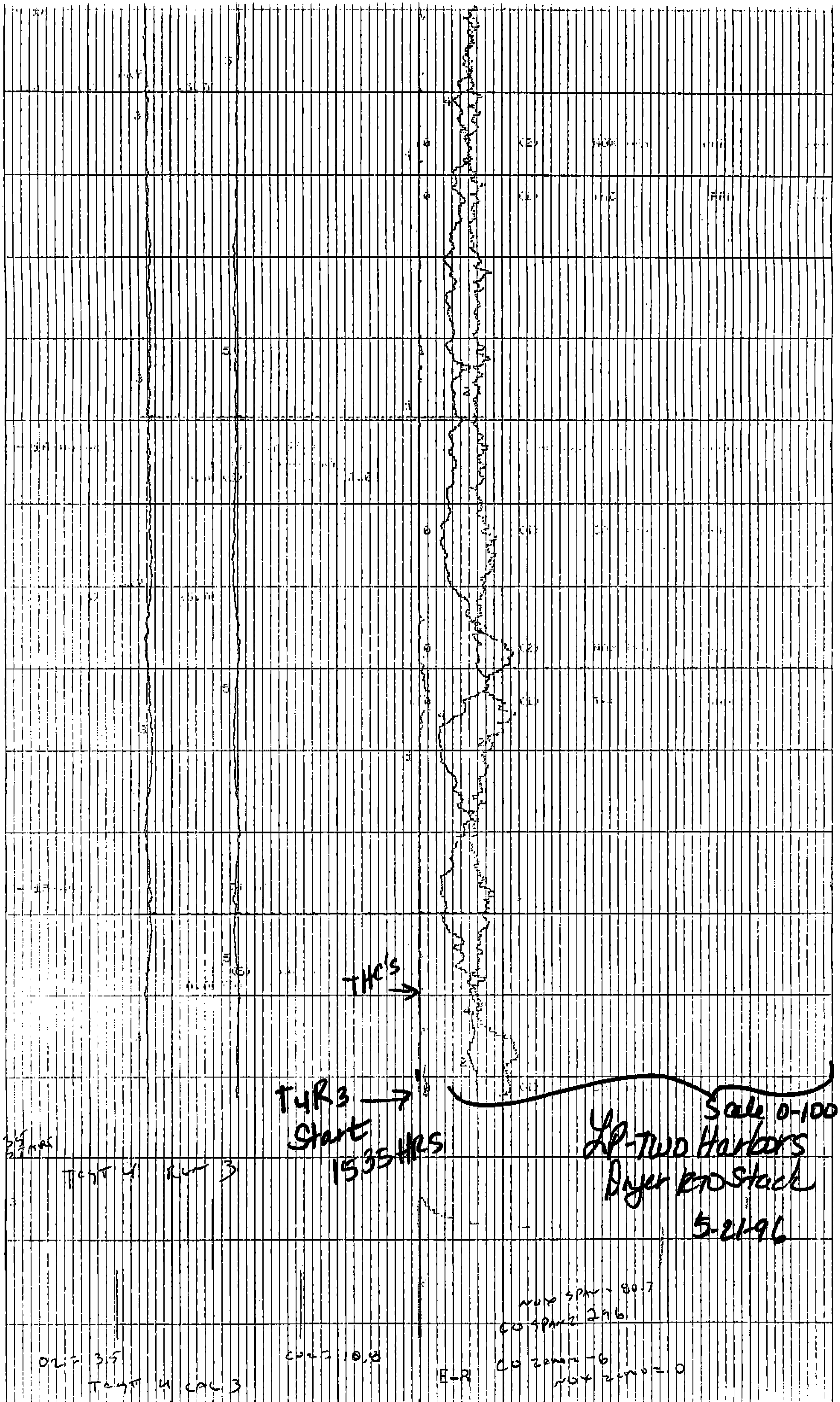
HONEYWELL





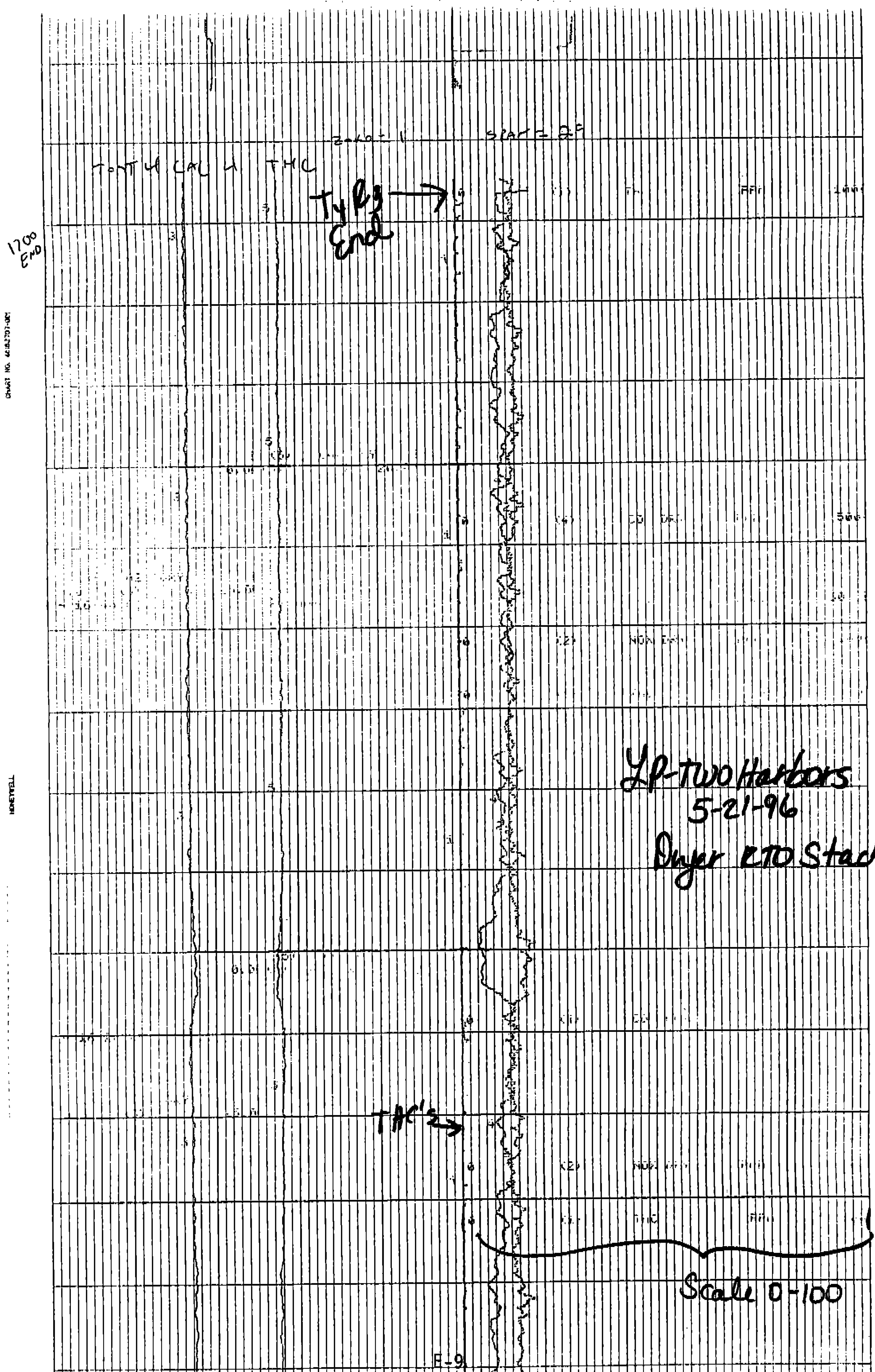
1307 RESTART
1249 Bob down
THC's →
1233 RESTART
1208 Bob went down
TyR2 → Start 1155HRS
Scale 0-100
LP-Two Harbors
Dryer #10 Stack
5-21-96
1155 START
TEST 4 RUN 2
O2 13.5
CO2 10.8
CO = 295
CO zero = -6
NOX = 80.6
NOX zero = 2
1106 TEST 4 CAL 2 THC 0 4-0 31 PPM

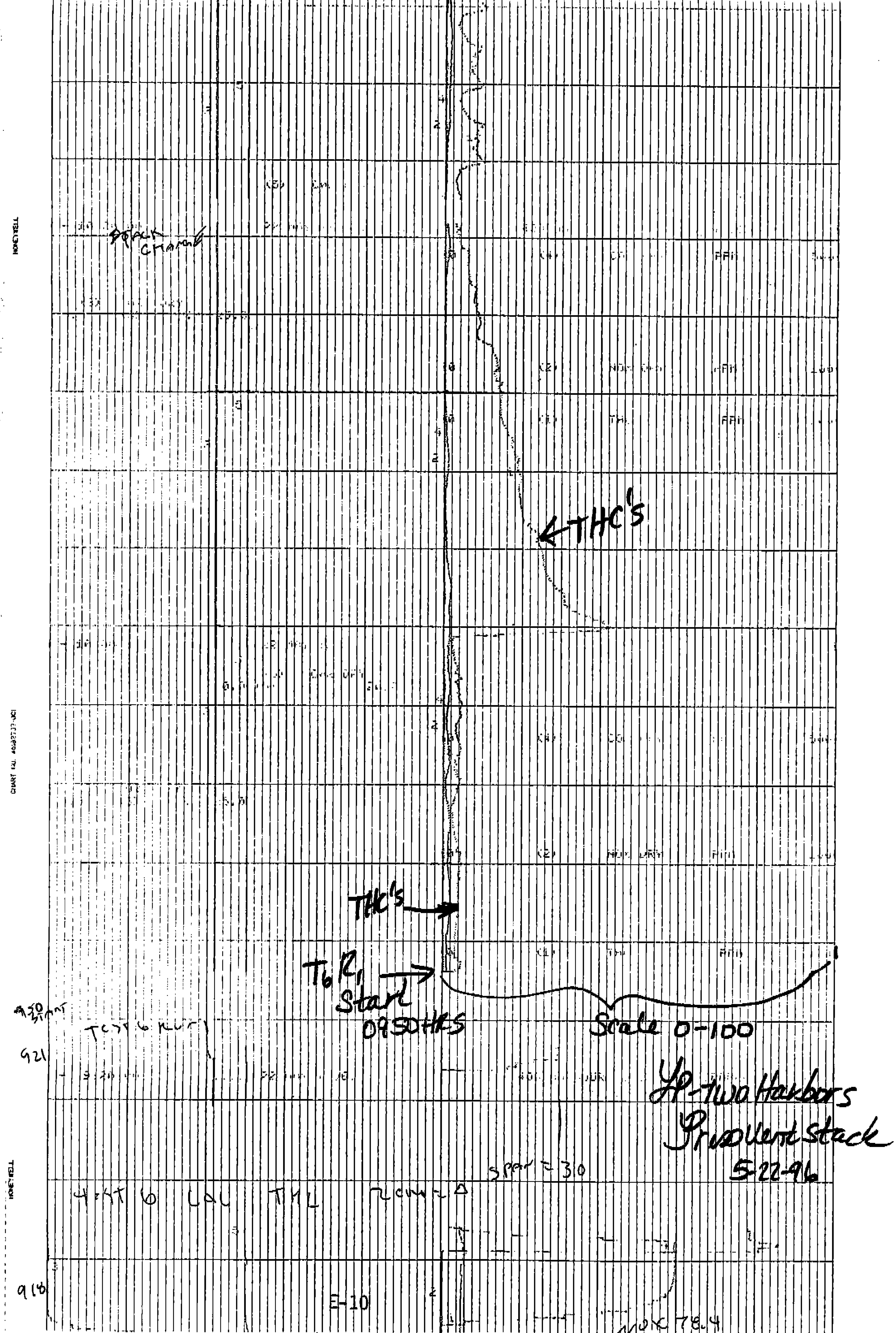

TEST 4 RUN 3
O2 = 3.5
CO2 = 10.8
NOx SPAN = 80.7
CO SPAN = 296
CO ZERO = 6
NOx ZERO = 0
TEST 4 CAL 3
LP- Two Harbors
5-21-96
Dryer RD Stack
1358
TEST 4 CAL 3 THC ZERO = 2
← T4R2 End 1313 HRS
1348
THC's
Scale 0-100
1307 Restart
1249



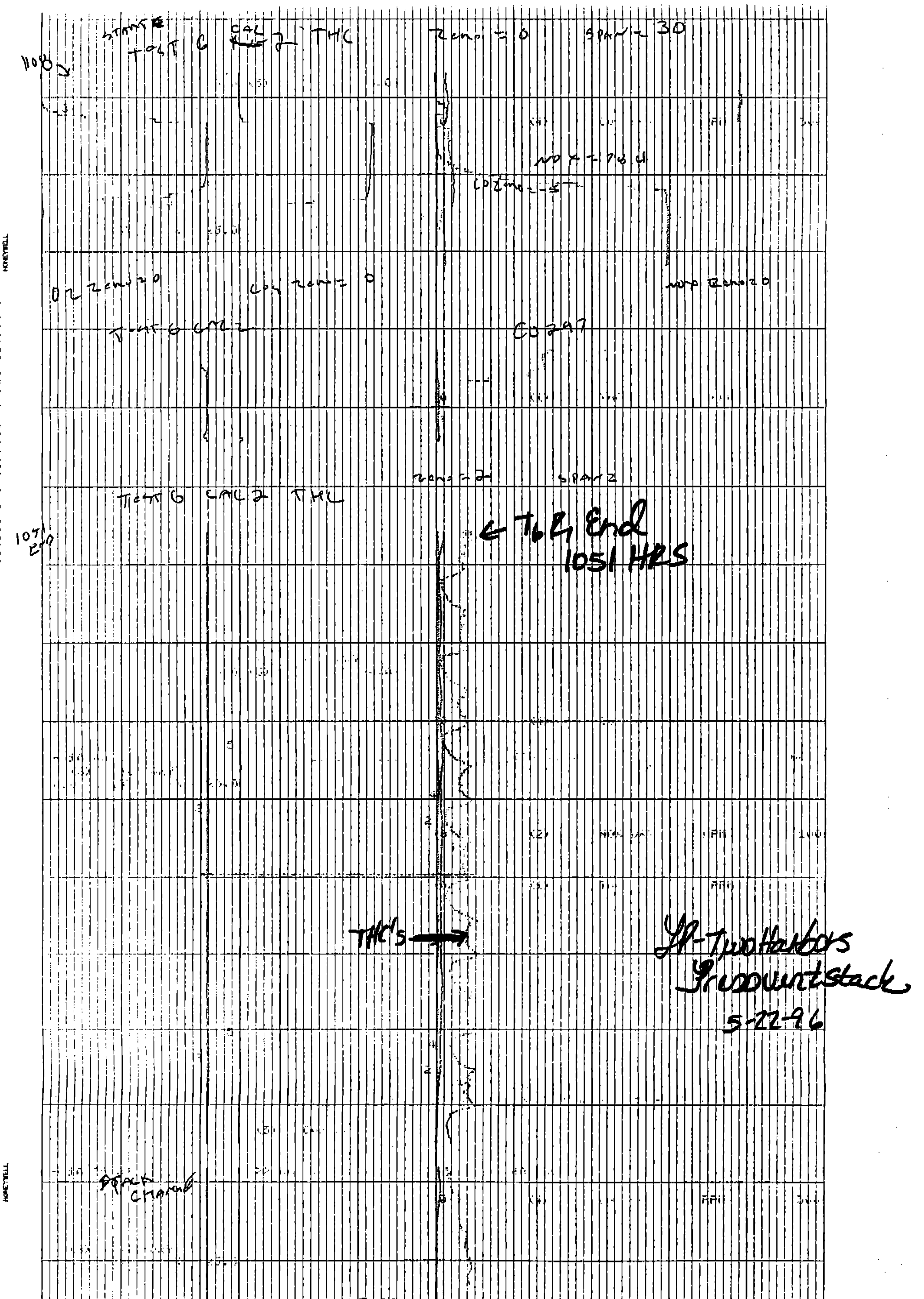
HONEYWELL

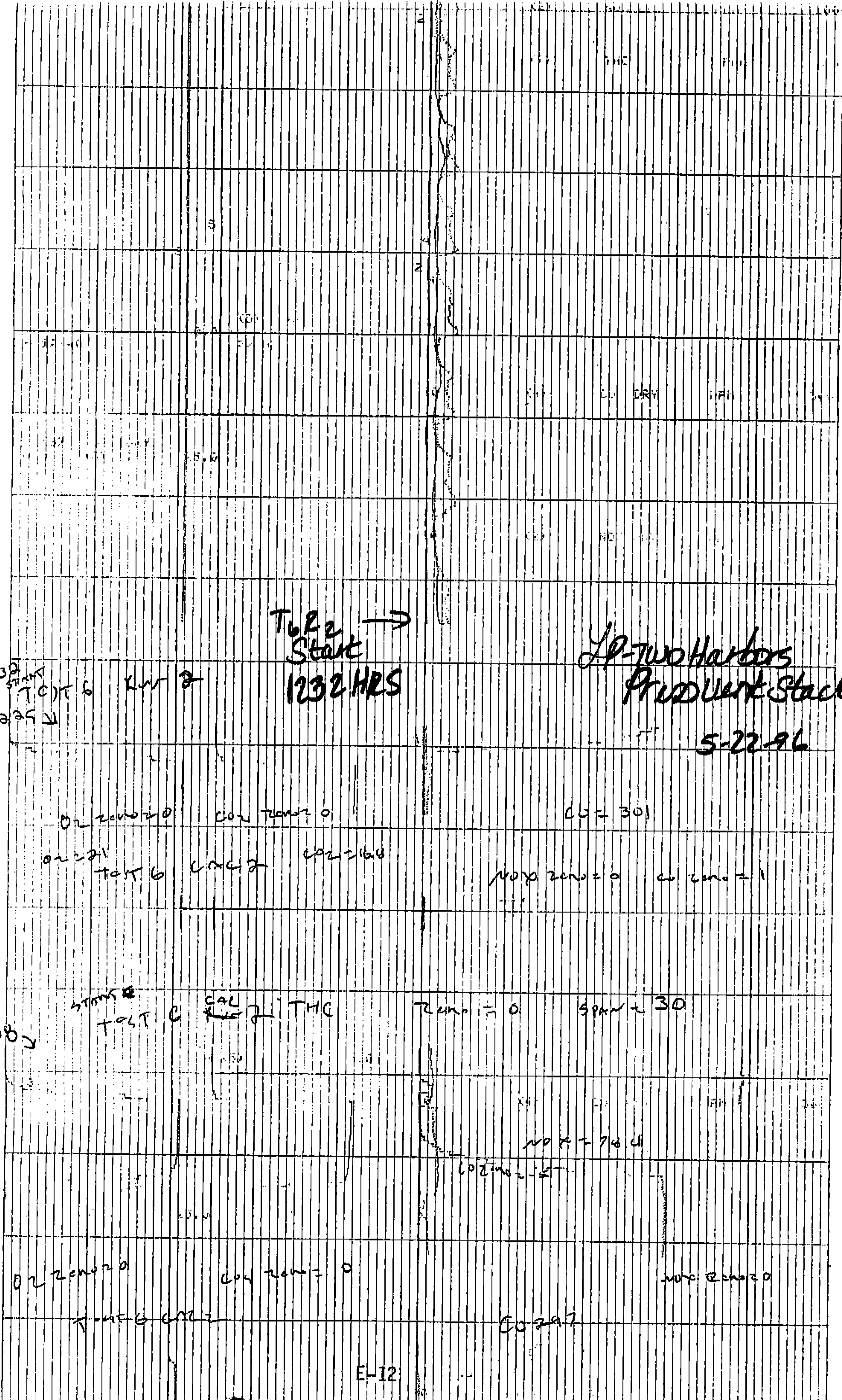
CHART NO. 46182737-001


1700 END
Ty Rg End
THC's
LP-Two Harbors
5-21-96
Dryer RTO Stack
Scale 0-100
HONEYWELL

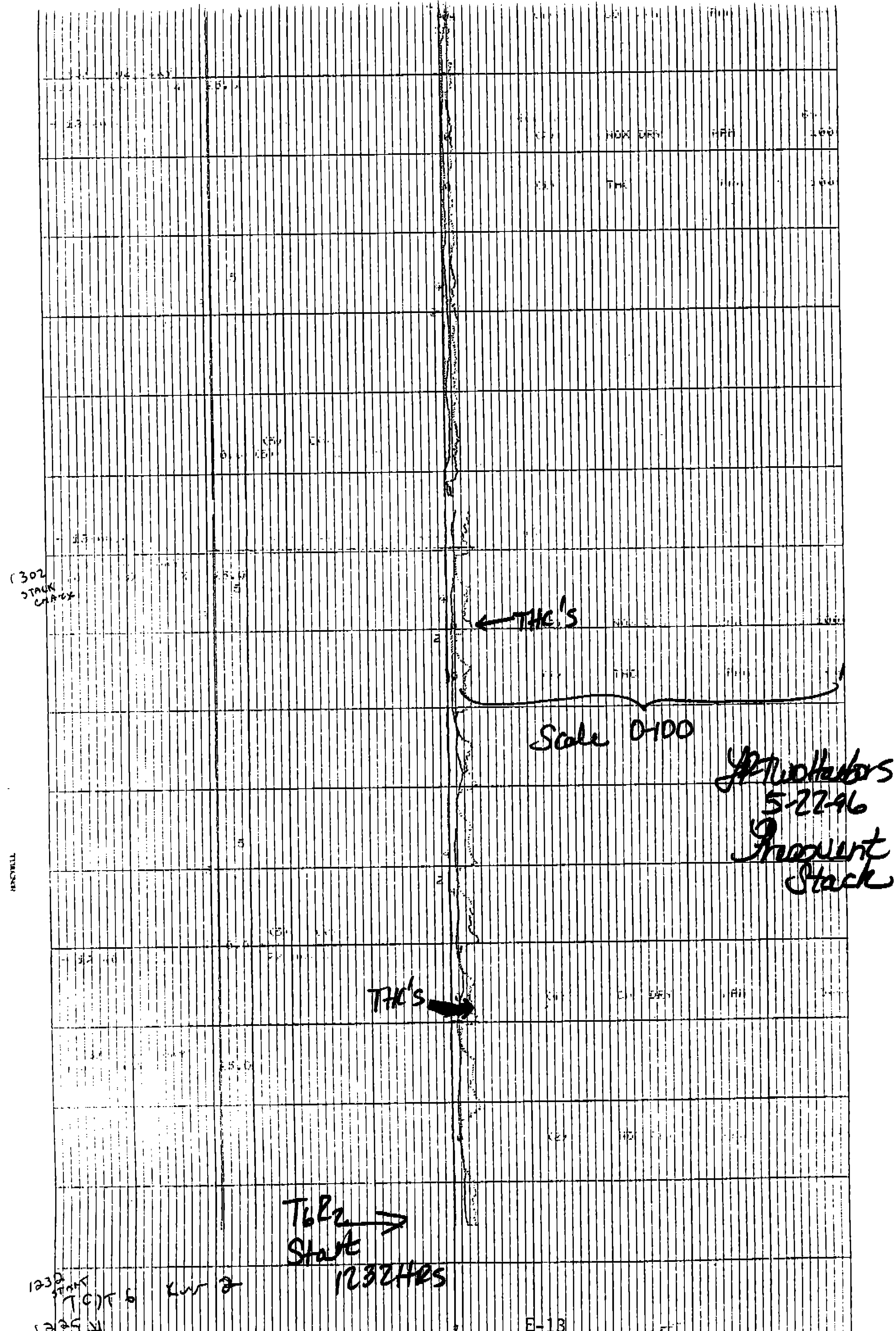


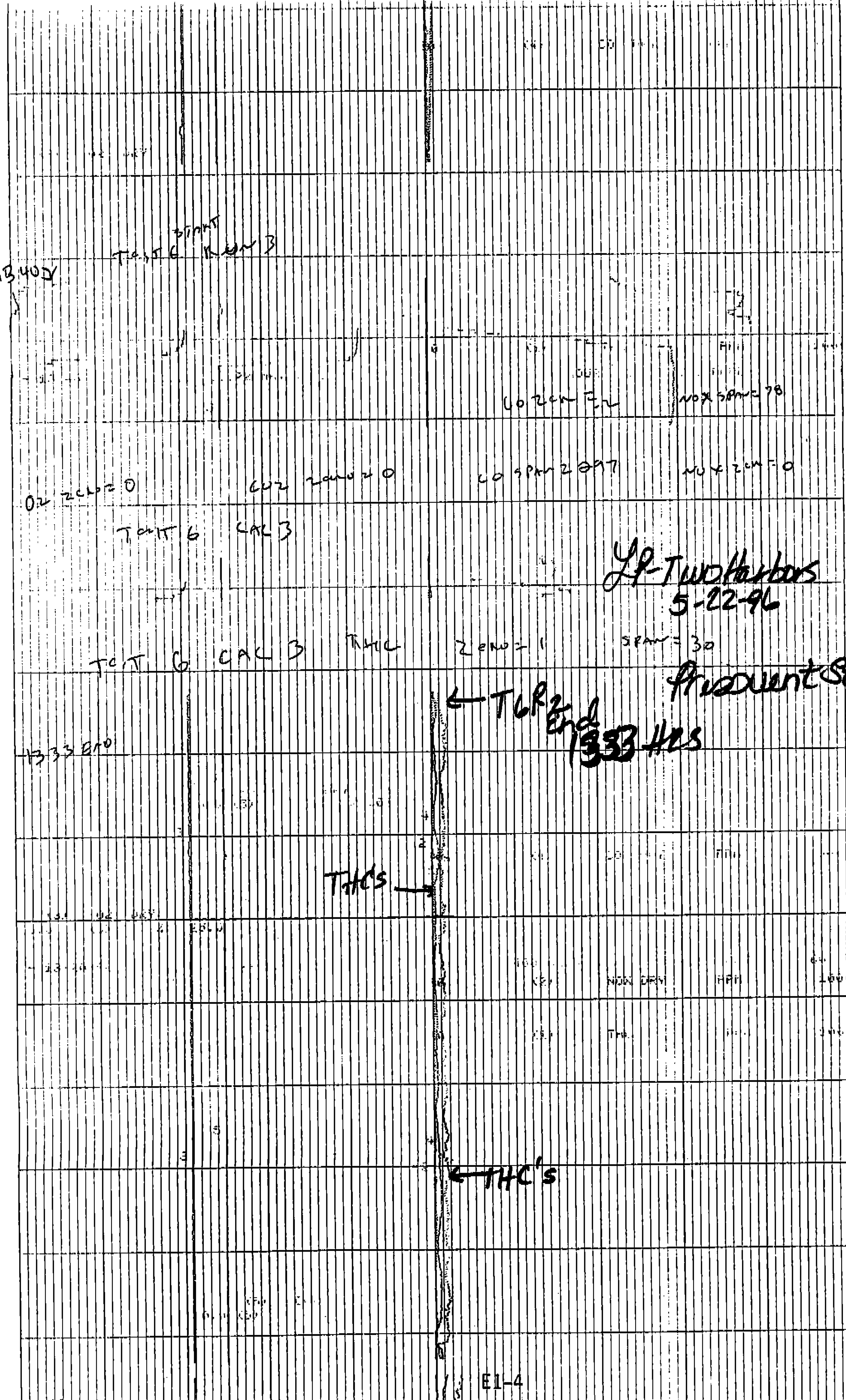
THC's
THC's
T6R1 Start
0950HRS
Scale 0-100
SPAN = 30
5-22-96

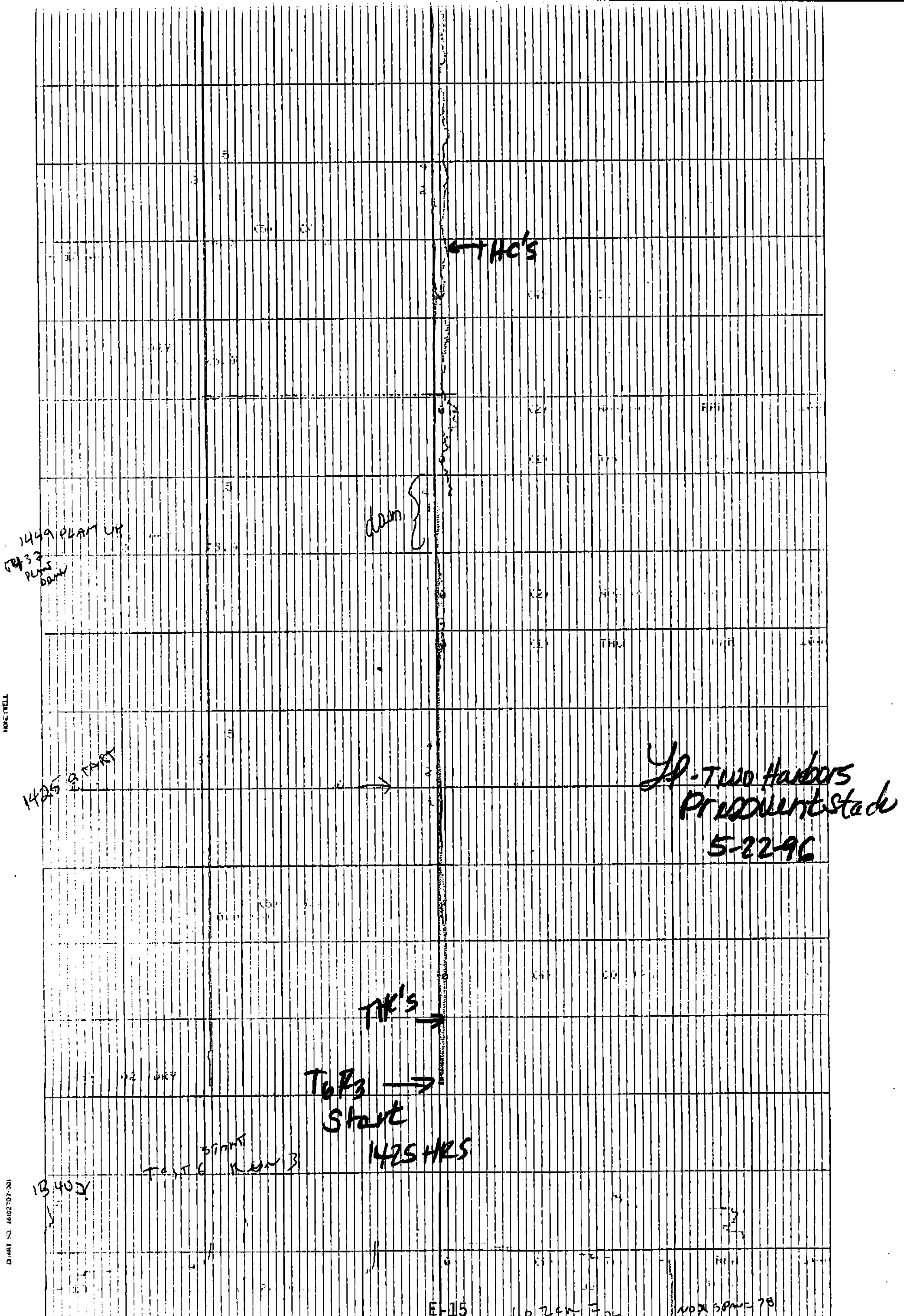

1108
START TEST 6 CAL 2 THC
ZERO = 0
SPAN = 30
NOX = 76
O2 ZERO = 0
CO2 ZERO = 0
NOX ZERO = 0
TEST 6 CAL 2
CO 297
ZERO = 2
SPAN 2
TEST 6 CAL 2 THC
1051
← T6R1 End
1051 HRS
THC's
5-22-96
SPAN CHANGE

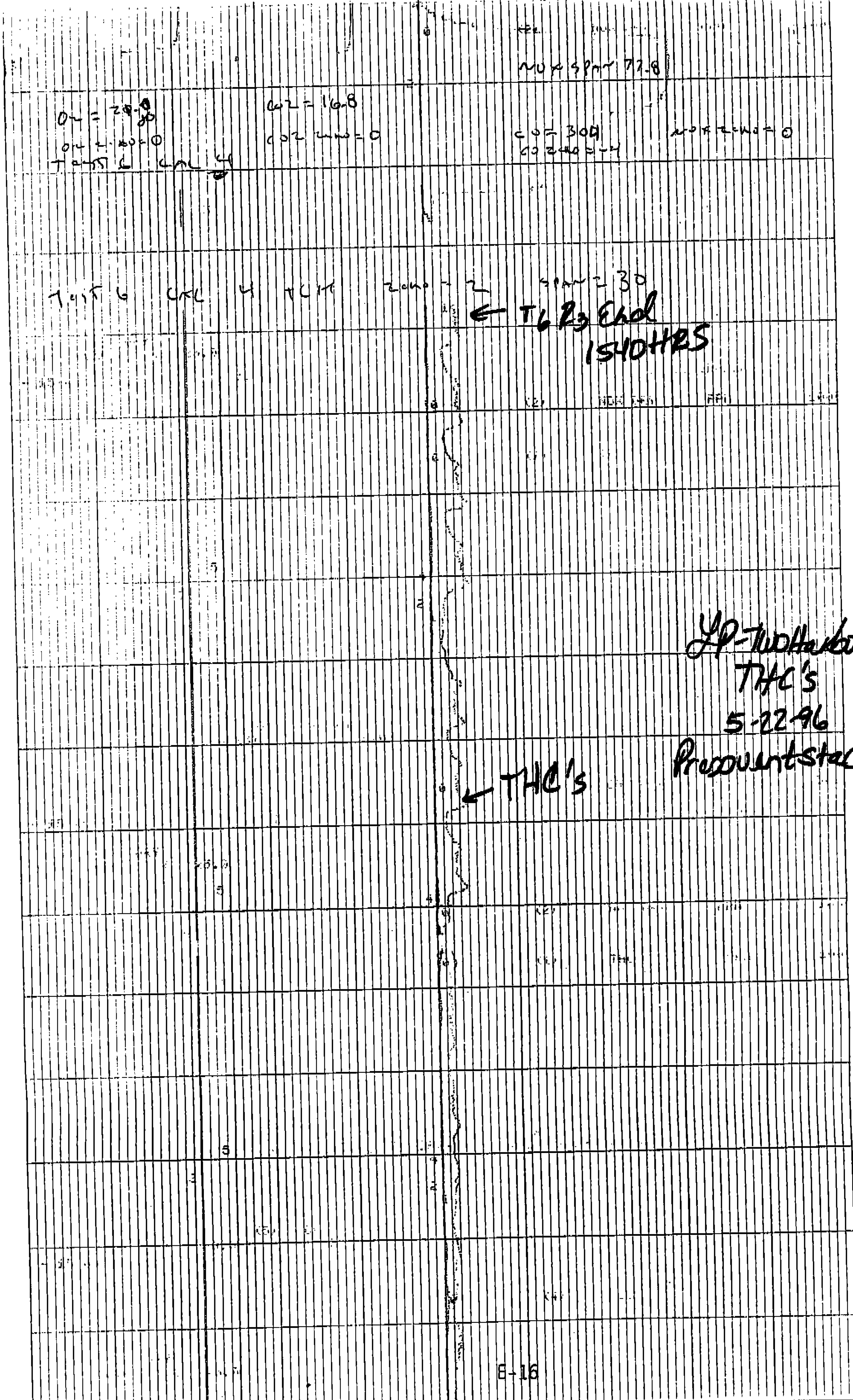


T6R2 Start
1232 HRS
LP-Two Harbors
Press Vent Stack
5-22-96
1232 START Test 6 Run 2
1235
O2 zero = 0
CO2 zero = 0
CO = 301
O2 = 21
Test 6 CAL 2
CO2 = 16.8
NOX zero = 0
CO zero = 1
1108
START Test 6 CAL 2 THC
zero = 0
SPAN = 30
NOX = 76.4
CO2 = 15
O2 zero = 0
CO2 zero = 0
NOX zero = 0
Test 6 CAL 2
CO 297


1302 STACK CHECK
THC's
Scale 0-100
5-22-96
Stack
THC's
Start
1232 Hrs
1232 START


TEST 6 RUN 3 START
1340
CO ZERO = 2
NOX SPAN = 78
O2 ZERO = 0
CO2 ZERO = 0
CO SPAN = 2097
NOX ZERO = 0
TEST 6 CAL 3
LP-Two Harbors
5-22-96
TEST 6 CAL 3 THC ZERO = 1 SPAN = 30
Precipitant Stack
← TGR2
End 1333 Hrs
1333 END
THCs →
← THC's


THC's
down
1449 PLANT UP
1437 PLANT DOWN
1425 START
Two Harbors
5-22-96
THC's
T6R3
Start
1425 HRS
TEST 6 RUN 3 START
1340


NOx SPAN 77.8
O2 = 20.8
O2 ZERO = 0
TEST 6 CAL 4
CO2 = 16.8
CO2 ZERO = 0
CO = 304
CO ZERO = -4
NOx ZERO = 0
TEST 6 CAL 4 THC ZERO = 2 SPAN = 30
← T6 R3 End
1540HRS
LP-TwoHarbors
THC's
5-22-96
← THC's

LP / TWO HARBORS
DRYER RTO STACK
TEST 4 RUN 1

DATE	TIME	NOX	O2	CO	CO2
521.96	945.17	21.281	17.059	146.698	3.394
521.96	946.17	19.002	16.866	158.285	3.532
521.96	947.17	16.683	16.805	153.605	3.548
521.96	948.17	16.642	16.734	93.008	3.703
521.96	949.17	16.683	16.713	77.718	3.589
521.96	950.17	17.008	16.897	65.104	3.475
521.96	951.17	16.602	17.131	65.715	3.239
521.96	952.17	17.008	17.375	49.032	3.076
521.96	953.17	17.985	17.476	38.452	2.97
521.96	954.17	17.863	17.283	36.214	3.158
521.96	955.17	16.479	17.242	54.118	3.231
521.96	956.17	16.235	16.866	55.542	3.507
521.96	957.17	16.724	16.693	64.697	3.697
521.96	958.17	16.642	16.713	61.442	3.589
521.96	959.17	16.154	16.958	68.563	3.483
521.96	1000.17	15.747	16.897	59.814	3.459
521.96	1001.17	16.724	17.181	52.287	3.198
521.96	1002.17	17.497	17.293	40.283	3.133
521.96	1003.17	17.131	17.354	44.352	3.06
521.96	1004.17	17.09	17.426	37.842	3.06
521.96	1005.17	18.026	17.365	39.673	3.109
521.96	1006.17	18.392	17.181	36.825	3.223
521.96	1007.17	17.66	17.09	47.201	3.255
521.96	1008.17	17.09	17.171	44.352	3.312
521.96	1009.17	17.375	17.059	47.201	3.353
521.96	1010.17	17.863	16.937	45.98	3.41
521.96	1011.17	16.683	17.029	50.049	3.304
521.96	1012.17	17.537	17.242	45.166	3.125
521.96	1013.17	19.084	17.558	32.552	2.816
521.96	1014.17	21.281	17.71	21.362	2.694
521.96	1015.17	20.142	17.721	20.142	2.669
521.96	1021.17	18.311	17.242	34.587	3.125
521.96	1022.17	19.694	17.314	31.942	3.068
521.96	1023.17	19.816	17.354	28.076	2.962
521.96	1024.17	19.368	17.476	27.873	2.938
521.96	1025.17	20.874	17.68	21.159	2.694
521.96	1026.17	21.932	17.68	16.479	2.71
521.96	1027.17	22.38	17.782	14.648	2.604
521.96	1028.17	20.874	17.802	16.479	2.62
521.96	1029.17	21.037	17.792	15.462	2.62
521.96	1030.17	21.851	17.741	14.852	2.645
521.96	1031.17	22.135	17.771	13.835	2.588
521.96	1032.17	20.549	17.66	19.735	2.783
521.96	1033.17	21.2	17.771	15.462	2.677
521.96	1034.17	21.118	17.619	17.904	2.767
521.96	1035.17	21.891	17.619	16.276	2.718
521.96	1036.17	21.606	17.782	17.7	2.572
521.96	1037.17	21.851	17.731	12.207	2.612
521.96	1038.17	23.356	17.883	12.207	2.507
521.96	1039.17	24.007	17.893	8.748	2.507
521.96	1040.17	22.542	17.904	12.004	2.539
521.96	1041.17	22.176	17.883	11.393	2.531
521.96	1042.17	22.298	17.649	13.021	2.694
521.96	1043.17	22.461	17.639	12.817	2.751
521.96	1044.17	21.566	17.66	20.142	2.726
521.96	1045.17	21.566	17.721	14.852	2.661
521.96	1046.17	22.705	17.649	15.055	2.718
521.96	1047.17	22.909	17.588	14.242	2.734
521.96	1048.17	21.362	17.69	18.717	2.718
521.96	1049.17	21.362	17.629	16.479	2.718
		AVERAGE	AVERAGE	AVERAGE	AVERAGE
		[illegible]	17.344	[illegible]	3.056

LP / TWO HARBORS
DRYER RTO STACK
TEST 4 RUN 2

DATE	TIME	NOX	O2	CO	CO2
521.96	1155.27	18.188	17.568	28.28	2.865
521.96	1156.27	17.619	17.192	40.08	3.084
521.96	1157.27	16.764	17.171	45.98	3.149
521.96	1158.27	16.073	16.754	58.797	3.54
521.96	1159.27	16.642	16.774	70.801	3.532
521.96	1200.27	16.968	16.612	68.97	3.662
521.96	1201.27	16.113	16.52	77.515	3.687
521.96	1202.27	15.991	16.907	69.173	3.377
521.96	1203.27	16.479	16.602	67.749	3.654
521.96	1204.27	16.968	16.774	73.242	3.483
521.96	1205.27	16.357	16.907	63.68	3.345
521.96	1206.27	16.195	17.212	54.321	3.101
521.96	1207.27	16.276	17.232	48.828	3.068
521.96	1235.27	16.154	16.703	65.715	3.63
521.96	1236.27	16.235	16.703	67.342	3.475
521.96	1237.27	16.805	16.836	58.797	3.467
521.96	1238.27	15.91	17.151	58.594	3.141
521.96	1239.27	16.683	17.242	48.625	3.092
521.96	1240.27	17.415	17.192	49.438	3.141
521.96	1241.27	17.619	17.131	40.487	3.092
521.96	1242.27	17.66	17.242	43.335	3.101
521.96	1243.27	16.805	17.049	43.945	3.231
521.96	1244.27	17.537	17.029	48.014	3.32
521.96	1245.27	17.334	16.856	49.235	3.402
521.96	1246.27	16.724	16.836	58.39	3.426
521.96	1247.27	16.195	16.815	59.814	3.442
521.96	110.27	15.259	16.998	51.473	3.28
521.96	111.27	14.486	16.968	60.832	3.312
521.96	112.27	15.055	16.876	57.78	3.394
521.96	113.27	15.34	16.805	60.018	3.475
521.96	114.27	15.462	16.713	57.983	3.507
521.96	115.27	14.893	16.642	72.428	3.573
521.96	116.27	14.811	16.683	69.58	3.556
521.96	117.27	14.852	16.744	66.732	3.532
521.96	118.27	15.096	16.713	64.494	3.475
521.96	119.27	14.567	17.029	64.901	3.239
521.96	120.27	14.445	17.131	53.507	3.158
521.96	121.27	14.933	16.978	55.135	3.288
521.96	122.27	14.486	16.815	57.17	3.434
521.96	123.27	14.364	16.683	73.039	3.54
521.96	124.27	14.119	16.561	72.835	3.63
521.96	125.27	14.445	16.713	70.597	3.475
521.96	126.27	14.323	16.825	57.576	3.434
521.96	127.27	13.916	16.897	77.515	3.377
521.96	128.27	13.957	16.734	65.104	3.483
521.96	129.27	14.119	16.927	63.68	3.288
521.96	130.27	14.974	16.947	52.083	3.337
521.96	131.27	13.836	16.978	63.273	3.255
521.96	132.27	13.428	16.947	58.594	3.312
521.96	133.27	14.119	16.907	61.442	3.353
521.96	134.27	14.404	16.764	59.814	3.516
521.96	135.27	13.631	16.846	69.377	3.41
521.96	136.27	13.428	16.836	64.697	3.353
521.96	137.27	14.201	16.886	59.611	3.328
521.96	138.27	14.811	17.039	52.083	3.19
521.96	139.27	14.079	17.212	49.845	3.035
521.96	140.27	14.201	17.09	47.201	3.19
521.96	141.27	14.526	16.968	53.304	3.28
521.96	142.27	14.608	16.815	54.118	3.328
		AVERAGE	AVERAGE	AVERAGE	AVERAGE
		16.398	17.1915	41.188	3.0865

LP / TWO HARBORS
DRYER RTO STACK
TEST 4 RUN 3

DATE	TIME	NOX	O2	CO	CO2
521.96	400.47	14.242	17.324	44.963	2.881
521.96	401.47	13.835	17.303	44.149	2.84
521.96	402.47	14.384	17.303	43.945	2.887
521.96	403.47	15.299	17.365	48.421	2.783
521.96	404.47	14.282	17.415	39.266	2.775
521.96	405.47	14.079	17.426	38.452	2.734
521.96	406.47	14.323	17.527	37.028	2.751
521.96	407.47	15.015	17.365	41.504	2.799
521.96	408.47	14.079	17.466	37.028	2.686
521.96	409.47	12.695	17.354	42.114	2.673
521.96	410.47	13.631	17.253	52.083	2.987
521.96	411.47	13.997	17.181	47.811	2.987
521.96	412.47	12.533	17.12	52.083	3.068
521.96	413.47	12.37	17.11	59.001	3.084
521.96	414.47	13.753	17.202	53.507	2.97
521.96	415.47	13.753	17.171	49.032	3.076
521.96	416.47	12.695	17.09	55.745	3.084
521.96	417.47	12.207	17.019	57.373	3.19
521.96	418.47	12.614	16.886	66.935	3.263
521.96	419.47	12.777	16.927	66.325	3.263
521.96	420.47	12.41	17.131	61.239	3.011
521.96	421.47	15.259	17.619	42.725	2.555
521.96	422.47	16.073	17.639	28.449	2.58
521.96	423.47	16.602	17.588	28.042	2.637
521.96	424.47	13.997	17.375	29.5	2.799
521.96	425.47	13.387	17.263	41.504	2.913
521.96	426.47	12.858	17.131	47.811	3.101
521.96	427.47	13.713	16.988	56.152	3.223
521.96	428.47	12.695	17.008	56.559	3.141
521.96	429.47	12.248	17.1	58.152	3.092
521.96	430.47	13.184	17.141	51.473	3.068
521.96	431.47	13.794	17.039	54.525	3.109
521.96	432.47	12.777	17.08	51.88	3.117
521.96	433.47	12.451	16.958	61.035	3.182
521.96	434.47	12.451	16.897	62.256	3.247
521.96	435.47	13.387	16.897	64.087	3.271
521.96	436.47	13.062	16.947	59.814	3.182
521.96	437.47	12.736	17.029	59.814	3.125
521.96	438.47	12.736	17.039	58.986	3.084
521.96	439.47	13.55	16.988	59.001	3.174
521.96	440.47	13.306	16.988	56.559	3.149
521.96	441.47	12.736	17.151	57.983	3.076
521.96	442.47	13.102	17.019	56.152	3.174
521.96	443.47	14.16	16.978	55.135	3.174
521.96	444.47	14.486	17.019	50.863	3.117
521.96	445.47	13.224	17.049	56.152	3.141
521.96	446.47	13.55	16.876	57.373	3.271
521.96	447.47	14.486	16.978	58.594	3.182
521.96	448.47	14.852	16.998	47.811	3.109
521.96	449.47	14.119	17.131	50.049	3.044
521.96	450.47	13.957	17.029	48.014	3.133
521.96	451.47	14.648	17.039	50.456	3.133
521.96	452.47	14.404	16.937	47.201	3.182
521.96	453.47	13.265	16.937	60.425	3.255
521.96	454.47	12.899	16.886	60.832	3.271
521.96	455.47	13.509	16.815	63.273	3.288
521.96	456.47	14.404	16.886	54.728	3.255
521.96	457.47	13.753	16.927	60.832	3.215
521.96	458.47	13.672	16.998	67.342	3.166
521.96	459.47	14.608	16.968	57.576	3.158
		AVERAGE 14.425	AVERAGE 17.146	AVERAGE 51.2885	AVERAGE 3.0165

Interpoll Laboratories, Inc.
(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. MOBILE
- 1996 -

File Name: LPT7R1
Job Number: 6-7712
Client: Louisiana - Pacific
Location: Two Harbors, Minnesota

Primary Cyclone Outlet -- Run 1

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO (ppmv)	THC (ppm,w)
142	09:49:00			59.0
142	09:50:00			60.4
142	09:51:00			56.4
142	09:52:00			44.6
142	09:53:00			35.5
142	09:54:00			26.5
142	09:55:00			29.0
142	09:56:00			35.7
142	09:57:00			47.4
142	09:58:00			57.9
142	09:59:00			57.2
142	10:00:00			54.3
142	10:01:00			53.2
142	10:02:00			42.5
142	10:03:00			33.9
142	10:04:00			33.1
142	10:05:00			29.3
142	10:06:00			30.8
142	10:07:00			30.6
142	10:08:00			38.2
142	10:09:00			37.1
142	10:10:00			39.8
142	10:11:00			42.5
142	10:12:00			42.4
142	10:13:00			37.1
142	10:14:00			23.6
142	10:15:00			15.5
142	10:16:00			13.4
142	10:17:00			13.4
142	10:18:00			16.3
142	10:19:00			23.5
142	10:20:00			24.2
142	10:21:00			30.8
142	10:22:00			28.2

Interpoll Laboratories, Inc.
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Printout of ESC Model 80 DAS
for CEM Trailer No. MOBILE
- 1996 -

File Name: LPT7R1
Job Number: 6-7712
Client: Louisiana - Pacific
Location: Two Harbors, Minnesota

Primary Cyclone Outlet -- Run 1

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO (ppmv)	THC (ppm,w)
142	10:23:00			26.9
142	10:24:00			21.3
142	10:25:00			21.3
142	10:26:00			14.8
142	10:27:00			11.7
142	10:28:00			9.6
142	10:29:00			8.1
142	10:30:00			9.1
142	10:31:00			8.0
142	10:32:00			7.5
142	10:33:00			11.0
142	10:34:00			8.5
142	10:35:00			11.3
142	10:36:00			9.8
142	10:37:00			7.0
142	10:38:00			5.6
142	10:39:00			5.1
142	10:40:00			3.5
142	10:41:00			4.1
142	10:42:00			5.3
142	10:43:00			7.0
142	10:44:00			7.3
142	10:45:00			10.6
142	10:46:00			7.7
142	10:47:00			8.1
142	10:48:00			9.4
	Run Average			25.0

Interpoll Laboratories, Inc.
(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. MOBILE
- 1996 -

File Name: LPT7R2
Job Number: 6-7712
Client: Louisiana - Pacific
Location: Two Harbors, Minnesota

Primary Cyclone Outlet -- Run 2

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO (ppmv)	THC (ppm,w)
142	11:56:00			19.5
142	11:57:00			29.4
142	11:58:00			27.5
142	11:59:00			41.9
142	12:00:00			47.5
142	12:01:00			50.1
142	12:02:00			54.8
142	12:03:00			49.7
142	12:04:00			52.1
142	12:05:00			55.1
142	12:06:00			43.6
142	12:36:00			57.8
142	12:37:00			56.6
142	12:38:00			54.3
142	12:39:00			42.8
142	12:40:00			35.7
142	12:41:00			34.7
142	12:42:00			34.3
142	12:43:00			32.1
142	12:44:00			35.8
142	12:45:00			40.5
142	12:46:00			43.4
142	12:47:00			45.6
142	12:48:00			50.0
142	13:09:00			46.5
142	13:10:00			46.0
142	13:11:00			40.3
142	13:12:00			45.0
142	13:13:00			44.8
142	13:14:00			49.4
142	13:15:00			49.7
142	13:16:00			56.7
142	13:17:00			61.1
142	13:18:00			57.0

Interpoll Laboratories, Inc.
(612) 786-6020

Printout of ESC Model 80 DAS
for CEM Trailer No. MOBILE
- 1996 -

File Name: LPT7R2
Job Number: 6-7712
Client: Louisiana - Pacific
Location: Two Harbors, Minnesota

Primary Cyclone Outlet -- Run 2

Julian Date	Time (Hrs)	Conc. (dry basis unless noted) NOx (ppmv)	CO (ppmv)	THC (ppm,w)
142	13:19:00			61.7
142	13:20:00			48.2
142	13:21:00			43.2
142	13:22:00			42.8
142	13:23:00			48.6
142	13:24:00			56.3
142	13:25:00			63.2
142	13:26:00			59.9
142	13:27:00			54.2
142	13:28:00			51.8
142	13:29:00			57.9
142	13:30:00			54.8
142	13:31:00			49.1
142	13:32:00			50.8
142	13:33:00			49.8
142	13:34:00			51.3
142	13:35:00			59.0
142	13:36:00			59.0
142	13:37:00			57.3
142	13:38:00			53.3
142	13:39:00			50.6
142	13:40:00			40.0
142	13:41:00			42.0
142	13:42:00			46.3
142	13:43:00			51.3
142	13:44:00			49.0
	Run Average			48.0

LOUISIANA PACIFIC
TWO HARBORS, MN
TEST 4 / RUN 1
5/21/96

TIME	E-TUBE OUTLET THC PPM	RTO INLET THC PPM
946.29	90.959	83.895
947.29	85.158	77.14
948.29	79.102	68.042
949.29	64.022	57.332
950.29	58.187	49.601
951.29	52.702	44.246
952.29	59.701	49.072
953.29	61.727	53.979
954.29	76.554	66.634
955.29	81.852	74.3
956.29	77.887	70.304
957.29	80.542	68.237
958.29	77.083	64.225
959.29	64.697	52.23
1000.29	62.842	50.106
1001.29	57.878	46.11
1002.29	59.823	43.164
1003.29	56.038	42.7
1004.3	58.268	47.021
1005.29	65.381	49.85
1006.29	65.56	53.857
1007.29	68.001	55.306
1008.29	68.075	56.331
1009.29	68.498	53.971
1010.29	57.837	46.379
1011.29	48.649	35.885
1012.29	47.087	29.875
1013.29	40.544	29.468
1014.3	37.85	28.06
1015.29	41.958	33.455
1016.29	46.126	37.565
1017.29	47.705	40.536
1018.29	52.466	41.911
1019.3	49.919	42.521
1020.29	47.51	37.012
1021.29	43.522	33.879
1022.3	43.604	36.344
1023.29	33.87	28.844
1024.29	34.92	27.091
1025.29	29.183	23.975
1026.29	29.533	24.282
1027.29	31.104	23.47
1028.29	33.236	26.953
1029.3	31.689	23.478
1030.29	34.546	25.985
1031.29	30.892	23.812
1032.3	32.983	25.293
1033.29	31.144	23.934
1034.29	30.208	23.763
1035.29	27.84	21.785
1036.29	29.744	18.978
1037.3	29.126	18.62
1038.29	27.637	19.873
1039.3	27.555	19.36
1040.3	29.403	21.68
1041.3	28.532	23.519
1042.29	29.825	23.609
1043.29	28.621	22.843
1044.29	28.109	22.257
1045.29	27.58	23.34

	E-TUBE OUTLET	RTO INLET
AVERAGE	49.0289	39.7449

LOUISIANA PACIFIC
TWO HARBORS, MN
TEST 4 / RUN 2
5/21/96

			E-TUBE OUTLET		RTO INLET
TIME			THC PPM		THC PPM
1156.38			75.928		60.897
1157.38			83.211		65.308
1158.38			91.642		68.115
1159.38			104.11		74.056
1200.38			81.86		57.764
1201.37			104.712		75.928
1202.37			82.69		61.084
1203.37			73.798		57.387
1204.37			64.225		48.332
1205.38			63.249		44.499
1206.37			70.08		53.442
1236.37			72.965		52.881
1237.37			66.895		46.118
1238.37			65.387		45.573
1239.37			64.079		44.076
1240.37			61.914		43.896
1241.38			67.651		51.335
1242.37			71.395		53.695
1243.38			77.783		57.21
1244.38			87.297		62.907
1245.37			82.609		62.158
1246.37			85.946		61.816
1247.37			88.151		63.881
1248.38			85.685		63.265
109.38			80.379		56.828
110.38			85.248		60.262
111.38			89.412		63.558
112.37			92.025		65.098
113.38			105.273		72.632
114.38			103.695		71.021
115.38			104.02		75.439
116.37			92.513		65.234
117.38			82.389		55.436
118.38			77.458		54.818
119.38			83.813		59.53
120.38			93.75		66.699
121.38			102.637		72.225
122.38			110.571		78.898
123.38			97.51		69.66
124.38			91.178		65.47
125.38			88.029		32.186
126.38			103.068		21.574
127.38			88.958		21.663
128.38			88.421		20.353
129.38			83.341		21.948
130.38			86.483		21.965
131.38			89.518		22.86
132.37			100.399		21.493
133.38			94.116		22.42
134.37			89.078		23.079
135.38			87.769		22.607
136.38			78.408		22.298
137.38			69.832		22.217
138.38			73.942		22.412
139.38			82.804		20.557
140.38			85.728		21.68
141.38			86.141		22.339
142.38			93.457		22.925
143.38			87.898		22.534
144.38			73.942		22.339
			AVERAGE		AVERAGE
			84.94065		47.9631333

LOUISIANA PACIFIC
TWO HARBORS, MN
TEST 4 / RUN 3
5/21/96

				E-TUBE OUTLET		RTO INLET
TIME				THC PPM		THC PPM
401.28				36.646		30.632
402.28				30.99		29.305
403.28				31.242		28.76
404.28				29.842		25.358
405.28				32.918		30.469
406.28				28.8		25.895
407.28				34.399		31.852
408.28				41.349		36.338
409.28				40.771		37.264
410.28				44.661		39.242
411.28				53.597		44.604
412.28				49.08		39.062
413.28				44.157		39.624
414.28				51.571		42.578
415.28				54.232		44.108
416.28				65.78		50.521
417.28				67.041		50.789
418.28				62.264		44.702
419.28				43.188		32.031
420.28				29.419		24.056
421.28				30.485		23.853
422.28				32.292		27.368
423.28				38.826		31.836
424.28				43.245		37.044
425.28				54.093		45.109
426.28				57.821		44.637
427.28				54.321		42.187
428.28				52.897		40.283
429.28				58.968		44.165
430.28				52.799		41.675
431.28				59.31		47.567
432.28				67.407		50.277
433.28				67.896		51.579
434.28				67.684		50.765
435.28				60.221		47.518
436.28				59.473		46.932
437.28				65.12		51.392
438.28				69.206		144.271
439.28				76.066		392.383
440.28				64.657		47.949
441.28				65.617		48.242
442.28				59.945		42.822
443.28				59.741		43.49
444.28				64.054		48.576
445.28				68.424		49.406
446.28				59.456		44.149
447.28				58.307		41.195
448.28				58.455		42.472
449.28				59.432		45.011
450.28				63.55		46.151
451.28				69.027		51.4
452.38				78.855		55.086
453.38				79.411		53.923
454.38				75.374		51.221
455.38				74.251		48.421
456.38				71.948		48.842
457.38				66.528		45.964
458.38				69.027		51.221
459.38				75.374		45.011
500.38				63.55		42.472

AVERAGE	AVERAGE
55.6843333	49.6506833

LP / TWO HARBORS
PRESS VENT STACKS
TEST 6 RUN 1

DATE	TIME	NOX	O2	CO	CO2
522.96	950.14	0.366	21.027	7.324	0
522.96	951.14	0.407	21.006	9.359	0
522.96	952.14	0.203	21.027	7.121	0
522.96	953.14	0.326	20.976	4.679	0
522.96	954.14	0.407	20.996	8.138	0
522.96	955.14	0.285	21.006	7.528	0
522.96	956.14	0.244	21.006	5.697	0
522.96	957.14	0.285	20.976	7.731	0
522.96	958.14	0.448	20.986	8.952	0
522.96	959.14	0.244	20.996	6.917	0
522.96	1000.14	0.326	20.935	8.545	0
522.96	1001.14	0.448	21.027	9.359	0
522.96	1002.14	0.61	20.945	10.173	0.008
522.96	1003.14	0.407	20.925	8.341	0
522.96	1004.14	0.244	20.925	5.493	0
522.96	1005.14	0.285	21.006	4.476	0
522.96	1006.14	0.326	20.966	2.848	0
522.96	1007.14	0.366	21.027	3.459	0
522.96	1008.14	0.203	20.976	6.51	0
522.96	1009.14	0.163	20.986	6.51	0
522.96	1010.14	0.244	21.016	4.272	0
522.96	1011.14	0.163	21.016	3.052	0
522.96	1012.14	0.407	20.986	2.035	0
522.96	1013.14	0.285	20.976	2.035	0.008
522.96	1014.14	0.163	20.935	1.628	0
522.96	1015.14	0.285	20.945	1.424	0
522.96	1016.14	0.326	20.955	2.238	0
522.96	1017.14	0.285	21.006	2.238	0
522.96	1018.14	0.244	20.996	4.883	0
522.96	1019.14	0.448	20.945	6.714	0
522.96	1020.14	0.285	20.976	3.866	0
522.96	1021.55	0.244	20.935	2.645	0
522.96	1022.54	0.407	20.966	2.441	0
522.96	1023.54	0.488	20.976	3.662	0.041
522.96	1024.54	0.203	20.996	5.9	0.016
522.96	1025.54	0.244	20.986	6.307	0
522.96	1026.54	0.407	20.976	7.528	0
522.96	1027.54	0.407	20.945	7.935	0.049
522.96	1028.54	0.448	20.945	8.545	0
522.96	1029.54	0.285	20.935	7.324	0
522.96	1030.54	0.448	20.905	6.917	0.033
522.96	1031.54	0.488	21.016	6.917	0.041
522.96	1032.54	0.366	20.955	6.104	0
522.96	1033.54	0.407	20.945	6.51	0
522.96	1034.54	0.407	20.976	7.324	0.057
522.96	1035.54	0.244	20.925	8.138	0.024
522.96	1036.54	0.285	20.986	7.935	0
522.96	1037.54	0.529	20.884	6.714	0.008
522.96	1038.54	0.61	20.925	6.714	0.049
522.96	1039.54	0.61	20.976	8.545	0.016
522.96	1040.54	0.448	20.955	7.324	0
522.96	1041.54	0.488	20.945	5.697	0.024
522.96	1042.54	0.366	20.925	6.51	0.041
522.96	1043.54	0.244	20.996	5.086	0
522.96	1044.54	0.488	20.976	4.883	0
522.96	1045.54	0.57	20.986	6.104	0.033
522.96	1046.54	0.488	20.925	7.121	0.033
522.96	1047.54	0.244	20.945	5.493	0
522.96	1048.54	0.448	20.945	3.866	0
522.96	1049.54	0.61	20.935	6.51	0.041
		AVERAGE 0.489	AVERAGE 20.981	AVERAGE 6.917	AVERAGE 0.205

LP / TWO HARBORS
PRESS VENT STACKS
TEST 6 RUN 2

DATE	TIME	NOX	O2	CO	CO2
522.96	1232.34	0.081	20.976	9.766	0
522.96	1233.34	0.285	20.935	9.562	0.008
522.96	1234.34	0.081	20.945	11.597	0.033
522.96	1235.34	0.081	20.976	11.8	0
522.96	1236.34	0.041	20.945	8.952	0
522.96	1237.34	0.326	20.976	12.41	0.033
522.96	1238.34	0.203	21.006	16.479	0.024
522.96	1239.34	0.163	20.976	11.597	0
522.96	1240.34	0.366	20.966	8.341	0
522.96	1241.34	0.244	20.996	10.986	0.049
522.96	1242.34	0.122	21.027	10.173	0.016
522.96	1243.34	0.041	20.966	10.579	0
522.96	1244.34	0.163	21.016	8.341	0.016
522.96	1245.34	0.203	20.935	9.155	0.041
522.96	1246.34	0.081	20.976	10.579	0
522.96	1247.34	0.041	20.996	12.41	0
522.96	1248.34	0.285	20.955	17.904	0.016
522.96	1249.34	0.285	20.935	12.817	0.041
522.96	1250.34	0.163	20.925	11.8	0
522.96	1251.34	0.122	20.976	7.731	0
522.96	1252.34	0.081	20.945	7.324	0.033
522.96	1253.34	0.122	20.915	7.935	0.033
522.96	1254.34	0	20.946	7.121	0
522.96	1255.34	0	20.894	7.528	0
522.96	1256.34	0.081	20.894	7.324	0.049
522.96	1257.34	0.203	20.935	9.155	0.008
522.96	1258.34	0	20.894	11.393	0
522.96	1259.34	0.203	20.884	10.173	0.008
522.96	100.34	0	20.854	10.986	0.049
522.96	102.27	0.041	20.935	5.086	0
522.96	103.24	0.326	20.894	3.052	0
522.96	104.24	0.326	20.915	7.528	0
522.96	105.24	0.244	20.955	7.528	0
522.96	106.24	0.203	20.915	5.697	0
522.96	107.24	0.326	20.894	5.086	0
522.96	108.24	0.326	20.905	8.138	0
522.96	109.24	0.448	20.915	8.545	0
522.96	110.24	0.203	20.894	8.138	0
522.96	111.24	0.285	20.915	6.51	0
522.96	112.24	0.244	20.905	4.883	0
522.96	113.24	0.285	20.905	3.662	0
522.96	114.24	0.326	20.894	5.697	0
522.96	115.24	0.407	20.884	5.9	0
522.96	116.24	0.366	20.945	4.679	0
522.96	117.24	0.326	20.864	5.697	0
522.96	118.24	0.163	20.905	4.272	0
522.96	119.24	0.203	20.864	3.459	0.008
522.96	120.24	0.122	20.905	3.052	0
522.96	121.24	0.203	20.874	4.272	0
522.96	122.24	0.407	20.915	5.086	0
522.96	123.24	0.326	20.884	4.476	0
522.96	124.24	0.326	20.894	7.935	0.008
522.96	125.24	0.285	20.844	7.731	0.049
522.96	126.24	0.203	20.874	4.679	0
522.96	127.24	0.366	20.864	5.493	0
522.96	128.24	0.244	20.884	6.307	0
522.96	129.24	0.448	20.864	5.9	0.008
522.96	130.24	0.57	20.874	3.662	0
522.96	131.24	0.488	20.874	6.104	0
522.96	132.24	0.407	20.894	4.069	0
		AVERAGE	AVERAGE	AVERAGE	AVERAGE
		0.244	20.935	6.9175	0

LP / TWO HARBORS
PRESS VENT STACKS
TEST 6 RUN 3

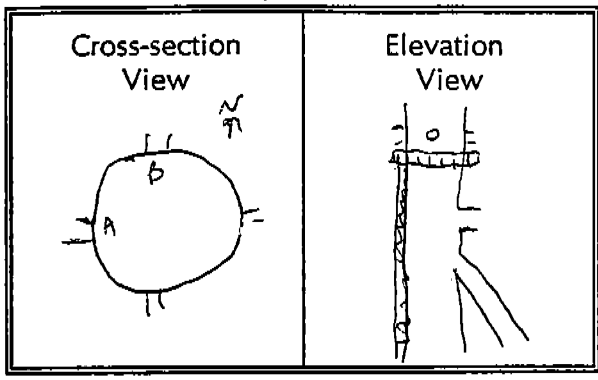
DATE	TIME	NOX	O2	CO	CO2
522.96	225.24	0.203	20.955	3.459	0
522.96	226.24	0.244	20.976	4.272	0
522.96	227.24	0.285	21.027	3.866	0
522.96	228.24	0.203	20.945	3.662	0
522.96	229.24	0.244	20.976	4.883	0
522.96	230.24	0.122	20.976	4.476	0
522.96	231.24	0.081	20.996	1.424	0
522.96	250.24	0.041	20.935	0	0
522.96	251.24	0	20.925	0	0
522.96	252.24	0.122	20.925	1.424	0.008
522.96	253.24	0.163	20.915	1.628	0
522.96	254.24	0.081	20.935	1.221	0
522.96	255.24	0.041	20.955	1.221	0
522.96	256.24	0.041	20.955	2.238	0
522.96	257.24	0.081	20.955	3.866	0
522.96	258.24	0.081	20.945	3.459	0
522.96	259.24	0.203	20.894	2.645	0
522.96	300.24	0.203	20.884	3.052	0
522.96	301.24	0.163	20.945	1.017	0
522.96	302.24	0.041	20.935	0.61	0
522.96	303.24	0.081	20.935	0.814	0
522.96	304.24	0.041	20.925	1.221	0
522.96	305.24	0.041	20.945	1.017	0
522.96	306.24	0.203	20.905	1.221	0
522.96	307.24	0.081	20.905	1.424	0
522.96	308.24	0.081	20.955	1.424	0
522.96	309.24	0.163	20.935	1.424	0
522.96	310.24	0.285	20.905	3.052	0
522.96	311.24	0.081	20.945	3.052	0
522.96	312.24	0.041	20.955	2.441	0
522.96	315.54	0.041	20.905	2.238	0
522.96	316.54	0.081	20.945	1.831	0
522.96	317.54	0.122	20.884	1.628	0.041
522.96	318.54	0.081	20.935	1.831	0.008
522.96	319.54	0.041	20.945	1.221	0
522.96	320.54	0.081	20.925	0.814	0.016
522.96	321.54	0.163	20.955	1.017	0.016
522.96	322.54	0	20.894	1.017	0
522.96	323.54	0.041	20.935	1.017	0
522.96	324.54	0.122	20.894	0.814	0.033
522.96	325.54	0.041	20.986	1.221	0.008
522.96	326.54	0.163	20.864	1.017	0
522.96	327.54	0.081	20.905	1.221	0
522.96	328.54	0.041	20.915	1.628	0
522.96	329.64	0.244	20.935	1.017	0
522.96	330.54	0.285	20.905	2.441	0.024
522.96	331.54	0.407	20.894	3.255	0.016
522.96	332.54	0.081	20.805	3.459	0.008
522.96	333.54	0.122	20.905	3.052	0
522.96	334.54	0.203	20.884	1.424	0.024
522.96	335.54	0.081	20.935	1.221	0.008
522.96	336.54	0.122	20.915	1.424	0
522.96	337.54	0.203	20.955	1.628	0.008
522.96	338.54	0.081	20.925	2.035	0.041
522.96	339.54	0.081	20.935	2.645	0.008
522.96	340.54	0.122	20.925	1.628	0
522.96	341.54	0.122	20.915	2.238	0.016
522.96	342.54	0.163	20.894	2.238	0.041
		AVERAGE 0.163	AVERAGE 20.9345	AVERAGE 2.2495	AVERAGE 0.0305

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: LP Two Harbors
Source: Dryer RTO Stack
Test: 4 Run: 3 Date: 5-21-96
Stack Dimen.: 64 IN.
Dry Bulb: ____ °F Wet bulb: ____ °F
Manometer: ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.84 IN.HG
Static Pressure: ____ IN.WC
Operators: S.B / M.P
Pitot No.: ____ C_p ____

Drawing of Test Site



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN. 6.5	Time Start:	HRS
1	16.7	10.69	17.19		
2	50	32.00	38.50		
3	83.3	53.31	59.81		
Temp. Meas. Device & S/N:				Time End:	HRS

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

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC
(612) 786-6020

O_2 Cal Drift Check

Job: LP TWO HARBORS Source: DRYER RTO
Test: 4 Run: 1-3 Date: 5-21-96 Site: STACK
Operator: SD

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	17.3	Zero Gas	0	0	0	0		17.3
		Upscale	13.5	13.5	13.5		13.5	
2	17.2	Zero Gas	0	0	0	0		17.2
		Upscale	13.5	13.5	13.5		13.5	
3	17.1	Zero Gas	0	0	0	0		17.1
		Upscale	13.5	13.5	13.5		13.5	
4		Zero Gas	0					
		Upscale						
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO_2 Cal Drift Check

Job: LP Two Harbors
Source: Dryer RTO
Test: 4 Run: 1-3 Date: 5-21-96
Site: STACK
Operator: SB

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Final	C_o	C_m	C_{gas}
1	3.1	Zero Gas	0	0	0	0		3.1
		Upscale	10.8	10.8	10.8		10.8	
2	3.1	Zero Gas	0	0	0	0		3.1
		Upscale	10.8	10.8	10.8		10.8	
3	3.0	Zero Gas	0	0	0	0		3.0
		Upscale	10.8	10.8	10.7		10.75	
4		Zero Gas	0					
		Upscale						
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

NOx Cal Drift Check

Job: LP Two Harbors
Test: 4 Run: 1-3 Date: 5-21-96
Operator: JB
Source: Dryer RTO
Site: STACK

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	21.3	Zero Gas	0	0	2	1		20.3
		Upscale	78.4	78.4	80.6		79.5	
2	16.4	Zero Gas	0	0	0	0		16.2
		Upscale	78.4	78.4	80.7		79.6	
3	14.2	Zero Gas	0	0	0	0		14.2
		Upscale	78.4	78.4	78.6		78.5	
4		Zero Gas	0					
		Upscale						
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC

(612) 786-6020

CO Cal Drift Check

Job: LP ~~H~~ TWO HARBORS   Source: DRYER RTO

Test: 4 Run: 1-3 Date: 5-21-96   Site: STACK

Operator: SB

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	81.6	Zero Gas	0	0	-6	-3		84.3
		Upscale	299	299	295		297	
2	41.2	Zero Gas	0	0	-6	-3		44.0
		Upscale	299	299	296		297.5	
3	51.3	Zero Gas	0	0	0	0		51.65
		Upscale	299	299	295		297	
4		Zero Gas	0					
		Upscale						
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC Cal Drift Check

Job: LP TWO HARBORS
Test: 4 Run: 1-3 Date: 5-21-96
Operator: SB
Source: DRYER RTO
Site: STACK

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	41.5	Zero Gas	0	0	0	0		41.5
		Upscale	30	30	31		30.5	
2	41.5	Zero Gas	0	0	2	1		41.5
		Upscale	30	30	31		30.5	
3	41.5	Zero Gas	0	0	1	.5		41.5
		Upscale	30	30	29		29.5	
4		Zero Gas	0					
		Upscale						
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						

Margin notes: 945 / To 15.. / POINT CH... / TO 50 / 11 35 / 1208 ↓ / 1235 / 124... / 130... ↑ / 1313 / POINT C... / 134... / ~~1537~~ ↓ / 1600 ... / 1600 / 1642 END FORMS / 1700 (ENST)

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

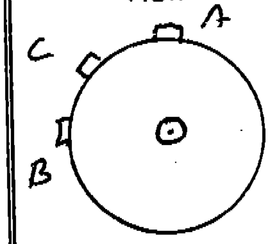
091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. / Two Harbors, MN
Source: RTO / Inlet
Test: 4 Run: 0 Date: 5-21-96
Stack Dimen.: 54 IN.
Dry Bulb: 164 °F Wet bulb: 140 °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.84 IN.HG
Static Pressure: ~1.35 IN.WC
Operators: M. Kuehler + K. Wessmeier
Pitot No.: INST C_p: NA

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: 6 IN.		Time Start: NA HRS	
C-1	1/6	9.00	15.00		
2	3/6	27.00	33.00		164
3	5/6	45.00	51.00		

Temp. Meas. Device & S/N: PDT-31 / TC

Time End: NA HRS

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

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC Cal Drift Check

Job: L.P. / Two Harbors, MN Source: RTO
Test: 4 Run: 1, 2, 3 Date: 5-21-96 Site: Inlet
Operator: M. Koehler

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	39.74	Zero Gas	0	0	0	0		39.55
		Upscale	292.6	291	297		294	
2	47.98	Zero Gas	0	0	1	.5		47.09
		Upscale	292.6	297	294		295.5	
3	49.65	Zero Gas	0	1	2	1.5		48.41
		Upscale	292.6	294	291		292.5	
4		Zero Gas	0					
		Upscale						
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC Cal Drift Check

Job: LP/Two Harbors
Test: 4 Run: 1-3 Date: 5-21-96
Operator: Bob
Source: Primary Cyclone outlet
Site: Outlet

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	25	Zero Gas	0	0	1	0.5		25
		Upscale	287	285	284		285	
2	48	Zero Gas	0	1	2	1.5		50
		Upscale	30	30	28.76		29	
3	44	Zero Gas	0	2	3	2.5		46
		Upscale	30	28.76	31		30	
4		Zero Gas	0					
		Upscale						
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC Cal Drift Check

Job: L.P. / Two Harbors, MN
Source: E-Tube
Test: 4 Run: 1,2,3 Date: 5-22-96
Site: Outlet
Operator: M. Kuehler

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Final	C_o	C_m	C_{gas}
1	49.03	Zero Gas	0	1	2	1.5		47.38
		Upscale	292.6	294	296		295	
2	84.94	Zero Gas	0	2	1	1.5		83.33
		Upscale	292.6	296	293		294.5	
3	55.68	Zero Gas	0	1	4	2.5		53.47
		Upscale	292.6	293	294		293.5	
4		Zero Gas	0					
		Upscale						
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.

070695-G:\STACK\WP\FORMS\S-559

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC Cal Drift Check

Job LP Two Harbors Source Press Vent

Test 6 Run 1-3 Date 5-22-96 Site Stacks

Operator JB

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	24	Zero Gas	0	0	2	1		25
		Upscale	30	30	27		28.5	
2	11	Zero Gas	0	0	1	.5		11
		Upscale	30	30	30		30	
3	10	Zero Gas	0	0	2	1		9
		Upscale	30	30	30		30	
4		Zero Gas	0					
		Upscale						
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.

950 S
1020
Stack change
1021 N
1051

1232
1302
Stack change
1203 S
1333

1425
1432 N
1449 N
1512
Stack change
1513
1543

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020
O₂ Cal Drift Check

Job: LP Two Harbors
Test: 6 Run: 1-3 Date: 5-22-96
Operator: SB
Source: Press Vent
Site: Stacks

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Final	C_o	C_m	C_{gas}
1	20.9	Zero Gas	0	0	0	0	▒	20.9
		Upscale	21.0	21.0	20.9	▒	20.95	
2	20.9	Zero Gas	0	0	0	0	▒	20.9
		Upscale	21.0	21.0	20.8	▒	20.9	
3	20.9	Zero Gas	0	0	0	0	▒	20.9
		Upscale	21.0	20.9	21.0	▒	20.95	
4		Zero Gas	0				▒	
		Upscale				▒		
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC

(612) 786-6020

CO_2 Cal Drift Check

Job LP Two Harbors

Test 6 Run 1-3 Date 5-22-96

Operator TB

Source Press Vent

Site Stacks

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Final	C_o	C_m	C_{gas}
1	0	Zero Gas	0	0	0	0		0
		Upscale	16.8	16.8	16.7		16.75	
2	0	Zero Gas	0	0	0	0		0
		Upscale	16.8	16.8	16.8		16.8	
3	0	Zero Gas	0	0	0	0		0
		Upscale	16.8	16.8	16.8		16.8	
4		Zero Gas	0					
		Upscale						
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

NOx Cal Drift Check

Job: LP Two Harbors
Test: 6 Run: 1-3 Date: 5-22-96
Operator: JB
Source: Press Vent ~~Stacks~~
Site: Stacks

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Final	C_o	C_m	C_{gas}
1	0	Zero Gas	0	0	0	0		0
		Upscale	78.4	78.4	78.4		78.4	
2	0	Zero Gas	0	0	0	0		0
		Upscale	78.4	78.4	78		78.2	
3	0	Zero Gas	0	0	0	0		0
		Upscale	78.4	78.0	77.8		77.9	
4		Zero Gas	0					
		Upscale						
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO Cal Drift Check

Job: LP Two Harbors   Source: Press Vent
Test: 6   Run: 1-3   Date: 5-22-96   Site: Stacks
Operator: S B

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	6.9	Zero Gas	0	1	-6	-2.5		9.4
		Upscale	299	299	297		298	
2	6.9	Zero Gas	0	[illegible]	-2	-1		7.9
		Upscale	299	299	297		298	
3	2.8	Zero Gas	0	0	-4	-2		4.7
		Upscale	299	297	304		300.5	
4		Zero Gas	0					
		Upscale						
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.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC

(612) 786-6020

THC System Bias Check

Job: L.P. / Two Harbors, MN Source: E-Tube

Test: 4 Run: 0 Date: 5-21-96 Site: outlet

Operator: M. Koehler

Instrument	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
			Cal. Err.	Sys. Bias			
VIG	Zero Gas	0	0	1	1	1,000	.1
	Upscale	292.6	288	293	5	1,000	.5
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						

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

070595-G:\STACK\WP\FORMS\S-562

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Calibration Error Check

Job L.P. / Two Harbors, MN

Test 4 Run 0 Date 5-21-96

Operator M. Kaehler

SO_2 Calibration: Time (HRS)

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	Ø				
Mid Level					
High Level					

NO_x Calibration: Time (HRS) 0735

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	Ø	-0	0	500	0
Mid Level	239	245	6	500	1.2
High Level	465	466	1	500	.2

O_2 Calibration: Time (HRS)

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	Ø				
Mid Level					
High Level					

CO_2 Calibration Time (HRS)

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	Ø				
Mid Level					
High Level					

CO Calibration Time (HRS) 0735

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	Ø	MK ~~0~~ 2	2 ~~1000~~ ML	1,000	.2
Mid Level	289	294	5 ~~10~~ ML	1,000	.5
High Level	620	621	1	1,000	.1

052394-G:\STACK\WP\FORMS\S-420-10

INTERPOLL LABORATORIES, INC
(612) 786-6020

EPA Method 25 A
Calibration Error Check & Drift Determination

Job L.P. / Two Harbors, MN

Test 4 Run 0 Date 5-21-96

Operator M. Koehler

THC Calibration (Low Range): **Time (HRS)** 1820

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0	0	0	100	0
Low Level	30.0	30	0	100	0
Mid Level	292.6	287	5.6	1000	.56
High Level	2990	3005	15	10,000	.15

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.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

________ System Bias Check

Job: LP TWO HARBORS
Source: DRYER RTO
Test: 4 Run: 0 Date: 5-21-96
Site: STACK
Operator: S BARNVILLE

Instrument	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Cal. Err.	Sys. Bias	Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
THC	Zero Gas	0	0	0	0	100	0
	Upscale	30	30	30	30	100	0
NOX	Zero Gas	0	0	0	0	100	0
	Upscale	78.4	80	80	0	100	0
CO	Zero Gas	0	0	0	0	1000	0
	Upscale	299	293	304	11	1000	1.1
O2	Zero Gas	0	0	0	0	25	0
	Upscale	13.5	13.6	13.5	.1	25	.4%
CO2	Zero Gas	0	0	0	0	20	0
	Upscale	10.8	10.6	10.8	.2	20	1%
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						

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

070595-G:\STACK\WP\FORMS\S-562

INTERPOLL LABORATORIES, INC.

(612) 786-6020

Calibration Error Check

Job: LP TWO HARBORS

Test: 4 Run: 0 Date: 5-21-96

Operator: J BARNVILLE

THC ~~SO_2~~ Calibration:

Time (HRS) ______

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	∅	~~[illegible]~~ -1	1	100	1 %
Low ~~Mid~~ Level	30	30	0	100	0
Mid ~~High~~ Level	299	287	12	1000	1.2 %
High	2972	3030		10,000	.6 %

NO_x Calibration:

Time (HRS) ______

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	∅	0	0	250	0
Mid Level	78.4	80	1.6	250	.6 %
High Level	143	143	0	250	0

O_2 Calibration:

Time (HRS) ______

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value ~~(PPM)~~	Percent of Span
Zero Gas	∅	0	0	25 %	0
Mid Level	13.5	13.6	.1	25 %	.4 %
High Level	21	21	0	25 %	0

CO_2 Calibration

Time (HRS) ______

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value ~~(PPM)~~	Percent of Span
Zero Gas	∅	0	0	20 %	0
Mid Level	10.8	10.6	.2	20 %	1.0 %
High Level	16.8	16.8	0	20 %	0

CO Calibration

Time (HRS) ______

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	∅	0	0	1000	0
Mid Level	299	293	6	1000	.6 %
High Level	600	600	~~1000~~ 0	1000	0

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INTERPOLL LABORATORIES, INC
(612) 786-6020

EPA Method 25 A
Calibration Error Check & Drift Determination

Job CP / Two Harbors

Test 4 Run ______ Date ______

Operator GCB

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	
Low Level	30	30.2	.2	100	
Mid Level	287	287	0	1000	
High Level	2960	3000	40	10000	

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.

052394-G:\STACK\WP\FORMS\S-420-14

INTERPOLL LABORATORIES, INC
(612) 786-6020

EPA Method 25 A
Calibration Error Check & Drift Determination

Job L.P. / Two Harbors, MN

Test 4 Run 0 Date 5-21-96

Operator M. Koehler

THC Calibration (Low Range): Time (HRS) 1800

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0	0	0	100	0
Low Level	30.0	30	0	100	0
Mid Level	292.6	288	4.6	1,000	.46
High Level	2990	3013	23	10,000	.23

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.

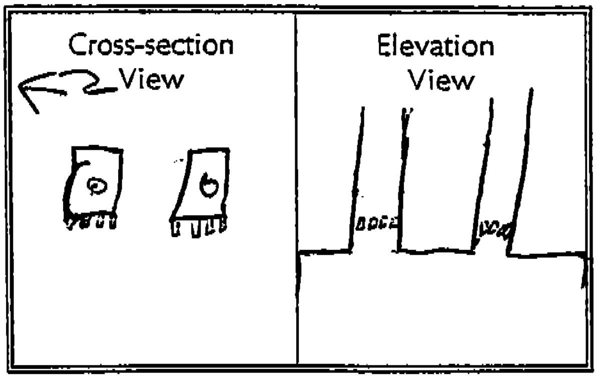
052394-G:\STACK\WP\FORMS\S-420-14

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP/Two Harbors
Source Press Vent Stacks
Test 6 Run 1-3 Date 5-22-96
Stack Dimen. 55" by 55" X 2 IN.
Dry Bulb ____ °F Wet bulb ____ °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure ____ IN.HG
Static Pressure ____ IN.WC
Operators S.B.
Pitot No. ____ C_p ____

Drawing of Test Site



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas
		Port Length:	4 IN.	Time Start:	HRS
1	.167	9.2	13.2		
2	.5	27.5	31.5		
3	.833	45.8	49.8		

Temp. Meas. Device & S/N: | Time End: HRS

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

032594-G:\STACK\WP\FORMS\S-392.1

Servomex

1420
Oxygen Analyser
Instruction Manual

Ref : 01420/001A/0

Order as part No. 01420001A

was (7982-2842)

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

1.3 Sampling System

The sampling system of the analyser includes a combination filter/automatic flow control device, designed to keep a constant flow of sample gas through the measuring cell for varying input pressures and to prevent the entrance of particulate matter into the measuring cell. Excess flow is vented to the by-pass.

1.4 Specification

Performance Specification (typical)

Repeatability:	Better than +/-0.2% O_2 under constant conditions.
Drift:	Less than 0.2% O_2 per week under constant conditions. (Excluding variation due to barometric pressure changes; reading is proportional to barometric pressure.)

Outputs

Display:	3 1/2 digit LCD reading 0.0 to 100.0% oxygen with overrange capability.
Output:	0 to 1V (non-isolated) for 0 to 100% oxygen available on 'D' type connector located on the back panel of the instrument. Output impedance is less than 10 ohms.
Option:	4 - 20mA isolated, Max impedance 500 ohms.
Flow alarm output:	Change over relay contact rated at 3A/115V ac, 1A/240V ac or 1A/28V dc. 4 sets of single pole changeover contacts. Alarm becomes active when sample gas flow through the analyser fails.

Sample requirements

Condition:	Clean, dry gas with dew point 5 deg C below ambient temperature.
Inlet pressure:	0.5 to 3psig (3.5 to 21kPa). Inlet pressure changes within this range will change the reading by less than 0.1% O_2. May be operated up to 10psig (70kPa) with degraded stability.
Flowrate:	1.5 to 6 litres/minute approximately depending on sample pressure.
Filtering:	0.6 micron replaceable filter integral to the automatic flow control device.

Response time:	Less than 15 secs. to 90% at an inlet pressure of 3psig (21kPa).
Inlet/vent connections:	1/4 inch OD tube (stainless steel) suitable for 6mm ID flexible tubing or 1/4 inch OD compression fittings.
Materials exposed to the sample:	Stainless steel, Pyrex glass, brass, platinum, epoxy resin, Viton, polypropylene and glass fibre filter.

Physical Characteristics

Case:	Steel and aluminium finished in epoxy powder paint.
Case classification:	IP 20 (IEC 529) when fitted into the Servomex 1400 series 19 inch case.
Dimensions:	See Figure 2.1.
Weight:	10Kg (22lb) approximately.

Electrical

AC Supply:	110 to 120V AC or 220 to 240V AC, +/-10%, 48 to 62Hz. Voltage selected by a voltage selector integral to the IEC supply plug.
Power required:	15VA maximum.

Environmental Limits

Operating ambient temperature:	0 to +40 deg C (32 to 104 deg F)
Storage temp. range:	-20 to +70 deg C (-4 to 158 deg F)
Relative humidity:	0-85%, non-condensing.

SPECIFICATIONS FOR ACS MODEL 3300 CO_2 NDIR

Measuring principle	NDIR single beam method
Measurable gas components and measuring range	0 - 20%
Reproducibility	±0.5% of full scale
Stability	Zero drift; ±% of full scale/24H Span drift; ±% of full scale/24H
Noise	0.5% of full scale
Ambient temperature	-5 to 45°C
Ambient humidity	Less than 90% RH
Response time (90% of final reading)	Electrical system; 2 sec, 3 sec, 5 sec (selectable with connector) Response of actual gas; Within 15 sec (depending on cell length)
Indicator	100 linear division
Output signal	OUTPUT 1; DC 0 - 1 V OUTPUT 2; DC 0 - 10 mV or DC 0 - 100 mV or DC 0 - 1 V or DC 4 - 20 mA (Allowable load resistance 500Ω max.)
Linearity	Better than ±2% of full scale (when linearizer is used)
Power supply	AC 115 V ± 10%, 60 Hz

Power consumption	Approx. 30 VA
Materials of gas-contacting parts	Measuring cell; SUS304 Window; CaF_2 Piping; Polyethylene
Sample gas flow rate	1ℓ/min ± 0.5ℓ/min
Sample gas temperature	0 to 55°C
Purging gas flow rate	1ℓ/min (to be flowed as occasion demands)
Warmup time	Approx. 2 hours
External dimensions	200 x 250 x 541 (H x W x D) mm
Weight	Approx. 11 kg
Finish Color	MUNSELL N1.5

Remarks: For combinations of measuring ranges for the dualcomponent analyzer, inquiry should be made to the manufacturer.

SPECIFICATIONS FOR MODEL 10A
ROCK MOUNTED CHEMILUMINESCENT
$NO-NO_x$ GAS ANALYZER

Sensitivity	Each instrument is equipped with the following ranges: 0 - 2.5 ppm 0 - 10 ppm 0 - 25 ppm 0 - 100 ppm 0 - 250 ppm 0 - 1000 ppm 0 - 2500 ppm 0 - 10000 ppm
Accuracy	Derived from the NO or NO_2 calibration gas, ±1% of fullscale
Response time (0-90%) Typical	1.5 seconds - NO Mode 1.7 seconds - NO_x Mode
Output	0 - 10mV and 0 - 10V
Zero Drift	Negligible after 1/2-hour warm-up
Linearity	±1% of full scale
Input Power Requirements	115v/50Hz; 115v/60Hz

SPECIFICATIONS FOR ACS MODEL 3300 CO NDIR

Measuring principle	NDIR single beam method
Operating ranges	0 - 500 ppm 0 - 1000 ppm
Reproducibility	±0.5% of full scale
Stability	Zero drift; ±% of full scale/24H Span drift; ±% of full scale/24H
Noise	0.5% of full scale
Ambient temperature	-5 to 45°C
Ambient humidity	Less than 90% RH
Response time (90% of final reading)	Electrical system; 2 sec, 3 sec, 5 sec (selectable with connector) Response of actual gas; Within 15 sec (depending on cell length)
Indicator	100 linear division
Output signal	OUTPUT 1; DC 0 - 1 V OUTPUT 2; DC 0 - 10 mV or DC 0 - 100 mV or DC 0 - 1 V or DC 4 - 20 mA (Allowable load resistance 500Ω max.)
Linearity	Better than ±2% of full scale (when linearizer is used)
Power supply	AC 115 V ± 10%, 60 Hz

Power consumption	Approx. 30 VA
Materials of gas-contacting parts	Measuring cell; SUS304 Window; CaF_2 Piping; Polyethylene
Sample gas flow rate	1ℓ/min ± 0.5ℓ/min
Sample gas temperature	0 to 55°C
Purging gas flow rate	1ℓ/min (to be flowed as occasion demands)
Warmup time	Approx. 2 hours
External dimensions	200 x 250 x 541 (H x W x D) mm
Weight	Approx. 11 kg
Finish Color	MUNSELL N1.5

Remarks: For combinations of measuring ranges for the dualcomponent analyzer, inquiry should be made to the manufacturer.

Ratfisch INSTRUMENTE

TOTAL HYDROCARBON ANALYZER (FLAME IONIZATION
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:

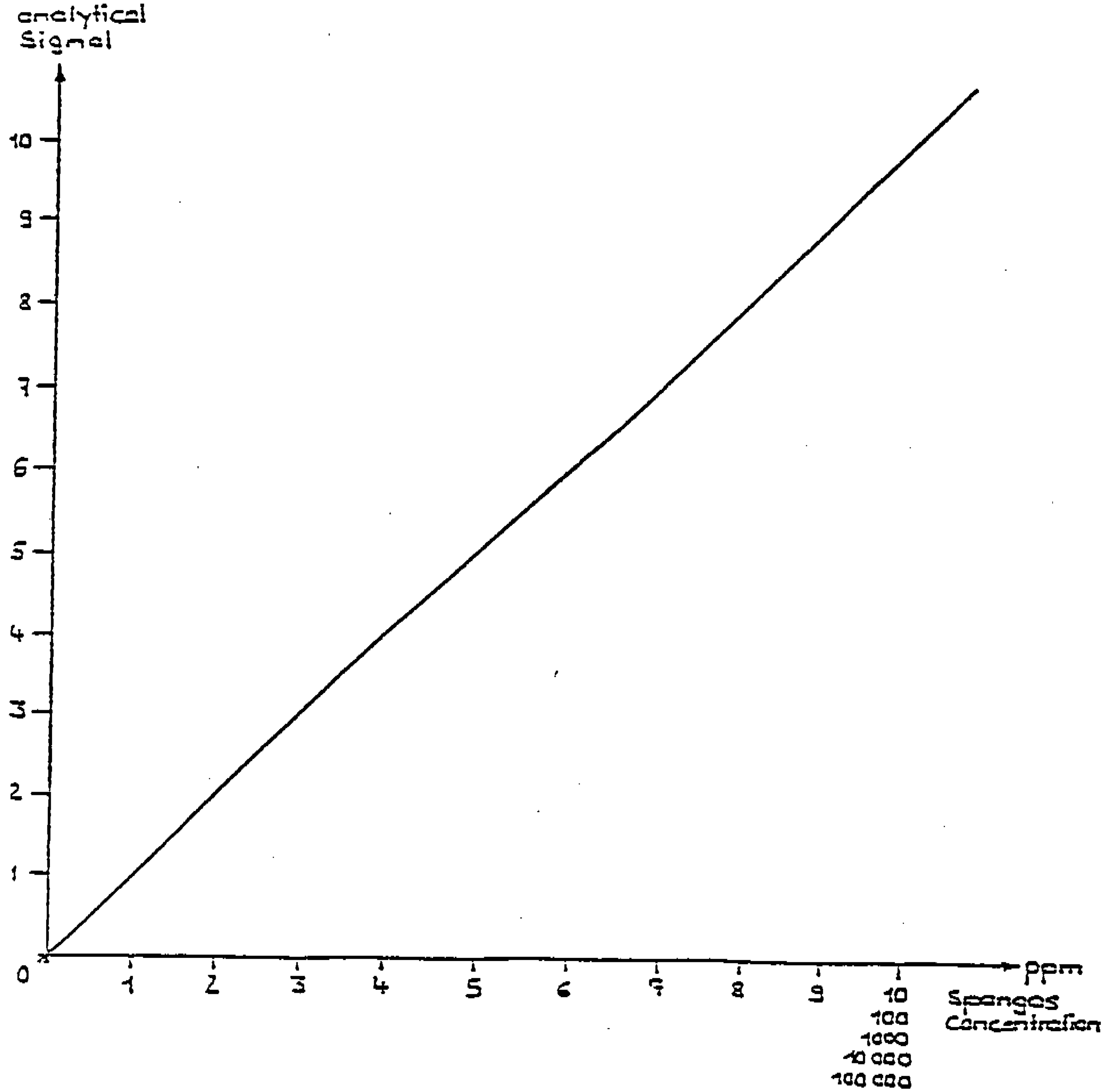
Temperature: ..160.°C

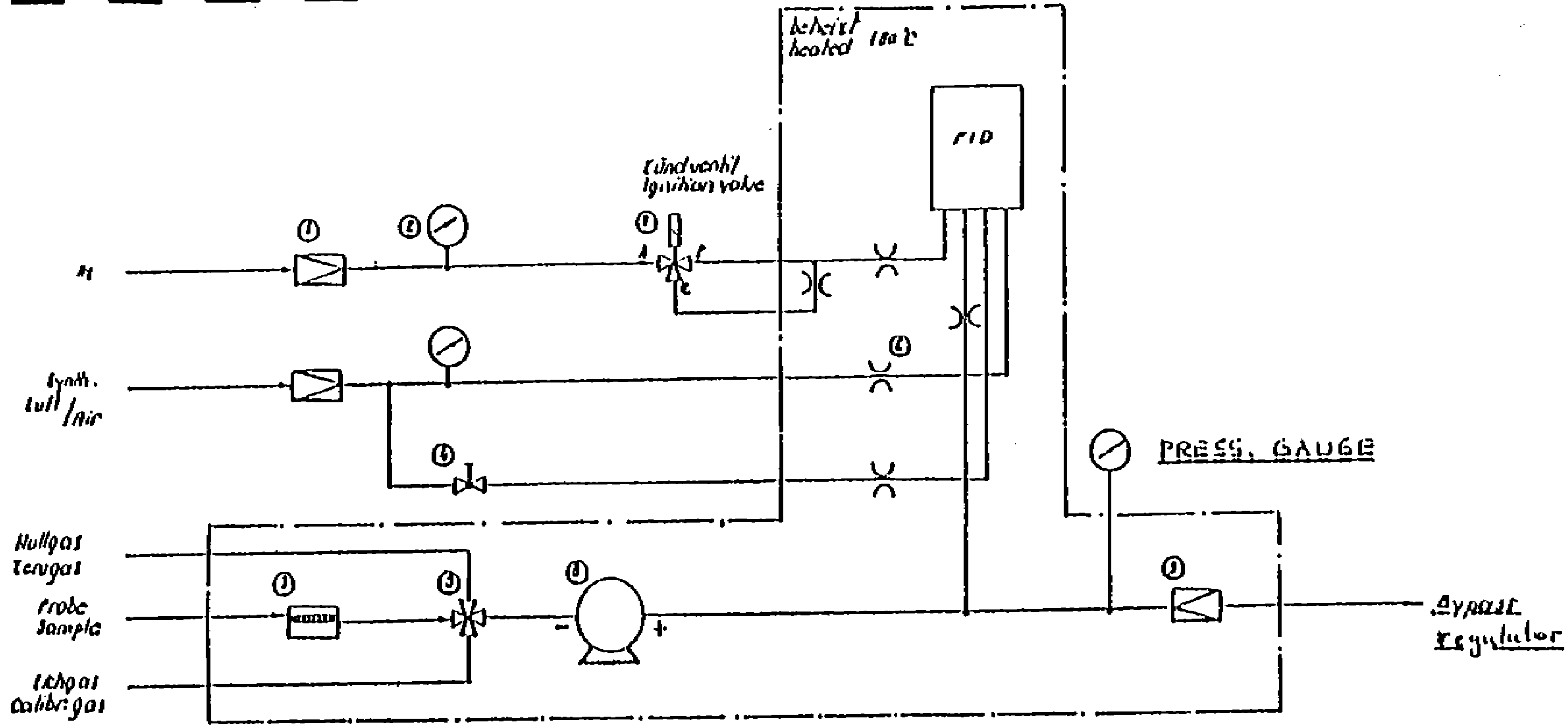
Zero Point : .3,90...
Gain : ....7,70...

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

CALIBRATION DIAGRAMM





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

Zündventil
Ignition valve

E-A angezogen
energised

R-A stromlos
at rest

Handumschaltung
manual switching

Ratfisch Instruments	FLAMMEN IONISATIONS DETEKTOR Flame Ionisation Detector	
	Fließplan Flowdiagram	RS 55 13.04.88

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certificate of Analysis for Standard Gas

Vendor: National Specialty Gases
Cylinder No.: CC 114192
Date of Preparation: ~~4-4-96~~ 3-23-93
Label: Nitric Oxide
Blend Specification: 239 ppm Balance N_2

Results of Analysis of Standard Gas			
Date of Analysis	Run	NOx	
4-5-96	1	236.5035	
4-5-96	2	235.5680	
4-5-96	3	234.6729	
	4		
	5		
	6		
	Avg	235.5815	1.43%

Analyst: Bob A

☒ Results are within 2% of the vendor tag value; use tag value.

☐ Results are not within 2% of the vendor tag value; conduct another set of triplicate analyses.

☐ All results within ± 2% of the average; relabel as above.

☐ All results not within ± 2% of the average; perform another set of triplicate analyses.

Date: April 5, 1996

Approved by: [signature]

012696-G:\STACK\WP\FORMS\S-425

INTERPOL LABS

TANK CERT
TANK NUMBER CC114192
4/5/96

4/5/96	7:54:00 AM			
0	237.175	0	0	0
4/5/96	7:54:06 AM			
0	236.361	0	0	0
4/5/96	7:54:12 AM			
0	236.768	0	0	0
4/5/96	7:54:18 AM			
0	236.361	0	0	0
4/5/96	7:54:24 AM			
0	237.175	0	0	0
4/5/96	7:54:30 AM			
0	236.361	0	0	0
4/5/96	7:54:36 AM			
0	236.768	0	0	0
4/5/96	7:54:42 AM			
0	236.361	0	0	0
4/5/96	7:54:48 AM			
0	235.954	0	0	0
4/5/96	7:54:54 AM			
0	236.768	0	0	0
4/5/96	7:55:00 AM			
0	236.361	0	0	0
4/5/96	7:55:06 AM			
0	236.768	0	0	0
4/5/96	7:55:12 AM			
0	236.361	0	0	0
4/5/96	7:55:18 AM			
0	235.548	0	0	0
4/5/96	7:55:24 AM			
0	235.954	0	0	0
4/5/96	7:55:30 AM			
0	237.582	0	0	0
4/5/96	7:55:36 AM			
0	235.548	0	0	0
4/5/96	7:55:42 AM			
0	235.954	0	0	0
4/5/96	7:55:48 AM			
0	236.361	0	0	0
4/5/96	7:55:54 AM			
0	237.582	0	0	0
	236.50355			

INTERPOLL LABS

TANK CERT
TANK NUMBER CC114192
4/5/96

4/5/96	8:09:00 AM			
0	234.327	0	0	0
4/5/96	8:09:06 AM			
0	234.734	0	0	0
4/5/96	8:09:12 AM			
0	235.141	0	0	0
4/5/96	8:09:18 AM			
0	235.141	0	0	0
4/5/96	8:09:24 AM			
0	235.548	0	0	0
4/5/96	8:09:30 AM			
0	235.141	0	0	0
4/5/96	8:09:36 AM			
0	235.141	0	0	0
4/5/96	8:09:42 AM			
0	234.734	0	0	0
4/5/96	8:09:48 AM			
0	234.734	0	0	0
4/5/96	8:09:54 AM			
0	235.141	0	0	0
4/5/96	8:10:00 AM			
0	234.734	0	0	0
4/5/96	8:10:06 AM			
0	234.734	0	0	0
4/5/96	8:10:12 AM			
0	235.141	0	0	0
4/5/96	8:10:18 AM			
0	235.141	0	0	0
4/5/96	8:10:24 AM			
0	235.141	0	0	0
4/5/96	8:10:30 AM			
0	234.734	0	0	0
4/5/96	8:10:36 AM			
0	233.106	0	0	0
4/5/96	8:10:42 AM			
0	233.513	0	0	0
4/5/96	8:10:48 AM			
0	233.92	0	0	0
4/5/96	8:10:54 AM			
0	233.513	0	0	0

234.67295

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-23182 CYLINDER #: CC114192 CYL PRESSURE: 2000PSIG

EXPIRATION DATE: 3-23-95 LAST ANALYSIS DATE: 3-23-93

CUSTOMER: TWIN CITY OXYGEN P.O.#
METHOD: EPA PROTOCOL # 1 3.0.4. G-1

STANDARD:

SRM #: 1685B

CYL #: CLM-4728

CONC.: 248 PPM

INSTRUMENT:

COMPONENT: BECKMAN CHEMILUMINESCENT

MODEL #: 951A

SERIAL #: 100532

LAST CAL.: 1-2-93

COMP: NO
MEAN CONC: 239 PPM

REPLICATE CONC.

DATE: 3-16-93	DATE: 3-23-93
240 PPM	236 PPM
240 PPM	237 PPM
241 PPM	238 PPM

COMP: NO2
MEAN CONC: 2.99 PPM

REPLICATE CONC.
DATE: DATE:

COMP:
MEAN CONC:

REPLICATE CONC.
DATE: DATE:

BALANCE GAS: NITROGEN

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certificate of Analysis for Standard Gas

Vendor: National Specialty Gases
Cylinder No.: CC 117633
Date of Preparation: ~~4-4-96~~ 2-7-94
Label: Nitric Oxide
Blend Specification: 465 ppm Balance N_2

Results of Analysis of Standard Gas			
Date of Analysis	Run	NOx	
4-5-96	1	453.0160	
4-5-96	2	452.6701	
4-5-96	3	452.2835	
4-5-96	4	449.4960	
4-5-96	5	450.9201	
4-5-96	6	450.8387	
	Avg	451.5374	– 2.89%

Analyst: [signature]

☐ Results are within 2% of the vendor tag value; use tag value.

☒ Results are not within 2% of the vendor tag value; conduct another set of triplicate analyses.

☒ All results within ± 2% of the average; relabel as above.

☐ All results not within ± 2% of the average; perform another set of triplicate analyses.

Date: April 5, 1996

Approved by: [signature]

012696-G:\STACK\WP\FORMS\S-425

INTERPOL LABS

TANK CERT
TANK NUMBER CC117633
4/5/96

4/5/96	9:56:00 AM			
0	453.24	0	0	0
4/5/96	9:56:06 AM			
0	453.24	0	0	0
4/5/96	9:56:12 AM			
0	452.426	0	0	0
4/5/96	9:56:18 AM			
0	453.24	0	0	0
4/5/96	9:56:24 AM			
0	453.24	0	0	0
4/5/96	9:56:30 AM			
0	452.426	0	0	0
4/5/96	9:56:36 AM			
0	452.426	0	0	0
4/5/96	9:56:42 AM			
0	453.24	0	0	0
4/5/96	9:56:48 AM			
0	453.24	0	0	0
4/5/96	9:56:54 AM			
0	452.833	0	0	0
4/5/96	9:57:00 AM			
0	454.46	0	0	0
4/5/96	9:57:06 AM			
0	453.646	0	0	0
4/5/96	9:57:12 AM			
0	453.24	0	0	0
4/5/96	9:57:18 AM			
0	453.24	0	0	0
4/5/96	9:57:24 AM			
0	452.426	0	0	0
4/5/96	9:57:30 AM			
0	452.426	0	0	0
4/5/96	9:57:36 AM			
0	452.833	0	0	0
4/5/96	9:57:42 AM			
0	452.426	0	0	0
4/5/96	9:57:48 AM			
0	453.646	0	0	0
4/5/96	9:57:54 AM			
0	452.426	0	0	0
	453.016			

INTERPOLL LABS

TANK CERT
TANK NUMBER CC17633
4/5/96

4/5/96	10:03:00 AM			
0	452.833	0	0	0
4/5/96	10:03:06 AM			
0	452.833	0	0	0
4/5/96	10:03:12 AM			
0	452.426	0	0	0
4/5/96	10:03:18 AM			
0	452.019	0	0	0
4/5/96	10:03:24 AM			
0	452.426	0	0	0
4/5/96	10:03:30 AM			
0	453.646	0	0	0
4/5/96	10:03:36 AM			
0	452.833	0	0	0
4/5/96	10:03:42 AM			
0	453.24	0	0	0
4/5/96	10:03:48 AM			
0	452.426	0	0	0
4/5/96	10:03:54 AM			
0	452.019	0	0	0
4/5/96	10:04:00 AM			
0	452.833	0	0	0
4/5/96	10:04:06 AM			
0	452.019	0	0	0
4/5/96	10:04:12 AM			
0	452.833	0	0	0
4/5/96	10:04:18 AM			
0	452.426	0	0	0
4/5/96	10:04:24 AM			
0	452.833	0	0	0
4/5/96	10:04:30 AM			
0	452.833	0	0	0
4/5/96	10:04:36 AM			
0	452.833	0	0	0
4/5/96	10:04:42 AM			
0	452.833	0	0	0
4/5/96	10:04:48 AM			
0	452.426	0	0	0
4/5/96	10:04:54 AM			
0	452.833	0	0	0

452.67015

INTERPOL LABS

TANK CERT
TANK NUMBER CC117633
4/5/96

4/5/96	10:12:00 AM			
0	451.205	0	0	0
4/5/96	10:12:06 AM			
0	452.019	0	0	0
4/5/96	10:12:12 AM			
0	452.426	0	0	0
4/5/96	10:12:18 AM			
0	452.426	0	0	0
4/5/96	10:12:24 AM			
0	452.019	0	0	0
4/5/96	10:12:30 AM			
0	452.426	0	0	0
4/5/96	10:12:36 AM			
0	452.019	0	0	0
4/5/96	10:12:42 AM			
0	452.019	0	0	0
4/5/96	10:12:48 AM			
0	452.426	0	0	0
4/5/96	10:12:54 AM			
0	452.833	0	0	0
4/5/96	10:13:00 AM			
0	452.426	0	0	0
4/5/96	10:13:06 AM			
0	452.426	0	0	0
4/5/96	10:13:12 AM			
0	452.426	0	0	0
4/5/96	10:13:18 AM			
0	452.019	0	0	0
4/5/96	10:13:24 AM			
0	452.019	0	0	0
4/5/96	10:13:30 AM			
0	452.833	0	0	0
4/5/96	10:13:36 AM			
0	452.019	0	0	0
4/5/96	10:13:42 AM			
0	452.426	0	0	0
4/5/96	10:13:48 AM			
0	452.833	0	0	0
4/5/96	10:13:54 AM			
0	452.426	0	0	0
	452.28355			

INTERPOLL LABS

TANK CERT
TANK NUMBER CC117633
4/5/96

4/5/96	10:19:00 AM			
0	449.577	0	0	0
4/5/96	10:19:06 AM			
0	449.577	0	0	0
4/5/96	10:19:12 AM			
0	449.171	0	0	0
4/5/96	10:19:18 AM			
0	449.577	0	0	0
4/5/96	10:19:24 AM			
0	449.577	0	0	0
4/5/96	10:19:30 AM			
0	449.171	0	0	0
4/5/96	10:19:36 AM			
0	448.764	0	0	0
4/5/96	10:19:42 AM			
0	449.171	0	0	0
4/5/96	10:19:48 AM			
0	449.171	0	0	0
4/5/96	10:19:54 AM			
0	449.577	0	0	0
4/5/96	10:20:00 AM			
0	449.577	0	0	0
4/5/96	10:20:06 AM			
0	449.577	0	0	0
4/5/96	10:20:12 AM			
0	449.171	0	0	0
4/5/96	10:20:18 AM			
0	449.171	0	0	0
4/5/96	10:20:24 AM			
0	449.577	0	0	0
4/5/96	10:20:30 AM			
0	449.171	0	0	0
4/5/96	10:20:36 AM			
0	449.984	0	0	0
4/5/96	10:20:42 AM			
0	449.984	0	0	0
4/5/96	10:20:48 AM			
0	449.984	0	0	0
4/5/96	10:20:54 AM			
0	450.391	0	0	0

449.496

INTERPOLL LABS

TANK CERT
TANK NUMBER CC117633
4/5/96

4/5/96	10:26:00 AM			
0	451.205	0	0	0
4/5/96	10:26:06 AM			
0	451.205	0	0	0
4/5/96	10:26:12 AM			
0	450.391	0	0	0
4/5/96	10:26:18 AM			
0	452.019	0	0	0
4/5/96	10:26:24 AM			
0	450.798	0	0	0
4/5/96	10:26:30 AM			
0	450.798	0	0	0
4/5/96	10:26:36 AM			
0	451.205	0	0	0
4/5/96	10:26:42 AM			
0	450.798	0	0	0
4/5/96	10:26:48 AM			
0	450.798	0	0	0
4/5/96	10:26:54 AM			
0	450.798	0	0	0
4/5/96	10:27:00 AM			
0	450.391	0	0	0
4/5/96	10:27:06 AM			
0	450.798	0	0	0
4/5/96	10:27:12 AM			
0	451.612	0	0	0
4/5/96	10:27:18 AM			
0	450.391	0	0	0
4/5/96	10:27:24 AM			
0	451.205	0	0	0
4/5/96	10:27:30 AM			
0	450.391	0	0	0
4/5/96	10:27:36 AM			
0	451.612	0	0	0
4/5/96	10:27:42 AM			
0	450.798	0	0	0
4/5/96	10:27:48 AM			
0	450.798	0	0	0
4/5/96	10:27:54 AM			
0	450.391	0	0	0
	450.9201			

INTERPOLL LABS

TANK CERT
TANK NUMBER CC117633
4/5/96

4/5/96	10:33:01 AM			
0	450.798	0	0	0
4/5/96	10:33:07 AM			
0	450.391	0	0	0
4/5/96	10:33:13 AM			
0	449.984	0	0	0
4/5/96	10:33:19 AM			
0	450.391	0	0	0
4/5/96	10:33:25 AM			
0	451.205	0	0	0
4/5/96	10:33:31 AM			
0	449.984	0	0	0
4/5/96	10:33:37 AM			
0	450.798	0	0	0
4/5/96	10:33:43 AM			
0	450.798	0	0	0
4/5/96	10:33:49 AM			
0	451.612	0	0	0
4/5/96	10:33:55 AM			
0	450.798	0	0	0
4/5/96	10:34:01 AM			
0	450.798	0	0	0
4/5/96	10:34:07 AM			
0	450.798	0	0	0
4/5/96	10:34:13 AM			
0	451.205	0	0	0
4/5/96	10:34:19 AM			
0	450.798	0	0	0
4/5/96	10:34:25 AM			
0	451.205	0	0	0
4/5/96	10:34:31 AM			
0	451.205	0	0	0
4/5/96	10:34:37 AM			
0	451.612	0	0	0
4/5/96	10:34:43 AM			
0	451.205	0	0	0
4/5/96	10:34:49 AM			
0	450.798	0	0	0
4/5/96	10:34:55 AM			
0	450.391	0	0	0
	450.8387			

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-29387 CYLINDER #:CC117633 CYL. PRESSURE:2000PSIG
EXPIRATION DATE: 2/7/96
CUSTOMER:TWIN CITY OXYGEN

LAST ANALYSIS DATE:2/7/94
P.O.# 8550
METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1

STANDARD:
SRM #:1686B

CYL #:CLM4860

CONC.:492PPM

INSTRUMENT:
BECKMAN
COMPONENT: CHEMILUMINESCENT

MODEL #: 951A

SERIAL #: 0101572

LAST CAL.: 1/3/94

COMPONENT: NO
MEAN CONC: 465PPM

REPLICATE CONC.

DATE: 2/1/94	DATE: 2/8/94
463PPM	466PPM
464PPM	467PPM
465PPM	465PPM

COMPONENT: NO2
MEAN CONC: 3.09PPM

REPLICATE CONC.
DATE: DATE:

COMPONENT:
MEAN CONC:

REPLICATE CONC.
DATE: DATE:

BALANCE GAS:N2

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC
27713
(919)544-3772

CERTIFICATE OF ANALYSIS ↑ EPA PROTOCOL MIXTURES

REFERENCE #:	88-45052	CYLINDER #:	CC50725	CYL. PRESSURE:	2000PSIG	P.O. #:
EXP. DATE:	1/5/99	LAST ANALYSIS DATE:	1/5/96	CUSTOMER:	TWIN CITY OXYGEN	

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1 THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150 PSIG).

COMPONENT:	CARBON MONOXIDE	COMPONENT:		COMPONENT:	
STANDARD		STANDARD		STANDARD	
SRM #:	1680B	SRM #:		SRM #:	
CYL. #:	FF 34077	CYL. #		CYL. #	
CONC:	477 PPM	CONC:		CONC:	
INSTRUMENT:	ROSEMOUNT NDIR	INSTRUMENT:		INSTRUMENT:	
MODEL #:	880A	MODEL #:		MODEL #:	
SERIAL #:	2000172	SERIAL #:		SERIAL #:	
LAST CAL.:	12/13/95	LAST CAL.:		LAST CAL.:	
MEAN CONC.:	289 PPM +/- 2.31 PPM	MEAN CONC.:		MEAN CONC.:	
REPLICATE CONC.		REPLICATE CONC.		REPLICATE CONC	

DATE: 12/28/95	DATE: 1/5/96	DATE:	DATE:	DATE:	DATE:
289 PPM	289 PPM				
289 PPM	289 PPM				
290 PPM	289 PPM				

BALANCE GAS: NITROGEN

REPLICATE DATA

DATE:	12/28/95				
Z	0	R	478	C	289.6
R	477	Z	0	C	289.0
Z	0	C	290.0	R	477
DATE	1/5/96				
Z	0	R	478	C	289.6
R	477	Z	0	C	289
Z	0	C	289.6	R	478

REPLICATE DATA

DATE:		
Z	R	C
R	Z	C
Z	C	R
DATE:		
Z	R	C
R	Z	C
Z	C	R

REPLICATE DATA

DATE:		
Z	R	C
R	Z	C
Z	C	R
DATE:		
Z	R	C
R	Z	C
Z	C	R

Z= ZERO C=CANDIDATE R=REFERENCE

ANALYST: [signature] APPROVED BY: [signature]

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-25249 CYLINDER #:CC44391 CYL. PRESSURE: 2000PSIG

EXPIRATION DATE: 7-7-96 LAST ANALYSIS DATE:7-7-93

CUSTOMER:TWIN CITY OXYGEN P.O.# 5337

METHOD: EPA PROTOCOL # 13.0.4.G-1

STANDARD:

SRM #:1681B

CYL #:CLM4470

CONC.:975PPM

INSTRUMENT:

COMPONENT: BECKMAN NDIR

MODEL #: 865

SERIAL #: 0103409

LAST CAL.: 4-2-93

COMPONENT: CO
MEAN CONC: 620PPM

REPLICATE CONC.

DATE: 6-30-93	DATE: 7-7-93
623PPM	618PPM
620PPM	616PPM
621PPM	619PPM

COMPONENT:
MEAN CONC:

REPLICATE CONC.
DATE: DATE:

COMPONENT:
MEAN CONC:

REPLICATE CONC.
DATE: DATE:

BALANCE GAS:N2

NATIONAL SPECIALTY GASES•630 UNITED DRIVE•DURHAM, N.C. 27713•(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-42146 CYLINDER #: CC97988 CYL. PRESSURE:2000PSIG CUSTOMER:TWIN CITY
EXPIRATION DATE: 8/18/98 LAST ANALYSIS DATE: 8/18/95 P.O.#:18724
METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1.
THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150PSIG).

STANDARD:
SRM #: 1667B
CYL. #: CLM5293
CONC.: 47.3PPM
INSTRUMENT:ROSEMOUNT THC
MODEL#:400A
SERIAL #:2000335
LAST CAL.:8/2/95

COMPONENT:PROPANE
MEAN CONC:30.0 ± 0.30PPM
REPLICATE CONC.
DATE:8/18/95 DATE:
30.0PPM
30.1PPM
30.0PPM

BALANCE GAS:AIR

COMPONENT:PROPANE
REPLICATE DATA
DATE: 8/18/95

Z	0	R	97.4	C	61.8
R	97.3	Z	0	C	61.9
Z	0	C	61.8	R	97.4

DATE:

Z	R	C
R	Z	C
Z	C	R

STANDARD:
SRM #:
CYL. #:
CONC.:
INSTRUMENT:
MODEL #:
SERIAL #:
LAST CAL.:

COMPONENT:
MEAN CONC:
REPLICATE CONC.
DATE: DATE:

COMPONENT:
REPLICATE DATA
DATE:

Z	R	C
R	Z	C
Z	C	R

DATE:

Z	R	C
R	Z	C
Z	C	R

STANDARD:
SRM #:
CYL. #:
CONC.:
INSTRUMENT:
MODEL #:
SERIAL #:
LAST CAL.:

COMPONENT:
MEAN CONC:
REPLICATE CONC.
DATE: DATE:

COMPONENT:
REPLICATE DATA
DATE:

Z	R	C
R	Z	C
Z	C	R

DATE:

Z	R	C
R	Z	C
Z	C	R

Z=ZERO C=CANDIDATE R=REFERENCE

ANALYST: Richard Sykes APPROVED BY: [signature]

"THIS REPORT STATED ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO DETERMINE OBJECTIVELY THE INFORMATION REQUESTED; HOWEVER, IN CONNECTION WITH ITS RENDERING OF THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE."

Customer :
GENEX
2455 CLEVELAND AVENUE
ROSEVILLE MN 55113

****** CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES ******

PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Protocol # 1 — Procedure # G1

Certified Accuracy 1 % NIST Traceable

LAB # 5305

Shipped From	:	Scott Michigan
Our Project #	:	542740
Your P.O. #	:	40643
Expiration Date	:	4-13-94
Cylinder Number	:	ALM011494
Cylinder Pressure	:	1900 psig
Certification Date	:	10-13-92

1 of 1 Component(s)

A N A L Y Z E D   C Y L I N D E R

COMPONENT	CERTIFIED CONCENTRATION
PROPANE	292.6 PPM

BALANCE GAS : AIR

R E F E R E N C E   S T A N D A R D S

SRM # (CRM #)	CYLINDER NUMBER	CONCENTRATION
1669B	CLM-000702	466.0 PPM
1668B	CLM-000694	95.00 PPM

I N S T R U M E N T A T I O N

INSTRUMENT/ MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
BECKMAN 400 1002059	9-15-92	FLAME IONIZATION DETECTOR

ANALYSIS

DATE : 10-13-92

ZERO GAS	TEST GAS	CURVE RESULTS PPM	REFERENCE GAS CONCENTR.	REFERENCE GAS (mV)	CURVE [illegible] PPM
[illegible]	63.20	[illegible]	[illegible]	100.0	466.0
0.00	63.20	292..		[illegible]	[illegible]
0.00	63.20	292.6		[illegible]	[illegible]

CALCULATED RESULTS
292.6
292.6
292.6

AVERAGE : 292.6 PPM

CALIBRATION CURVE 2 nd DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
[illegible]	[illegible]	100	100.0	466.0	0.00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-0.05
GMIS	199.9	43	[illegible]	[illegible]	[illegible]
1668B	95.00	20	20.80	95.45	0.47
	0.0000	0	0.0000	0.0000	0.00
		0		0.00	0.00
		0		0.00	0.00
1668B	95.00	LOW	20.80	95.45	0.47
1669B	466.0	HIGH	100.0	466.0	0.00

* GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : [signature]
FRANK P. DORAN

Approved By : J. Shapiro

Revised : 3/31/92 RML

AIR PRODUCTS
4822 INDUSTRY LANE
DURHAM, NC 27713

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-41042 CYLINDER #SG9151802 CYL. PRESSURE:2000PSIG
EXPIRATION DATE: 6/22/98 LAST ANALYSIS DATE:6/22/95
CUSTOMER: P.O.# 4TM3916

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS SEPTEMBER 1993:G-1.
THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150 PSIG).

STANDARD:
SRM #: 2648A
CYL #: FF27155
CONC.: 4892PPM
VAL. DATE: 2/28/94
EXP. DATE: 2/28/98

INSTRUMENT:VARIAN GC
MODEL #:3400
SERIAL #:10056
LAST CAL.:6/1/95

COMPONENT: PROPANE
MEAN CONC:2990 ± 30.0PPM
REPLICATE CONC.
DATE:6/22/95 DATE:
2990PPM
2994PPM
2994PPM

COMPONENT:
MEAN CONC:
REPLICATE CONC.
DATE: DATE:

COMPONENT:
MEAN CONC:
REPLICATE CONC.
DATE: DATE:

BALANCE GAS:AIR

REPLICATE DATA

DATE: 6/22/95

Z	0	R	348.9	C	213.2
R	348.9	Z	0	C	213.5
Z	0	C	213.5	R	348.8

COMPONENT:PROPANE

DATE:

Z	0	R		C	
R		Z	0	C	
Z	0	C		R	

REPLICATE DATA

DATE:

Z	0	R		C	
R		Z	0	C	
Z	0	C		R	

COMPONENT:

DATE:

Z	0	R		C	
R		Z	0	C	
Z	0	C		R	

REPLICATE DATA

DATE:

Z	0	R		C	
R		Z	0	C	
Z	0	C		R	

COMPONENT:

DATE:

Z	0	R		C	
R		Z	0	C	
Z	0	C		R	

Z=ZERO C=CANDIDATE R=REFERENCE

ANALYST: Richard Sykes APPROVED BY: [signature]

NATIONAL SPECIALTY GASES

630 UNITED DRIVE
DURHAM, NC
27713
(919)544-3772

CERTIFICATE OF ANALYSIS • EPA PROTOCOL MIXTURES

REFERENCE #:	88-46474	CYLINDER #:	CC 35931	CYL. PRESSURE:	2000 PSIG	P.O. #:	22209
EXP. DATE:	3/14/99	LAST ANALYSIS DATE:	3/14/96	CUSTOMER:	TWIN CITY OXYGEN		

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1 THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150 PSIG).

COMPONENT:	CARBON DIOXIDE	COMPONENT:	OXYGEN	COMPONENT:	
STANDARD		STANDARD		STANDARD	
SRM #:	1675B	SRM #:	2659A	SRM #:	
CYL. #:	CLM 6481	CYL. #	CLM 6737	CYL. #	
CONC:	14.01 %	CONC:	20.72 %	CONC:	
INSTRUMENT:	ROSEMOUNT NDIR	INSTRUMENT:	BECKMAN PARAMAGNETIC	INSTRUMENT:	
MODEL #:	880	MODEL #:	755	MODEL #:	
SERIAL #:	2000418	SERIAL #:	1001419	SERIAL #:	
LAST CAL.:	2/20/96	LAST CAL.:	3/1/96	LAST CAL.:	
MEAN CONC.:	10.8% +/- 0.09 %	MEAN CONC.:	13.5% +/- 0.11 %	MEAN CONC.:	
REPLICATE CONC.		REPLICATE CONC.		REPLICATE CONC.	
DATE: 3/14/96	DATE:	DATE: 3/14/96	DATE:	DATE:	DATE:
10.8 %		13.5 %			
10.9 %		13.4 %			
10.8 %		13.5 %			

BALANCE GAS: NITROGEN

REPLICATE DATA

DATE: 3/14/96					
Z	0	R	14.1	C	10.9
R	14.1	Z	0	C	11.0
Z	0	C	10.3	R	14.0
DATE					
Z		R		C	
R		Z		C	
Z		C		R	

REPLICATE DATA

DATE: 3/14/96					
Z	0	R	400.2	C	260.7
R	400.3	Z	0	C	258.9
Z	0	C	260.9	R	400.4
DATE:					
Z		R		C	
R		Z		C	
Z		C		R	

REPLICATE DATA

DATE:					
Z		R		C	
R		Z		C	
Z		C		R	
DATE:					
Z		R		C	
R		Z		C	
Z		C		R	

ANALYST: [signature] Z=ZERO C=CANDIDATE R=REFERENCE
APPROVED BY: [signature]

THIS REPORT STATES ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO DETERMINE OBJECTIVELY THE INFORMATION REQUESTED. HOWEVER, IN CONNECTION WITH THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE.
ANALYZED AT: NATIONAL SPECIALTY GASES 630 UNITED DRIVE, DURHAM, NC 27713 (919)544-3772

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919)544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-40607 CYLINDER #:CC46348 CYL. PRESSURE:2000PSIG
EXPIRATION DATE: 6/2/98 LAST ANALYSIS DATE:6/2/95
CUSTOMER: TWIN CITY OXYGEN P.O.# 17405

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1.
THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150 PSIG).

STANDARD:
SRM #: 1675B 2659A
CYL #: CLM6413 CLM6737
CONC.: 14.01% 20.72%

INSTRUMENT:	BECKMAN NDIR	BECKMAN PARAMAGNETIC
MODEL #:	880	755
SERIAL #:	2000418	1001419
LAST CAL.:	5/22/95	6/1/95

COMPONENT:CO2		COMPONENT: O2		COMPONENT:	
MEAN CONC:16.8%		MEAN CONC: 21.0%		MEAN CONC:	
REPLICATE CONC.		REPLICATE CONC.		REPLICATE CONC.	
DATE:6/2/95	DATE:	DATE:6/2/95	DATE:	DATE:	DATE:
16.8%		21.0%			
16.8%		21.0%			
16.9%		21.1%			

BALANCE GAS:N2

REPLICATE DATA — COMPONENT:CO2

DATE: 6/2/95						DATE:		
Z	0	R	168.0	C	201.5	Z	R	C
R	168.5	Z	0	C	202.1	R	Z	C
Z	0	C	203.9	R	169.0	Z	C	R

REPLICATE DATA — COMPONENT:O2

DATE: 6/2/95						DATE:		
Z	0	R	210.0	C	212.8	Z	R	C
R	210.5	Z	0	C	213.0	R	Z	C
Z	0	C	214.9	R	211.0	Z	C	R

REPLICATE DATA — COMPONENT:

DATE:			DATE:		
Z	R	C	Z	R	C
R	Z	C	R	Z	C
Z	C	R	Z	C	R

Z=ZERO C=CANDIDATE R=REFERENCE

ANALYST: *Gary A. Savage* APPROVED BY: *Tina Rowe*

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certificate of Analysis for Standard Gas

Vendor: National Specialty Gases
Cylinder No.: CC 117755
Date of Preparation: ~~4-4-96~~ 1-5-96
Label: Nitric Oxide
Blend Specification: 78.4 ppm Balance N_2

Results of Analysis of Standard Gas			
Date of Analysis	Run	NOx	
4-5-96	1	78.7281	
4-5-96	2	76.9577	
4-5-96	3	78.2398	
	4		
	5		
	6		
	Avg	77.9752	-.54%

Analyst: Bob A

☑ Results are within 2% of the vendor tag value; use tag value.

☐ Results are not within 2% of the vendor tag value; conduct another set of triplicate analyses.

☐ All results within ± 2% of the average; relabel as above.

☐ All results not within ± 2% of the average; perform another set of triplicate analyses.

Date: April 5, 1996

Approved by: [signature]

012696-G:\STACK\WP\FORMS\S-425

INTERPOLL LABS

TANK CERT
TANK NUMBER CC117755
4/5/96

4/5/96	10:42:00 AM			
0	79.704	0	0	0
4/5/96	10:42:06 AM			
0	79.298	0	0	0
4/5/96	10:42:12 AM			
0	79.704	0	0	0
4/5/96	10:42:18 AM			
0	79.298	0	0	0
4/5/96	10:42:24 AM			
0	78.891	0	0	0
4/5/96	10:42:30 AM			
0	78.891	0	0	0
4/5/96	10:42:36 AM			
0	78.484	0	0	0
4/5/96	10:42:42 AM			
0	78.484	0	0	0
4/5/96	10:42:48 AM			
0	78.484	0	0	0
4/5/96	10:42:54 AM			
0	79.298	0	0	0
4/5/96	10:43:00 AM			
0	79.298	0	0	0
4/5/96	10:43:06 AM			
0	78.484	0	0	0
4/5/96	10:43:12 AM			
0	77.67	0	0	0
4/5/96	10:43:18 AM			
0	78.484	0	0	0
4/5/96	10:43:24 AM			
0	78.484	0	0	0
4/5/96	10:43:30 AM			
0	78.077	0	0	0
4/5/96	10:43:36 AM			
0	78.484	0	0	0
4/5/96	10:43:42 AM			
0	78.077	0	0	0
4/5/96	10:43:48 AM			
0	78.484	0	0	0
4/5/96	10:43:54 AM			
0	78.484	0	0	0

78.7281

NATIONAL SPECIALTY GASES•630 UNITED DI •DURHAM, N.C. 27713•(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-45046 CYLINDER #: CC117755 CYL. PRESSURE:2000PSIG CUSTOMER:TWIN CITY OXYGEN
EXPIRATION DATE: 1/5/98 LAST ANALYSIS DATE: 1/5/96 P.O.#:809089
METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1.
THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150PSIG).

COMPONENT:NO	COMPONENT:	COMPONENT:
STANDARD:	STANDARD:	STANDARD:
SRM #: 1684B	SRM #:	SRM #:
CYL. #: CLM8177	CYL. #:	CYL. #:
CONC.: 96.5PPM	CONC.:	CONC.:
INSTRUMENT:BECK CHEM	INSTRUMENT:	INSTRUMENT:
MODEL#:951A	MODEL #:	MODEL #:
SERIAL #:0101572	SERIAL #:	SERIAL #:
LAST CAL.:1/2/96	LAST CAL.:	LAST CAL.:

MEAN CONC:78.4PPM +/- 0.78PPM			MEAN CONC:		MEAN CONC:
REPLICATE CONC.		REPLICATE CONC.		REPLICATE CONC.	
DATE:12/29/95	DATE: 1/5/96	DATE:	DATE:	DATE:	DATE:
78.4PPM	78.5PPM				
78.6PPM	78.4PPM				
78.2PPM	78.3PPM				

NO2 3.39PPM

BALANCE GAS:N2

REPLICATE DATA						REPLICATE DATA			REPLICATE DATA		
DATE:	12/29/95					DATE:			DATE:		
Z	0	R	309	C	251	Z	R	C	Z	R	C
R	310	Z	0	C	252.5	R	Z	C	R	Z	C
Z	0	C	250.8	R	309.5	Z	C	R	Z	C	R
DATE:	1/5/96					DATE:			DATE:		
Z	0	R	312	C	253.8	Z	R	C	Z	R	C
R	311	Z	0	C	252.7	R	Z	C	R	Z	C
Z	0	C	252.8	R	311.5	Z	C	R	Z	C	R

Z=ZERO C=CANDIDATE R=REFERENCE

ANALYST: [signature] APPROVED BY: [signature]

"THIS REPORT STATED ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO DETERMINE OBJECTIVELY THE INFORMATION REQUESTED; HOWEVER, IN CONNECTION WITH ITS RENDERING OF THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE."

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certificate of Analysis for Standard Gas

Vendor Air Products
Cylinder No. SG 9162775
Date of Preparation 11-3-95
Label Nitric Oxide
Blend Specification 145 ppm Balance N_2

Results of Analysis of Standard Gas			
Date of Analysis	Run	NOx	
4-5-96	1	143.3031	
4-5-96	2	142.8554	
4-5-96	3	142.9571	
	4		
	5		
	6		
	Avg	143.0385	-1.35%

Analyst Bob A

☒ Results are within 2% of the vendor tag value; use tag value.

☐ Results are not within 2% of the vendor tag value; conduct another set of triplicate analyses.

☐ All results within ± 2% of the average; relabel as above.

☐ All results not within ± 2% of the average; perform another set of triplicate analyses.

Date: April 5, 1996
Approved by: [signature]

012696-G:\STACK\WP\FORMS\S-425

INTERPOLL LABS

TANK CERT
TANK NUMBER SG9162775
4/5/96

4/5/96	12:29:00 PM			
0	144.809	0	0	0
4/5/96	12:29:06 PM			
0	144.809	0	0	0
4/5/96	12:29:12 PM			
0	144.809	0	0	0
4/5/96	12:29:18 PM			
0	143.995	0	0	0
4/5/96	12:29:24 PM			
0	143.588	0	0	0
4/5/96	12:29:30 PM			
0	143.181	0	0	0
4/5/96	12:29:36 PM			
0	143.995	0	0	0
4/5/96	12:29:42 PM			
0	143.181	0	0	0
4/5/96	12:29:48 PM			
0	143.588	0	0	0
4/5/96	12:29:54 PM			
0	142.774	0	0	0
4/5/96	12:30:00 PM			
0	143.588	0	0	0
4/5/96	12:30:06 PM			
0	142.774	0	0	0
4/5/96	12:30:12 PM			
0	142.367	0	0	0
4/5/96	12:30:18 PM			
0	142.774	0	0	0
4/5/96	12:30:24 PM			
0	142.774	0	0	0
4/5/96	12:30:30 PM			
0	142.774	0	0	0
4/5/96	12:30:36 PM			
0	142.367	0	0	0
4/5/96	12:30:42 PM			
0	143.181	0	0	0
4/5/96	12:30:48 PM			
0	142.367	0	0	0
4/5/96	12:30:54 PM			
0	142.367	0	0	0

143.3031

INTERPOLL LABS

TANK CERT
TANK NUMBER SG9162775
4/5/96

4/5/96	12:36:00 PM			
0	144.402	0	0	0
4/5/96	12:36:06 PM			
0	144.809	0	0	0
4/5/96	12:36:12 PM			
0	143.181	0	0	0
4/5/96	12:36:18 PM			
0	143.588	0	0	0
4/5/96	12:36:24 PM			
0	143.181	0	0	0
4/5/96	12:36:30 PM			
0	142.367	0	0	0
4/5/96	12:36:36 PM			
0	142.367	0	0	0
4/5/96	12:36:42 PM			
0	142.774	0	0	0
4/5/96	12:36:48 PM			
0	143.181	0	0	0
4/5/96	12:36:54 PM			
0	142.367	0	0	0
4/5/96	12:37:00 PM			
0	143.181	0	0	0
4/5/96	12:37:06 PM			
0	142.367	0	0	0
4/5/96	12:37:12 PM			
0	142.367	0	0	0
4/5/96	12:37:18 PM			
0	142.367	0	0	0
4/5/96	12:37:24 PM			
0	142.367	0	0	0
4/5/96	12:37:30 PM			
0	142.367	0	0	0
4/5/96	12:37:36 PM			
0	142.367	0	0	0
4/5/96	12:37:42 PM			
0	141.96	0	0	0
4/5/96	12:37:48 PM			
0	142.774	0	0	0
4/5/96	12:37:54 PM			
0	142.774	0	0	0

142.6554

INTERPOL LABS

TANK CERT
TANK NUMBER SG9162775
4/5/96

4/5/96	12:42:00 PM			
0	144.809	0	0	0
4/5/96	12:42:06 PM			
0	144.402	0	0	0
4/5/96	12:42:12 PM			
0	143.995	0	0	0
4/5/96	12:42:18 PM			
0	143.181	0	0	0
4/5/96	12:42:24 PM			
0	143.588	0	0	0
4/5/96	12:42:30 PM			
0	143.995	0	0	0
4/5/96	12:42:36 PM			
0	142.774	0	0	0
4/5/96	12:42:42 PM			
0	143.181	0	0	0
4/5/96	12:42:48 PM			
0	142.367	0	0	0
4/5/96	12:42:54 PM			
0	142.774	0	0	0
4/5/96	12:43:00 PM			
0	142.367	0	0	0
4/5/96	12:43:06 PM			
0	141.96	0	0	0
4/5/96	12:43:12 PM			
0	143.181	0	0	0
4/5/96	12:43:18 PM			
0	142.774	0	0	0
4/5/96	12:43:24 PM			
0	142.367	0	0	0
4/5/96	12:43:30 PM			
0	142.367	0	0	0
4/5/96	12:43:36 PM			
0	142.367	0	0	0
4/5/96	12:43:42 PM			
0	142.367	0	0	0
4/5/96	12:43:48 PM			
0	141.96	0	0	0
4/5/96	12:43:54 PM			
0	142.367	0	0	0

142.95715

A[redacted]Pro[redacted]ts [redacted]d C[redacted]ica[redacted] I[redacted]
SPECIALTY GAS DEPARTMENT
12722 S. WENTWORTH AVENUE
CHICAGO, IL 60628

Certificate of Analysis - EPA Protocol Gas Standard

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
TWIN CITY OXYGEN (MAIN ACCT.)
305 2ND STREET NW
NEW BRIGHTON MN 55112-

Notes:

Order No: CSS-296700-01
Batch No: 861-28757

Cylinder No: SG9162775BAL
Cylinder Pressure*: 2000 psig
Certification Date: 11/09/95
Expiration Date: 11/09/97

PO: 20013 Rel:

*** Certified Concentration ***		********* Reference Standards *********			************* Analytical Instrumentation *************			
Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
NITRIC OXIDE	145 ±1.0 PPM	SG9151688BAL	GMIS	145.5000 PPM	Rosemount 951a	0101877	10/19/95	CHEMILUMINESCENCE

Balance Gas: NITROGEN

Contaminent	
Nitrogen Dioxide	1.80 PPM

---

* Standard should not be used below 150 psig

Analyst: Shaher Aboor

Approved By: Richard Fry

ir Products and Chemicals, Inc.
.O. BOX 351
.D. #1
AMAQUA, PA 18252

Certificate of Analysis - EPA Protocol Gas Standard

ERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

ustomer:
AIR PRODUCTS & CHEMICALS
CAROL PORTER
FREEPORT RD, ROUTE 28
CREIGHTON PA 15030

Notes:

PO: 055-94 Rel:

Order No: 148-012359-03
Batch No: 255-58321

Cylinder No: SG9120705BAL
Cylinder Pressure*: 2000 psig
Certification Date: 11/13/94
Expiration Date: 11/13/96

** Certified Concentration *** ********* Reference Standards ********* ************* Analytical Instrumentation ************

omponent	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
ARBON MONOXIDE	299 ±1.47 PPM	SG9113535BAL	GMIS	506.5000 PPM	Hewlett Packar	2518A052	10/14/94	GC-FID

alance Gas: Nitrogen

* Standard should not be used below 150 psig

alyst: Michael Wagner

Approved By: Ken Roubik

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC
27713
(919)544-3772

CERTIFICATE OF ANALYSIS EPA PROTOCOL MIXTURES

REFERENCE #:	88-44358	CYLINDER #:	CC117373	CYL. PRESSURE:	2000 PSIG	P. O./CODE #	20388
EXP. DATE:	11/30/98	LAST ANALYSIS DATE:	11/30/95	CUSTOMER:	TWIN CITY OXYGEN		

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1 THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150 PSIG).

COMPONENT: CARBON MONOXIDE

STANDARD

SRM #: 1681B

CYL. #: CLM 4470

CONC: 975 PPM

INSTRUMENT: ROSEMOUNT NDIR

MODEL #: 880A

SERIAL #: 2000172

LAST CAL.: 11/8/95

MEAN CONC.: 600 PPM +/- 4.80 PPM

REPLICATE CONC.

DATE: 11/23/95		DATE: 11/30/95	
600	PPM	599	PPM
600	PPM	599	PPM
600	PPM	600	PPM

BALANCE GAS: NITROGEN

REPLICATE DATA						REPLICATE DATA	REPLICATE DATA
DATE: 11/23/95							
Z	0	R	975	C	600.0		
R	975	Z	0	C	600.0		
Z	0	C	600.6	R	976		
DATE 11/30/95							
Z	0	R	974	C	598.4		
R	974	Z	0	C	598.4		
Z	0	C	600.0	R	975		

Z= ZERO C=CANDIDATE R=REFERENCE

ANALYST: APPROVED BY:

THIS REPORT STATED ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO DETERMINE OBJECTIVELY THE INFORMATION REQUESTED; HOWEVER, IN CONNECTION WITH THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE.
ASSAYED AT: NATIONAL SPECIALTY GASES, 630 UNITED DRIVE, DURHAM, NC 27713. (919)544-3772

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certificate of Analysis for Standard Gas

Vendor: Air Products
Cylinder No.: 56 915 1692
Date of Preparation: ~~4-4-96~~ 6-2-95
Label: Nitric Oxide
Blend Specification: 73.7 ppm, Balance N_2

Results of Analysis of Standard Gas			
Date of Analysis	Run	NOx	
4-4-96	1	72.4614	
4-4-96	2	72.3393	
4-4-96	3	72.6038	
	4		
	5		
	6		
	Avg	72.4682	1.67%

Analyst: 603

☒ Results are within 2% of the vendor tag value; use tag value.

☐ Results are not within 2% of the vendor tag value; conduct another set of triplicate analyses.

☐ All results within ± 2% of the average; relabel as above.

☐ All results not within ± 2% of the average; perform another set of triplicate analyses.

Date: April 4, 1996

Approved by: [signature]

012696-G:\STACK\WP\FORMS\S-425

INTERPOLL LABS

TANK CEWRT
TANK NUMBER SG9151692
4/4/96

4/4/96	1:20:00 PM			
0	71.973	0	0	0
4/4/96	1:20:06 PM			
0	74.008	0	0	0
4/4/96	1:20:12 PM			
0	73.601	0	0	0
4/4/96	1:20:18 PM			
0	73.194	0	0	0
4/4/96	1:20:24 PM			
0	72.787	0	0	0
4/4/96	1:20:30 PM			
0	72.38	0	0	0
4/4/96	1:20:36 PM			
0	71.973	0	0	0
4/4/96	1:20:42 PM			
0	72.787	0	0	0
4/4/96	1:20:48 PM			
0	72.38	0	0	0
4/4/96	1:20:54 PM			
0	71.566	0	0	0
4/4/96	1:21:00 PM			
0	72.38	0	0	0
4/4/96	1:21:06 PM			
0	72.38	0	0	0
4/4/96	1:21:12 PM			
0	72.787	0	0	0
4/4/96	1:21:18 PM			
0	73.194	0	0	0
4/4/96	1:21:24 PM			
0	71.16	0	0	0
4/4/96	1:21:30 PM			
0	72.38	0	0	0
4/4/96	1:21:36 PM			
0	72.38	0	0	0
4/4/96	1:21:42 PM			
0	71.973	0	0	0
4/4/96	1:21:48 PM			
0	72.38	0	0	0
4/4/96	1:21:54 PM			
0	71.566	0	0	0

72.46145

TANK CERT
TANK NUMBER SG9151692
4/4/96

4/4/96	1:41:05 PM			
0	72.38	0	0	0
4/4/96	1:41:11 PM			
0	72.787	0	0	0
4/4/96	1:41:17 PM			
0	73.194	0	0	0
4/4/96	1:41:23 PM			
0	72.38	0	0	0
4/4/96	1:41:29 PM			
0	72.787	0	0	0
4/4/96	1:41:35 PM			
0	73.194	0	0	0
4/4/96	1:41:41 PM			
0	71.973	0	0	0
4/4/96	1:41:47 PM			
0	71.973	0	0	0
4/4/96	1:41:53 PM			
0	71.973	0	0	0
4/4/96	1:41:59 PM			
0	73.194	0	0	0
4/4/96	1:42:05 PM			
0	71.973	0	0	0
4/4/96	1:42:11 PM			
0	72.787	0	0	0
4/4/96	1:42:17 PM			
0	71.973	0	0	0
4/4/96	1:42:23 PM			
0	72.787	0	0	0
4/4/96	1:42:29 PM			
0	72.787	0	0	0
4/4/96	1:42:35 PM			
0	73.194	0	0	0
4/4/96	1:42:41 PM			
0	73.601	0	0	0
4/4/96	1:42:47 PM			
0	72.787	0	0	0
4/4/96	1:42:53 PM			
0	71.973	0	0	0
4/4/96	1:42:59 PM			
0	72.38	0	0	0

72.60385

A[redacted]ro[redacted]ts [redacted] C[redacted]ica[redacted] I[redacted]
SPECIALTY GAS DEPARTMENT
12722 S. WENTWORTH AVENUE
CHICAGO, IL 60628

Certificate of Analysis - EPA Protocol Gas Standard

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS, INC.
373 CANTERBURY ROAD
SHAKOPEE MN 55379

Notes:

Order No: CSS-174990-01
Batch No: 861-25878

Cylinder No: SG9151692BAL
Cylinder Pressure*: 2000 psig
Certification Date: 06/02/95
Expiration Date: 06/02/97

PO: Rel:

*** Certified Concentration ***		********* Reference Standards *********			************** Analytical Instrumentation *************			
Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
NITRIC OXIDE	73.7 ±0.64 PPM	SG9119927BAL	GMIS	93.7200 PPM	Rosemount 951a	0101877	05/18/95	CHEMILUMINESCENCE

Balance Gas: Nitrogen

Contaminent	
Nitrogen Dioxide	.300 PPM

---

* Standard should not be used below 150 psig

Analyst: Richard VanDyke

Approved By: Robert McNear

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certificate of Analysis for Standard Gas

Vendor: Air Products

Cylinder No.: SG 9132402

Date of Preparation: ~~4-4-96~~ 5-12-94

Label: Nitric Oxide

Blend Specification: 148 ppm Balance N_2

Results of Analysis of Standard Gas			
Date of Analysis	Run	NOx	
4-4-96	1	146.8226	
4-4-96	2	146.6598	
4-4-96	3	147.0872	
	4		
	5		
	6		
	Avg	146.8565	.77%

Analyst: Bob A

☒ Results are within 2% of the vendor tag value; use tag value.

☐ Results are not within 2% of the vendor tag value; conduct another set of triplicate analyses.

☐ All results within ± 2% of the average; relabel as above.

☐ All results not within ± 2% of the average; perform another set of triplicate analyses.

Date: April 4, 1996

Approved by: [signature]

012696-G:\STACK\WP\FORMS\S-425

INTERPOL LABS

TANK CERT
TANK NUMBER SG9132402
4/4/96

4/4/96	12:49:05 PM			
0	147.25	0	0	0
4/4/96	12:49:11 PM			
0	146.436	0	0	0
4/4/96	12:49:17 PM			
0	146.843	0	0	0
4/4/96	12:49:23 PM			
0	147.25	0	0	0
4/4/96	12:49:29 PM			
0	147.25	0	0	0
4/4/96	12:49:35 PM			
0	146.843	0	0	0
4/4/96	12:49:41 PM			
0	146.843	0	0	0
4/4/96	12:49:47 PM			
0	146.436	0	0	0
4/4/96	12:49:53 PM			
0	146.436	0	0	0
4/4/96	12:49:59 PM			
0	146.436	0	0	0
4/4/96	12:50:05 PM			
0	146.436	0	0	0
4/4/96	12:50:11 PM			
0	146.843	0	0	0
4/4/96	12:50:17 PM			
0	147.25	0	0	0
4/4/96	12:50:23 PM			
0	146.843	0	0	0
4/4/96	12:50:29 PM			
0	146.029	0	0	0
4/4/96	12:50:35 PM			
0	146.436	0	0	0
4/4/96	12:50:41 PM			
0	147.25	0	0	0
4/4/96	12:50:47 PM			
0	146.843	0	0	0
4/4/96	12:50:53 PM			
0	147.25	0	0	0
4/4/96	12:50:59 PM			
0	147.25	0	0	0
	146.82265			

INTEREPOLL LABS

TANK CERT
TANK NUMBER SG9132402
4/4/96

4/4/96	1:03:04 PM			
0	146.843	0	0	0
4/4/96	1:03:10 PM			
0	147.25	0	0	0
4/4/96	1:03:16 PM			
0	146.029	0	0	0
4/4/96	1:03:22 PM			
0	146.843	0	0	0
4/4/96	1:03:28 PM			
0	146.436	0	0	0
4/4/96	1:03:34 PM			
0	146.843	0	0	0
4/4/96	1:03:40 PM			
0	146.843	0	0	0
4/4/96	1:03:46 PM			
0	146.436	0	0	0
4/4/96	1:03:52 PM			
0	146.436	0	0	0
4/4/96	1:03:58 PM			
0	146.843	0	0	0
4/4/96	1:04:04 PM			
0	145.622	0	0	0
4/4/96	1:04:10 PM			
0	146.843	0	0	0
4/4/96	1:04:16 PM			
0	146.843	0	0	0
4/4/96	1:04:22 PM			
0	146.436	0	0	0
4/4/96	1:04:28 PM			
0	147.25	0	0	0
4/4/96	1:04:34 PM			
0	147.25	0	0	0
4/4/96	1:04:40 PM			
0	146.843	0	0	0
4/4/96	1:04:46 PM			
0	146.436	0	0	0
4/4/96	1:04:52 PM			
0	146.843	0	0	0
4/4/96	1:04:58 PM			
0	146.029	0	0	0
	146.65985			

INTERPOLL LABS

TANK CERT
TANK NUMBER SG9132402
4/4/96

4/4/96	1:11:05 PM			
0	146.843	0	0	0
4/4/96	1:11:11 PM			
0	147.657	0	0	0
4/4/96	1:11:17 PM			
0	146.843	0	0	0
4/4/96	1:11:23 PM			
0	146.843	0	0	0
4/4/96	1:11:29 PM			
0	147.25	0	0	0
4/4/96	1:11:35 PM			
0	146.436	0	0	0
4/4/96	1:11:41 PM			
0	146.843	0	0	0
4/4/96	1:11:47 PM			
0	147.25	0	0	0
4/4/96	1:11:53 PM			
0	147.25	0	0	0
4/4/96	1:11:59 PM			
0	147.25	0	0	0
4/4/96	1:12:05 PM			
0	147.25	0	0	0
4/4/96	1:12:11 PM			
0	146.843	0	0	0
4/4/96	1:12:17 PM			
0	146.843	0	0	0
4/4/96	1:12:23 PM			
0	147.25	0	0	0
4/4/96	1:12:29 PM			
0	147.657	0	0	0
4/4/96	1:12:35 PM			
0	146.843	0	0	0
4/4/96	1:12:41 PM			
0	147.25	0	0	0
4/4/96	1:12:47 PM			
0	146.843	0	0	0
4/4/96	1:12:53 PM			
0	147.25	0	0	0
4/4/96	1:12:59 PM			
0	147.25	0	0	0
	147.0872			

Air Products and Chemicals, Inc.
SPECIALTY GAS DEPARTMENT
12722 S. WENTWORTH AVENUE
CHICAGO, IL 60628

Certificate of Analysis - EPA Protocol Gas Standard

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS, INC.
373 CANTERBURY ROAD
SHAKOPEE MN 55379

Notes:

PO: Rel:

Order No: 233-043674-01
Batch No: 861-18097

Cylinder No: SG9132402BAL
Cylinder Pressure*: 2000 psig
Certification Date: 05/12/94
Expiration Date: 05/12/96

*** Certified Concentration ***		********* Reference Standards *********			************* Analytical Instrumentation *************			
Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
NITRIC OXIDE	148 ±0.5 PPM	SG9113408BAL	GMIS	147.3000 PPM	Rosemount 951a	0101877	05/04/94	CHEMILUMINESCENCE

Balance Gas: Nitrogen

Contaminent

Nitrogen Dioxide .500 PPM

---

* Standard should not be used below 150 psig

Analyst: Richard VanDyke

Approved By: Robert McNear

Air Products and Chemicals, Inc.
SPECIALTY GAS DEPARTMENT
12722 S. WENTWORTH AVENUE
CHICAGO, IL 60628

Certificate of Analysis - EPA Protocol Gas Standard

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS, INC.
373 CANTERBURY ROAD
SHAKOPEE MN 55379

Notes:

Order No: CSS-188056-01
Batch No: 861-26102

Cylinder No: SG9150281BAL
Cylinder Pressure*: 2000 psig
Certification Date: 06/13/95
Expiration Date: 06/13/98

PO: Rel:

*** Certified Concentration ***		********* Reference Standards *********			************* Analytical Instrumentation *************			
Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
CARBON MONOXIDE	296 ±0.9 PPM	SG9113596BAL	GMIS	504.2000 PPM	Horiba VIA-510	405079	05/20/95	INFRARED HORIBA

Balance Gas: Nitrogen

---

* Standard should not be used below 150 psig

Analyst: Shaher Aboor

Approved By: Robert McNear

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Certification Date: 06/13/95
Expiration Date: 06/13/98

*** Certified Concentration ***		********* Reference Standards *********			************** Analytical Instrumentation **************			
Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
CARBON MONOXIDE	593 ±1.0 PPM	SG9113594BAL	GMIS	993.3000 PPM	Horiba VIA-510	405079	06/15/95	INFRARED HORIBA

Balance Gas: Nitrogen

* Standard should not be used below 150 psig

Analyst: [signature] James Laas

Approved By: [signature] Robert McNear

NATIONAL SPECIALTY GASES•630 UNITED DRIVE•DURHAM, N.C. 27713•(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-42146 CYLINDER #: CC97988 CYL. PRESSURE:2000PSIG CUSTOMER:TWIN CITY
EXPIRATION DATE: 8/18/98 LAST ANALYSIS DATE: 8/18/95 P.O.#:18724
METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1.
THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150PSIG).

STANDARD:	STANDARD:	STANDARD:
SRM #: 1667B	SRM #:	SRM #:
CYL. #: CLM5293	CYL. #:	CYL. #:
CONC.: 47.3PPM	CONC.:	CONC.:
INSTRUMENT:ROSEMOUNT THC	INSTRUMENT:	INSTRUMENT:
MODEL#:400A	MODEL #:	MODEL #:
SERIAL #:2000335	SERIAL #:	SERIAL #:
LAST CAL.:8/2/95	LAST CAL.:	LAST CAL.:
COMPONENT:PROPANE	COMPONENT:	COMPONENT:
MEAN CONC:30.0 ± 0.30PPM	MEAN CONC:	MEAN CONC:
REPLICATE CONC.	REPLICATE CONC.	REPLICATE CONC.
DATE:8/18/95 DATE:	DATE: DATE:	DATE: DATE:
30.0PPM		
30.1PPM		
30.0PPM		
BALANCE GAS:AIR		

COMPONENT:PROPANE						COMPONENT:						COMPONENT:					
REPLICATE DATA						REPLICATE DATA						REPLICATE DATA					
DATE: 8/18/95						DATE:						DATE:					
Z	0	R	97.4	C	61.8	Z		R		C		Z		R		C	
R	97.3	Z	0	C	61.9	R		Z		C		R		Z		C	
Z	0	C	61.8	R	97.4	Z		C		R		Z		C		R	
DATE:						DATE:						DATE:					
Z		R		C		Z		R		C		Z		R		C	
R		Z		C		R		Z		C		R		Z		C	
Z		C		R		Z		C		R		Z		C		R	

Z=ZERO C=CANDIDATE R=REFERENCE

ANALYST: Richard Sykes APPROVED BY: [signature]

Air Products and Chemicals, Inc.
SPECIALTY GAS DEPARTMENT
12722 S. WENTWORTH AVENUE
CHICAGO, IL 60628

Certificate of Analysis - EPA Protocol Gas Standard

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS, INC.
373 CANTERBURY ROAD
SHAKOPEE MN 55379

Notes:

PO: Rel:

Order No: CSS-320133-01
Batch No: 861-29310

Cylinder No: SG9165627BAL
Cylinder Pressure*: 2000 psig
Certification Date: 12/04/95
Expiration Date: 12/04/98

*** Certified Concentration ***		********* Reference Standards *********			************** Analytical Instrumentation **************			
Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
PROPANE	287 ±3.2 PPM	SG9128611BAL	GMIS	351.5000 PPM	Gow-Mac 750	59405U	11/14/95	GC-FID

Balance Gas: AIR
Oxygen Concentration 20.2 %

---

* Standard should not be used below 150 psig

Analyst: Richard VanDyke

Approved By: Richard Fry

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC
27713
(919)544-3772

CERTIFICATE OF ANALYSIS - EPA PROTOCOL MIXTURES

REFERENCE #:	88-44768	CYLINDER #:	CC112043	CYL. PRESSURE:	2000 PSIG	P. O. #	20694
EXP. DATE:	12/19/98	LAST ANALYSIS DATE:	12/19/95	CUSTOMER:	TWIN CITY OXYGEN		

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1 THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150 PSIG).

COMPONENT: PROPANE

STANDARD
SRM #: 2648A
CYL. #: FF 26617
CONC: 4892 PPM

INSTRUMENT: ROSEMOUNT THC
MODEL #: 400A
SERIAL #: 2000335
LAST CAL.: 11/28/95

MEAN CONC.: 2960 PPM +/- 23.7 PPM
REPLICATE CONC.
DATE: 12/19/95
2961 PPM
2963 PPM
2965 PPM

BALANCE GAS: AIR

REPLICATE DATA | REPLICATE DATA | REPLICATE DATA

DATE: 12/19/95

Z	0	R	183.6	C	111.1
R	183.7	Z	0	C	111.3
Z	0	C	111.4	R	183.8

DATE

Z		R		C	
R		Z		C	
Z		C		R	

Z= ZERO C=CANDIDATE R=REFERENCE

ANALYST: Mary A. Savage
APPROVED BY: Laura Thantors

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, 1995). 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).

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Condensible Organic Compounds Analysis

(State of Minnesota - MPCA Exhibit C)

Method II-8672-MN

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a 17 mm stem

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

Reagents: Diethyl ether - reagent grade

Chloroform - reagent grade

Sodium sulfate - (ACS) granular anhydrous

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

Glass wool (Pyrex microfiber)

PREPARATION

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

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

SAMPLING

An all-glass impinger assembly is used in the back half of the EPA Method 5 sampling train when an organic wet catch is to be collected. The impinger assembly consists of a modified impinger, a Greenburg Smith impinger followed by another modified impinger. The third impinger should have a temperature measuring device at the outlet upstream of a final impinger or desiccant column to monitor the temperature of the outlet gas stream. Prior to the start of the test, each of the first two impingers should be charged with 100 g of Class I water. The Method 5 train should be operated as provided for in EPA Method 5. Ice should be added to the impinger bath to keep the temperature of the gas at the outlet at or less than 68°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.

030894-G:\STACK\WP\METHODS\II-8672.MN

ANALYSIS

I. ORGANICS

Caution! Work in vented hood!!!

A. Organic Blank Determination

1. Pour 125 ml of ethyl ether and 125 ml of chloroform into a tared beaker.

2. Evaporate solvent in hood at 70°F or less until no solvent remains.

3. Desiccate the sample in dish for two hours.

4. Weigh the sample to nearest 0.1 mg, record and report on Form LSC-03G.

B. Organic Sample Determination

1. Test for peroxide in sample ether using KI strips. (If KI strip shows positive, contact your supervisor before proceeding.)

2. Transfer the sample solution quantitatively to a 500 ml separatory funnel. Use the first of three 25 ml chloroform aliquots to rinse the sample container.

3. Extract with three 25 ml portions of chloroform. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Bottom layer is chloroform.) Draw off the bottom layer, transferring the solvent with a funnel containing a plug of sodium sulfate into a tared beaker. (Do not draw off any of the aqueous layer.)

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

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

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

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

8. Desiccate to constant weight (two hours). Record and report the final weight to the nearest 0.1 mg on Form LSC-03G.

II. INORGANICS

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

A. Inorganic Blank Determination

1. Vent the remaining aqueous phase from the organic extraction in the hood to remove residual organic solvents (usually overnight).

2. Decant the impinger catch into a tared evaporating dish.

3. Evaporate all of the water in the sample in an oven at 100°C. Take care not to boil to prevent bumping and loss of sample.

4. Cool the dried sample in the desiccator and desiccate until a constant weight is obtained.

5. Report the results to the nearest 0.1 mg on Form LSC-03G.

B. Inorganic Sample Determination

Follow steps 1-5 in Section A above.

NOTES

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

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

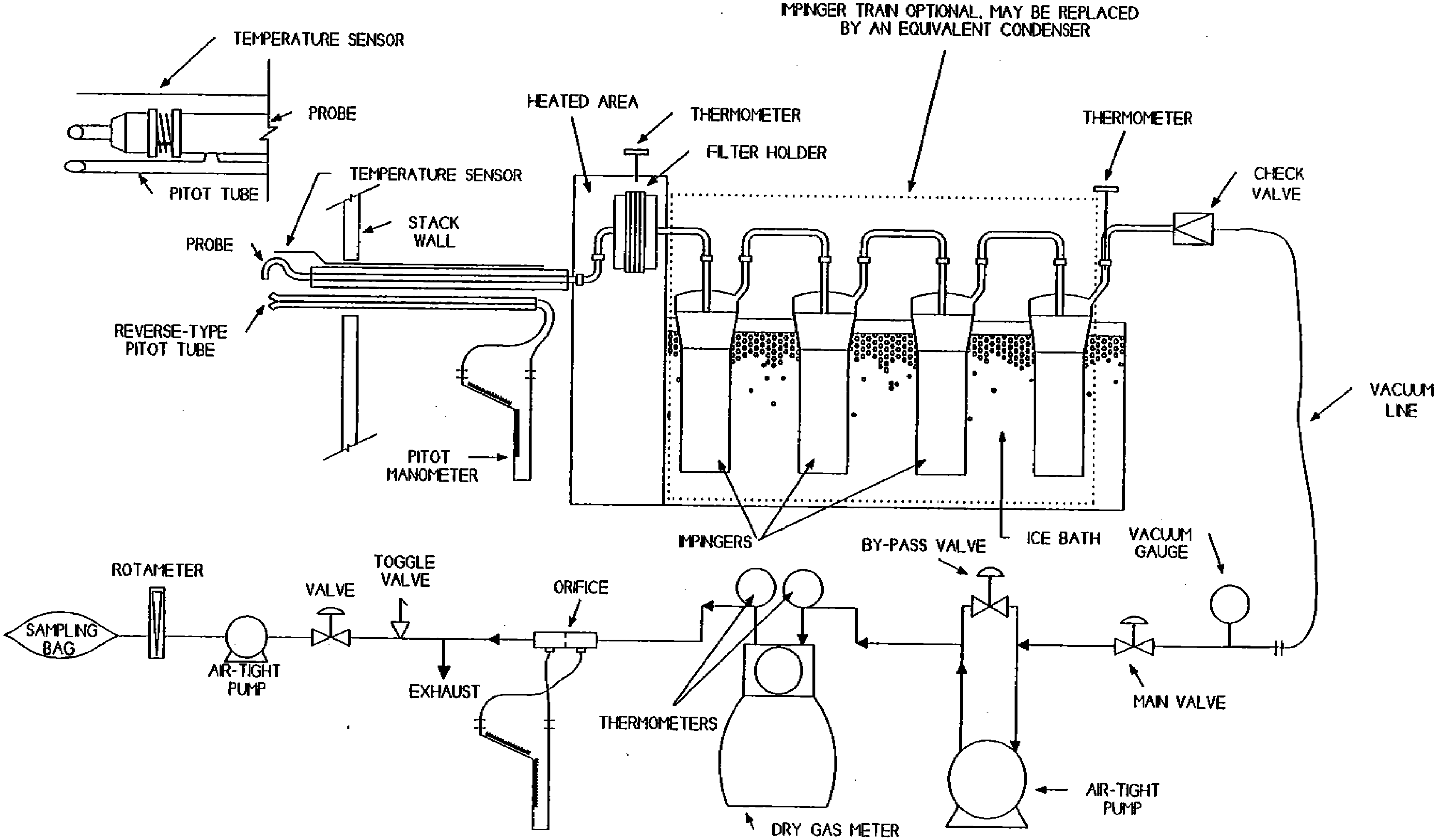
3. Special state requirements:
   Michigan - Total sample evaporated in tared evaporating dish on steam bath.
   Iowa - Organics and inorganics separately, as required.
   Wisconsin - Use Method II-8672-WI.
   Rest of states - Organics only.

REFERENCES

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

Minnesota Pollution Control Agency, Exhibit C.

PARTICULATE SAMPLING TRAIN



Method 7E—Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure)

1. Applicability and Principle

1.1 **Applicability.** This method is applicable to the determination of nitrogen oxides (NO_x) concentrations in emissions from stationary sources only when specified within the regulations.

1.2 **Principle.** A gas simple is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental chemiluminescent analyzer for determination of NO_x concentration. Performance specifications and test procedures are provided to ensure reliable data.

2. Range and Sensitivity

Same as Method 6C, Sections 2.1 and 2.2.

3. Definitions

3.1 **Measurement System.** The total equipment required for the determination of NO_x concentration. The measurement system consists of the following major subsystems:

3.1.1 **Sample Interface, Gas Analyzer, and Data Recorder**. Same as Method 6C, Sections 3.1.1, 3.1.2, and 3.1.3.

3.1.2 **NO_2 to NO Converter.** A device that converts the nitrogen dioxide (NO_2) in the sample gas to nitrogen oxide (NO).

3.2 Span, Calibration Gas, Analyzer Calibration Error, Sampling System Bias, Zero Drift, Calibration Drift, and Response Time. Same as Method 6C, Sections 3.2 through 3.8.

3.3 **Interference Response.** The output response of the measurement system to a component in the sample gas, other than the gas component being measured.

4. Measurement System Performance Specifications

Same as Method 6C, Sections 4.1 through 4.4.

5. Apparatus and Reagents

5.1 **Measurement System.** Any measurement system for NO_x that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1 of Method 6C. The essential components of the measurement system are described below:

5.1.1 Sample Probe, Sample Line, Calibration Valve Assembly, Moisture Removal System, Particulate Filter, Sample Pump, Sample Flow Rate Control, Sample Gas Manifold, and Data Recorder. Same as Method 6C, Sections 5.1.1 through 5.1.9, and 5.1.11.

5.1.2 **NO_2 to NO Converter.** That portion of the system that converts the nitrogen dioxide (NO_2) in the sample gas to nitrogen oxide (NO). An NO_2 to NO converter is not necessary if data are presented to demonstrate that the NO_2 portion of the exhaust gas is less than 5 percent of the total NO_x concentration.

5.1.3 **NO_x Analyzer.** An analyzer based on the principles of chemiluminescence, to determine continuously the NO_x concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

5.2 **NO_x Calibration Gases.** The calibration gases for the NO_x analyzer shall be NO in N_2. Three calibration gases, as specified in Sections 5.3.1 through 5.3.3. of Method 6C, shall be used. Ambient air may be used for the zero gas.

6. Measurement System Performance Test Procedures

Perform the following procedures before measurement of emissions (Section 7).

6.1 **Calibration Gas Concentration Verification.** Follow Section 6.1 of Method 6C, except if calibration gas analysis is required, use Method 7, and change all 5 percent performance values to 10 percent (or 10 PPM, whichever is greater).

6.2 **Interference Response.** Conduct an interference response test of the analyzer prior to its initial use in the field. Thereafter, recheck the measurement system if changes are made in the instrumentation that could alter the interference response (e.g., changes in the gas detector). Conduct the interference response in accordance with Section 5.4 of Method 20.

6.3 **Measurement System Preparation, Analyzer Calibration Error, and Sample System Bias Check.** Follow Sections 6.2 through 6.4 of Method 6C.

6.4 **NO_2 to NO Conversion Efficiency.** Unless data are presented to demonstrate that the NO_2 concentration within the sample stream is not greater than 5 percent of the NO_x concentration, conduct an NO_2 to NO conversion efficiency test in accordance with Section 5.6 of Method 20.

7. Emission Test Procedure

7.1 **Selection of Sampling Site and Sampling Points.** Select a measurement site and sampling points using the same criteria that are applicable to tests performed using Method 7.

7.2 **Sample Collection.** Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the system calibration drift test. Maintain constant rate sampling (i.e., ± 10 percent) during the entire run. The sampling time per run shall be the same as the total time required to perform a run using Method 7, plus twice the system response time. For each run, use only those measurements obtained after twice the response time of the measurement system has elapsed, to determine the average effluent concentration.

7.3 **Zero and Calibration Drift Test.** Follow Section 7.4 of Method 6C.

8. Emission Calculation

Follow Section 8 of Method 6C.

9. Bibliography

Same as bibliography of Method 6C.

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.
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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.

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 Systems.** 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 midlevel 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:

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.

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

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 Citation 2 of Bibliography. 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 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 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

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

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.

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

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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 greater [less than] 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 heads (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 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 1 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:

$T_s = t_s + 466$

but $Q_{s(std)} = \frac{V_{m(std)}}{\Theta}$

$K_1 = 17.64$

Substituting gives:

$Q_s = \frac{5.669 \times 10^{-2} (t_s + 460)}{\Theta P_s} [V_{m(std)} + .04707 (V_f ...$

$$Q_s = \frac{T_s}{K_1 P_s} \left[Q_{s(std)} + \frac{V_{w(std)}}{\theta} \right]$$

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 $9.0\ \mu m \leq D_{50} \leq 11.0\ \mu m$. 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 $9.0\ \mu m$, 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.

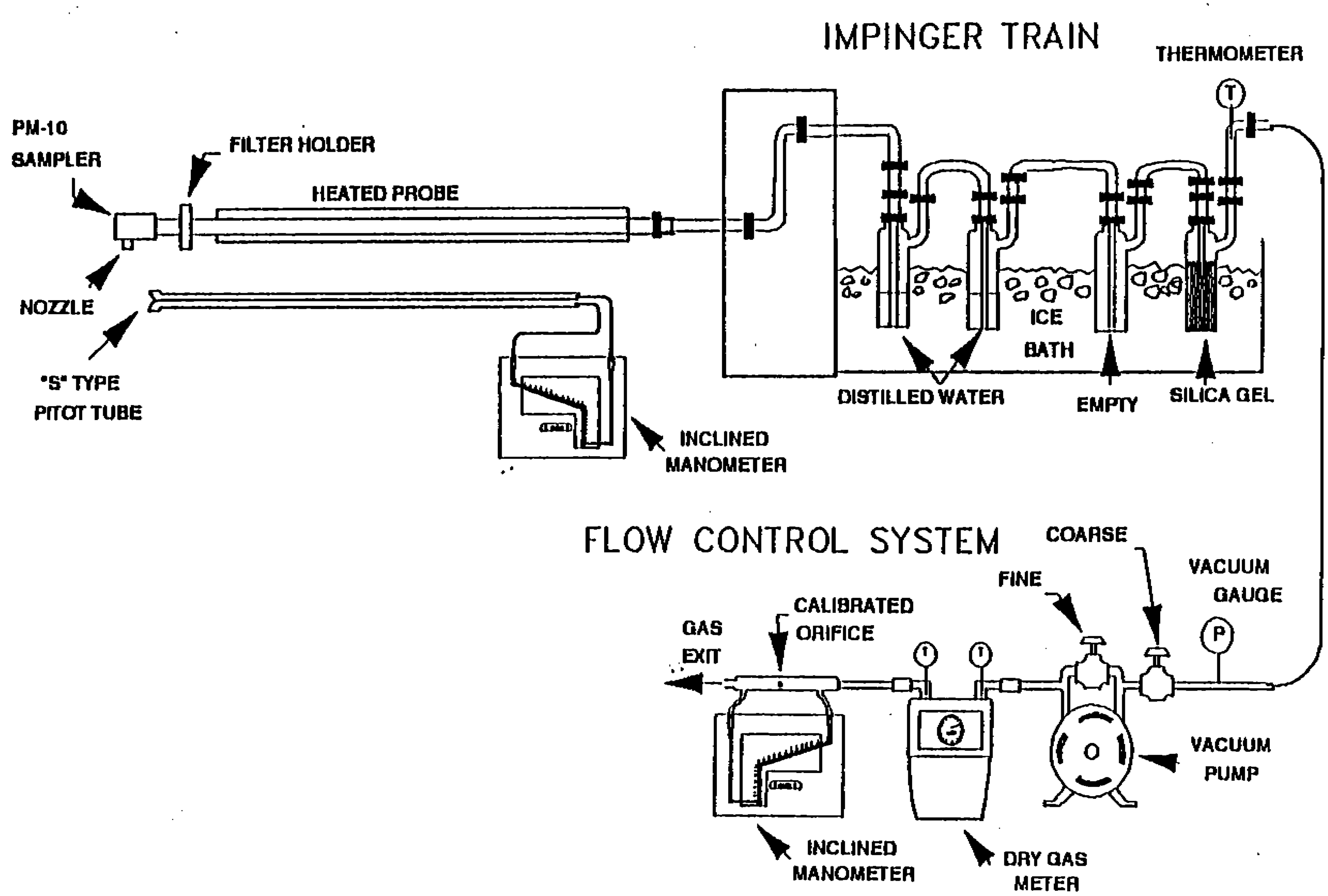
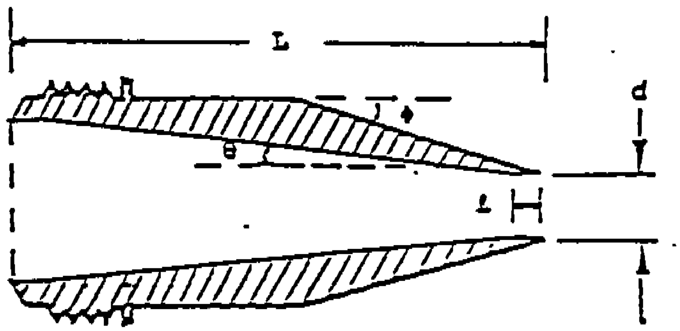


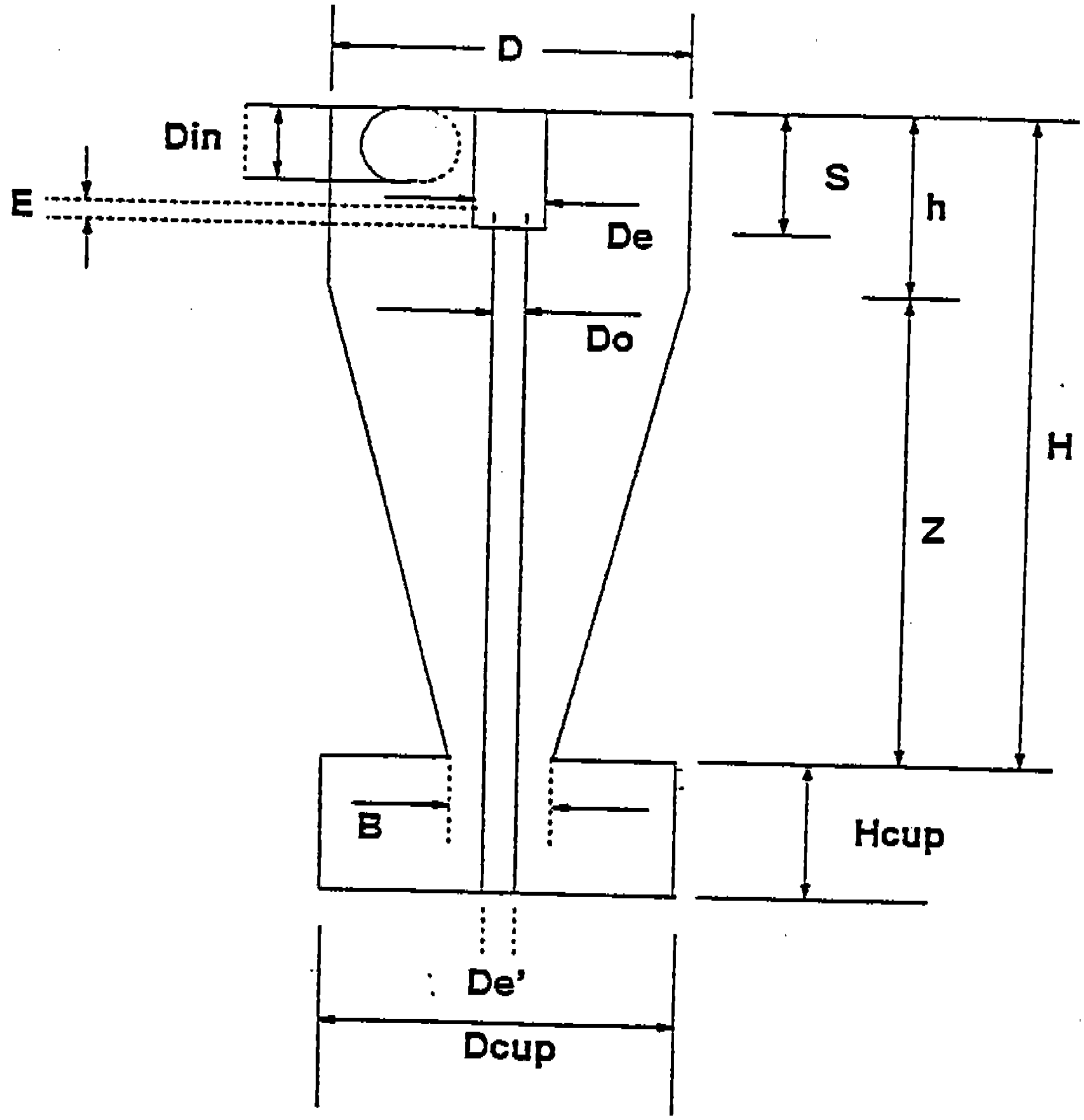
Figure 1. CSR Sampling Train



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.

Orifice pressure head (ΔH) needed for cyclone flow rate:

note

$$\Delta H = \left[\frac{Q_s(1-B_{ws})P_s}{t_s + 460}\right]^2 \frac{(t_m + 460)\ M_d\ (1.083)\ \Delta H_a}{P_{bar}} = \_\_\_\_\_\_ \text{ in. } H_2O$$

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, ft³/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, <u>or</u> 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 $\quad v_{max} = v_n\ (1.5) =$ ______ ft/sec

Eq. 4 $\quad v_{max} = v_n\ R_{max} =$ ______ ft/sec

Maximum and minimum velocity head values:

$$\Delta p_{min} = 1.3686 \times 10^{-4} \frac{P_s\ M_w\ (v_{min})^2}{(t_s + 460)\ C_p^2} = \underline{\qquad} \text{ in. } H_2O$$

$$\Delta p_{max} = 1.3686 \times 10^{-4} \frac{P_s\ M_w\ (v_{max})^2}{(t_s + 460)\ C_p^2} = \underline{\qquad} \text{ in. } H_2O$$

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

$$\Delta p(\text{Method 201A}) = \Delta p(\text{Method 2}) \left[\frac{C_p}{C_p'}\right]^2 = \Delta p^{M2} \left(\frac{C_p^{M2}}{C_p^{201A}}\right)^2$$

Figure 5. Example worksheet 2 (page 2 of 2), nozzle selection.

4-11-91 PL

Total run time, minutes = ________

Number of traverse points = ________

$$t_1 = \sqrt{\frac{\Delta p'_1}{\Delta p'_{avg}}} \left[\frac{\text{Total run time}}{\text{Number of points}}\right]$$

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:

$$t_n = \frac{t_1}{\sqrt{\Delta p_1}} \sqrt{\Delta p_n}, \text{ where } n = 2,3,\ldots\text{total number of sampling points}$$

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.

Point Number	Port No______ Δp	t	Port No______ Δp	t	Port No______ Δp	t	Port No______ 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.

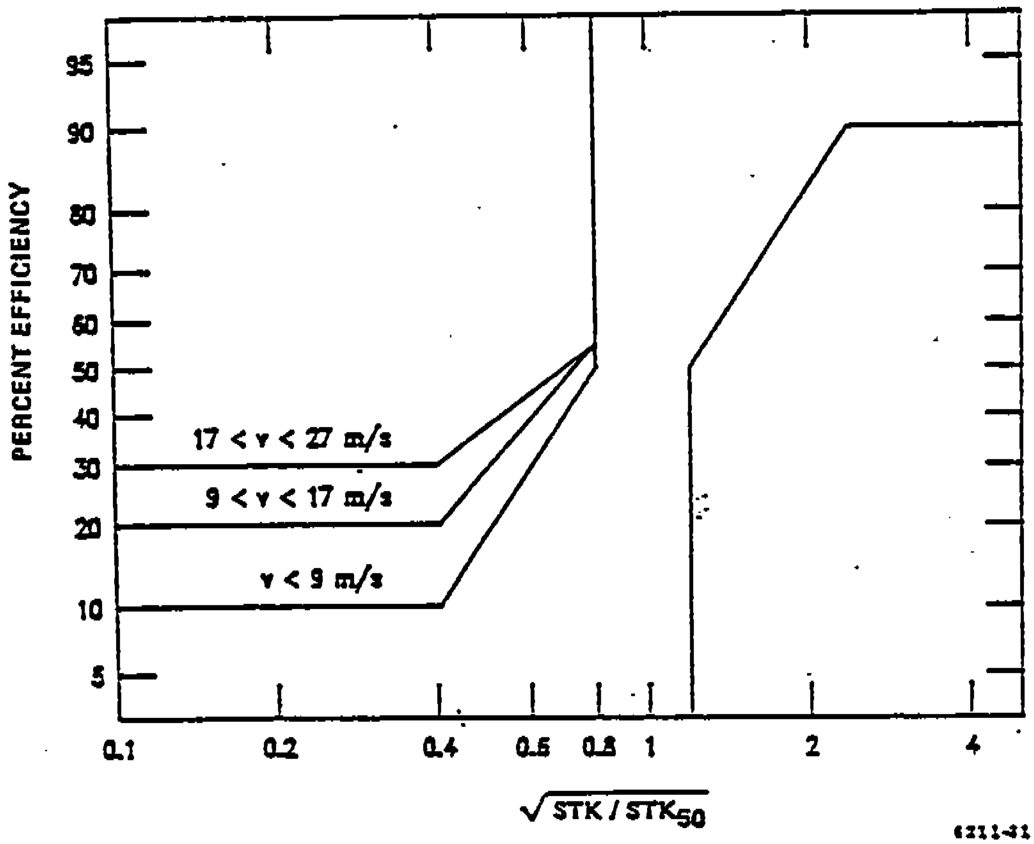


Figure 9. Efficiency envelope for first calibration stage.

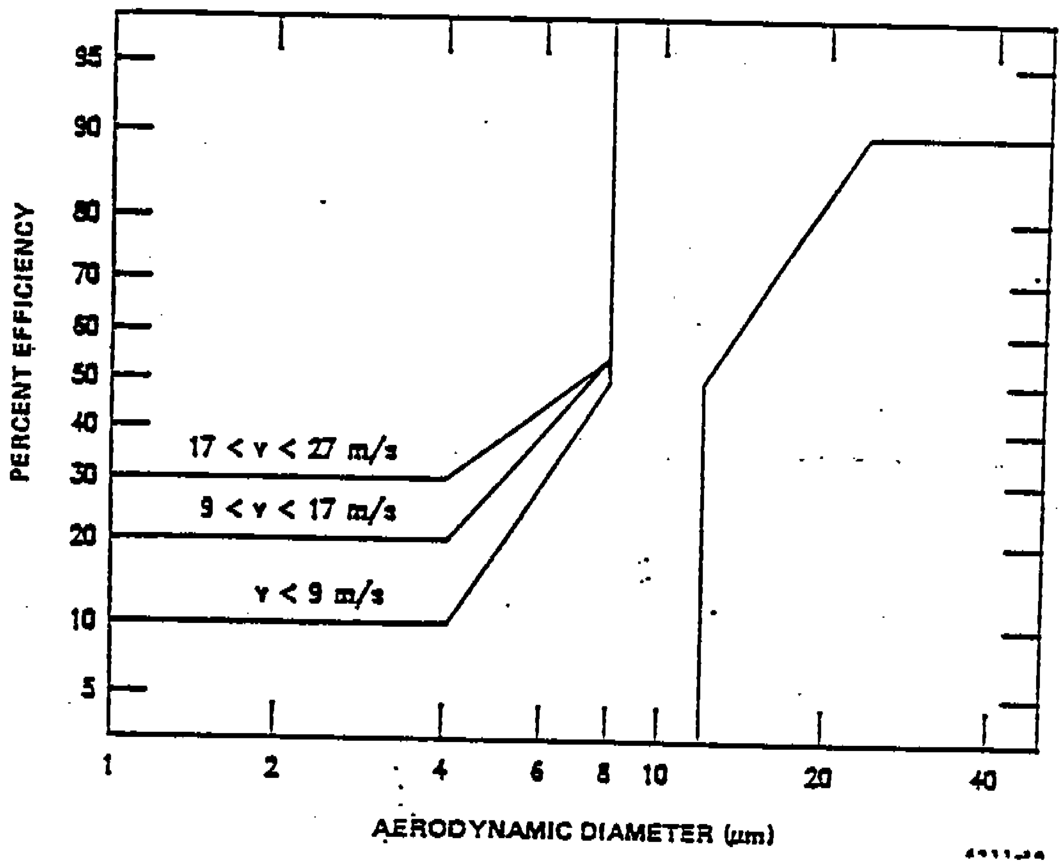


Figure 8. Efficiency envelope for the PM_{10} cyclone.

EPA
METHOD 0011

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INTERPOLL LABORATORIES

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 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 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 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 <u>Sample Containers</u>:

7.2.1 <u>Container 1: Probe and Impinger Catches</u>. 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 curing 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 = $C_d \times V \times DF \times$

$([g/mole\ aldehyde]/[g/mole\ DNPH\ derivative]) \times$

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:

$$C_f = K\ [\text{total formaldehyde, mg}] / V_{m(std)}$$

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:

$$Max\ FORM_i\ conc = [Max\ FORM_i\ Mass\ ]\ /\ DV_{eff(std)}$$

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.

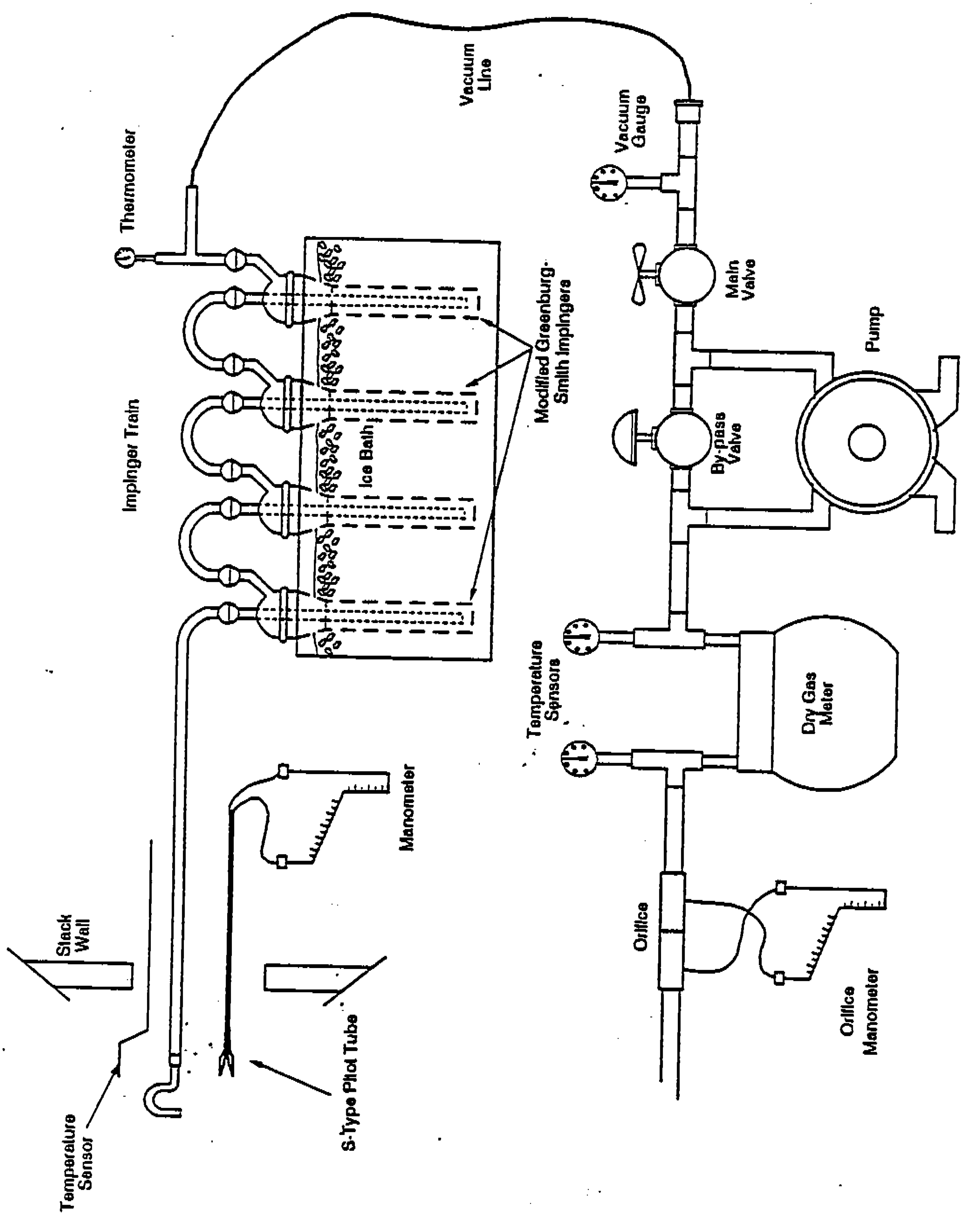
12.0 METHOD PERFORMANCE

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 ____________________

Pitot Tube Coefficient C_p ____________________

Schematic of Stack Cross Section

Ambient Temperature ____________________

Barometric Pressure ____________________

Assumed Moisture % ____________________

Probe Length, m(ft) ____________________

Nozzle Identification No. ____________________

Average Calibrated Nozzle Diameter, cm (in) ____________________

Probe 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: Inlet °C(°F)	Gas Sample Temp. at Dry Gas Meter: Outlet °C(°F)	Filter Holder Temperature °C(°F)	Temperature of Gas Leaving Last Impinger °C(°F)
Total							Avg.	Avg.		
Average										

3404346R

Figure 2. Field Data Sheet

Report No. 6-7712

LOUISIANA PACIFIC
Two Harbors, Minnesota

Total HydroCarbons Calculations

DRYER RTO STACK

TEST #	RUN	MC%		CONC (ppmC,w)	GASFLOW (DSCFM)		MASSRATE (LB/HR)		AVERAGE (ppmC,w)		AVERAGE (LB/HR)	(GR/DSCF)
4	1	19.69	<	5	41390	<	0.48					0.0013572
	2	23.45	<	5	39160	<	0.48					0.0014239
	3	20.90	<	5	40860	<	0.48					0.001378
								<	5	<	0.480688	

PRIMARY CYCLONE OUTLET

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)	(GR/DSCF)
4	1	25.34	75	27140	5.09			0.0218993
	2	30.42	150	25565	10.30			0.0469963
	3	25.05	138	27455	9.45			0.0401388
						121	8.279445	

E-TUBE OUTLET

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)	(GR/DSCF)
4	1	23.50	141	28975	9.98			0.0401804
	2	23.40	249	30060	18.26			0.0708642
	3	25.00	159	36900	14.62			0.046216
						183	14.28503	

RTO INLET

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)	(GR/DSCF)
4	1	18.00	120	43980	12.03			0.0319024
	2	21.00	141	41700	13.91			0.0389089
	3	20.00	144	41700	14.03			0.03924
						135	13.3196	

PRESS VENT STACK

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)	(GR/DSCF)
4	1	2.14	75	39650	5.68			0.0167075
	2	2.17	33	38950	2.46			0.0073536
	3	2.00	27	37840	1.95			0.0060061
						45	3.36041	

LOUISIANA PACIFIC
TWO HARBORS, MN

Report No. 6-7712

DRYER RTO STACK

Oxides of Nitrogen
LB/HR Calculations

RUN	NOx ppm	Flow	LB/DSCF	LB/HR
1	20.3	41390	2.424E-06	6.019
2	16.2	39160	1.934E-06	4.545
3	14.2	40860	1.695E-06	4.156
AVG	**16.9**			**4.907**

Carbon Monoxide
LB/HR Calculations

RUN	CO ppm	Flow	LB/DSCF	LB/HR
1	84.3	41390	6.125E-06	15.211
2	44.0	39160	3.197E-06	7.512
3	51.7	40860	3.757E-06	9.209
AVG	**60.0**			**10.644**

PRESS VENT STACK

Oxides of Nitrogen
LB/HR Calculations

RUN		NOx ppm	Flow		LB/DSCF		LB/HR
1	<	1	39650	<	1.194E-07	<	0.284
2	<	1	38950	<	1.194E-07	<	0.279
3	<	1	37840	<	1.194E-07	<	0.271
AVG	<	**1**				<	**0.278**

Carbon Monoxide
LB/HR Calculations

RUN	CO ppm	Flow	LB/DSCF	LB/HR
1	9.4	39650	6.83E-07	1.62
2	7.9	38950	5.74E-07	1.34
3	4.7	37840	3.415E-07	0.78
AVG	**7.3**			**1.247**

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.

032294-G:\STACK\WP\METHODS\S-EQ.15

SYMBOLS

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

T_{db}	=	Dry bulb temperature of stack gas, °F
T_{wb}	=	Wet bulb temperature of stack gas, °F
$T_{m(avg)}$	=	Absolute average dry gas meter temperature, °R
$T_{s(avg)}$	=	Absolute average stack temperature, °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

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

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

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

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

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

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

$$(\dot{m}_p)_1 = 8.5714\ x\ 10^{-3}\ C_s\ Q_{s,\ d}$$

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

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

CALCULATION EQUATIONS

METHOD 7

$$V_{m(std)} = 17.64\ (V_f - 25)\ [\frac{P_f}{T_f} - \frac{P_i}{T_i}]$$

$$C_s = 6.243\ x\ 10^{-5}\ \frac{M}{V_{m(std)}}$$

$$E = \frac{2090\ C_s F}{20.9 - \bar{B}_{O_2}}$$

$$C_s\ (GR/DSCF) = 7000\ C_s$$

$$C_s\ (MG/DSCM) = 1.60186\ x\ 10^7\ C_s$$

$$C_s\ (ppm\text{-}dry) = 8.37552\ x\ 10^6\ C_s$$

$$C_s\ (ppm\text{-}3\%\ O_2) = 8.37552\ x\ 10^6\ C_s\ \{1 + [\frac{\bar{B}_{O_2} - 3}{20.9 - B'_{O_2}}]\}$$

$$C_s\ (ppm\text{-}wet) = 8.37552\ x\ 10^6\ C_s\ (1 - \frac{MC}{100})$$

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SYMBOLS

$\bar{B}\ O_2$	=	Average oxygen content in flue gas, % v/v
C_s	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, LB/DSCF
C_s (GR/DSCF)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, GR/DSCF
C_s (MG/DSCM)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, MG/DSCM
E	=	Emission factor, LB/10^6BTU
F	=	F-Factor for given fuel type, DSCF/10^4BTU
M	=	Mass of nitrogen oxides as nitrogen dioxide in gas sample, ug
MC	=	Moisture content of flue gas, %
P_f	=	Final absolute pressure in flask, IN. HG
P_i	=	Initial absolute pressure in flask, IN. HG
C_s (ppm-dry)	=	Concentration of nitrogen oxides in flue gas, dry basis, (v/v), ppm
C_s (ppm-3% O_2)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to 3% O_2, (v/v) ppm
C_s (ppm-wet)	=	Concentration of nitrogen oxides in flue gas, wet basis, (v/v), ppm
T_f	=	Final absolute temperature in flask, °R
T_i	=	Initial absolute temperature in flask, °R
V_f	=	Volume of flask and valve, cc
$V_{m(std)}$	=	Sample volume at standard conditions, dry basis, cc

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CALCULATION EQUATIONS

METHOD 10

$$CO{\cdot}PPM{\cdot}DRY = CO_{CO_2} - free,\ dry,\ avg\ (1 - CO_{2},\ d/100)$$

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

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

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

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

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

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)

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METHOD 25A

Total Gaseous Organics Calculation Equation

GR C/SCF = 2.180×10^{-4} (ppm, w)

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

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

where:

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

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

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

Note 1: The Ratfisch Model RS 55 Heated FID Analyzer as normally operated with a heated filter, sample line and heated detector oven gives ppm, w.

Note 2: ppm, C = ppm as carbon = 3(ppm propane)

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CALCULATION EQUATIONS

Chromotropic Acid Method for Formaldehyde

$$m_t = \frac{m_a \, V_{soln}}{V_{aliq}}$$

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·DRY	=	$\frac{0.0283\ m_t}{V_{std}}$
PPM·WET	=	PPM.DRY (1-MC/100)
GR/DSCF	=	5.45×10^{-4} (PPM·DRY)
mg/dscm	=	1.249 (PPM·DRY)
$\dot{m}$	=	8.5714×10^{-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 °F, 29.92 IN. HG.)
$\dot{m}$	=	emission or mass rate of formaldehyde in pounds per hour (LB/HR)
V_{std}	=	dry gas volume as measured by the dry gas meter, corrected to standard conditions (at 68 °F and 1 atmosphere) DSCF

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

PM - 10 Equations

Preliminary Run Calculations:

$$Md = 0.44\ B_{CO_2} + 0.32\ B_{O_2} + 0.28\ (B_{N_2} + B_{CO})$$

$$M_s = M_d\ (1 - \frac{MC}{100}) + 0.18\ (MC)$$

$$P_s = P_b + \frac{P_g}{13.6}$$

$$\mu = 152.418 + 0.2552\ t_s + 3.2355\ x\ 10^{-5}\ t_s^2 + 0.53147\ (B_{O_2}) - 0.74143\ MC$$

$$Q_s = 2.837\ x\ 10^{-3}\ \mu\ [\frac{(t_S + 460)}{(M_s P_s)}]^{0.2949}$$

$$\Delta H = \frac{1.083\ (t_m + 460)\ M_d \Delta H@}{P_b} [\frac{Q_s\ (1 - \frac{MC}{100})\ P_s}{t_s + 460}]^2$$

$$\Delta_p^{M2O1A} = \Delta_P^{M2}\ (\frac{C_P^{M_2}}{C_P^{M201A}})^2$$

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Dwell Times:

First point

$$\Delta t_1 = [\frac{\sqrt{\Delta \acute{P}_i}}{(\sqrt{\Delta \acute{P}})_{AVG}}]$$

Other points

$$\Delta t_n = (\frac{\Delta t_1}{\sqrt{\Delta P_1}}) \sqrt{\Delta P_n} \quad where\ n = 2,3,...,12$$

Post Test Calculations:

$$V_{m(std)} = 17.64\ \gamma\ V_m\ (\frac{P_b + \frac{\Delta \bar{H}}{13.6}}{\bar{t}_m + 460})$$

$$Q_s = \frac{5.669\ x\ 10^{-2}\ (\bar{t}_s + 460)}{\theta\ P_s}\ [V_{m(std)} + 0.04707\ (V_f - V_i)]$$

$$\mu = 152.418 + 0.2552\ \bar{t}_s + 3.2355\ x\ 10^{-5}\ \bar{t}_s^2 + 0.53147\ B_{O_2} - 0.74143\ MC$$

$$M_s = M_d\ (1 - \frac{MC}{100}) + 0.18\ MC$$

$$D_{50} = 0.15625\ (\frac{\bar{t}_s + 460}{M_s P_s})^{0.2091}\ (\frac{\mu}{Q_s})^{0.7091}$$

122093-G:\STACK\WP\FORMS\PM-10(2)

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, °F
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, °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 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
$\overline{t_s}$	=	average stack gas temperature during test run, °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
$\overline{t_m}$	=	average temperature of dry test meter during run, °F
Y	=	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

122093-G:\STACK\WP\FORMS\PM-10(3)

OUISIANA-PACIFIC CORP.

LETTER OF TRANSMITTAL

NORTHERN DIVISION
OUTE 8, BOX 8263
AYWARD, WISCONSIN 54843
715) 634-3454
(715) 634-5963 FAX

DATE:	6/24/96
ATTENTION:	KATHY EICHSTADT
RE:	TWO HARBORS TESTING

O INTERPOLL LABORATORIES, INC.
4500 BALL ROAD NE
CIRCLE PINES, MN 55014

E ARE SENDING YOU

- [X] Attached
- [ ] Under separate cover via ________ the following items:
- [ ] Shop Drwgs.
- [ ] Prints
- [ ] Plans
- [ ] Samples
- [ ] Specifications
- [ ] Copy/Letter
- [ ] Change Order
- [ ]

COPIES	DATE	NO.	DESCRIPTION
1			PROCESS DATA FOR TWO HARBORS TESTING MAY 21-22, 1996

HESE ARE TRANSMITTED as checked below:

- [ ] For Approval
- [X] For Your Use
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- [ ] For Review & Comment
- [ ] FOR BIDS DUE ________ 199 .
- [ ] Approved As Submitted
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EMARKS:

SIGNED: [signature]
JOEL ANDERSON

TWO HARBORS DRYER & PRESS TESTS

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TWO HARBORS TEST SCHEDULE MAY 21st - 22nd 1996

Dryer	POLLUTANT	RUN #1	RUN #2	RUN #3
5-21	PM	*0945-1049*	*1155-1208* *1235-1249* *1308-1344*	*1535-1637*

Dryer	POLLUTANT	RUN #1	RUN #2	RUN #3
5-21	NOX/CO/VOC	*0945-1049*	*1155-1208* *1235-1249* *1308-1344*	*1600-1700*

Dryer	POLLUTANT	RUN #1	RUN #2	RUN #3
5-22	PM 10	*0902-1044*	*1135-1159* *1250-1408*	*1500-1636*

Dryer	POLLUTANT	RUN #1	RUN #2	RUN #3
5-22	FORMALDEHYDE	*0910-1026*	*1135-1159* *1250-1348*	*1500-1620*

Press	POLLUTANT	RUN #1	RUN #2	RUN #3
5-22	TSP	*0950-1038* *1117-1133*	*1221-1341*	*1425-1432* *1449-1543*

Press	POLLUTANT	RUN #1	RUN #2	RUN #3
5-22	NOX/CO/VOC	*0950-1050*	*1225-1333*	*1425-1432* *1449-1543*

APPROXIMATE TEST TIMES ONLY - SEE INTERPOLL SHEETS FOR EXACT TIMES.

Two Harbors Testing
May 21-22, 1996

General Process Information Notes

Production rates are calculated for blocks of time during which that process ran at a consistent rate. When the source went down for an extended period of time, sampling was stopped. In these cases, the process data was calculated for the period that sampling occurred.

RTO set point was 1510.

Regarding maintenance prior to testing, the RTO was baked out on May 2, 1996. This bakeout procedure is anticipated to place on a quarterly basis. All maintenance records on the RTO and E-Tube since startup are attached.

Process inputs:
MDI resin: ICI R-1840
Face paper: DYNO 42-506
Backer paper: DYNO 42-270
Face paint: ACI PFX 95H16Q
Edge paint: ACI PF 4012-13
Zinc borate: BOROGUARD ZB
Species: hardwood

Records on the quantity of all additives are included. Zinc borate usage is calculated on an as received basis.

2

TWO HARBORS TESTING MAY 21st - 22nd 1996
Process data summary

DRYER MAY 21, 1996 - NOX,CO,VOC,PM

11.85	=PressProduction rate in Tons per hour
27,279	=Production rate of both dryers in pounds per hour
2.39	=Total fuel burned in tons per hour
50.57%	=average incoming moisture percent
5.62%	=average dry moisture percent
1,186	=average inlet temperature
1,505	=average RTO burner temperature #1
1,507	=average RTO burner temperature #2
185	=Face paint used in pounds per hour
454	=Edge paint used in pounds per hour

DRYER MAY 22, 1996 - PM 10, FORMALDEHYDE

11.93	=PressProduction rate in Tons per hour
27,425	=Production rate of both dryers in pounds per hour
2.38	=Total fuel burned in tons per hour
49.55%	=average incoming moisture percent
5.24%	=average dry moisture percent
1,354	=average inlet temperature
1,507	=average RTO burner temperature #1

PRESS MAY 22, 1996 - NOX,CO,VOC,TSP

12.33	=Plant Production rate in Tons per hour
808.83	=MDI resin usage in pounds per hour
3.28%	=MDI resin usage as % of finished product
200.49	=Wax usage in pounds per hour
0.81%	=Wax usage as % of finished product
287.50	=Zinc Borate usage in pounds per hour
1.17%	=Zinc Borate as % of finished product
927.79	=Face paper usage in pounds per hour
319.54	=Backer paper usage in pounds per hour

3

DRYER MARCH 21st 1996
NOX,CO,VOC,PM
DATA TIME: START= 09:40 END= 17:00 HOURS= 7.33

BOARD WEIGHTS - LBS
average weights determined by taking every 25th untrimmed board (from press tapes)

7/16"			
per/peice	48.07	206.1	lb= average untrimmed mat weight
per/ 8' x 16'	192.29		
weight of paper overlay (per msf)	76.9	6.7%	=trim %

PLANT PRODUCTION RATE

7.33 =hours during testing
113 =pressloads
904 =no. of 8'x16' boards produced (pressloads x 8 boards per load)
115,712 =volume produced in surface footage (pressloads x 8'x16'x8 openings)
135,001 =volume produced 3/8" basis (pressloads x 8'x16'x 8 openings x 1.1667)
173,833 =lbs of finished product (boards produced x weight of finished board)
23,705 =lbs of finished product per hour (lbs of finshed product / hours)
11.85 =tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

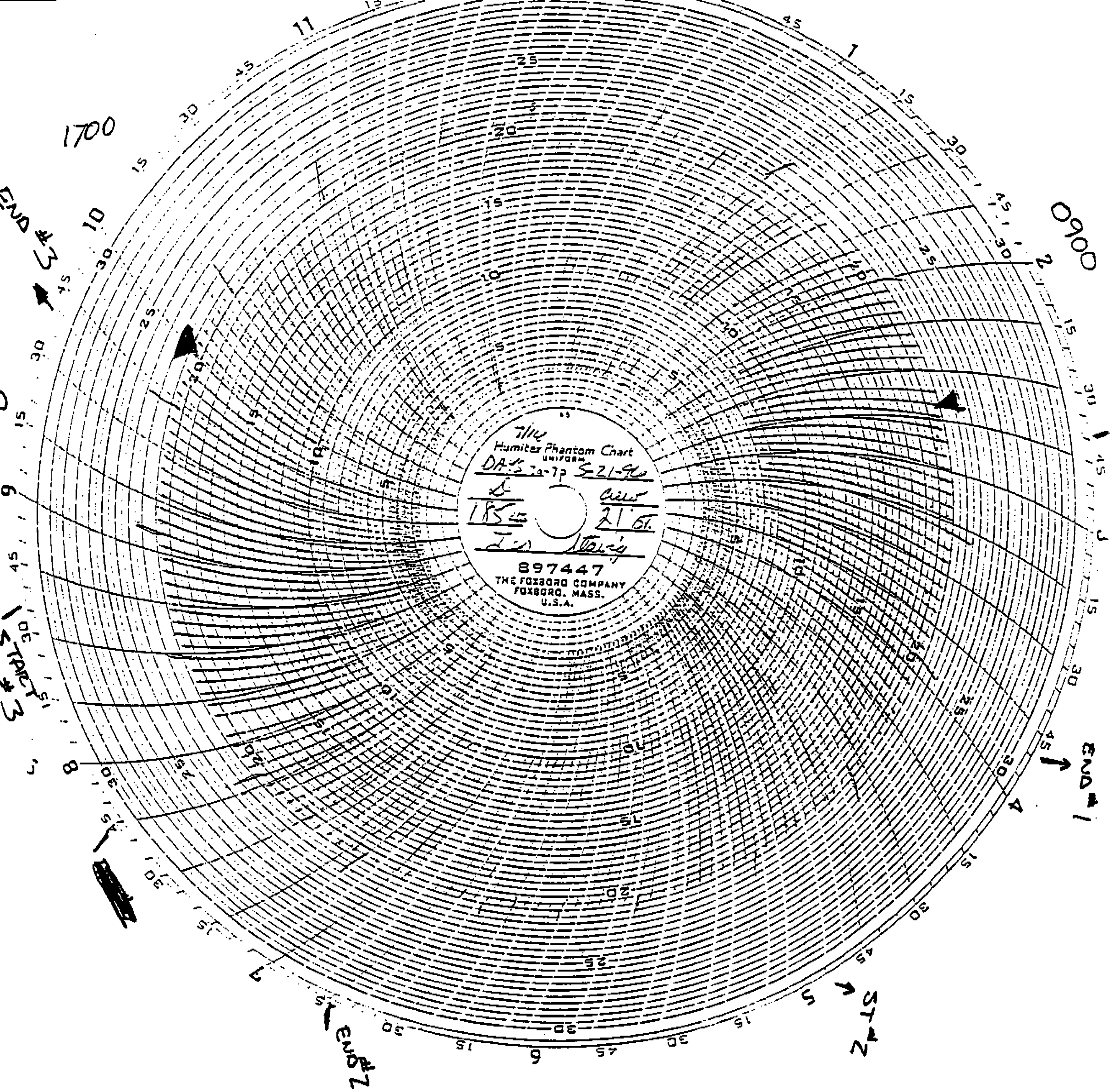
FUEL BURNING RATE ESTIMATED BY DRY FUEL INPUT

5.2 =fuel calibration in pounds per count
6,752 =counts during testing hours
35,110 = lbs of fuel burned during testing
7.33 =hours during testing
4,788 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
2.39 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,500 =estimated BTU content per pound of dry fuel,
40.7 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,186 =average inlet temperature
50.57 =average incoming moisture percent
5.62 =average dry moisture percent

DRYER THROUGHPUT RATE

4,788 =Total pounds of fuel burned per hour in Dryer
23,705 =lbs of finished product per hour (lbs of finshed product / hours)
1,213 =lbs of face & backer paper per hour (surf. ftge.produced per hour x lbs of paper per M/1000)
22,491 =lbs of finished product per hour less paper (lbs of finshed product / hours- paper)
27,279 =Pounds of material produced by the dryer per hour (dry basis, assumming fuel balances)
4,788 =weight of screened fines per hour (total fuel)
17.55% =resulting loss to fines as percentage of dryer throughput 13.64 ODTH

4



LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
PRESS CHART
7AM - 7PM, 5/21/96

PRESS LOADS
0940 - 1700 = 113

5

Louisiana-Pacific Corporation, Two Harbors, MN. Rev. 5/13/96

PRESS REPORT

Operator	Shift	Crew	Date
Les Stavig	DAYS	D	5-21-96

thickness	press temp.	loads w/backer	loads no backer	total loads	down time
7/16"	220 °C	185		185	21

line speed	from	to	paper north	paper south
733	7AM	7PM	938	443
			684	581
				443

	downtime from	downtime to	min.	reason
	7:09	7:10	1	4X16's
	8:38	8:45	7	CORE Plug.
	9:29	9:32	3	#2-PAPER ch/
(12)	1103	1104	1	#1 IN LOADER
	150	151	1	#1 PAPER
	151	152	1	INJECTOR
	153	155	2	#1 PAPER
(18)	2:04	2:06	2	4X8's
	3:03	3:06	3	#2 PAPER ch/
				(21)

Time To Position (seconds)
(indicate with an "X" load using backer paper)

1	64	41	53	81	48	121	46	161	47
2	67	42	56	82	46	122	42	162	50
3	102	43	52	83	51	123	45	163	50
4	70	44	54	84	56	124	46	164	48
5	70	45	57	85	52	125	44	165	46
6	68	46	54	86	52	126	47	166	41
7	71	47	54	87	52	127	47	167	34
8	71	48	56	88	58	128	44	168	35
9	73	49	53	89	55	129	44	169	40
10	66	50	52	90	58	130	48	170	42
11	69	51	56	91	60	131	46	171	42
12	50	52	61	92	57	132	45	172	45
13	49	53	55	93	60	133	48	173	48
14	50	54	56	94	54	134	48	174	48
15	51	55	55	95	58	135	48	175	45
16	52	56	56	96	58	136	45	176	43
17	54	57	58	97	56	137	48	177	48
18	52	58	61	98	57	138	45	178	46
19	42	59	66	99	57	139	47	179	48
20	44	60	65	100	60	140	50	180	49
21	42	61	68	101	57	141	48	181	51
22	40	62	71	102	56	142	52	182	50
23	43	63	66	103	55	143	52	183	59
24	43	64	75	104	56	144	53	184	60
25	49	65	70	105	55	145	53	185	58
26	50	66	66	106	44	146	53	186	
27	48	67	58	107	45	147	52	187	
28	50	68	62	108	60	148	54	188	
29	52	69	56	109	49	149	53	189	
30	55	70	51	110	50	150	53	190	
31	57	71	54	111	56	151	51	191	
32	54	72	51	112	53	152	50	192	
33	56	73	56	113	53	153	45	193	
34	52	74	54	114	47	154	52	194	
35	52	75	56	115	50	155	53	195	
36	56	76	56	116	50	156	49	196	
37	52	77	50	117	46	157	47	197	
38	55	78	44	118	47	158	46	198	
39	56	79	44	119	43	159	47	199	
40	67	80	41	120	44	160	46	200	

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TWO HARBORS
SHIFT PRODUCTION
SUMMARY
5-21-96

273

21-May-96

SHIFT	C	TY PE	# OF LOADS	NO. OF PANELS	SURFACE FOOTAGE	3/8" FOOTAGE	SCHED. RUN HRS	DOWN TIME	NET RUN HRS.	% RUN TIME	% PLANT CAPACITY
DAY	D	7/ 16	185	5,920	189,440	221,020	12.00	21	11.65	97.1%	164.4%
	E	7/ 16	0	0	0	0	0.00	0	0.00	0.0%	0.0%
NITE	A	7/ 16	169	5,408	173,056	201,904	12.00	89	10.52	87.6%	150.2%
DAILY											
TOTAL DAILY			354	11,328	362,496	422,924	24.00	110	22.17	92.4%	157.3%
					WTD	2,111,036	120.00	518	111.37	92.8%	157.1%
					MTD	10,087,365	602.00	3,145	549.58	91.3%	152.6%
					YTD	50,676,462					

KONUS #1
DAY DRYER:

KONUS #1
NITE DRYER:

TOTALS		
	KONUS MTI	0
	DRYER MTI	0

MTD 3/8" FOOTAGE			
0	<--1/4	1/2-->	0
156,672	<--3/8	19/32>	0
9,896,901	<--7/16	5/8-->	0
	<--7/16S	11/16>	0
		3/4-->	0

	FOREMAN	%R/T	%P/C	LOG COUNT	DAILY	MTD
"A"	DUANE	88.7%	144.6%	A" CREW	2,920	32,696
"B"	BOB	92.7%	152.7%	B" CREW	0	34,085
"C"	JOHN	92.1%	152.2%	C" CREW	0	37,235
"D"	STEVE	91.5%	161.3%	D" CREW	2,539	33,274

COMMENTS:

"D" CREW: CORE BLENDER OUTFEED PLUG - 7 MIN., #2 PAPER - 6 MIN., SAWLINE - 3 MIN., #1 PAPER - 3 MIN., #1 IN LOADER - 1 MIN., INJECTOR - 1 MIN.

"A" CREW: REACHED EPA PRODUCTION CAP - 27 MIN., #1 PAPER - 24 MIN., #1 SYSTEM BELT - 14 MIN., #2 PAPER - 7 MIN., #1 LOADER - 7 MIN., TRIANGLE CONVEYOR - 2 MIN., PANEL LINE E-WTOP - 2 MIN., CHANGE SCREEN - 2 MIN.

PAINT INVENTORY SHEET

Date: 5/21/96

DAYS IN MONTH: 28

DAY # 25

PRODUCTION	3/8 CONVERSION	PRESS LOADS	DAILY	MTD
3/8	(1.024)	0	0.000	190.464
7/16	(1.1947006)	354	422.924	9,896.901
19/32	(1.6212992)	0	0.000	0.000
1/2	(1.3653333)	0	0.000	0
		TOTAL	422.924	10,087.365

PAINT INVENTORY

SUPPLIER	BEG INVENT.	INCOM. INVENT.	TOTAL INVENT.	END INVENT.	USAGE	PRICE PER UNIT	USAGE DOLLARS	MTD DOLLARS
4012-13	3,957	0	3,957	3,235	722	$8.54	$6,165.88	$107,100.14
6015-40	0	0	0	0	0	$4.24	$0.00	$0.00
95H16Q	3,040	0	3,040	2,785	255	$9.18	$2,340.90	$65,214.72

RED EDGE SEAL

	DAILY	MTD
GAL/MSF	0.0000	ERR
COST /M	$0.00	ERR

EDGE SEAL (GRAY)

	DAILY	MTD
GAL/MSF	1.7072	1.2429
COST /M	$14.58	$10.61

TOP COAT (GRAY)

	DAILY	MTD
GAL/MSF	0.6029	0.7041
COST /M	$5.54	$6.46

AS of 4:00 5/21/96
145 gals of top
390 gals of Edge

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Product Shipping Report

Louisiana-Pacific Corp.
HWY 2, Industrial Park North
Two Harbors, MN 55616
Attention: Tim Jackson

Product Code PF4012-13
Product Name High-Solids Grey Edge Primer
Batch Number # 98579
Date Mfg. March 8, 1996

Physical Characteristics

	Specifications	Actual
Weight per Gallon	10.5 +/- 0.2 lb/gallon	10.48 lb/gallon
% Solids (Weight)	54 % +/- 2 %	55.01%
Specific Gravity	1.26 +/- .03	1.258
*Manufactured Viscosity (78°F)	800 +/- 100 cps #3@50	784 cps
pH	9.00 +/- .25	9.95
Color	To Match Standard	OK

Comments:

This is a 4050 gallon batch

Material VOC as delivered = 0.000117 lbs/gal. (0.014 grams/l.)
*Coating VOC (minus water) =0.000283 lbs/gal. (0.034 grams/l.)

*Viscosity of product is measured at time of manufacture. Subsequent to shipment, viscosity may vary due to conditions encountered during shipment and storage.

Store at 40°F or greater. Keep away from temperature extremes, e.g., do not store in direct sunlight in summer, near open doors in winter, etc. This product does not qualify as a hazardous waste under current RCRA regulations.
Please rotate stock on a regular basis.

Certified by: Stephen [signature] Duff

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associated chemists inc.
4401 S.E. JOHNSON CREEK BOULEVARD PORTLAND, OREGON 97222 503/659-1708 TOLL FREE 800/554-4556 FAX 503/653-0409

Product Shipping Report

Louisiana-Pacific Corp.
HWY 2, Industrial Park North
Two Harbors, MN 55616
Attention: Tim Jackson

Product Code PFX95H16Q
Product Name OSB Face Primer
Batch Number # 99782
Date Mfg. April 11, 1996

Physical Characteristics

	Specifications	Actual
Weight per Gallon	11.4 +/- 0.2 lb/gallon	11.47 lb/gallon
% Solids (Weight)	56 +/- 2.0%	57.38%
Specific Gravity	1.38 +/- 0.03	1.38
*Manufactured Viscosity (78°F)	400 +/- 100 cps #3@50	334 ps
pH	8.95 +/- 0.2	8.84
Color	To Match Standard	OK

Comments:

This is a 12 bin shipment

Material VOC as delivered = 0.2236 lbs/gal. (26.836 grams/l.)
*Coating VOC (minus water) = 0.5083 lbs/gal. (61.029 grams/l.)

*Viscosity of product is measured at time of manufacture. Subsequent to shipment, viscosity may vary due to conditions encountered during shipment and storage.

Store at 40°F or greater. Keep away from temperature extremes, e.g., do not store in direct sunlight in summer, near open doors in winter, etc. This product does not qualify as a hazardous waste under current RCRA regulations.
Please rotate stock on a regular basis.

Certified by: [signature]

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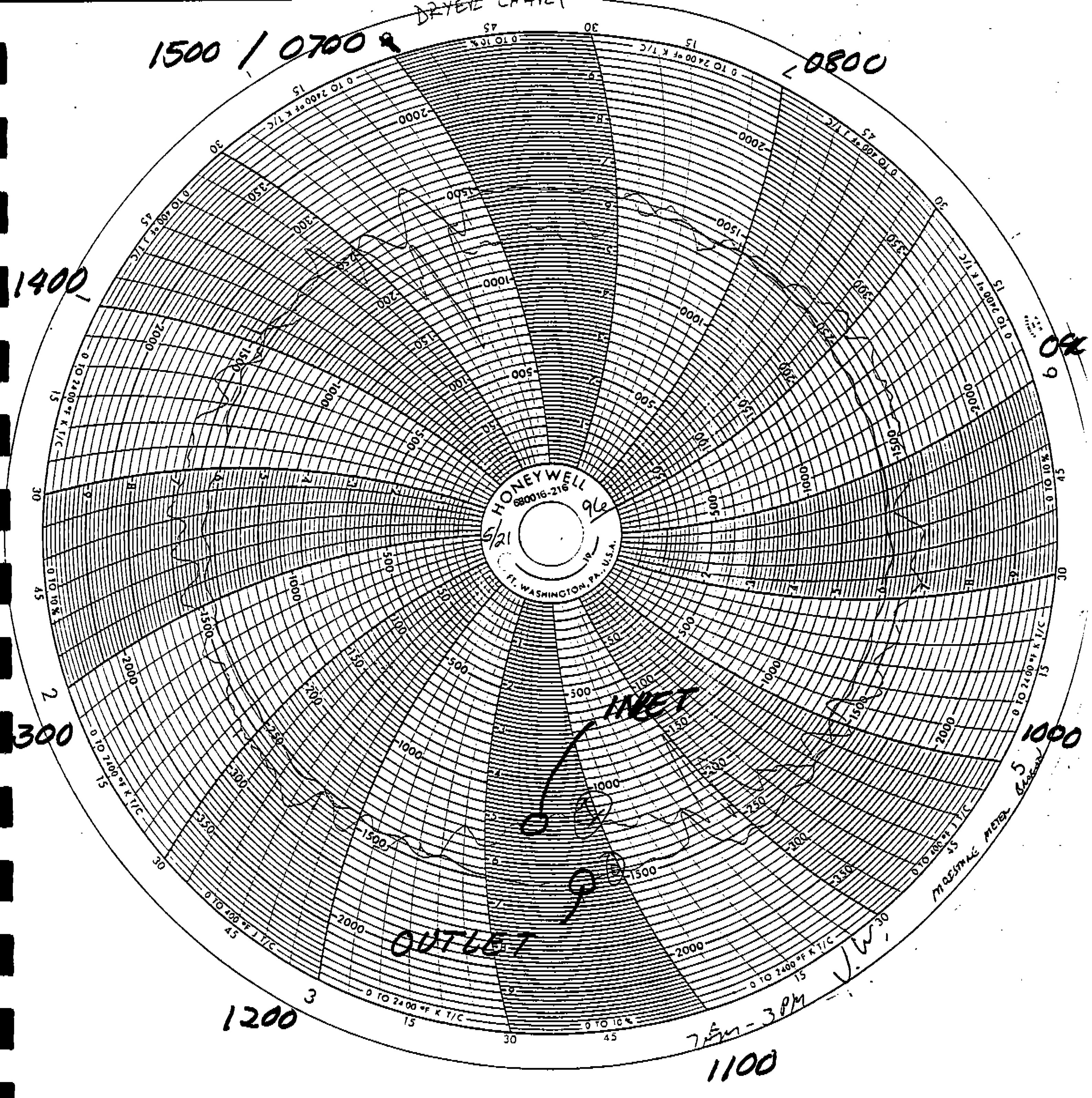
associated chemists inc.
4401 S.E. JOHNSON CREEK BOULEVARD PORTLAND, OREGON 97222 503/659-1703 TOLL FREE 800 554-4666 FAX 503/653-0409



LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
DRYER CHART
7AM - 3PM, 5/21/96

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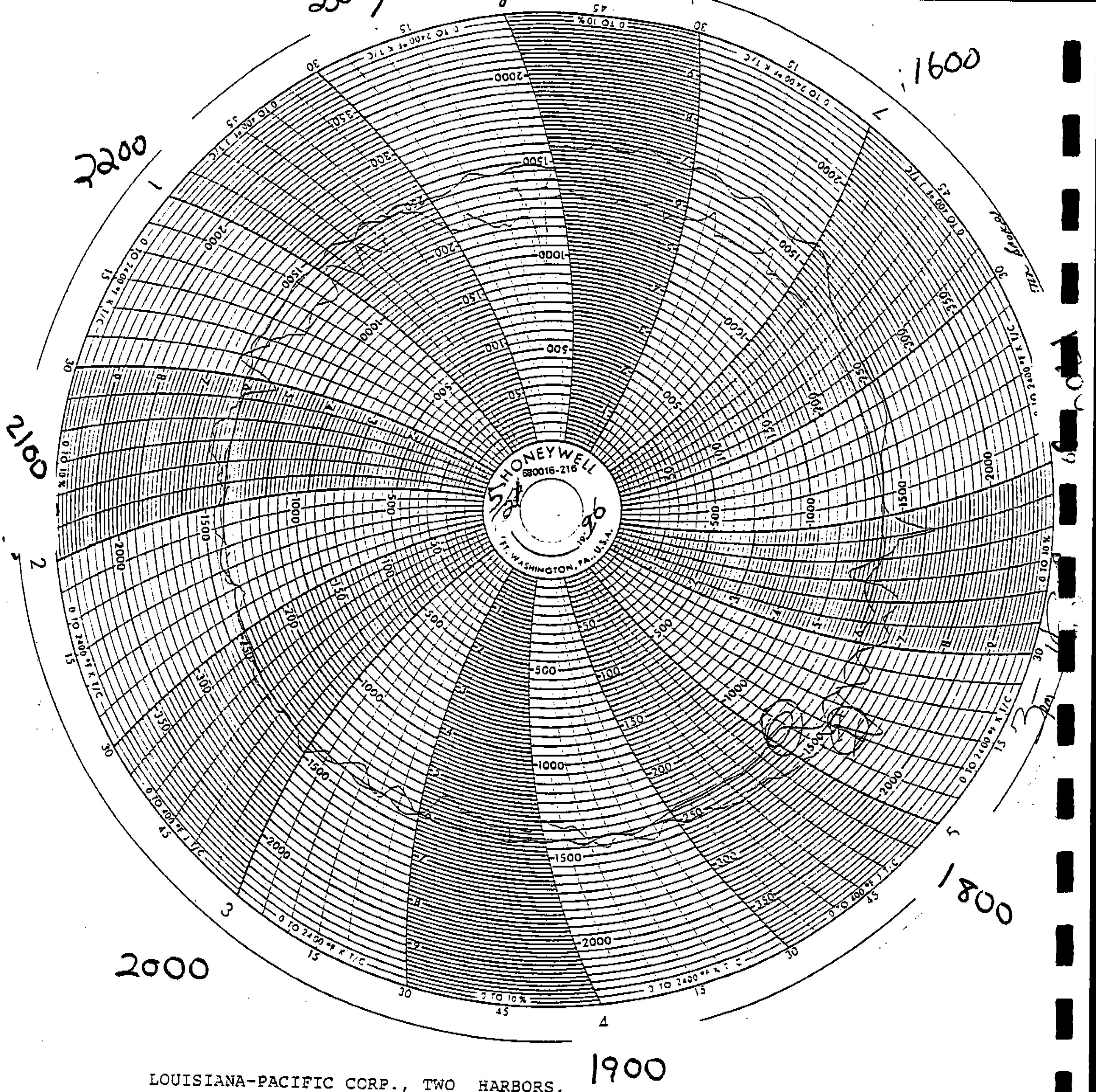

LOUISIANA-PACIFIC CORP., TWO HARBORS,
DRYER CHART
3PM - 11PM, 5/21/96

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Louisiana-Pacific Corporation, Two Harbors, MN
Dryer Data
Air Testing
Fuel calibration lb/count 5.2
Rev. 5/13/96

Date 5/21/96
Page 1 of 2
Fuel Moisture 32 %

TIME	FEED RATE%	OUT. SET POINT °F	OUTLET TEMP. °F	INLET TEMP. °F	FUEL COUNT	WET BIN LEVEL %	DRY BIN LEVEL SURF.%	DRY BIN LEVEL CORE%	FLAKE MOISTURE IN%	FLAKE MOISTURE OUT%
8:00 am	90	257	253	1286	792	100%	50?	50	49.8	
8:10	95	255	252	1335	997	85%	50	50		
8:20	95	253	246	1308	1163	85%	50	50		4.8
8:30	92	253	250	1280	1345	95%	50	50		
8:40	92	253	255	1340	1500	95%	50	50		
8:50	92	253	253	1329	1666	95%	60	70		
9:00	92	253	252	1285	1817	95%	70	70	?	
9:10	92	253	252	1249	1972	95%	70	70		4.6
9:20	92	252	252	1290	2135	100%	70	70		
9:30	92	252	254	1286	2297	100%	70	70		
9:40	92	252	256	1261	2460	95%	70	70		
9:50	90	252	252	1280	2613	100%	85	85	53.2	
10:00	90	252	252	1262	2764	100%	85	85		
10:10	86	252	251	1206	2914	100%	100	100		5.0
10:20	86	253	251	1086	3058	100%	100	100		
10:30	80	255	257	954	3197	100%	100	100		
10:40	80	257	258	905	3323	95%	95	95		
10:50	83	256	257	964	3466	95%	95	95	50.4	
11:00	84	255	257	1001	3611	95%	95	95		
11:10	84	255	256	1018	3765	95%	95	95		5.4
11:20	38	250	246	1175	3899	95	95	95		
11:30	75	267	269	1167	4033	95	85	85		
11:40	80	266	264	1225	4155	95	85	85		
11:50	90	261	261	1278	4347	100	85	65	47.2	
12:00	90	255	245	1289	4489	100	70	50		
12:10	90	250	249	1245	4645	100	80	80		
12:20	90	250	249	1254	4800	100	80	80		6
12:30	90	250	251	1285	4965	100	80	80		
12:40	90	250	253	1226	5122	85	80	80		
12:50	91	250	250	1296	5295	100	80	80	50.2	
1:00	91	250	250	1291	5444	100	50	80		6.2
1:10	90	250	250	1280	5626	100	50	50		
1:20	91	250	250	1258	5786	100	50	60		
1:30	90	250	250	1248	5942	100	60	70	46.5	
1:40	91	250	250	1167	6098	100	60	70		
1:50	91	250	249	1181	6271	100	60	70		

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Louisiana-Pacific Corporation, Two Harbors, MN

Dryer Data

Air Testing

Fuel calibration lb/count 5.2

Rev. 5/13/96

Date 05/21/96

Page 2 of 2

Fuel Moisture 3.2 7[illegible]

TIME	FEED RATE%	OUT. SET POINT °F	OUTLET TEMP. °F	INLET TEMP. °F	FUEL COUNT	WET BIN LEVEL %	DRY BIN LEVEL SURF.%	DRY BIN LEVEL CORE%	FLAKE MOISTURE IN%	FLAKE MOISTURE OUT%
2:00PM	91	250	248	1092	6453	100	80	85		
2:10	90	250	250	1214	6601	100	80	85		
2:20	80	250	252	1203	6763	100	90	80		5.5
2:30	80	258	259	1058	6906	100	95	90		
2:40	80	258	259	1026	7055	100	95	90		
2:50	80	259	260	908	7221	100	85	85	49.4	
3:00	80	259	261	987	7418	70	85	85		
3:10	80	259	259	963	7489	70	85	95		
3:20	80	259	260	992	7629	70	85	85		
3:30	85	256	253	1175	7789	100	85	85		
3:40	85	255	255	1071	7943	100	80	95		5.1
3:50	85	255	253	1142	8094	100	85	85	52.7	
4:00	85	255	255	1068	8239	100	85	85		
4:10	91	255	253	1087	8389	100	85	85		5.8
4:20	91	255	255	1221	8550	100	85	85		
4:30	91	251	251	1177	8707	90	50	85		
4:40	91	250	246	1254	8877	100	75	85	53.8	
4:50	91	250	249	1161	9045	100	80	80		
5:00	91	250	248	1184	9212	80	90	80		

Record every 10 minutes; flake moisture once per hour.

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Louisiana-Pacific Corporation, Industrial Park North, Highway 2, Lake County, Two Harbors, MN 55616

DRYER OPERATING REPORT (AQ Stack I. D. No.: 001)

Operator		Crew	Date
Days	Jeff Waschek	D	5/21/96
Nights	Charles Aune	A	

Time	Inlet Moist % 6 times	Inlet Temp °F	Outlet Temp. °F	Feed Speed	Dryer Pressure "w.c.	Outlet Moisture Moist. System.	Outlet Moisture CSC	Fuel Count
8:00 AM	49.8	1295	255	95	5	-	4.8	860
9:00 AM	53.2	1214	253	92	5	-	4.6	1705
10:00 AM	50.4	1181	252	90	5	-	5	2800
11:00 AM	47.2	1061	255	84	5	—	5.4	3662
12:00 PM	50.2	1108	255	90	5	—	6	4421
1:00 PM	46.5	1295	250	90	5	-	6.2	5387
2:00 PM	49.4	1110	250	90	5	—	5.5	6220
3:00 PM	52.7	1054	259	80	5	—	5.1	7180
4:00 PM	53.8	1026	255	85	5	-	5.8	8117
5:00 PM	—	1163	250	91	5	-	5.4	9020
6:00 PM	—	1068	250	93	5	-	5.4	9875
7:00 PM	—	1122	250	94	5	—	5.2	10780
8:00 PM	46.4	1272	250	87	5	—	5.8	12131
9:00 PM		1191	250	89	5		6.1	12705
10:00 PM		1123	260	79	5		5.7	12705
11:00 PM		933	260	79	5		4.8	12712
12:00 AM		1147	260	85	5		5.1	13600
1:00 AM	49.8	1242	260	85	5		5.4	14615
2:00 AM		1138	260	85	5		4.8	15536
3:00 AM		1164	260	85	5		4.9	16750
4:00 AM		1311	260	82	5		5.5	17551
5:00 AM		1140	260	88	5		5.2	18002
6:00 AM	50.2	1093	260	88	5		5.0	18529
7:00 AM		1061	260	88	5		5.7	18529
average:	49.9	1144	256	87			5.3	

Gas Burner (unit no.: 003) Ft³ natural gas (X 1000)	running time	meter reading
start:	8:50	32046
stop:	10:50	32231
total:	230 min.	185

	Wood burner (unit no.: 002) running time min.	Wood burner down time min.	Dryer (Unit no.: 001) running time min.	Dryer down time min.
days	720	0	720	0
nights	490	230	720	0
total	1210	230	1440	0

RTO meter readings, Ft³ nat gas (X 10)	
Start	1326660
Stop	1346091
Total	19431

fuel moist.: 3.2% Gas on 5:10 To 7:00 120/110

form revised 5/9/96

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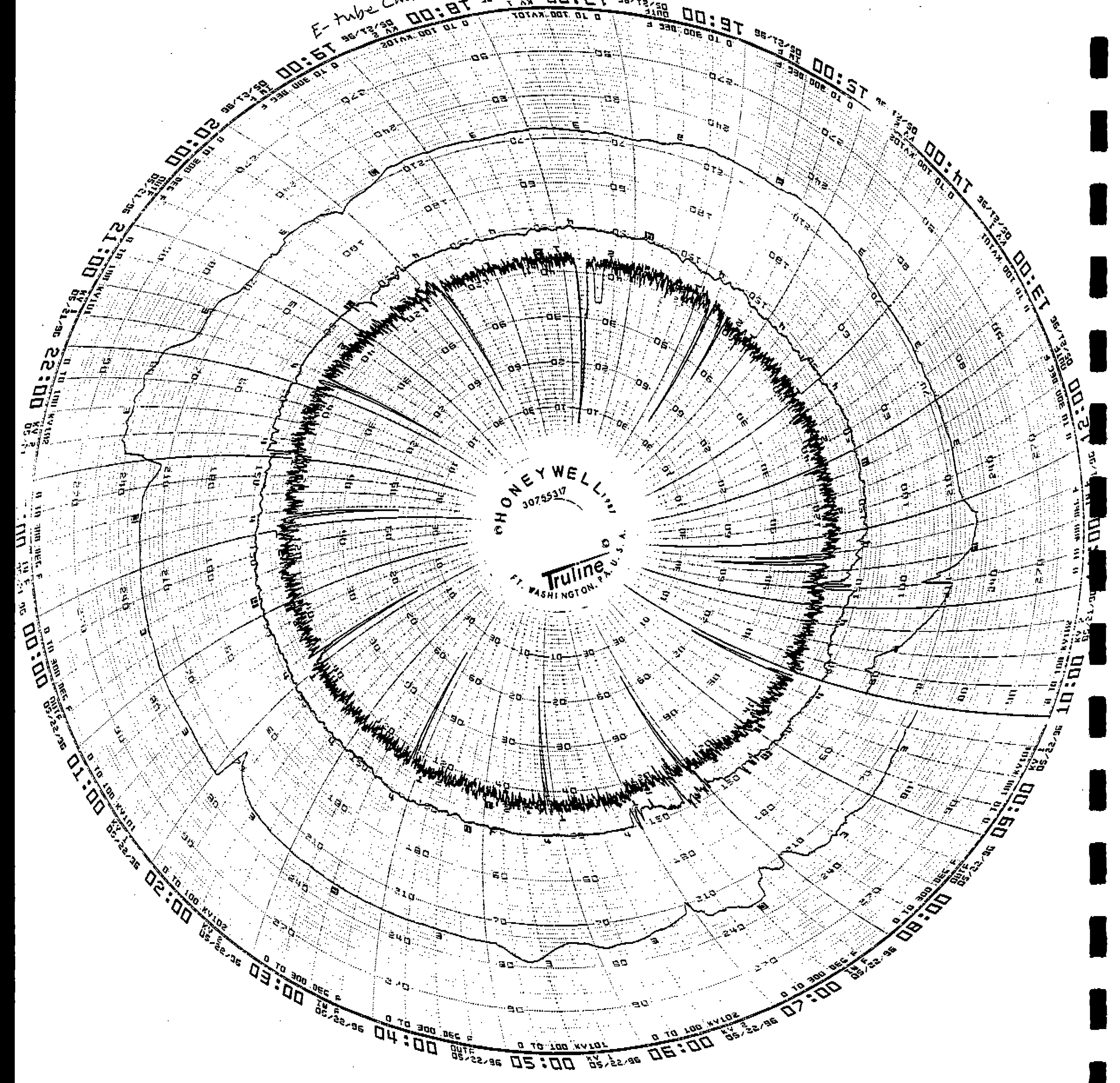

LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
E-TUBE CHART

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Louisiana-Pacific Corporation, Two Harbors, MN

E-Tube Data Sheet

Air Testing

Rev. 5/13/96

RECORDED BY DOUG TEET

DATE: 5-21-96

RECORD EVERY 10 MINUTES										
	QUENCH CHAMBER TEMP. °F		TRANSFORMER/RECTIFIERS NO. 1			TRANSFORMER/RECTIFIERS NO. 2				
TIME	INLET	OUTLET	KV	mA	SPARK RATE	KV	mA	SPARK RATE	Flush Time	Diff. press.
8:00	192	147	46	200	25.6	46	180	25.6		
8:10	189	147	46	180	25.6	48	200	25.6		
8:20	182	147	44	200	25.6	48	240	25.6		
8:30	181	147	46	200	25.5	47	200	25.6		
8:40	182	145	46	240	25.7	48	180	25.6		
8:50	183	147	46	200	25.5	48	200	25.5		
9:00	181	147	46	240	25.6	48	250	25.6		
9:10	181	147	48	210	25.5	46	220	25.6		
9:20	180	147	46	180	25.5	48	230	25.7		
9:30	176	147	46	240	25.6	47	220	25.5		15
9:40	166	145	46	220	25.6	48	180	25.6	9:14	14
9:50	170	146	48	200	25.5	48	240	25.6		16
10:00	175	146	47	180	25.5	47	220	25.5		16
10:10	174	145	46	240	25.5	48	240	25.6		15
10:20	170	143	46	220	25.6	48	220	25.5		15
10:30	173	138	46	200	25.6	46	200	25.6		14
10:40	185	137	46	230	25.6	46	200	25.6		14
10:50	192	139	45	200	25.6	46	220	25.6		13
11:00	200	139	46	250	25.6	44	240	25.6		14
11:10	205	141	46	220	25.6	46	240	25.6		14
11:20	197	129	45	180	25.7	45	195	25.7		13
11:30	213	137	47	205	25.5	46	210	25.5		13
11:40	219	144	42	175	25.6	49	165	25.6		13
11:50	220	145	47	230	25.5	47	210	25.4		11
12:00	214	148	46	225	25.6	47	210	25.5		15
12:10	210	148	46	240	25.6	47	240	25.6		16
12:20	209	147	47	250	25.6	49	230	25.6		16
12:30	210	148	46	250	25.5	48	240	25.6		14
12:40	209	146	46	240	25.6	47	240	25.6		15
12:50	208	148	49	240	25.5	48	240	25.6		16
1:00	208	146	48	280	25.5	48	250	25.6		14
1:10	208	148	46	240	25.6	48	220	25.6		17
1:20	208	148	47	230	25.5	48	250	25.5		14
1:30	208	147	46	250	25.6	49	230	25.6		15
1:40	208	147	46	240	25.6	46	250	25.6		15
1:50	208	146	46	220	25.5	48	230	25.5		16

Louisiana-Pacific Corporation, Two Harbors, MN
E-Tube Data Sheet
Air Testing RECORDED BY DOUG TEET
Rev. 5/13/96

DATE: 05/21/96
PAGE: 2 OF 2

TIME	QUENCH CHAMBER TEMP. °F INLET	QUENCH CHAMBER TEMP. °F OUTLET	T/R NO. 1 KV	T/R NO. 1 mA	T/R NO. 1 SPARK RATE	T/R NO. 2 KV	T/R NO. 2 mA	T/R NO. 2 SPARK RATE	
2:00			46	260	25.6	47	240	25.6	
2:10			46	260	25.6	47	180	25.6	
2:20			46	220	25.6	46	200	25.6	
2:30			46	250	25.6	46	180	25.4	
2:40			46	230	25.5	46	220	25.6	
2:50			46	320	25.6	46	200	25.6	
3:00			46	260	25.6	47	180	25.6	
3:10			46	260	25.5	46	220	25.6	
3:20			45	240	25.7	46	210	25.6	
3:30			46	250	25.6	46	220	25.6	
3:40			46	250	25.6	46	210	25.5	
3:50			46	240	25.6	46	160	25.7	
4:00			46	250	25.7	46	210	25.3	
4:10			46	240	25.5	46	200	25.8	
4:20			46	270	25.8	47	220	25.5	
4:30			46	200	25.6	47	210	25.6	
4:40			46	260	25.6	46	220	25.7	
4:50			46	240	25.6	47	210	25.6	
5:00			45	260	25.6	47	210	25.6	
5:10			44	210	25.5	48	210	25.5	
5:20			46	250	25.6	47	210	25.5	
5:30									
5:40									

RECORD EVERY 10 MINUTES

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Louisiana-Pacific Corporation, Two Harbors, MN
E-Tube Data Sheet
Air Testing
Rev. 5/13/96

DATE: 5/21/96
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RECORDED BY Barbara Hamilton

RECORD EVERY 10 MINUTES

TIME	QUENCH CHAMBER TEMP. °F		TRANSFORMER/RECTIFIERS NO. 1			TRANSFORMER/RECTIFIERS NO. 2			FLUSH RATE / DIFF. PRESSURE
	INLET	OUTLET	KV	mA	SPARK RATE	KV	mA	SPARK RATE	
8:00 AM	192	147							
8:10	189	147							
8:20	182	147							
8:30	181	147							
8:40	182	145							
8:50	183	147							
9:00	181	147							
9:10	181	147							
9:20	180	147							
9:30	176	147							15
9:40	166	145							9.44 16
9:50	170	146							16
10:00	175	146							16
10:10	174	145							15
10:20	170	143							15
10:30	173	138							14
10:40	185	137							14
10:50	192	139							13
11:00	200	139							14
11:10	205	141							14
11:20	197	129							13
11:30	213	137							13
11:40	219	144							13
11:50	220	145							15
12:00	214	148							15
12:10	210	148							16
12:20	209	147							16
12:30	210	148							14
12:40	209	146							15
12:50	208	148							16
1:00	208	146							16
1:10	208	148							17
1:20	208	148							14
1:30	208	147							15
1:40	208	147							15
1:50	208	146							16

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Louisiana-Pacific Corporation, Two Harbors, MN
E-Tube Data Sheet
Air Testing
Rev. 5/13/96

DATE: 05/21/96
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RECORDED BY Barbara Hamilton

TIME	QUENCH CHAMBER TEMP. °F		TRANSFORMER/RECTIFIERS						DEFF. PRESSURE
			NO. 1			NO. 2			
	INLET	OUTLET	KV	mA	SPARK RATE	KV	mA	SPARK RATE	
2:00PM	207	145							15
2:10	207	144							15
2:20	208	141							15
2:30	212	141							15
2:40	213	141							14
2:50	214	140							14
3:00	215	139							14
3:10	216	139							14
3:20	216	140							14
3:30	214	144							15
3:40	213	142							15
3:50	214	143							15
4:00	214	140							14
4:10	214	141							13
4:20	215	142							13
4:30	213	143							13
4:40	210	144							14
4:50	209	144							14
5:00	208	143							15

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Louisiana-Pacific Corporation
Two Harbors MN

Rev. 5/17/96

E-TUBE OPERATING REPORT

	Operator	Crew	Date
Days	TODD MURPHY	D	May 21, 96
Nights	DEAN BAUMGARTNER	A	

Time	T/R CONTROL PANEL DIGITAL TRANSFORMER/RECTIFIERS No. 1 KV	No. 1 mA	No. 2 KV	No. 2 mA	Mesh Pad DP	ZYCOM QUENCH INLET deg. F	QUENCH OUTLET deg. F	INLET PSI in H2O	OUTLET PSI in H2O	Beginning & End of Shift on the Vessel: Flush Water total gal.	Make-up Water total gal.	DP in H2O
7:00 AM	48	184	48	150	.5	186°F	134	11	25	396380	208986	13
8:00 AM	46	200	46	180	.5	190	147	7	24			17
9:00 AM	48	190	47	190	.4	183	146	7	24			16
10:00 AM	49	220	49	210	.5	169	147	8	24			15
11:00 AM	46	250	46	240	.5	202	141	10	24			14
12:00 PM	46	225	47	210	.5	211	148	4	24			15
1:00 PM	48	240	48	240	.5	209	148	8	23			15
2:00 PM	46	260	47	240	.5	207	145	8	24			15
3:00 PM	46	320	47	210	.5	213	140	9	24			14
4:00 PM	48	255	47	195	.5	214	141	8	24			15
5:00 PM	47	240	47	230	.5	208	144	8	24			15
6:00 PM	46	240	48	240	.5	210	144	7	24			16
7:00 PM	46	240	47	210	.5	209	143	9	24	398,656	210,595	16
8:00 PM	47	220	48	160	.4	203	145	12	23			11
9:00 PM	47	260	49	250	.4	206	145	11	23			13
10:00 PM	48	240	50	200	.4	225	144	11	24			12
11:00 PM	48	200	48	180	.4	214	139	12	24			12
12:00 AM	46	190	47	180	.4	216	143	10	24			14
1:00 AM	47	160	47	170	.4	220	145	8	24			15
2:00 AM	46	170	47	100	.4	217	144	9	24			15
3:00 AM	47	180	46	120	.4	219	143	9	24			15
4:00 AM	47	220	47	210	.4	219	147	7	23			16
5:00 AM	46	150	47	190	.4	222	145	7	24			16
6:00 AM	49	240	49	260	.4	221	145	9	24	400910	212320	14
									Total:	4530	3,334	

Total Hours Dryer Operating on Natural Gas 3.83

11%	11.0%	
a.m.	10:00 P.M.	

RECYCLE BLOWDOWN Estimated Gallons
3025

25.6
No. 2

	Gallons Used: Caustic	Defoamer
Start:	1950	1590
End:	1963	1615
Total:	13	25

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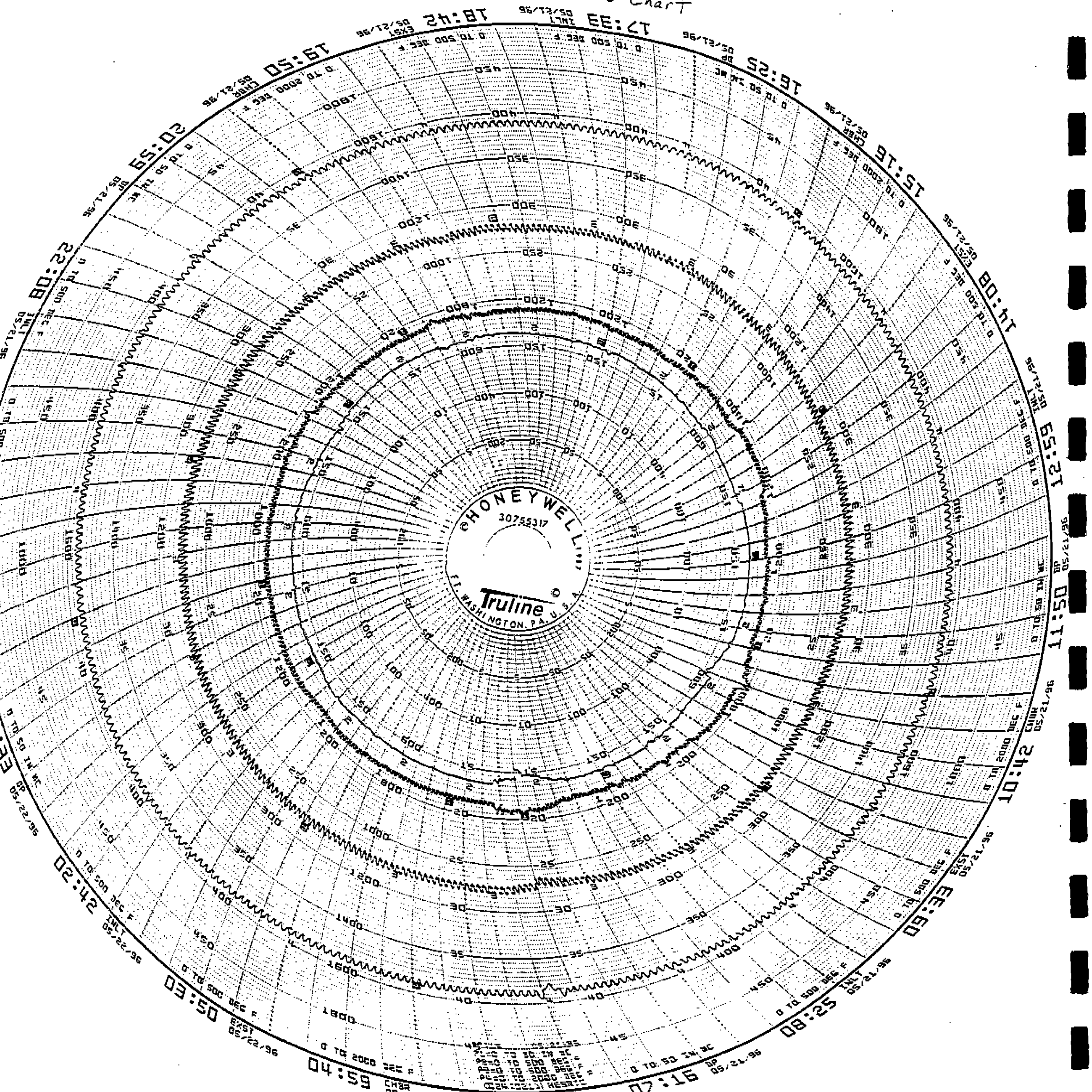

LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
RTO CHART

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Louisiana-Pacific Corporation, Two Harbors, MN
RTO Data Sheet
Air Testing

DATE: 5/21/96
PAGE: 1 OF 2

Rev. 5/13/96 RTO SET POINT 1510 AT 7:15 A.M.

TIME	RTO Chamber Bed Temp °F #1	#2	#3	#4	#5	INLET PRESS.	BURNER TEMPS °F B #1	B #2	COMBUST TEMP. °F	EXHAUST TEMP. °F	PRESS. DROP	Every 30 min. GAS USAGE (meter reading)	Inlet Temp.
8:00AM	511	489	522	484	516	1	1520	1512	1549	273	18	1327725	
8:10	508	492	525	482	522	1	1496	1510	1581	268	19		159
8:20	510	494	522	487	530	1	1510	1501	1527	278	19		159
8:30	510	493	529	482	522	0	1510	1509	1535	270	18	1328114	160
8:40	508	496	526	485	521	1	1496	1506	1578	273	21		159
8:50	512	494	529	487	517	1	1520	1510	1543	277	19		160
9:00	509	496	523	484	523	1	1502	1513	1524	271	20	*1328458	
9:10	513	496	525	487	[illegible]	1	1520	1510	1544	277	18		
9:20	509	496	524	483	521	1	1504	1510	1525	270	18		
9:30	513	495	523	489	520	0	1496	1506	1535	272	17	*1328801	
9:40	513	494	532	482	521	1	1509	1508	1528	275	20		
9:50	510	497	520	485	520	0	1497	1509	1532	275	18		
10:00	513	493	530	485	516	1	1523	1510	1547	272	20	*1329187	
10:10	510	496	520	484	521	1	1494	1511	1518	273	19		
10:20	514	494	529	485	517	1	1521	1507	1542	278	19		
10:30	509	496	530	484	521	1	1495	1510	1518	272	19	*1329532	
10:40	513	493	527	484	514	1	1514	1512	1550	277	20		
10:50	514	493	525	478	520	1	1498	1510	1578	269	20		
11:00	510	495	519	484	515	1	1510	1511	1550	276	19	*1329923	
11:10	509	492	526	479	519	1	1498	1510	1528	268	19		
11:20	509	495	519	483	516	1	1508	1515	1524	271	22		
11:30	507	492	528	479	516	0	1512	1513	1538	266	19	*1330444	
11:40	507	495	515	482	513	1	1494	1503	1521	270	21		
11:50	509	491	527	478	514	1	1515	1508	1537	268	18		
12:00	505	496	516	481	517	1	1494	1508	1520	271	18	*1330748	
12:10	510	492	527	482	513	1	1520	1508	1545	276	18		
12:20	507	495	521	480	518	1	1494	1509	1526	269	19		
12:30	509	496	521	485	514	1	1514	1510	1548	279	19	*1331095	
12:40	507	493	529	480	518	1	1504	1507	1524	271	20		
12:50	512	495	528	484	515	1	1520	1506	1548	280	19		

Record Every 10 Minutes

multiply gas meter reading x10 for cu.ft.

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Louisiana-Pacific Corporation, Two Harbors, MN
RTO Data Sheet
Air Testing

Rev. 5/13/96

DATE: 05/21/96
PAGE: 2 OF 2

TIME	RTO Chamber Bed Temp °F #1	#2	#3	#4	#5	INLET PRESS.	BURNER TEMPS °F B #1	B #2	COMBUST TEMP. °F	EXHAUST TEMP. °F	PRESS. DROP	Every 30 min. GAS USAGE (meter reading)
1:00 PM	511	494	530	481	518	1	1506	1511	1529	272	20	*1331528
1:10	513	495	528	485	514	1	1518	1505	1540	280	19	
1:20	509	494	526	481	519	1	1497	1511	1521	274	19	
1:30	509	498	519	485	517	0	1497	1504	1531	277	18	*1331876
1:40	513	494	530	485	515	1	1519	1504	1537	277	20	
1:50	509	498	520	485	517	0	1495	1503	1517	274	17	~~1332[illegible]~~
2:00	510	497	527	482	520	1	1496	1508	1528	273	20	*1332175
2:10	509	498	530	482	519	1	1494	1509	1517	273	17	
2:20	514	494	525	486	514	1	1520	1514	1549	278	18	
2:30	509	497	528	482	519	1	1503	1513	1525	271	20	*1332568
2:40	512	495	525	486	513	1	1519	1511	1547	276	20	
2:50	509	497	518	484	516	0	1496	1503	1534	274	18	
3:00	511	492	530	482	514	1	1519	1508	1541	276	20	*1333091
3:10	509	493	526	480	518	1	1489	1506	1532	269	19	
3:20	508	495	519	485	514	1	1510	1511	1550	277	21	
3:30	510	491	530	481	516	1	1508	1507	1529	269	19	*1333397
3:40	509	495	531	485	513	1	1495	1504	1532	275	18	
3:50	510	491	530	480	516	1	1503	1508	1525	269	20	
4:00	507	495	518	484	515	0	1497	1505	1539	274	18	*1333748
4:10	509	492	529	482	515	1	1514	1504	1536	268	21	
4:20	505	495	528	484	515	1	1496	1506	1520	270	21	
4:30	511	491	530	481	514	1	1512	1507	1537	277	19	*1334144
4:40	507	495	520	481	517	1	1495	1504	1517	273	21	
4:50	511	490	531	480	515	1	1509	1506	1541	278	19	
5:00	507	495	520	482	518	1	1494	1503	1521	275	22	*1334584

* multiply reading x 10 for cu. ft.

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Louisiana-Pacific Corporation
Two Harbors MN

Wheelabrator Clean Air Systems
RTO Daily Operating Report

Rev. 4/15/96

Date: May 21, 96

Time	8:00 AM	10:00 AM	12:00 PM	2:00 PM	4:00 PM	6:00 PM	8:00 PM	10:00 PM	12:00 AM	2:00 AM	4:00 AM	6:00 AM
Burner S.P.	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510
Bnr #1 temp	1501	1510	1499	1498	1516	1510	1498	1510	1525	1521	1507	1507
Bnr #1 out	48.8	41.9	52.4	49.6	44.5	49.4	48.5	43.7	40.8	40.9	43.2	44.6
Bnr #2 temp	1508	1509	1508	1506	1508	1511	1505	1510	1506	1507	1511	1514
Brn #2 out	49.6	49.5	42.4	51.5	51.5	50.7	57.0	46.7	51.1	57.5	46.4	47.7
Inlet temp	157	158	160	160	156	159	159	157	155	156	160	159
Chamber temp	1536	1516	1542	1524	1530	1549	1531	1524	1533	1532	1517	1519
Exhaust temp	273	270	274	276	268	279	270	270	268	269	272	272
RTO Dif Press	18.3	18.8	18.4	18.9	18.8	18.7	18.9	19.1	19.0	18.7	18.7	18.6
VFD Amps	527	522	545	523	489	517	531	534	502	512	519	476
VFD RPM	1379	1375	1382	1366	1335	1368	1386	1382	1365	1363	1371	1335
P/V setpoint	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
P/V out	71.4	69.5	69.4	72.4	76.7	70.6	73.1	71.2	72.9	71.0	69.4	71.6
Cbr #1 B.O. temp	511	510	509	513	509	512	512	508	505	507	507	508
Cbr #2 B.O. temp	489	496	493	494	494	491	487	490	485	487	490	491
Cbr #3 B.O. temp	527	520	523	529	519	527	530	520	523	522	516	518
Cbr #4 B.O. temp	484	484	482	485	485	487	481	483	480	481	487	486
Cbr #5 B.O. temp	516	519	512	515	513	513	518	520	521	520	519	518
Fan brg #1 temp	96	102	129	131	124	125	105	123	116	119	93	89
Fan brg #2 temp	116	119	123	125	124	128	106	116	113	113	114	112
Motor brg #1 temp	107	114	119	122	123	124	112	109	105	107	105	106
Motor brg #2 temp	105	113	118	121	122	124	111	107	103	105	103	104
Dryer to RTO	yes	yes	yes	yes	yes	yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel Line to RTO	yes	yes	yes	yes	yes	yes	Yes	Yes	Yes	Yes	Yes	Yes
Lap Line to RTO	yes	yes	yes	yes	yes	yes	Yes	Yes	Yes	Yes	Yes	Yes
Chamber Prg Fan	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
BTUE Pressure	off											
BTUE Flow DP	off		1.6									
Natural Gas Usage:	194310 cu. ft.											

Comments:

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DRYER MARCH 22nd 1996
PM 10,FORMALDEHYDE

DATA TIME:	START=	09:00	END=	12:00	HOURS=	3.00
	START=	12:50	END=	14:10	HOURS=	1.33
	START=	15:00	END=	16:40	HOURS=	1.67
					TOTAL=	6.00

BOARD WEIGHTS - LBS
average weights determined by taking every 25th untrimmed board (from press tapes)

7/16"			
per/peice	48.65	208.6	lb= average untrimmed mat weight
per/ 8' x 16'	194.58		
weight of paper overlay (per msf)	76.9	6.7%	=trim %

PLANT PRODUCTION RATE
6.00 =hours during testing
92 =pressloads
736 =no. of 8'x16' boards produced (pressloads x 8 boards per load)
94,208 =volume produced in surface footage (pressloads x 8'x16'x8 openings)
109,912 =volume produced 3/8" basis (pressloads x 8'x16'x 8 openings x 1.1667)
143,214 =lbs of finished product (boards produced x weight of finished board)
23,869 =lbs of finished product per hour (lbs of finshed product / hours)
11.93 =tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY DRY FUEL INPUT

5.2 =fuel calibration in pounds per count
5,496 =counts during testing hours
28,579 = lbs of fuel burned during testing
6.00 =hours during testing
4,763 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
2.38 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,500 =estimated BTU content per pound of dry fuel,
40.5 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,354 =average inlet temperature
49.55 =average incoming moisture percent
5.24 =average dry moisture percent

DRYER THROUGHPUT RATE
4,763 =Total pounds of fuel burned per hour in Dryer
23,869 =lbs of finished product per hour (lbs of finshed product / hours)
1,207 =lbs of face & backer paper per hour (surf. ftge.produced per hour x lbs of paper per M/1000)
22,662 =lbs of finished product per hour less paper (lbs of finshed product / hours- paper)
27,425 =Pounds of material produced by the dryer per hour (dry basis, assumming fuel balances)
4,763 =weight of screened fines per hour (total fuel)
17.37% =resulting loss to fines as percentage of dryer throughput

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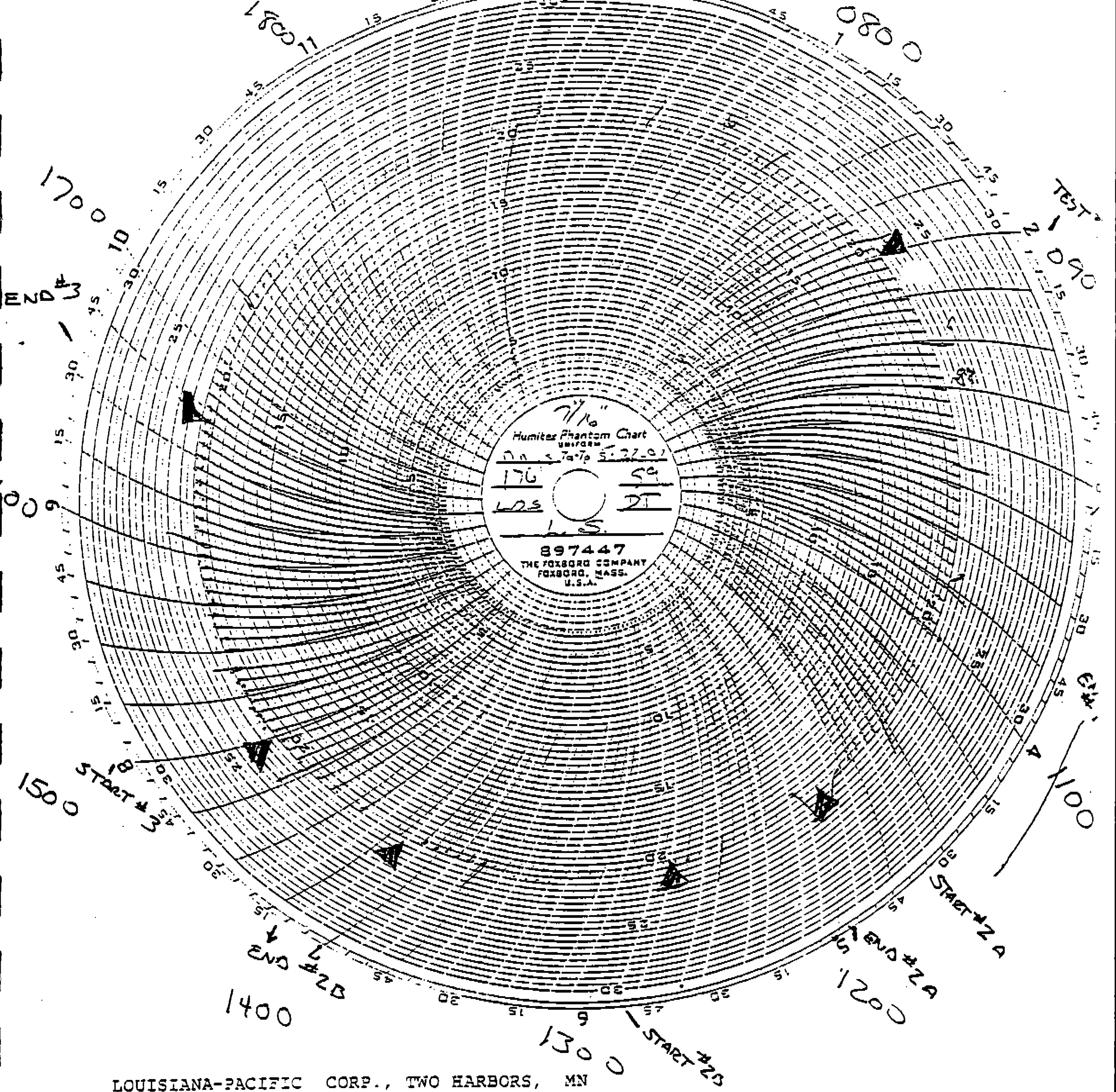

LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
PRESS CHART
7AM?-?7PM, 5/22/96

PRESSLOADS

0900 - 1200 = 44
1250 - 1410 = 21
1500 - 1640 = 27
92

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Louisiana-Pacific Corporation, Two Harbors, MN. Rev. 5/13/96

PRESS REPORT

Operator	Shift	Crew	Date
LS	Days	D	5.22.96

thick-ness	press temp.	loads w/backer	loads no backer	total loads	down time
7/16	220° °C	171			59

line speed	from	to	paper north	paper south
733	7 AM		884	~~380~~ 380
				336
				382
				447

downtime from	downtime to	min.	reason
7:40	7:42	2	#1 - Paper ch/
1101	1105	4	#1 Paper/Limit #1
1107	1110	3	#1 Paper #1 limit
11:50	11:52	2	# - Limit
11:52	12:16	24	Pit - Chain Head Bar
2:07	2:09	2	#2 - Paper
2:11	2:16	5	Core Plug
2:20	2:25	5	#1 - Loader Off limit
2:29	2:36	7	#1 - " limit
2:40	2:41	1	#1 - Limit
2:41	2:43	2	#1 limit Board on gate
3:25	3:27	2	#1 - Paper
			(59)

Time To Position (seconds)
(indicate with an "X" load using backer paper)

1	56.	41	64.	81	64,	121	65,	161	51,
2	58,	42	61,	82	64,	122	62.	162	52,
3	52.	43	60,	83	62,	123	62,	163	52,
4	57,	44	60.	84	63,	124	61,	164	57,
5	59.	45	60.	85	67.	125	66,	165	55,
6	56,	46	60.	86	64,	126	64,	166	57,
7	100,	47	61,	87	63,	127	65,	167	57,
8	58,	48	62,	88	64.	128	65.	168	58,
9	60.	49	62.	89	57.	129	66,	169	58,
10	57,	50	58,	90	54	130	68,	170	59,
11	62.	51	59,	91	52	131	62.	171	53,
12	64,	52	58,	92	54	132	64.	172	51,
13	61,	53	59;	93	52	133	59,	173	48,
14	61.	54	60.	94	54	134	58,	174	51,
15	58,	55	59	95	54	135	56,	175	53,
16	56.	56	62	96	53	136	53.	176	54,
17	57,	57	63	97	54,	137	54,	177	
18	100,	58	63	98	54,	138	51.	178	
19	61,	59	62	99	54.	139	52.	179	
20	103,	60	60	100	51.	140	52	180	
21	64,	61	56	101	53,	141	51.	181	
22	61,	62	58	102	50,	142	52,	182	
23	63,	63	54.	103	54.	143	51,	183	
24	59,	64	56,	104	51,	144	42,	184	
25	61.	65	55,	105	53,	145	52	185	
26	57.	66	58.	106	57,	146	50,	186	
27	61.	67	54,	107	54.	147	51,	187	
28	58,	68	51,	108	50	148	50.	188	
29	60,	69	51,	109	52	149	50.	189	
30	46.	70	48.	110	52,	150	57,	190	
31	43.	71	47.	111	55,	151	58,	191	
32	42.	72	52	112	59	152	52,	192	
33	52.	73	51	113	62	153	53,	193	
34	54.	74	57	114	65,	154	53,	194	
35	52.	75	56	115	65,	155	58,	195	
36	56.	76	54	116	69.	156	51,	196	
37	52.	77	59	117	62,	157	50,	197	
38	57,	78	55	118	62,	158	52,	198	
39	60,	79	54	119	65	159	52,	199	
40	62.	80	57.	120	63	160	54.	200	

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TWO HARBORS SHIFT PRODUCTION Summary 5/22/96

22-May-96

SHIFT	C	TYPE	# OF LOADS	NO. OF PANELS	SURFACE FOOTAGE	3/8" FOOTAGE	SCHED. RUN HRS	DOWN TIME	NET RUN HRS.	% RUN TIME	% PLANT CAPACITY
DAY	D	7/16	176	5,632	180,224	210,267	12.00	59	11.02	91.8%	156.4%
	E	7/16	0	0	0	0	0.00	0	0.00	0.0%	0.0%
NITE	A	7/16	178	5,696	182,272	212,657	12.00	53	11.12	92.6%	158.2%
DAILY											
TOTAL DAILY			354	11,328	362,496	422,924	24.00	112	22.13	92.2%	157.3%
					WTD	2,533,960	144.00	630	133.50	92.7%	157.1%
					MTD	10,510,290	626.00	3,257	571.72	91.3%	152.7%
					YTD	51,099,387					

KONUS #1 DAY DRYER:

KONUS #1 NITE DRYER:

TOTALS		
	KONUS MTI	0
	DRYER MTI	0

MTD 3/8" FOOTAGE			
0	<--1/4	1/2-->	0
156,672	<--3/8	19/32>	0
10,319,826	<--7/16	5/8-->	0
	<--7/16S	11/16>	0
		3/4-->	0

	FOREMAN	%R/T	%P/C	LOG COUNT	DAILY	MTD
"A"	DUANE	89.0%	145.6%	A" CREW	2,750	35,446
"B"	BOB	92.7%	152.7%	B" CREW	0	34,085
"C"	JOHN	92.1%	152.2%	C" CREW	0	37,235
"D"	STEVE	91.6%	160.9%	D" CREW	2,971	36,245

COMMENTS:

"D" CREW: TRIANGLE CONVEYOR CHAIN BROKE - 24 MIN., #1 PULLED BACK IN LOADER - 24 MIN., CORE BLENDER OUTFEED PLUG - 5 MIN., #1 PAPER - 4 MIN., #2 PAPER - 2 MIN.'

"A" CREW: REACHED EPA PRODUCTION CAP - 6 MIN., #6 TAKEOVER - 24 MIN., #2 PAPER - 10 MIN., CORE PLUG - 8 MIN., SCALE - 2 MIN., NO WAFERS - 2 MIN., #1 LOADER - 1 MIN.

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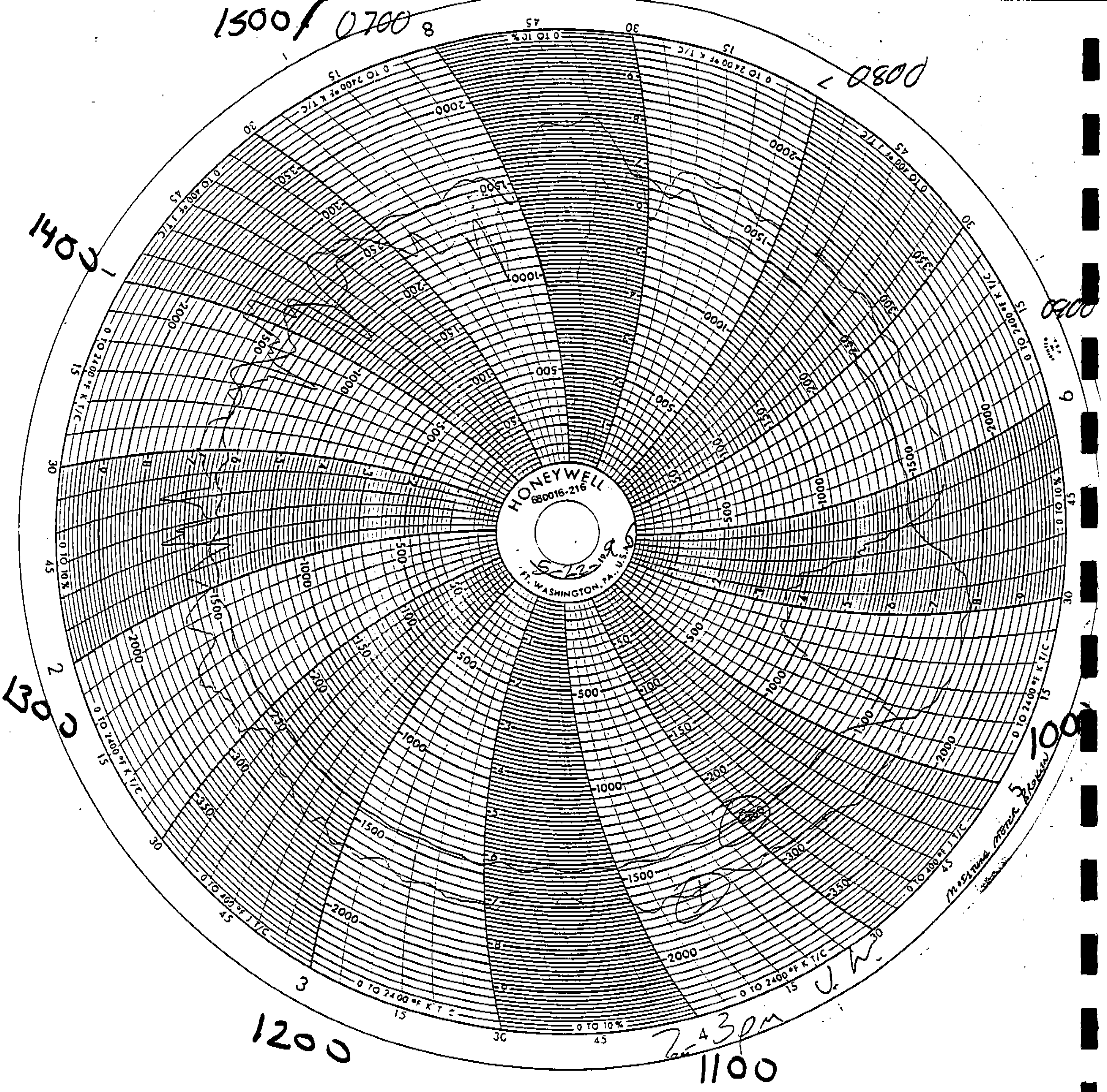
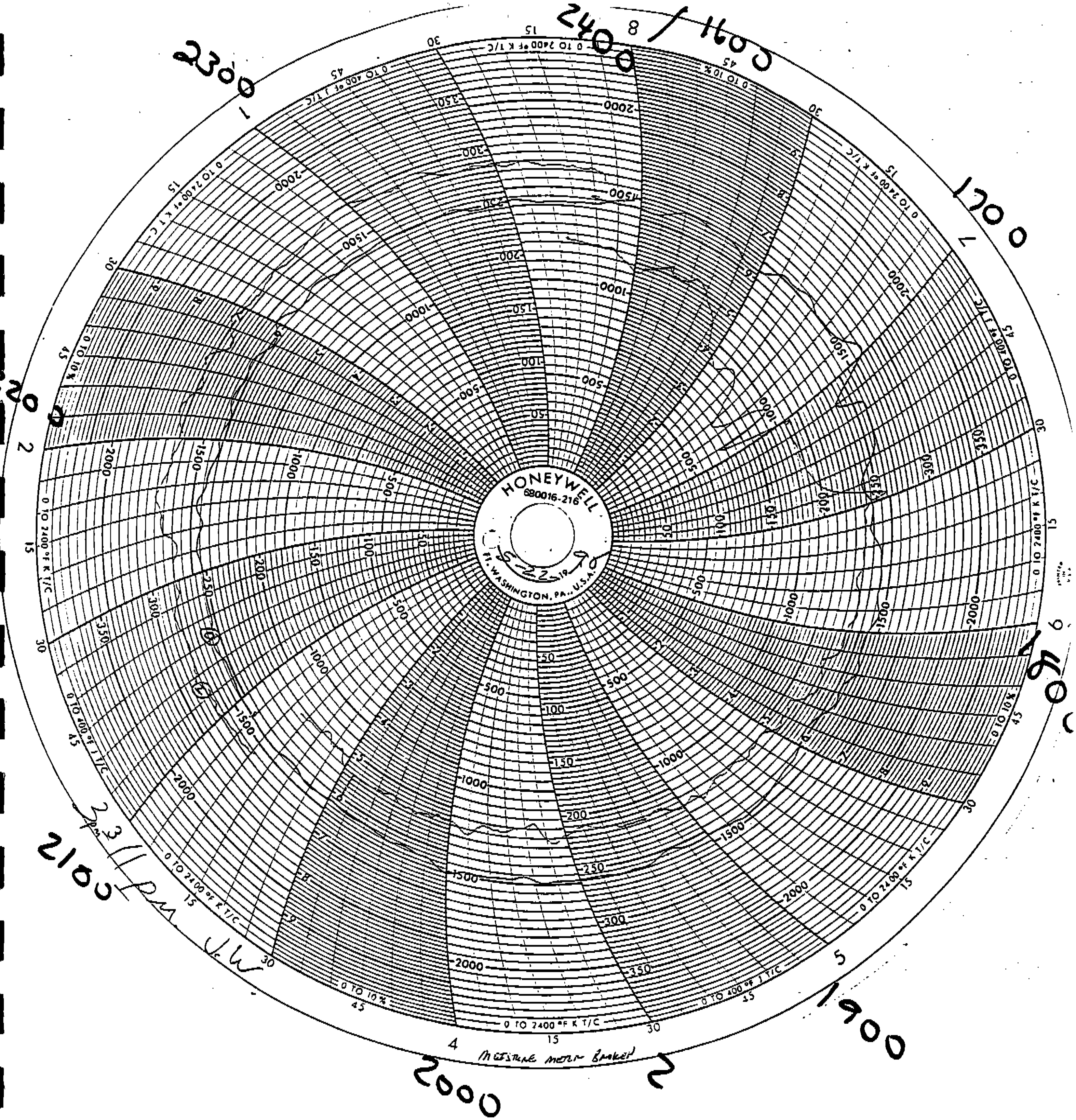


LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
DRYER CHART
7AM - 3PM, 5/22/96

30



LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
DRYER CHART
3PM - 11PM, 5/22/96

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Louisiana-Pacific Corporation, Two Harbors, MN
Dryer Data
Air Testing
Fuel calibration lb/count 5.2

Rev. 5/13/96

Date 5/22/96
Page 1 of 2

Fuel Moisture 35 %

TIME	FEED RATE%	OUT. SET POINT °F	OUTLET TEMP. °F	INLET TEMP. °F	FUEL COUNT	WET BIN LEVEL %	DRY BIN LEVEL SURF.%	DRY BIN LEVEL CORE%	FLAKE MOISTURE (Once per hour) IN%	FLAKE MOISTURE (Once per hour) OUT%
8:00 AM	85	265	248	1148	517	100	80	80		5.2
8:10	85	269	269	1214	612	100	70	50	48.6	
8:20	85	269	263	1315	683	80	50	50		
8:30	85	269	254	1239	752	90	45	45		
8:40	85	261	256	1304	856	90	45	45		
8:50	90	260	263	1272	1000	100	45	45		[illegible]
9:00	90	258	262	1318	1157	90	45	45		6.2
9:10	90	256	257	1404	1310	90	45	45	49.8	
9:20	90	250	253	1279	1515	100	45	45		
9:30	90	250	250	1300	1634	90	45	45		
9:40	90	250	250	1354	1774	90	45	45		
9:50	90	250	249	1393	1935	90	45	45		
10:00	92	250	251	1332	2092	90	50	50		4.8
10:10	92	250	251	1352	2272	90	50	50	59.2	
10:20	92	250	251	1371	2410	90	50	50		
10:30	92	250	252	1385	2552	90	50	50		
10:40	92	250	251	1384	2719	90	50	50		
10:50	92	250	251	1320	2886	90	50	50		
11:00	92	250	250	1372	3064	90	50	50	50.3	5.0
11:10	92	250	252	1328	3208	90	50	50		
11:20	92	250	251	1379	3372	90	50	50		
11:30	92	250	250	1384	3541	95	50	50		
11:40	92	250	249	1449	3705	100	50	50		
11:50	92	250	250	1450	3869	95	50	50		
12:00	75	250	254	1376	4028	95	75	75	48.8	
12:10	38	295	297	703	4144	70	85	100		
12:20	38	299	301	670	4228	85	85	100		5.2
12:30	47	299	300	704	4326	100	85	85		
12:40	76	280	283	1078	4454	90	70	70		
12:50	90	258	256	1393	4621	90	50	70		
1:00	90	253	256	1368	4780	90	50	70		5.3
1:10	92	250	249	1322	4992	75	50	70		
1:20	92	250	252	1345	5081	80	50	70	49.4	
1:30	92	250	251	1364	5233	100	50	50		
1:40	92	250	250	1333	5382	95	50	50		
1:50	92	250	250	1326	5528	70	50	50		

Louisiana-Pacific Corporation, Two Harbors, MN

Dryer Data

Air Testing

Fuel calibration lb/count 5.2

Date 05/22/96

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Fuel Moisture 3.5 %

Rev. 5/13/96

Record every 10 minutes									Once per hour	
							DRY BIN LEVEL		FLAKE MOISTURE	
TIME	FEED RATE%	OUT. SET POINT °F	OUTLET TEMP. °F	INLET TEMP. °F	FUEL COUNT	WET BIN LEVEL %	SURF.%	CORE%	IN%	OUT%
2:00	92	250	249	1364	5695	70	50	50	49.3	
2:10	92	250	249	1353	5828	70	50	50		
2:20	79	260	266	1107	5963	75	80	80		
2:30	70	269	269	1199	6104	100	80	80		5.4
2:40	40	299	297	753	6243	100	80	80		
2:50	80	289	289	919	6304	100	70	70		
3:00	92	255	258	1334	6459	95	80	80		5.2
3:10	92	250	250	1335	6608	95	80	80		
3:20	92	250	250	1362	6766	95	80	80		
3:30	92	250	249	1358	6921	100	80	80	42.0	
3:40	92	250	252	13[illegible]	7081	80	80	80		
3:50	92	250	250	1409	7247	90	90	80		
4:00	92	250	250	1362	7391	100	85	85		5.0
4:10	92	250	249	1357	7561	100	85	85		
4:20	92	250	247	1348	7717	100	85	85		
4:30	92	250	244	1333	7871	95	85	85	47.6	

Louisiana-Pacific Corporation, Industrial Park North, Highway 2, Lake County, Two Harbors, MN 55616

DRYER OPERATING REPORT (AQ Stack I. D. No.: 001)

Operator	Crew	Date
Days: Jeff Washechek	D	5/22/96
Nights: Charles Aune	A	

Time	Inlet Moist % 6 times	Inlet Temp °F	Outlet Temp. °F	Feed Speed	Dryer Pressure "w.c.	Outlet Moisture: Moist. System.	Outlet Moisture: CSC	Fuel Count
8:00 AM	48.6	1173	255	85	5	–	5.7	480
9:00 AM	49.8	1373	258	90	5	–	6.2	1001
10:00 AM	59.2	1349	250	92	5	–	4.8	1950
11:00 AM	50.3	1323	250	92	5	–	5	2810
12:00 PM	48.8	1450	250	92	5	–	5.2	3790
1:00 PM	49.4	1363	252	90	5	–	5.3	4644
2:00 PM	49.3	1326	250	92	5	–	5.4	5504
3:00 PM	42	1316	258	90	5	–	5.2	6360
4:00 PM	47.6	1387	250	92	5	–	5	7184
5:00 PM	–	1346	250	92	5	–	5.3	8068
6:00 PM	–	1299	255	85	5	–	5.4	9000
7:00 PM	–	1287	255	85	5	–	5.7	9890
8:00 PM	44.0	1261	260	91	5		5.0	11169
9:00 PM		1387	260	91	5		5.1	12075
10:00 PM		1043	260	89	5		6.2	12816
11:00 PM		1172	259	89	5		5.6	13517
12:00 AM		1274	259	89	5		5.8	14874
1:00 AM	49.6	1268	265	65	5		5.4	15681
2:00 AM		1135	265	76	5		5.6	16403
3:00 AM		1151	265	85	5		5.7	17115
4:00 AM		1123	265	85	5		4.8	18217
5:00 AM	45.2	1356	265	85	5		5.0	19312
6:00 AM		1437	265	92	5		5.3	20342
7:00 AM		1509	265	92	5		5.6	21107
average:	48.6	1296	257	87			5.3	

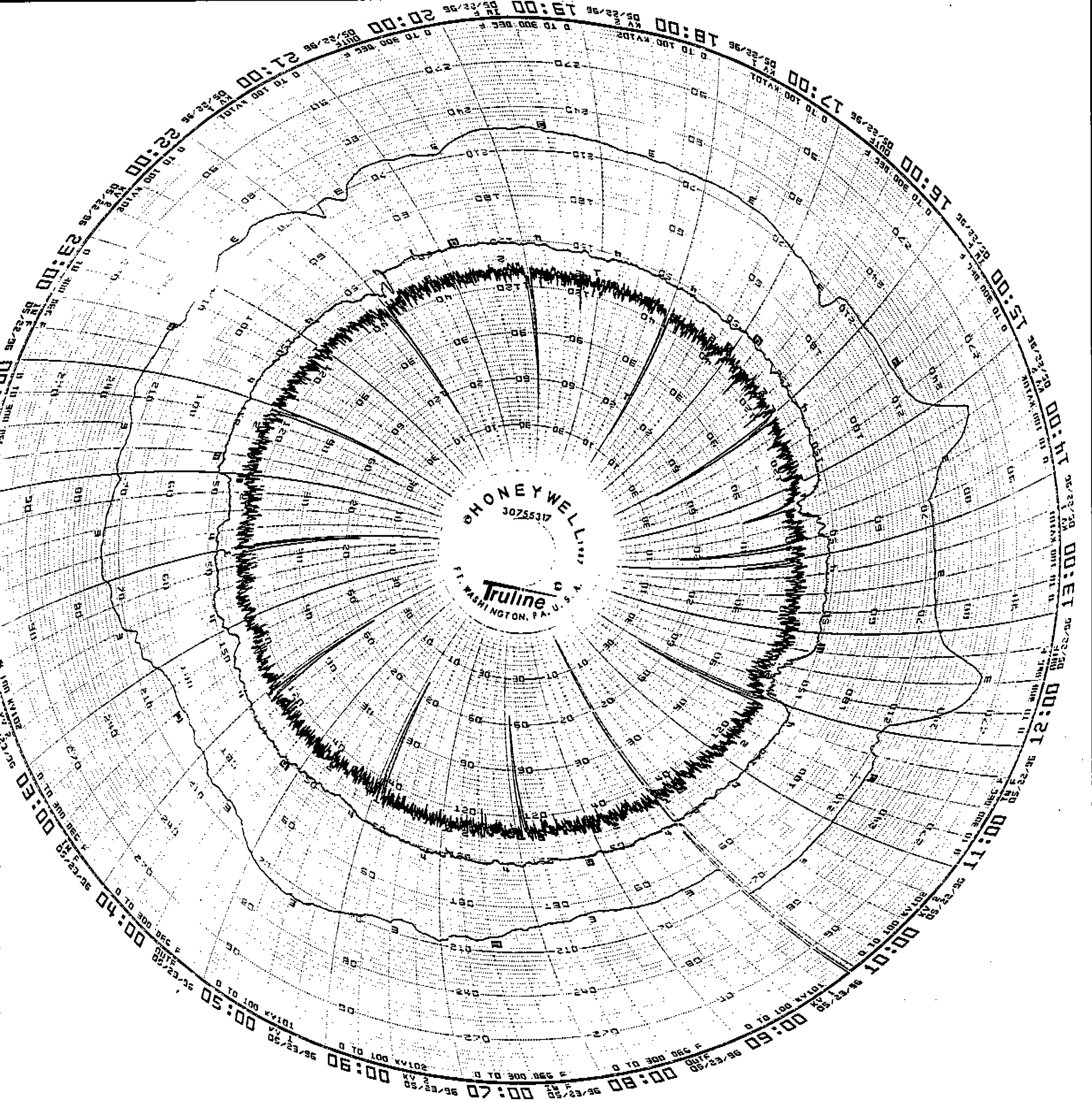
Gas Burner (unit no.: 003) Ft³ natural gas (X 1000)	running time	meter reading
start:	7:20 pm	32231
stop:	7:40 pm	32244
total:	20	13

	Wood burner (unit no.: 002) running time min.	Wood burner down time min.	Dryer (Unit no.: 001) running time min.	Dryer down time min.
days	700	20	720	0
nights	720	0	720	0
total	1420	20	1440	0

RTO meter readings, Ft³ nat gas (X 10)	
Start	1346091
Stop	1363916
Total	17825

fuel moist.: 35

form revised 5/9/96



LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
E-TUBE CHART

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Louisiana-Pacific Corporation, Two Harbors, MN
E-Tube Data Sheet
Air Testing
Rev. 5/13/96

RECORDED BY DOUG TEET

DATE: 5-22-96
PAGE: 1 OF 2

	RECORD EVERY 10 MINUTES									
			TRANSFORMER/RECTIFIERS							
	QUENCH CHAMBER TEMP. °F		NO. 1			NO. 2				
TIME	INLET	OUTLET	KV	mA	SPARK RATE	KV	mA	SPARK RATE	DP
8:00	203	132	46	216	25.6	46	160	25.5	14
8:10	215	139	46	220	25.6	46	220	25.6	13
8:20	216	141							13
8:30	215	146							14
8:40	214	141	46	210	25.6	46	180	25.5	14
8:50	215	141	46	220	25.6	46	190	25.6	15
9:00	214	143	46	200	25.6	47	200	25.6	16
9:10	215	144	46	220	25.6	47	190	25.6	16
9:20	212	142	46	200	25.5	47	180	25.6	17
9:30	211	143	46	210	25.6	47	180	25.5	16
9:40	210	144	46	23	25.5	47	190	25.7	16
9:50	210	145	46	200	25.6	48	200	25.5	16
10:00	210	145	48	216	25.6	46	210	25.6	14
10:10	210	145	48	210	25.5	47	230	25.6	16
10:20	210	144	46	225	25.6	46	210	25.7	14
10:30	210	144	47	216	25.6	48	220	25.5	16
10:40	211	144	47	210	25.7	48	210	25.5	16
10:50	210	144	46	200	25.5	48	200	25.6	16
11:00	211	145	46	200	25.6	47	200	25.5	16
11:10	210	144	48	190	25.5	47	180	25.6	16
11:20	210	144	47	240	25.6	48	190	25.5	16
11:30	210	145	46	210	25.6	47	210	25.4	16
11:40	210	147	46	250	25.7	47	230	25.6	16
11:50	203	147	47	240	25.6	48	220	25.5	16
12:00	203	141	46	246	25.6	46	180	25.7	16
12:10	224	126	44	170	25.6	45	150	25.7	13
12:20	244	125	44	170	25.7	45	150	25.7	12
12:30	250	127	44	150	25.6	44	150	25.6	12
12:40	246	136	45	210	25.5	46	210	25.5	12
12:50	227	144	46	220	25.6	48	230	25.6	14
1:00	218	143	47	240	25.5	48	230	25.6	15
1:10	212	142	47	240	25.6	48	240	25.6	16
1:20	211	141	46	240	25.5	47	200	25.6	16
1:30	210	142	46	220	25.6	47	230	25.6	16
1:40	209	142	46	240	25.6	48	200	25.6	16
1:50	209	141	46	250	25.6	48	240	25.5	16

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Louisiana-Pacific Corporation, Two Harbors, MN
E-Tube Data Sheet
Air Testing
Rev. 5/13/96 Recorded by Doug Teet

DATE: 5-22-96
PAGE: 2 OF 2

	RECORD EVERY 10 MINUTES							
			TRANSFORMER/RECTIFIERS					
	QUENCH CHAMBER TEMP. °F		NO. 1			NO. 2		
TIME	INLET	OUTLET	KV	mA	SPARK RATE	KV	mA	SPARK RATE
2:00			46	230	25.5	47	220	25.6
2:10			46	230	25.6	48	200	25.6
2:20			46	180	25.6	48	180	25.6
2:30			45	180	25.6	46	190	25.6
2:40			44	170	25.6	44	150	25.5
2:50			46	210	25.5	47	180	25.7
3:00			46	230	25.5	46	200	25.5
3:10			45	230	25.5	46	220	25.6
3:20			46	220	25.6	48	210	25.6
3:30			46	230	25.6	48	233	25.6
3:40			46	240	25.5	48	200	25.6
3:50			47	220	25.6	48	220	25.5
4:00			44	200	25.6	44	60	25.9
4:10			46	240	25.5	46	230	25.2
4:20			48	240	25.6	48	220	25.5
4:30			46	220	25.5	48	220	25.6
4:40								
4:50								
5:00								
5:10								

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Louisiana-Pacific Corporation, Two Harbors, MN
E-Tube Data Sheet
Air Testing
Rev. 5/13/96

Recorded by [illegible]

DATE: 5/22/96
PAGE: 1 OF 2

TIME	QUENCH CHAMBER TEMP. °F		TRANSFORMER/RECTIFIERS NO. 1			TRANSFORMER/RECTIFIERS NO. 2			DP
	INLET	OUTLET	KV	mA	SPARK RATE	KV	mA	SPARK RATE	
8:00 AM	132	203							14
8:10	215	139							13
8:20	216	141							13
8:30	215	146							14
8:40	214	141							14
8:50	215	141							15
9:00	216	143							16
9:10	215	144							16
9:20	212	142							17
9:30	211	143							16
9:40	210	144							16
9:50	210	145							16
10:00	210	145							16
10:10	210	145							16
10:20	210	144							16
10:30	210	144							16
10:40	211	144							16
10:50	210	144							16
11:00	211	145							16
11:10	210	144							16
11:20	210	144							16
11:30	210	145							16
11:40	210	147							16
11:50	203	147							16
12:00	203	141							16
12:10	224	126							13
12:20	244	125							12
12:30	250	127							12
12:40	246	136							12
12:50	227	144							14
1:00	218	143							15
1:10	212	142							16
1:20	211	141							16
1:30	210	142							16
1:40	209	142							16
1:50	209	141							16

RECORD EVERY 10 MINUTES

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Louisiana-Pacific Corporation, Two Harbors, MN
E-Tube Data Sheet
Air Testing
Rev. 5/13/96 Recorded by [signature]

DATE: 05/22/96
PAGE: 2 OF 2

TIME	QUENCH CHAMBER TEMP. °F		TRANSFORMER/RECTIFIERS NO. 1			TRANSFORMER/RECTIFIERS NO. 2			D.P
	INLET	OUTLET	KV	mA	SPARK RATE	KV	mA	SPARK RATE	
2:00	209	142							16
2:10	208	142							16
2:20	211	136							16
2:30	217	136							16
2:40	242	135							15
2:50	246	135							15
3:00	227	141							15
3:10	216	142							16
3:20	212	144							15
3:30	211	144							15
3:40	210	144							15
3:50	210	146							15
400	208	143							16
4:10	209	144							15
4:20	207	145							15
4:30	194	146							15

RECORD EVERY 10 MINUTES

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Louisiana-Pacific Corporation
Two Harbors MN

Rev. 5/17/96

E-TUBE OPERATING REPORT

	Operator	Crew	Date
Days	Todd Murphy	D	5-22-96
Nights	DeaN BauMgartner	A	

Time	T/R CONTROL PANEL DIGITAL TRANSFORMER/RECTIFIERS No. 1 KV	No. 1 mA	No. 2 KV	No. 2 mA	Mesh Pad DP	ZYCOM QUENCH INLET deg. F	QUENCH OUTLET deg. F	INLET PSI in IFO	OUTLET PSI in IFO	Beginning & End of Shift on the Vessel: Flush Water total gal.	Make-up Water total gal.	DP in IFO
7:00 AM	46	200	46	210	.5	206	143	9	24	400,910	212,320	14
8:00 AM	47	230	48	230	.3	211	144	8	24			15
9:00 AM	48	190	47	205	.4	213	141	9	24			15
10:00 AM	46	230	46	240	.4	211	143	9	24			15
11:00 AM	46	200	47	200	.4	211	146	7	23			16
12:00 PM	46	240	46	180	.4	210	146	7	24			16
1:00 PM	47	240	48	230	.4	213	143	7	24			16
2:00 PM	46	230	47	220	.4	208	141	7	24			17
3:00 PM	46	230	46	200	.4	239	126	10	25			15
4:00 PM	44	200	44	60	.4	208	144	9	24			15
5:00 PM	48	240	47	240	~4	205	145	7	24			17
6:00 PM	46	200	48	230	.4	211	141	12	24			11
7:00 PM	47	180	49	220	.4	212	143	12	24	403,651	213,866	11
8:00 PM	46	170	47	140	.4	212	144	7	24			17
9:00 PM	47	160	48	150	.4	212	147	7	24			17
10:00 PM	46	150	47	180	.4	195	139	8	24			16
11:00 PM	48	160	47	150	.4	212	144	8	24			15
12:00 AM	49	190	49	170	.4	214	146	7	24			16
1:00 AM	49	170	4.8	150	.3	210	137	10	24			14
2:00 AM	48	150	47	130	.3	208	140	11	25			13
3:00 AM	47	120	47	160	.3	190	139	10	24			14
4:00 AM	44	150	48	150	.3	212	143	10	24			14
5:00 AM	46	140	47	130	.3	210	143	10	24			13
6:00 AM	46	130	47	150	.3 / .4	207	144	10	24	405,910	215,650	13
Total:										5000	3330	

Total Hours Dryer Operating on Natural Gas 0.33 *RTO-8

... %	12%	11.0%	
	...AM	10:00PM	

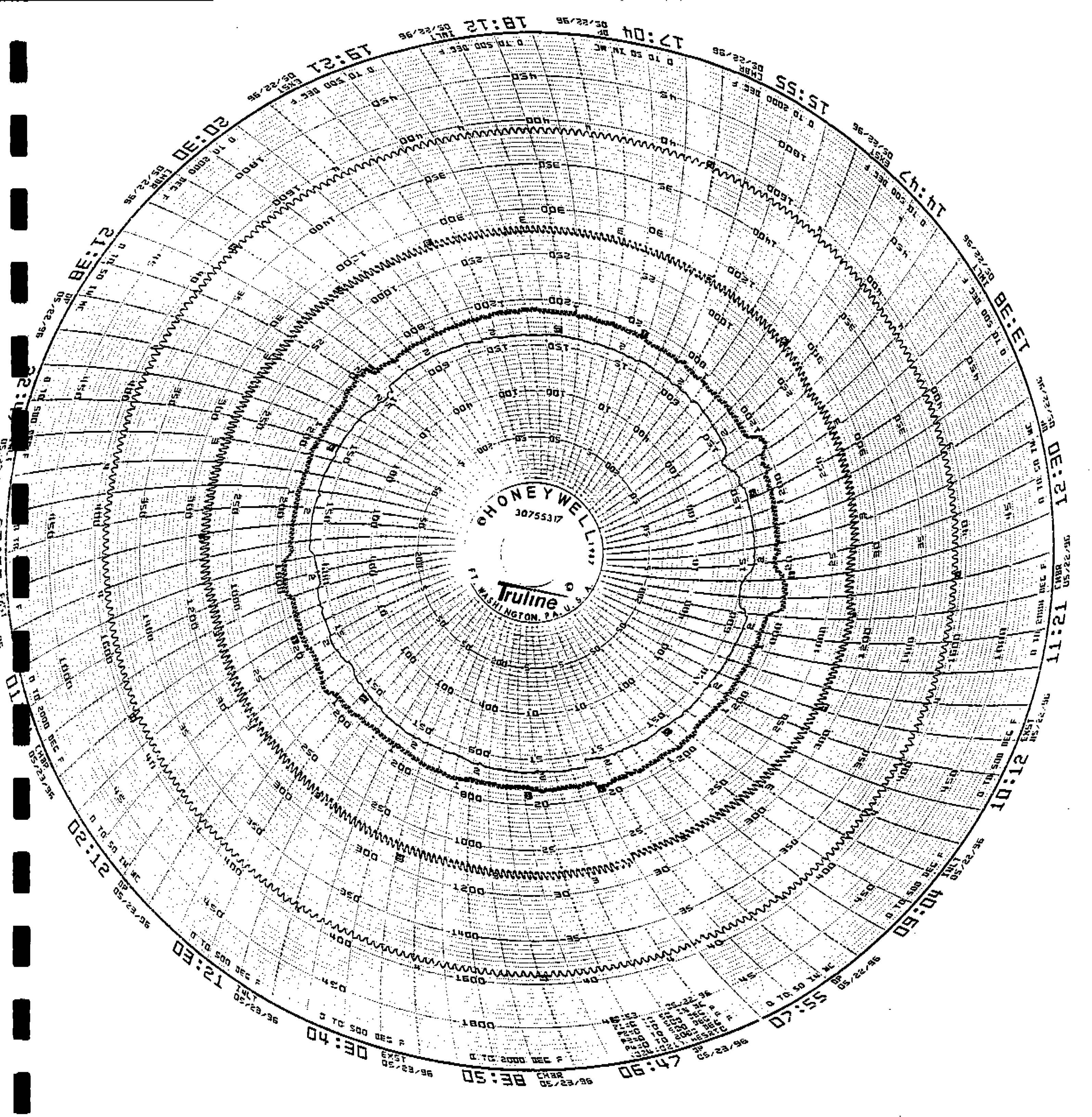
RECYCLE BLOWDOWN Estimated Gallons
3550

26.0
No. 2

Gallons Used	Caustic	Defoamer
Start:	1963	1615
End:	1985	1649
Total:	22	34

40

2



LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
RTO CHART

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Louisiana-Pacific Corporation, Two Harbors, MN
RTO Data Sheet
Air Testing
Rev. 5/13/96

DATE: 5/22/96
PAGE: 1 OF 2

Record Every 10 Minutes

TIME	RTO Chamber Bed Temp °F #1	#2	#3	#4	#5	INLET PRESS.	BURNER TEMPS °F B #1	B #2	COMBUST TEMP. °F	EXHAUST TEMP. °F	PRESS. DROP	meter reading Every 30 min. GAS USAGE
8:00AM	510	489	523	484	512	/	1517	1510	1541	275	17	1346091
8:10	508	484	526	480	516	/	1521	1510	1541	273	21	
8:20	508	491	520	484	513	/	1521	1509	1544	273	20	
8:30	509	489	526	481	514	/	1520	1507	1542	274	19	*1346519
8:40	507	492	518	483	514	/	1523	1516	1542	273	19	
8:50	509	490	525	481	515	/	1516	1502	1537	272	20	
9:00	507	491	526	479	519	/	1507	1512	1527	267	18	*1346864
9:10	508	493	518	483	514	/	1499	1508	1535	273	18	
9:20	511	490	527	482	513	/	1523	1510	1548	275	18	
9:30	510	491	523	483	514	/	1521	1511	1550	276	19	*1347296
9:40	511	490	529	480	513	/	1520	1511	1543	277	19	
9:50	506	494	518	480	518	/	1496	1507	1524	270	19	
10:00	510	493	522	484	514	/	1518	1512	1548	275	19	*1347598
10:10	509	495	517	482	517	/	1495	1500	1527	275	20	
10:20	510	495	520	484	514	/	1515	1510	1530	276	18	
10:30	512	492	527	482	514	/	1517	1507	1537	277	20	*1347985
10:40	507	496	518	482	517	/	1493	1498	1517	273	21	
10:50	513	492	530	480	515	/	1510	1508	1516	277	19	
11:00	511	495	521	484	515	0	1496	1504	1531	275	17	*1348372
11:10	512	494	522	485	512	/	1520	1510	1544	273 ~~544~~	18	
11:20	508	495	523	480	516	/	1506	1513	1528	264	18	
11:30	511	495	521	485	513	/	1515	1512	1536	276	17	*1348801
11:40	512	492	530	480	516	/	1508	1510	1531	276	20	
11:50	511	497	520	483	516	/	1495	1503	1523	275	21	
12:00	513	493	528	484	512	/	1517	1506	1540	279	19	
12:10	512	495	523	484	514	/	1500	1507	1540	274	20	
12:20	512	494	525	483	511	/	1522	1511	1542	272	21	
12:30	508	492	525	477	515	/	1503	1513	1521	264	21	*1349542
12:40	505	494	515	480	511	/	1500	1507	1538	269	18	
12:50	504	490	525	476	513	/	1506	1510	1528	268	20	

multiply gas meter reading x 10 for cu. ft.

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Louisiana-Pacific Corporation, Two Harbors, MN
RTO Data Sheet
Air Testing
Rev. 5/13/96

DATE: 05/22/96
PAGE: 2 **OF** 2

TIME	RTO Chamber Bed Temp °F #1	#2	#3	#4	#5	INLET PRESS.	BURNER TEMPS °F B #1	B #2	COMBUST TEMP. °F	EXHAUST TEMP. °F	PRESS. DROP	Every 30 min. GAS USAGE (meter reading)
1:00	506	492	514	480	513	0	1496	1514	1532	273	18	* 1349937
1:10	507	490	528	478	512	1	1517	1506	1537	272	20	
1:20	505	495	518	481	514	1	1495	1503	1519	273	19	
1:30	509	492	525	482	511	1	1521	1510	1544	277	19	* 1350333
1:40	505	495	520	478	516	1	1497	1511	1522	271	19	
1:50	510	493	524	483	511	1	1524	1510	1550	277	19	
2:00	507	496	518	482	515	1	1491	1506	1517	270	18	*1350728
2:10	509	493	518	484	513	1	1502	1507	1544	276	19	
2:20	508	492	527	479	513	1	1513	1506	1535	270	21	
2:30	506	494	516	483	513	0	1497	1505	1537	275	18	*1351124
2:40	507	491	527	478	515	1	1515	1504	1534	267	22	
2:50	504	494	515	480	513	0	1496	1508	1515	264	18	
3:00	506	489	524	479	510	1	1510	1506	1551	273	18	*1351564
3:10	502	492	521	477	515	1	1494	1509	1520	267	19	
3:20	507	490	518	482	511	1	1514	1511	1553	277	19	
3:30	504	493	523	478	516	1	1496	1509	1520	272	19	*1351960
3:40	505	493	518	483	512	1	1507	1507	1544	278	19	
3:50	504	492	526	478	517	1	1500	1524	1535	271	18	
4:00	504	495	518	482	516	1	1493	1503	1520	273	21	*1352268
4:10	508	491	529	481	514	1	1515	1507	1544	278	19	
4:20	505	495	520	480	517	1	1494	1507	1520	272	19	
4:30	508	491	529	484	513	1	1521	1509	1543	277	19	* 1352754
												*
												*

multiply gas meter reading x 10 for cu.ft.

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Louisiana-Pacific Corporation
Two Harbors MN

Wheelabrator Clean Air Systems
RTO Daily Operating Report

Rev. 4/15/96

Date: 5-22-96

Time	8:00 AM	10:00 AM	12:00 PM	2:00 PM	4:00 PM	6:00 PM	8:00 PM	10:00 PM	12:00 AM	2:00 AM	4:00 AM	6:00 AM
Burner S.P.	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510
Bnr #1 temp	1510	1519	1522	1499	1509	1523	1520	1497	1498	1522	1524	1509
Bnr #1 out	44.5	39.6	39.2	51.6	47.3	41.9	42.8	55.7	52.0	41.9	38.3	42.1
Bnr #2 temp	1521	1515	1513	1505	1512	1508	1504	1507	1509	1508	1513	1511
Brn #2 out	48	47.7	50.8	52.4	49.2	50.1	51.2	51.2	46.8	45.6	47.3	47.3
Inlet temp	155	159	156	157	158	156	158	151	161	158	156	160
Chamber temp	1522	1548	1547	1522	1526	1537	1532	1523	1516	1532	1544	1523
Exhaust temp	270	275	277	273	269	278	271	273	274	273	276	270
RTO Dif Press	19	18.3	18.8	19	18.7	18.5	18.8	19.7	18.2	18.6	18.2	18.3
VFD Amps	556	550	542	492	528	551	531	511	546	526	532	564
VFD RPM	1414	1394	1422	1323	1380	1397	1397	1362	1422	1398	1344	1364
P/V setpoint	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
P/V out	71.6	70.5	72.6	68.9	70.2	71.6	70.8	70.4	76.0	72.6	69.2	71.3
Cbr #1 B.O. temp	508	510	513	510	503	503	501	504	504	502	505	503
Cbr #2 B.O. temp	491	490	492	491	495	490	490	489	489	490	482	489
Cbr #3 B.O. temp	517	529	531	526	519	524	522	525	524	523	531	524
Cbr #4 B.O. temp	484	480	480	482	481	481	482	486	487	486	479	481
Cbr #5 B.O. temp	513	516	515	512	516	520	522	518	521	520	519	523
Fan brg #1 temp	86	97	122	123	108	128	105	114	115	115	117	83
Fan brg #2 temp	111	110	115	116	115	112	111	110	108	111	104	106
Motor brg #1 temp	107	108	110	111	111	107	106	104	102	103	98	99
Motor brg #2 temp	105	106	108	109	110	105	104	102	99	100	95	97
Dryer to RTO	yes	yes	yes	yes	yes	yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel Line to RTO	yes	yes	yes	yes	yes	yes	Yes	Yes	yes	Yes	Yes	Yes
Lap Line to RTO	yes	yes	yes	yes	yes	yes	Yes	Yes	Yes	Yes	Yes	Yes
Chamber Prg Fan	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
BTUE Pressure	OFF											→
BTUE Flow DP	OFF											→
Natural Gas Usage:	178350 cu. ft.											

Comments:

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PRESS MARCH 22nd 1996
TSP,NOX,CO,VOC

DATA TIME:						
START=	09:50	END=	10:50	HOURS=	1.00
START=	11:10	END=	11:40	HOURS=	0.50
START=	12:20	END=	13:40	HOURS=	1.33
START=	14:20	END=	14:30	HOURS=	0.17
START=	14:40	END=	15:50	HOURS=	1.17
				TOTAL=	4.17

BOARD WEIGHTS - LBS
average weights determined by taking every 25th untrimmed board (from press tapes)

7/16"
per/peice 48.65
per/ 8' x 16' 194.58

208.6 lb= average untrimmed mat weight

weight of paper overlay (per msf) 76.9

6.7% =trim %

PLANT PRODUCTION RATE
4.17 =hours during testing
66 =pressloads
528 =no. of 8'x16' boards produced (pressloads x 8 boards per load)
67,584 =volume produced in surface footage (pressloads x 8'x16'x8 openings)
78,850 =volume produced 3/8" basis (pressloads x 8'x16'x 8 openings x 1.1667)
102,741 =lbs of finished product (boards produced x weight of finished board)
24,658 =lbs of finished product per hour (lbs of finshed product / hours)
12.33 =tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

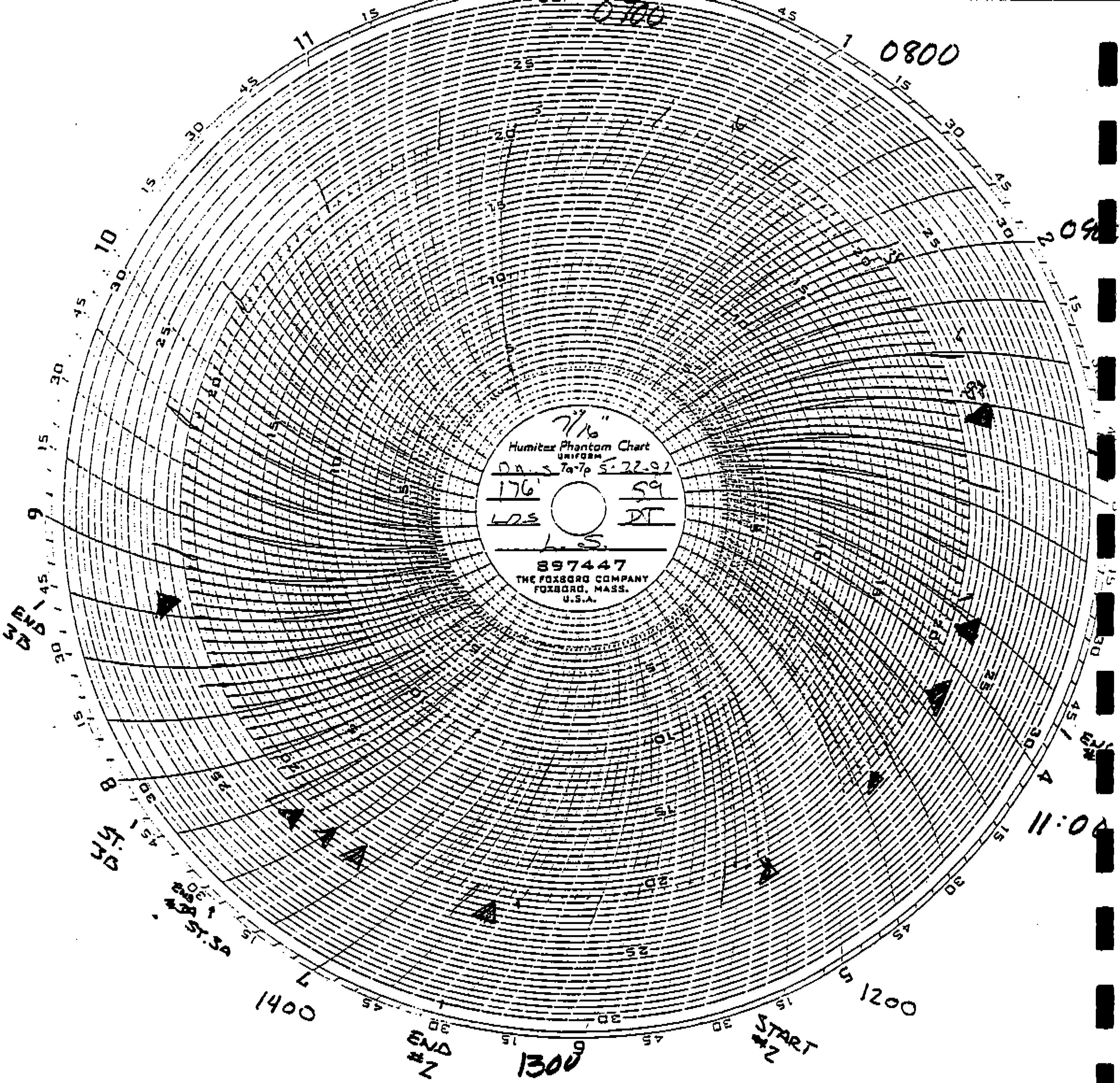
18.9 MSF 3/8

RESIN USAGE TAKEN FROM MICRO - MOTIONS

TIME	MDI	WAX	ZINC BOR.
10:00-16:00 ave. lbs/hr. 100% solids	808.83	200.49	287.50

24,658 =average lbs. per hour finished product produced during testing
808.83 =average lbs. per hour of MDI resin used during testing
3.28% = MDI resin used as % of finished product

200.49 =average lbs. per hour of wax (100% solids) used during testing
0.81% =wax used as % of finished product
287.50 =Zinc Borate usage in pounds per hour
1.17% =Zinc Borate as % of finished product



LOUISIANA-PACIFIC CORP., TWO HARBORS, MN
PRESS CHART
7AM-7PM, 5/22/96

PRESSLOADS
0950 - 1050 = 16
11:10 - 1140 = 8
1220 - 1340 = 23
1420 - 1430 = 1
1440 - 1550 = 18
66

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MATERIAL USAGES

TIME	MDI RESIN READING (LEFT) IN LBS.	MDI RESIN READING (RIGHT) IN LBS.	TOTAL MDI RESIN IN LBS.	WAX READING (LEFT) IN LBS.	WAX READING (RIGHT) IN LBS.	TOTAL WAX IN LBS.	TOTAL ZINC BOR. IN LBS.
10:00	1745	1,227	2,972	720	514	1,234	2,764.5
10:30	2038	1,431	3,469	839	601	1,440	2,563.0
11:00	2364	1,659	4,023	974	698	1,672	2,414.0
11:30	2541	1,784	4,325	1,048	752	1,800	2,288.5
12:00	2741	1,926	4,667	1,134	813	1,947	2,158.5
12:30	2846	2,000	4,846	1,178	845	2,023	2,076.0
13:00	3127	2,199	5,326	1,296	931	2,227	1,877.0
13:30	3430	2,422	5,852	1,428	1,026	2,454	1,762.0
14:00	3702	2,615	6,317	1,546	1,110	2,656	1,682.5
14:30	3832	2,737	6,569	1,604	1,163	2,767	1,422.0
15:00	3999	2,873	6,872	1,681	1,222	2,903	1,320.5
15:30	4273	3,068	7,341	1,798	1,305	3,103	1,155.0
16:00	4558	3,267	7,825	1,917	1,391	3,308	1,039.5

	MDI	WAX	ZINC BOR.
STARTING =	2,972	1,234	2,765
ENDING =	7,825	3,308	1,040
TOTAL USAGE =	4,853	2,074	1,725
HOURS OF DATA	6	6	6
LBS./HOUR =	**808.83**	345.67	**287.50**
100% SOLIDS =	N.A.	**200.49**	N.A.

BOARD TRIM %

Louisiana-Pacific Corporation, Two Harbors, MN
May 22, 1996

7/16 OSB with overlay and backer paper.	**Pounds**
Untrimmed weight of seven flights off the press:	1,500
Trimmed weight off the ~~T& G line (4 X 8's)~~:	1,400
Percent trimmed at T & G line:	6.70%

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DAILY INVENTORY SHEET — DATE 5-22-96 — 28 DAYS IN MONTH — 27 CURRENT DAY

SIDING	DAILY	MTD	OSB	DAILY	MTD
PRESSLDS 3/8	0	186	PRESSLDS	0	0
PRESSLDS 7/16	354	8,638	PRESSLDS 7/16	0	0
PRESSLDS 19/32	0	0	PRESSLDS 1/2	0	0
PRODUCTION (FT)	422,924.1	10,510,290	PRODUCTION (FT)	0.0	0
EST. PROD.(lbs)	525,236.4 LBS	13,061,614.7	EST. PROD.(lbs)	0.0 LBS	0.0
SIDING/OSB COMB. DAILY FOOT		422,924	SIDING/OSB COMB. MTD. FC	10,510,290	

INVENTORY TRACKING...

MDI RESIN	(LBS)	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE
ICI	R-1840	268,215	0	268,215	246,931	21,284
		0	0	0	0	0

	M.D.I.	END INV DOLLARS
USAGE (MTD)	529,942	[redacted]
% RESIN USED (DAILY)	4.05%	
% RESIN USED (MTD)	4.06%	

PF RESIN	(LBS)	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE
BORDEN	OS57H	0	0	0	0	0

		END INV DOLLARS
USAGE (MTD)	0	-
% RESIN USED (DAILY)	0.00%	
% RESIN USED (MTD)	#DIV/0!	

E-WAX	(LBS)	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE
BORDEN	EW-58%LV	43,885	0	43,885	34,754	9,131
BORDEN	EW - 58%	0	0	0	0	0

		(58%)	END INV DOLLARS
E-WAX USAGE (MTD)	220,530	127,907	
% WAX USED (DAILY)	1.01%		
% WAX USED (MTD)	0.98%		

RELEASE AGENT	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE
5309	0	0	0	0	0
RA-741	1,824	0	1,824	1,824	0
	0	0	0	0	0

		END INV DOLLARS
RELEASE AGENT (MTD)	0	
% R.A. USED (DAILY)	0.0000%	
% R.A. USED (MTD)	0.0000%	

OVERLAY	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE
DYNO PRODUCT 42506/504	0	0	0	0	0
DYNO PRODUCT 42506	1,387,178	642,102	2,029,280	1,643,090	386,190
DYNO PRODUCT 42503	0	0	0	0	0
DYNO PRODUCT 42503	0	0	0	0	0
DYNO GLUELINE UNPRIMED	0	0	0	0	0

GLUELINE IN LBS.	42-503 IN LBS.	END INV DOLLARS
22090.07	0.00	

BACKER	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE
DYNO PRODUCT 42270	1,887,257	0	1,887,257	1,289,771	397,496
DYNO PRODUCT 42270	0	0	0	0	0
DYNO PRODUCT 42270	0	0	0	0	0

XXXXXXX IN LBS.	42-270 IN LBS.	END INV DOLLARS
0.00	7820.67	

ZINC BORATE	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE
BOROGUARD ZB	67,501	0	67,501	59,871	7,630

100% ZB

ZINC BORATE (MTD)	177,135
% Z.B. USED (DAILY)	1.2415%
% Z.B. USED (MTD)	1.1591%

KNIVES	BEG INVENTORY	INCOMING INVENTORY	TOTAL INVENTORY	END INVENTORY	USAGE
I.K.S.	11	0	11	11	0
SIMONDS	0	0	0	0	0

END INV

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PAPER USAGE (5/22/96)

FOOTAGE PER TEST=	67,584
TEST HOURS=	4.17
FOOTAGE PER HOUR=	16,207

BACKER PAPER USE= (16,207/1000)x 19.7 lbs/1000 = 319 lb/HOUR

FACE PAPER USE= (16,207/1000)x 57.2 lbs/1000 = 927 lb/HOUR

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PAPER WEIGHTS

FAX

Date: Friday, May 31, 1996 **Time:** 7:38:00 AM 2 **Pages**

To: Joel Anderson
LP

Fax: 7156345117
Voice:

From: Mike Anderson
Louisiana-Pacific Corporation

Fax: 2188342363
Voice: 2188345652

Comments:

Attached is the resing usage in pounds every half hour.

DYNO BACKER PAPER 42-270 19.7 LBS/MSF

DYNO FACE PAPER 42-506 57.2 LBS/MSF

76.9/MSF

TWO HARBORS BOARD
(lbs./8x16 panel every
APPROXIMATE TIMES

0700-1520	0700-1638
05/21/96	**05/22/96**
211	209
209	206
222	209
205	213
203	209
208	210
204	215
199	216
215	213
208	207
204	210
200	215
212	214
194	212
204	213
202	212
209	212
205	213
207	217
212	209
207	207
204	207
202	198
197	188
197	196
193	210
205	215
205	203
208	204
212	206
210	204
212	207
203	205
203	192
203	209
209	215
214	214
203	213
205	208
203	211
211	215
206	205
204	202
204	
212	
211	
211	
205	
207	

8x16 panel		
AVERAGE	***206.10***	***208.56***
GR. 4x8 panel	51.53	52.14
NET 4x8 panel	48.07	48.65

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Louisiana—Pacific Corporation
Industrial Park North, Highway 2
Lake County
Two Harbors, MN 55616

1/5/96

QUARTERLY FUEL CALIBRATION

Date	print name and position	signature
4-2-96	CHRIS L BAUMGARTNER - ELECTRICIAN	[signature]
4-11-96	" " "	[signature]

The following are the results of the fuel weight calibrations for the McConnell wood—fired cyclonic suspension burner and the Konus thermal oil heater. These numbers will be used for the fiscal months of: APRIL, MAY JUNE

McConnell Wood Burner, Unit Number: 002
Fuel Calibration

1 sample	2 counter start	3 counter end	4 count	5 total weight	6 bag weight	7 net fuel weight
1	886	889	3	15.4	.2	15.2
2	889	892	3	16.1	.2	15.9
3	892	895	3	15.8	.2	15.7
		total:	9		total:	46.8

divide total of column 7 by the total of column 4 to get the #/count: 5.2

fuel bin level: 1/2

Konus thermal oil heater, Unit Number 019
Fuel Calibration Left Cell

1 sample	2 counter start	3 counter end	4 count	5 sample time	6 feed rate	7 total weight	8 barrel weight	9 net fuel weight
1	2396	2399	3	1:05	20%	32.9	5.7	27.2
2	2414	2417	3	1:03	20%	41.6	5.7	35.9
3	2435	2438	3	1:04	20%	39.8	5.8	34.0
		total:	9				total:	97.1

divide total of column 9 by the total of column 4 to get the #/count: 10.79

Fuel Calibration Right Cell

1 sample	2 counter start	3 counter end	4 count	5 sample time	6 feed rate	7 total weight	8 barrel weight	9 net fuel weight
1	2557	2560	3	1:01	20%	49.1	5.8	43.4
2	2578	2581	3	:58	20%	52.9	5.7	47.2
3	2594	2597	3	:57	20%	48.6	5.8	42.8
		total:	9				total:	133.4

divide total of column 9 by the total of column 4 to get the #/count: 14.82

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Louisiana-Pacific Corporation Two Harbors, MN
Geoenergy E-Tube® System
Shut Down Maintenance Check List

Date: 5/15/96

Rev. 4/9/96

Job:	Done by:
1. Place cardboard on walkways outside openings to drop out tank, cyclone & south doors of power grids & landings of floor under collection tubes.	TODD MURPHY
2. Make sure steam cleaner has extension hose attached and haul it to power grid deck.	TODD MURPHY
3. Perform controlled shutdown of E-Tube.	LARS CARLSON
4. Turn recycle pump to hand and verify FV 104 closes and FV 109 opens.	LARS CARLSON
5. Test air quality of upper and lower areas, fill out and post confined space permits.	LARS CARLSON
6. Inspect/clean power grid housing & collection tubes/electrodes. Alternate between grids #1 & ~~#2~~ but be sure to clean trouble areas.	DEAN BAUMGARTNER
7. Inspect/clear flush nozzles.	DEAN B.
8. Use compressed air to blow out insulator boxes and clean insulators off using oven cleaner. + WATER/WET DRY VAC.	MARK THOMAS
9. Inspect cyclone. Scrape walls, scoop out sludge & steam off any build-up in cyclone/diffuser area and transition from drop out tank to cyclone.	DEAN B.
10. Inspect/clear quench nozzles.	
11. Inspect/clean quench chamber and drain.	DEAN B.
12. Scrape up droppings from floor under collection tubes.	DEAN B.
13. Steam clean mesh pads.	DEAN B.
14. Inspect/clean purge air filters.	DEAN B.
15. ~~Manually crank ID fan damper closed for start up purposes.~~	
16.	
17.	

Note any abnormal build up or observations

SCOTT J., NEIL K., + GARY FROM GEO - ENERGY HERE TODAY

* COMMISSIONED BLOW DOWN TANK BUBBLER, INSTALLED NEW SCREEN ON ZYCOM, ADDED SOME RUN TIME LIMITS FOR CAUSTIC + DEFOAMER PUMPS

(DISCUSSED GETTING ZYCOM SOFTWARE)

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Louisiana-Pacific Corporation Two Harbors, MN
Geoenergy E-Tube® System
Shut Down Maintenance Check List

Date: 5/8/96

Rev. 4/9/95

Job:	Done by:
1. Place cardboard on walkways outside openings to drop out tank, cyclone & south doors of power grids & landings of floor under collection tubes.	DEAN B.
2. Make sure steam cleaner has extension hose attached and haul it to power grid deck.	DEAN B.
3. Perform controlled shutdown of E-Tube.	TODD M. / LARS C.
4. Turn recycle pump to hand and verify FV 104 closes and FV 109 opens.	LARS C.
5. Test air quality of upper and lower areas, fill out and post confined space permits. TESTER INOP. TODAY SEE PERMITS FOR MORE INFO.	LARS C. / ROGER L
6. Inspect/clean power grid housing & collection tubes/electrodes. Alternate between grids ~~#1~~ & (#2) but be sure to clean trouble areas.	TODD MURPHY
7. Inspect/clear flush nozzles.	TODD M. / LARS C.
8. Use compressed air to blow out insulator boxes and clean insulators off using oven cleaner.	MARK THOMAS
9. Inspect cyclone. Scrape walls, scoop out sludge & steam off any build-up in cyclone/diffuser area and transition from drop out tank to cyclone.	TODD M.
10. Inspect/clear quench nozzles.	—
11. Inspect/clean quench chamber and drain.	TODD M. / LARS C
12. Scrape up droppings from floor under collection tubes.	TODD M.
13. Steam clean mesh pads.	TODD M.
14. Inspect/clean purge air filters.	
15. Manually crank ID fan damper closed for start up purposes. —	AUTO OPERATION
16.	
17.	

Note any abnormal build up or observations

Louisiana-Pacific Corporation Two Harbors, MN
Geoenergy E-Tube® System
Shut Down Maintenance Check List

Date: 5-1-96

Rev. 4/9/96

Job:	Done by:
1. Place cardboard on walkways outside openings to drop out tank, cyclone & south doors of power grids & landings of floor under collection tubes.	
2. Make sure steam cleaner has extension hose attached and haul it to power grid deck.	
3. Perform controlled shutdown of E-Tube.	M. Wyeoff
4. Turn recycle pump to hand and verify FV 104 closes and FV 109 opens.	
5. Test air quality of upper and lower areas, fill out and post confined space permits.	M. Wyeoff
6. Inspect/clean power grid housing & collection tubes/electrodes. Alternate between grids #1 & #2 but be sure to clean trouble areas.	M. Wyeoff
7. Inspect/clear flush nozzles.	M. Wyeoff
8. Use compressed air to blow out insulator boxes and clean insulators off using oven cleaner.	M. Wyeoff
9. Inspect cyclone. Scrape walls, scoop out sludge & steam off any build-up in cyclone/diffuser area and transition from drop out tank to cyclone.	M Wyeoff
10. Inspect/clear quench nozzles.	
11. Inspect/clean quench chamber and drain.	M Wyeoff
12. Scrape up droppings from floor under collection tubes.	M. Wyeoff
13. Steam clean mesh pads.	M. Wyeoff
14. Inspect/clean purge air filters.	
15. Manually crank ID fan damper closed for start up purposes.	
16.	
17.	

Note any abnormal build up or observations

Louisiana-Pacific Corporation Two Harbors, MN
Geoenergy E-Tube® System
Shut Down Maintenance Check List

Date: 4/17/96 Rev. 4/9/96

Job:	Done by:
1. Place cardboard on walkways outside openings to drop out tank, cyclone & south doors of power grids & landings of floor under collection tubes.	DEAN B.
2. Make sure steam cleaner has extension hose attached and haul it to power grid deck.	DEAN B.
3. Perform controlled shutdown of E-Tube.	LARS C. & MARK W.
4. Turn recycle pump to hand and verify FV 104 closes and FV 109 opens.	LARS C + MARK W.
5. Test air quality of upper and lower areas, fill out and post confined space permits.	LARS C.
6. Inspect/clean power grid housing & collection tubes/electrodes. Alternate between grids #1 & #2 but be sure to clean trouble areas.	MARK W.
7. Inspect/clear flush nozzles.	LARS. C.
8. Use compressed air to blow out insulator boxes and clean insulators off using oven cleaner.	FRANK SELHORST
9. Inspect cyclone. Scrape walls, scoop out sludge & steam off any build-up in cyclone/diffuser area and transition from drop out tank to cyclone.	MARK W.
10. Inspect/clear quench nozzles.	NO
11. Inspect/clean quench chamber and drain.	MARK W.
12. Scrape up droppings from floor under collection tubes.	MARK W
13. Steam clean mesh pads.	MARK W.
14. Inspect/clean purge air filters.	LARS C.
15. Manually crank ID fan damper closed for start up purposes.	N/A, WIRED FOR AUTO
16.	
17.	

Note any abnormal build up or observations

① – CHANGED OUT PT 101 + 102 MODEL 2088 ROSEMOUNT PRESSURE TRANSMITTERS WITH MODEL 1151 SMART PRESSURE TRANSMITTERS AS GEOENERGY PRESCRIBED –

– STILL GETTING EXCESS BUILDUP ON SHAFT + SHROUD OF #7 INSULATOR BOX (POWER GRID #2) SCRAPED + CLEANED –

– PRESSURE WASHED/STEAMED POWER GRID #2

Louisiana-Pacific Corporation Two Harbors, MN
Geoenergy E-Tube® System
Shut Down Maintenance Check List

Date: 4/10/96

Rev. 4/9/96

	Job:	Done by:
4/9/96 nights	1. Place cardboard on walkways outside openings to drop out tank, cyclone & south doors of power grids & landings of floor under collection tubes.	Dean B.
4/9/96 nights	2. Make sure steam cleaner has extension hose attached and haul it to power grid deck.	
	3. Perform controlled shutdown of E-Tube.	Larry M
	4. Turn recycle pump to hand and verify FV 104 closes and FV 109 opens.	Larry M
	5. Test air quality of upper and lower areas, fill out and post confined space permits.	Larry Dean
	6. Inspect/clean power grid housing & collection tubes/electrodes. Alternate between grids #1 & #2 but be sure to clean trouble areas.	Larry
	7. Inspect/clear flush nozzles.	Larry
	8. Use compressed air to blow out insulator boxes and clean insulators off using oven cleaner.	Dean
	9. Inspect cyclone. Scrape walls, scoop out sludge & steam off any build-up in cyclone/diffuser area and transition from drop out tank to cyclone.	Larry
	10. Inspect/clear quench nozzles.	Larry
	11. Inspect/clean quench chamber and drain.	Larry
	12. Scrape up droppings from floor under collection tubes.	Larry Dean
	13. Steam clean mesh pads.	Larry Dean
	14. Inspect/clean purge air filters.	
	15. Manually crank ID fan damper closed for start up purposes.	
	16. Inspect duct from E-tube to RTO	Mike Anderson
	17.	

Note any abnormal build up or observations

CONTROL EQUIPMENT MAINTENANCE RECORD
Louisiana-Pacific Corporation
Two Harbors MN

All maintenance and repairs to dust and emission control equipment (i.e. EFB, Baghouse, etc.) must be recorded. Return the completed form to the Environmental Manager.

Equipment worked on: E-TUBE TRANSFER PUMP

Date/time started: 4-3-96 10:32 AM

Date/time finished: 4-3-96 11:02 AM

Person(s) performing maintenance/repairs: GARY CARLSON

Description of work completed: Changed oil In The pump

Louisiana-Pacific Corporation Two Harbors, MN

Geoenergy E-Tube® System
Shut Down Maintenance Check List DOWN DAY

Date: 4-3-96

Job:	Done by:
1. Place cardboard on walkways outside openings to drop out tank, cyclone & south doors of power grids & landings of floor under collection tubes.	LARRY M.
2. Make sure steam cleaner has extension hose attached and haul it to power grid deck.	LARRY M.
3. Perform controlled shutdown of E-Tube.	LARS CARLSON
4. Turn recycle pump to hand and verify FV 104 closes and FV 109 opens.	LARS CARLSON
5. Test air quality of upper and lower areas, fill out and post confined space permits.	DUANE ROBINSON
6. Inspect/clean power grid housing & collection tubes/electrodes. Alternate between grids #~~1~~ & (#2) but be sure to clean trouble areas.	TODD MURPHY #2
7. Inspect/clear flush nozzles.	TODD MURPHY
8. Use compressed air to blow out insulator boxes and clean insulators off using oven cleaner.	STEVE ELIAS
9. Inspect cyclone. Scrape walls, scoop out sludge & steam off any build-up in cyclone/diffuser area and transition from drop out tank to cyclone.	TODD MURPHY / LARS C.
10. Inspect/clear quench nozzles.	NO
11. Inspect/clean quench chamber and drain.	TODD MURPHY
12. Scrape up droppings from floor under collection tubes.	TODD MURPHY
13. Steam clean mesh pads.	TODD MURPHY
14. Inspect/clean purge air filters.	LARS CARLSON
15. Manually crank ID fan damper closed for start up purposes.	DUANE ROBINSON

Note any abnormal build up or observations

— EXCESSIVE BUILDUP OF MATERIAL AROUND #7 INSULATOR BOX SHROUD + SHAFT OF POWER GRID WHERE IT PASSES THROUGH SHROUD. (I PUT A CALL THROUGH + LEFT MESSAGE FOR NEIL K.) —

— CHANGED OUT DEFOAMER TOTE, REROUTED + SHORTENED SUCTION LINE

— HAD TO FORCE FV 109 AGAIN, AS TIME DELAY IS MUCH TO LONG BEFORE IT OPENS —

— PUT STAINLESS STEEL BANDING ON RUBBER BOOT BETWEEN E-TUBE AND ID FAN —

— PUT THE NEW STORAGE CABINET ON 2ND DECK —

CONTROL EQUIPMENT MAINTENANCE RECORD

All maintenance and repairs to dust and emission control equipment (i.e. EFB, Baghouse, etc.) must be recorded. Return the completed form to the environmental officer.

Equipment worked on: E-Tube Recycle pump #2

Date: 3/25/96 Time started: 8:30 Am Time finished: 9:00 AM

Person/s performing maintenance/repairs: Gary Carlson

Description of work completed: Change oil in the Recycle pump. Break in period.

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Louisiana-Pacific Corporation Two Harbors, MN

Geoenergy E-Tube® System
Shut Down Maintenance Check List

Date: 3/20/96

Job:	Done by:
1. Place cardboard on walkways outside openings to drop out tank, cyclone & south doors of power grids & landings of floor under collection tubes.	TODD MURPHY
2. Make sure steam cleaner has extension hose attached and haul it to power grid deck.	DEAN BAUMgarter
3. Perform controlled shutdown of E-Tube.	LARS C + TODD M.
4. Turn recycle pump to hand and verify FV 104 closes and FV 109 opens.	Lars C.
5. Test air quality of upper and lower areas, fill out and post confined space permits.	LARS C. + TODD M.
6. Inspect/clean power grid housing & collection tubes/electrodes. Alternate between grids (#1) ~~&~~ #2 but be sure to clean trouble areas.	Todd M. + LARS
7. Inspect/clear flush nozzles.	Lars C
8. Use compressed air to blow out insulator boxes and clean insulators off using oven cleaner.	Steve Elias
9. Inspect cyclone. Scrape walls, scoop out sludge & steam off any build-up in cyclone/diffuser area and transition from drop out tank to cyclone.	Todd Murphy
10. Inspect/clear quench nozzles.	Todd + Lars
11. Inspect/clean quench chamber and drain.	Lars C.
12. Scrape up droppings from floor under collection tubes.	Todd M.
13. Steam clean mesh pads.	Lars C.
14. Inspect/clean purge air filters.	Todd M.
15. Manually crank ID fan damper closed for start up purposes.	Lars C.

Note any abnormal build up or observations

— Purge air fan + heaters control power + output wires were ~~[illegible]~~ backward so start coil was always picked up, corrected wiring —

— Steam cleaned pump area floor + some equipment —

— Checked big recycle strainer, clean —

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CONTROL EQUIPMENT MAINTENANCE RECORD

All maintenance and repairs to dust and emission control equipment (i.e. EFB, Baghouse, etc.) must be recorded. Return the completed form to the environmental officer.

Equipment worked on: E-Tube

Date: 3/13/96 Time started: 9:00 Am Time finished: 11:00 Am

Person/s performing maintenance/repairs: Gary Carlson

Description of work completed: Change The oil in The Recycle pump. Break in period

Louisiana-Pacific Corporation
Two Harbors, MN

Geoenergy E-Tube® System
Shut Down Maintenance Check List

Date: 3-13-96

Job:	Done by:
1. Clean Insulators	Lars Carlson
2. Inspect/clean power grid housing	Dean Baumgartner
3. Inspect/clear flush nozzles	Dean & Lars
4. Inspect tubes/probes for abnormal build up	Dean & Lars
5. Inspect/clear outlet sump floor	Dean & Lars
6. Inspect/clear quench chamber and drain	Dean & Lars
7. Inspect/clear quench nozzles	Dean & Lars
8. Inspect/clear cyclone and drain	Dean Baumgartner
9. Inspect/clear purge air filters	Charlie Auno

Note any abnormal build up or observations

- No. 7 insulator had excesive buildup moved direction of spray nozzles a bit. Cleaned around insulator.

- Steam Cleaned mesh pads

- Switched from recycle pump #1 to pump #2 so oil in pump #1 can be changed as break in period is met. After pump #2 reaches break in time will switch back to #1 & change oil in #2.

CONTROL EQUIPMENT MAINTENANCE RECORD

All maintenance and repairs to dust and emission control equipment (i.e. EFB, Baghouse, etc.) must be recorded. Return the completed form to the environmental officer.

Equipment worked on: E-Tube ID Fan

Date: 3/13/96 Time started: 12:30 Time finished: 2:00

Person/s performing maintenance/repairs: Gary Carlson

Description of work completed: Repack Grease in The Bearings

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Wheelabrator Clean Air Systems
Huntington Energy Systems RTO

LP Two Harbors RTO
rev 1 DHS 3/8/96

Routine Inspection Form

	WEEKLY	MNTHLY	SHTDN	S. ANUL	COMMENTS/PERFORMED BY
Valve Drive					
check bolts, setscrews, keys (tight)	X				
lube bearing and shaft grease ftngs		X			5-10-96 RC
lube btn head fittings on valves				X	5-14-96 RC
replace gearbox lube				X	4-10-96 RC
coat shafts with CRC SP400				X	4-25-96 RC
check operation of prox switches		X			
inspect drive rotation for backlash	X				
Exhaust Fan					
lube fan bearings		X			5-14-96 RC
lube motor bearings		X			
record bearing temps	X				
lube damper bearings					5-10-96 RC
check calibration of actuator				X	
check fan shaft seals		X			
check vibration/rubbing noise	X				
Purge Fan					
lube fan bearings		X			5-10-96 RC
lube motor bearings		X			
check vibration/rubbing noise	X				
Burners					
check flame scanner oper/clean		X			
clean igniter		X			
check linkages (tight)	X				
verify operation of pressure switches				X	
calibrate actuators				X	
check for gas leakage	X				
Ductwork					
clean ductwork			X		
clean valve seats			X		
clean and adjust damper seats			X		
check and seal internal flanges			X		
clean dispersion tube			X		
check disp tube P/V taps (open)			X		
General					
inspect lower stoneware beds			X		
inspect refractory			X		
inspect upper stoneware			X		
check burner throats			X		
touch-up paint				X	
calibrate instruments				X	
adjust valve drive linkage (thrml bal)			X		

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Wheelabrator Clean Air Systems
Huntington Energy Systems RTO

LP Two Harbors RTO
rev 1 DHS 3/8/96

5/1/96

Routine Inspection Form

	WEEKLY	MNTHLY	SHTDN	S. ANUL	COMMENTS/PERFORMED BY
Valve Drive					
check bolts, setscrews, keys (tight)	(X)				
lube bearing and shaft grease ftngs		X			
lube btn head fittings on valves				X	
replace gearbox lube				X	
coat shafts with CRC SP400				X	
check operation of prox switches		(X)			
inspect drive rotation for backlash	(X)				
Exhaust Fan					
lube fan bearings		X			
lube motor bearings		X			
record bearing temps	X				
lube damper bearings					
check calibration of actuator				X	
check fan shaft seals		X			
check vibration/rubbing noise	X				
Purge Fan					
lube fan bearings		X			
lube motor bearings		X			
check vibration/rubbing noise	X				
Burners					
check flame scanner oper/clean		X			
clean igniter		X			
check linkages (tight)	X				
verify operation of pressure switches				X	
calibrate actuators				X	
check for gas leakage	X				
Ductwork					
clean ductwork			X		
clean valve seats			(X)		
clean and adjust damper seats			(X)		
check and seal internal flanges			X		
clean dispersion tube — Checked OK			(X)		
check disp tube P/V taps (open)			X		
General					
inspect lower stoneware beds			(X)		
inspect refractory			~~(X)~~		
inspect upper stoneware			X		
check burner throats			X		
touch-up paint				X	
calibrate instruments				X	
adjust valve drive linkage (thrml bal)			X		

CONTROL EQUIPMENT MAINTENANCE RECORD
Louisiana-Pacific Corporation
Two Harbors MN

All maintenance and repairs to dust and emission control equipment (i.e. EFB, Baghouse, etc.) must be recorded. Return the completed form to the Environmental Manager.

Equipment worked on: RTO

Date/time started: 5/1/96 ~7:30 AM

Date/time finished: 5/1/96 ~4:00 PM

Person(s) performing maintenance/repairs: Dave Stark (Wheelabrator) Rick Mueller (Wheelabrator) Dean Baumgartner, Charlie Aune, Tony Bennett

Description of work completed:
Cleaned valve seats, inspected dispersion tube, Dave and Rick fine tuned the RTO.

Completed bakeout of RTO 12:00 PM to 4:00 PM

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CONTROL EQUIPMENT MAINTENANCE RECORD
Louisiana-Pacific Corporation
Two Harbors MN

All maintenance and repairs to dust and emission control equipment (i.e. EFB, Baghouse, etc.) must be recorded. Return the completed form to the Environmental Manager.

Equipment worked on: "RTO"

Date/time started: 4/17/96 @ 0800

Date/time finished: 4/17/96 @ 1000

Person(s) performing maintenance/repairs: LAURI CARLSON

Description of work completed: — MADE AN EXCHANGE OF 984's, REMOVED SPARE MODEL 785E AND INSTALLED NEW REPLACEMENT MODEL 685E —

— CHECKED INTAKE + EXHAUST VALVES CHAMBERS #1 - #5 ALL SEATS ARE CLEAN + IN GOOD REPAIR —

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CONTROL EQUIPMENT MAINTENANCE RECORD
Louisiana-Pacific Corporation
Two Harbors MN

All maintenance and repairs to dust and emission control equipment (i.e. EFB, Baghouse, etc.) must be recorded. Return the completed form to the Environmental Manager.

Equipment worked on: RTO - MAIN FAN & PURGE FAN

Date/time started: 4-17-96 7:45 AM

Date/time finished: 4-17-96 9:35 AM

Person(s) performing maintenance/repairs: OILER
GARY CARLSON

Description of work completed: REPACKED FAN Bearings

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CONTROL EQUIPMENT MAINTENANCE RECORD

All maintenance and repairs to dust and emission control equipment (i.e. EFB, Baghouse, etc.) must be recorded. Return the completed form to the environmental officer.

Equipment worked on: "RTO."

Date: 4/4/96 Time started: 0900 Time finished: 0910

Person/s performing maintenance/repairs: LAURI CARLSON

Description of work completed: WHILE STILL RUNNING, MADE MINOR ADJUSTMENT TO INTAKE & EXHAUST VALVES #1 TO HELP EVEN LOWER CHAMBER TEMPERATURES.

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CONTROL EQUIPMENT MAINTENANCE RECORD

All maintenance and repairs to dust and emission control equipment (i.e. EFB, Baghouse, etc.) must be recorded. Return the completed form to the environmental officer.

Equipment worked on: "RTO"

Date: 4/1/96 Time started: 2130 Time finished: 2359

Person/s performing maintenance/repairs: LAURI CARLSON, JERRY HIUKKA

Description of work completed: TROUBLE SHOOTING, FOUND LOSS OF RUN CONDITION ON PROGRAMMABLE CONTROLLER, TRIED TO RESTART WITHOUT SUCESS, REPLACED 984 CONTROLLER WITH 785E CONTROLLER. RE CONFIGURED + RESTARTED "RTO".

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OPERATING DATA SUMMARY FOR PROCESS SOURCES

Form OPS01
11/01/95

Test Date(s): MAY 21, 1996

Company Name: LOUISIANA - PACIFIC CORPORATION

NO_x, CO, VOC and PM TESTING

A. Equipment & Operating Data

1. Process Equipment No./Id.: DRYER #001 & PAINT OVENS
2. Process Equipment Description: WAFER DRYER / McCONNELL BURNER
3. Process equipment operating under normal operating conditions? (YES) NO
   If no, explain BURNER FIRED WITH WOOD FINES
4. Process rate during the test (amount of raw material or finished product per hour, wet or dry basis)

Process Parameter: list type and units	Run 1	Run 2	Run 3
* TONS OF FINISHED PRODUCT/HR	11.85	11.85	11.85
* FUEL INPUT mm/BTU/HR	40.7	40.7	40.7

* RATES DID NOT VARY SIGNIFICANTLY FROM RUN TO RUN

B. Instrument Data on Process Equipment

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

C. Air Pollution Control Equipment

Clearly identify and summarize the operating ranges documented during testing in the table below: (Refer to the operating parameters to be monitored during testing as specified in the test plan.) **THE TABLE BELOW IS NOT SUITABLE FOR ESP DATA, PLEASE SUBMIT IN AN APPROPRIATE FORMAT.**

SEE ATTACHED WESP OPERATING DATA

Type of Control Equipment	Parameter monitored on control equipment.: **Max. and Min. Ranges**		
Run No.:	1	2	3
Baghouse: ΔP (in. w.c.)			
Cyclone: ΔP (in. w.c.)			
Multi-clone: ΔP (in. w.c.)			
Scrubber (type):_____ ΔP (in. w.c.)			
_____ feed rate (gpm and psi)			
Thermal Incinerator: (°$F_{operating\ temp}$)			
Catalytic Incinerator: (°F_{in}, °F_{out})			
Other: RTO BURNER #1 °F	1494 - 1523	1494 - 1520	1494 - 1512
Other: RTO BURNER #2 °F	1507 - 1512	1503 - 1511	1504 - 1508

1. Was the control equipment operating normally? (YES) NO
   If no, explain RTO SET POINT WAS REDUCED FROM 1520 °F TO 1510 °F
2. Date and procedures of last major maintenance/cleaning of control equipment LAST BAKEOUT WAS MAY 2, 1996. MAINTENANCE RECORDS ARE ATTACHED

Note: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report.

Form OPS01
11/01/95

OPERATING DATA SUMMARY FOR PROCESS SOURCES

Test Date(s): MAY 22, 1996

Company Name: LOUISIANA - PACIFIC CORPORATION
PM-10 AND FORMALDEHYDE

A. Equipment & Operating Data

1. Process Equipment No./Id.: DRYER #001 & PAINT OVENS

2. Process Equipment Description: WAFER DRYER / McCONNELL BURNER

3. Process equipment operating under normal operating conditions? (YES) NO
If no, explain BURNER FIRED WITH WOOD FINES

4. Process rate during the test (amount of raw material or finished product per hour, wet or dry basis)

Process Parameter: list type and units	Run 1	Run 2	Run 3
* TONS OF FINISHED PRODUCT/HR	11.93	11.93	11.93
* FUEL INPUT mm/BTU/HR	40.5	40.5	40.5

* RATES DID NOT VARY SIGNIFICANTLY FROM RUN TO RUN

B. Instrument Data on Process Equipment

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

C. Air Pollution Control Equipment

Clearly identify and summarize the operating ranges documented during testing in the table below: (Refer to the operating parameters to be monitored during testing as specified in the test plan.) **THE TABLE BELOW IS NOT SUITABLE FOR ESP DATA, PLEASE SUBMIT IN AN APPROPRIATE FORMAT.**

SEE ATTACHED WESP OPERATING DATA

Type of Control Equipment	Parameter monitored on control equipment.: **Max. and Min. Ranges**		
Run No.:	1	2	3
Baghouse: ΔP (in. w.c.)			
Cyclone: ΔP (in. w.c.)			
Multi-clone: ΔP (in. w.c.)			
Scrubber (type):_________ ΔP (in. w.c.)			
_________ feed rate (gpm and psi)			
Thermal Incinerator: ($°F_{operating\ temp}$)			
Catalytic Incinerator: ($°F_{in}$, $°F_{out}$)			
Other: RTO BURNER #1	1493-1523	1494-1524	1493-1521
Other: RTO BURNER #2	1507-1512	1503-1513	1503-1511

1. Was the control equipment operating normally? (YES) NO
If no, explain RTO SET POINT WAS REDUCED FROM 1520°F TO 1510°F

2. Date and procedures of last major maintenance/cleaning of control equipment LAST BAKEOUT WAS MAY 2, 1996. MAINTENANCE RECORDS ARE ATTACHED

Note: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report.

OPERATING DATA SUMMARY FOR PROCESS SOURCES

Form OPS01
11/01/95

Test Date(s): MAY 22, 1996

Company Name: LOUISIANA-PACIFIC CORPORATION

A. Equipment & Operating Data

1. Process Equipment No./Id.: PRESS
2. Process Equipment Description: MOTALA BOARD PRESS
3. Process equipment operating under normal operating conditions? (YES) NO
   If no, explain
4. Process rate during the test (amount of raw material or finished product per hour, wet or dry basis)

Process Parameter: list type and units	Run 1	Run 2	Run 3
* TONS OF FINISHED PRODUCT	12.33	12.33	12.33

* RATES DID NOT VARY SIGNIFICANTLY FROM RUN TO RUN

B. Instrument Data on Process Equipment

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

C. Air Pollution Control Equipment NO CONTROL EQUIPMENT

Clearly identify and summarize the operating ranges documented during testing in the table below: (Refer to the operating parameters to be monitored during testing as specified in the test plan.) **THE TABLE BELOW IS NOT SUITABLE FOR ESP DATA, PLEASE SUBMIT IN AN APPROPRIATE FORMAT.**

Type of Control Equipment		Parameter monitored on control equipment.: **Max. and Min. Ranges**		
	Run No.:	1	2	3
Baghouse:	ΔP (in. w.c.)			
Cyclone:	ΔP (in. w.c.)			
Multi-clone:	ΔP (in. w.c.)			
Scrubber (type):________	ΔP (in. w.c.)			
____________	feed rate (gpm and psi)			
Thermal Incinerator:	(°$F_{operating\ temp}$)			
Catalytic Incinerator:	(°F_{in}, °F_{out})			
Other:				
Other:				

1. Was the control equipment operating normally? YES NO
   If no, explain n/a
2. Date and procedures of last major maintenance/cleaning of control equipment n/a

Note: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job L.P. Two Harbors Date 5/20/96

Operator D. Van Hoever Module No. 6

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 28.69 in.Hg θ = .9967 ΔH@ 1.90 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(351.40)		
2.5	353.32	83	69
5.0	355.22	87	70
7.5	357.17	89	71
10	359.06	92	71
	V_m = 7.66	Avg(t_m) = 79.00 °F	

Calculate Y_{cm} as follows:

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

$$Y_{cm} = \frac{1.786}{(.9967)\,(7.66)} \left[\frac{(\ 79\ ) + 460}{(28.69)}\right]^{0.5}$$

Y_{cm} = 1.01

If Y_{cm} 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

011995-C:\STACK\WP\FORMS\S—32

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP/ Two Harbors Date 5-21-96

Operator [illegible] 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 28.64 in.Hg θ= 1.0019 ΔH@ 1.77 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(784.00)		
2.5	785.99	65	57
5.0	787.77	69	57
7.5	789.62	70	56
10	791.50	71	55
	V_m = 7.5	Avg(t_m) = 62.5 °F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(7.5)\ (1.0019)}\left[\frac{(62.5) + 460}{(28.64)}\right]^{0.5}$$

Y_{cn} = 1.0082

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

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job L.P. Two Harbors Date 5/21/96

Operator Dutt Module No. 10

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 28.84 in.Hg θ = .9909 ΔH@ 1.94 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(195.00)		
2.5	196.96	69	67
5.0	198.89	74	67
7.5	200.84	76	68
10	202.80	77	68
	V_m = 7.80	Avg(t_m) = 70.75 °F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(.9909)\;(7.80)} \left[\frac{(70.75) + 460}{(28.84)}\right]^{0.5}$$

Y_{cn} = .99

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

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP/Two Harbors Date 5-22-96

Operator Bog Module No. 11

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 28.95 in.Hg θ = .9990 ΔH@ 1.80 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F) Inlet	Meter Temp (°F) Outlet
	(516.00)		
2.5	517.91	57	54
5.0	519.82	61	54
7.5	521.76	63	54
10	523.67	65	55
	V_m = 7.67	Avg(t_m) = 57.875 °F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(7.67)(.9990)}\left[\frac{(57.875) + 460}{(28.95)}\right]^{0.5}$$

Y_{cn} = .9858

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

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP / Two Harbors, MN Date 5-21-96
Operator M. Koehler Module No. 18

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 28.84 in.Hg θ= 1.0051 ΔH@ 1.81 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(955.20)		
2.5	957.07	71	72
5.0	958.94	75	71
7.5	960.81	77	72
10	962.68	79	72
	V_m = 7.48	Avg(t_m) = 73.63 °F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(1.0051)(7.48)} \left[\frac{(73.63) + 460}{(28.84)}\right]^{0.5}$$

Y_{cn} = 1.022

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

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job L.P. / Two Harbors, MN Date 5-22-96
Operator M. Kaehler Module No. 18

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 28.95 in.Hg θ= 1.0051 ΔH@ 1.81 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(136.90)		
2.5	138.75	66	66
5.0	140.67	67	66
7.5	142.55	69	66
10	144.45	72	66
	V_m = 7.55	$Avg(t_m)$ = 67.25 °F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(1.0051)\ (7.55)}\left[\frac{(67.25) + 460}{(28.95)}\right]^{0.5}$$

Y_{cn} = 1.004

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: May 24, 1996

Meter Box No. : 6 (Rockwell Dry Test Meter Serial No. 964568)

Date of Last Calibration: April, 1996
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
May 07, 1996	6-7666	625.29	747.00	121.71	121.71
May 14, 1996	6-7685	752.60	980.40	227.80	349.51
May 16, 1996	6-7686	999.10	1350.31	351.21	700.72
May 21, 1996	6-7712	1359.24	1629.07	269.83	970.55

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: May 28, 1996

Meter Box No. : 8 (Rockwell Dry Test Meter Serial No. 964547)

Date of Last Calibration: February 29, 1996
Calibration Technician: S. Kelker
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.)
May 14, 1996	6-7684	654.80	779.30	124.50	124.50
May 22, 1996	6-7712	791.70	898.45	106.75	231.25

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: May 24, 1996

Meter Box No. : 10 (Rockwell Dry Test Meter Serial No. 1334112)

Date of Last Calibration: March 26, 1996
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
April 30, 1996	6-7646	413.00	1193.51	780.51	780.51
May 22, 1996	6-7712	1202.84	1301.45	98.61	879.12

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: May 24, 1996

Meter Box No. : 11 (Rockwell Dry Test Meter Serial No. 1334114)

Date of Last Calibration: January 9, 1996
Calibration Technician: S. Fjelsta
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.)
March 20, 1996	6-7452	405.60	509.66	104.06	104.06
May 22, 1996	6-7712	526.10	652.45	126.35	230.41

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: May 24, 1996

Meter Box No. : 18 (Rockwell Dry Test Meter Serial No. 1334117)

Date of Last Calibration: January 22, 1996
Calibration Technician: S. Kelker
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.)
February 21, 1996	6-7318	266.50	695.66	429.16	429.16
March 13, 1996	6-7406	753.30	953.67	200.37	629.53
May 22, 1996	6-7712	963.30	1300.00	336.70	966.23

* Total volume through meter since last calibration.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 4-1-96
Bar. Press. 29.42 IN.HG
Wet Test Meter No. AL-20

Control Module No. 6
Serial No. DTM 964568
Technician

ΔH (IN.WC) Nominal	ΔH (IN.WC) Actual	Gas Volume Wet Test Meter (ft³)	* Cal. Index φ (%)	* Diff. Wet Test Meter ΔP_w (IN.WC.)	Gas Volume Dry Test Meter (ft³) V_{di}	Gas Volume Dry Test Meter (ft³) V_{df}	Gas Temperatures Wet Test t_w (°F)	Gas Temperatures Dry Test t_{di} (°F)	Gas Temperatures Dry Test t_{do} (°F)	Time θ (Min/Sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_i
0.5	.5	2	99.85	0.01	856.300	858.286	69	75	57	5/03	.9985	1.83	
1.2	1.2	3	99.91	0.025	858.500	861.503	69	81	60	4/58	.9978	1.87	
2.0	2.0	3	99.93	0.055	862.000	865.030	69	86	62	3/54	.9936	1.91	
3.3	3.3	5	100.00	0.09	865.500	870.552	69	90	65	5/04	.9971	1.93	
4.7	4.7	5	100.02	0.12	871.000	876.066	69	93	68	4/19	.9966	1.95	
										Avg	.9967	1.90	

Positive leak check performed by
Meter was in tolerance ☒
Approved by

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date 4/9/96

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 2/29/96
Bar. Press. 29.30 IN.HG
Wet Test Meter No. AL-20

Control Module No. 8
Serial No. DTM 96547
Technician Steve Kilber

ΔH (IN.WC) Nominal	ΔH (IN.WC) Actual	Gas Volume Wet Test Meter (ft³)	* Cal. Index φ (%)	* Diff. Wet Test Meter ΔP_W (IN.WC.)	Gas Volume Dry Test Meter (ft³) V_{di}	Gas Volume Dry Test Meter (ft³) V_{df}	Gas Temperatures Wet Test t_w (°F)	Gas Temperatures Dry Test t_{di} (°F)	Gas Temperatures Dry Test t_{do} (°F)	Time θ (Min/Sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
0.5	0.5	2	99.85	0.01	390.975	392.965	69	72	69	4/57	1.0051	1.75	
1.2	1.2	3	99.91	0.025	394.951	397.978	69	76	70	4/47	.9946	1.74	
2.0	2.0	3	99.93	0.055	403.014	406.032	69	78	71	3/44	.9985	1.75	
3.3	3.3	5	100.00	0.09	414.100	419.105	69	79	71	4/55	1.0018	1.81	
4.7	4.7	5	100.02	0.12	427.971	432.871	70	72	69	4/6	1.0094	1.81	
	2	3	4	5	6	7	8	9	10	11/12 Avg	1.0019	1.77	

Positive leak check performed by [signature]
Meter was in tolerance ☒
Approved by [signature]

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date 3/14/96

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 3-26-96
Bar. Press. 29.49 IN.HG
Wet Test Meter No. AL-20

Control Module No. 10
Serial No. DTM 1334112
Technician [signature]

ΔH (IN.WC) Nominal	ΔH (IN.WC) Actual	Gas Volume Wet Test Meter (ft^3)	* Cal. Index ϕ (%)	* Diff. Wet Test Meter ΔP_w (IN.WC.)	Gas Volume Dry Test Meter (ft^3) V_{di}	Gas Volume Dry Test Meter (ft^3) V_{df}	Gas Temperatures Wet Test t_w (°F)	Gas Temperatures Dry Test t_{di} (°F)	Gas Temperatures Dry Test t_{do} (°F)	Time θ (Min/Sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
0.5	.5	2	99.85	0.01	371.800	373.865	65	84	73	7/10	.9906	1.84	
1.2	1.2	3	99.91	0.025	374.400	377.100	65	86	73	5/10	.9905	1.96	
2.0	2.0	3	99.93	0.055	368.500	371.590	65	87	73	3/59	.9928	1.94	
3.3	3.3	5	100.00	0.09	377.500	382.640	65	89	73	5/12	.9901	1.95	
4.7	4.7	5	100.02	0.12	383.000	388.145	65	90	73	4/24	.9906	1.99	
										Avg	.9909	1.94	

Positive leak check performed by [signature]
Meter was in tolerance
Approved by [signature]
*Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date 4/19/96

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date	1-9-96	Control Module No.	11
Bar. Press.	29.08 IN.HG	Serial No. DTM	1334114
Wet Test Meter No.	AL-20	Technician	SF

ΔH (IN.WC)		Gas Volume Wet Test Meter	* Cal. Index ϕ	* Diff. Wet Test Meter ΔP_w	Gas Volume Dry Test Meter (ft³)		Gas Temperatures			Time θ	Meter Coeff.	Orifice Const.	C_t
							Wet Test t_w (°F)	Dry Test					
Nominal	Actual	(ft³)	(%)	(IN.WC.)	V_{di}	V_{df}		t_{di} (°F)	t_{do} (°F)	(Min/Sec)	Y	ΔH@	
0.5	0.5	2	99.85	0.01	399.132	401.178	64.5	83	68	4/55	.99524	1.697	
1.2	1.2	3	99.91	0.025	383.150	386.170	64.5	78	65	4/55	1.00262	1.822	
2.0	2.0	3	99.93	0.055	379.080	382.130	64.5	77	65	3/50	.98995	1.847	
3.3	3.3	5	100.00	0.09	387.383	392.413	64.5	84	68	4/57	1.00719	1.810	
4.7	4.7	5	100.02	0.12	393.745	398.814	64.5	88	68	4/11	.99979	1.833	
	2	3	4	5	6	7	8	9	10	11/12 Avg	0.9990	1.80	

Positive leak check performed by SF

Meter was in tolerance ☒

Approved by [signature]

Meter was not in tolerance ☐: readjusted linkage

Meter was not in tolerance ☐: changed dry test meter

Date 1/17/96

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 1/22/96
Bar. Press. 29.19 IN.HG
Wet Test Meter No. AL-20

Control Module No. 18
Serial No. DTM 1334117
Technician SK

ΔH (IN.WC) Nominal	ΔH (IN.WC) Actual	Gas Volume Wet Test Meter (ft³)	* Cal. Index φ (%)	* Diff. Wet Test Meter ΔP_w (IN.WC.)	Gas Volume Dry Test Meter (ft³) V_{di}	Gas Volume Dry Test Meter (ft³) V_{df}	Gas Temperatures Wet Test t_w (°F)	Dry Test t_{di} (°F)	Dry Test t_{do} (°F)	Time θ (Min/Sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_t
0.5	0.5	2	99.85	0.01	235.948	237.984	58.8	78	65	5/00	1.0035	1.724	
1.2	1.2	3	99.91	0.025	240.040	243.090	58.8	77	65	4/59	1.0027	1.826	
2.0	2.0	3	99.93	0.055	229.839	232.878	58.5	79	63	3/53	1.0050	1.845	
3.3	3.3	5	100.00	0.09	245.114	250.196	59	84	66	5/00	1.0056	1.804	
4.7	4.7	5	100.02	0.12	252.210	257.282	59	88	67	4/13	1.0088	1.818	
	2	3	4	5	6	7	8	9	10	11/12 Avg	1.0051	1.80	

Positive leak check performed by SK
☒ Meter was in tolerance
Approved by [signature]

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date 2/2/96

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

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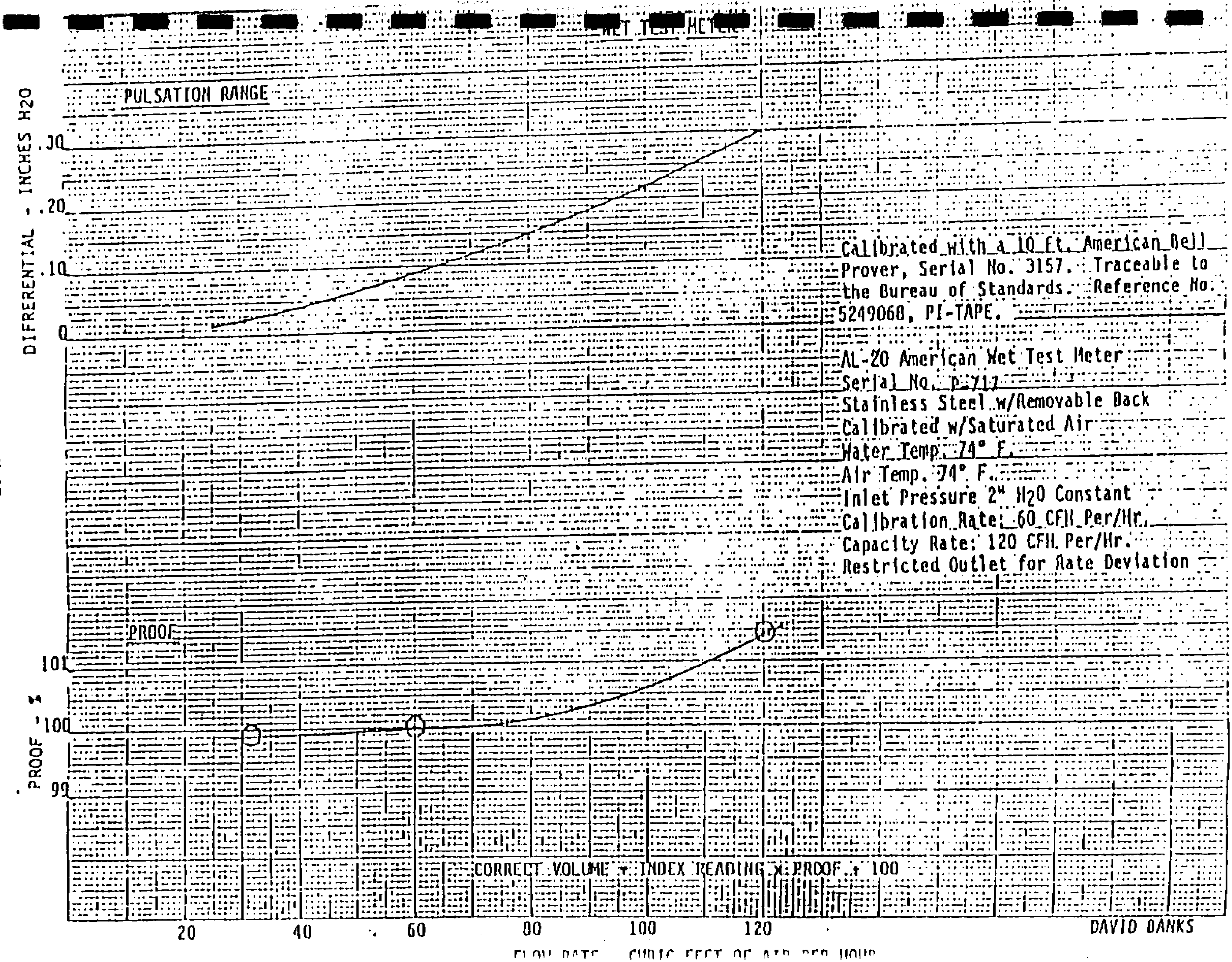
WET TEST METER
PULSATION RANGE
DIFRERENTIAL - INCHES H2O
.30
.20
.10
0
Calibrated With a 10 Ft. American Bell Prover, Serial No. 3157. Traceable to the Bureau of Standards. Reference No. 5249068, PI-TAPE.
AL-20 American Wet Test Meter
Serial No. P-717
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" 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
DAVID DANKS

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 05-21-96
Technician: Mark Kaehler
Nozzle Number: 1-4

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

Position	Diameter (inches)
1	0.249
2	0.250
3	0.251
Average	0.250

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 05-21-96
Technician: Duane Van Hoever
Nozzle Number: 7-4

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

Position	Diameter (inches)
1	0.247
2	0.247
3	0.247
Average	0.247

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 05-21-96
Technician: Bob Aschenbach
Nozzle Number: 9-3

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

Position	Diameter (inches)
1	0.192
2	0.192
3	0.192
Average	0.192

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 05-22-96
Technician: Duane Van Hoever
Nozzle Number: 4

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

Position	Diameter (inches)
1	0.182
2	0.183
3	0.181
Average	0.182

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 05-22-96
Technician: Duane Van Hoever
Nozzle Number: 5

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

Position	Diameter (inches)
1	0.193
2	0.193
3	0.192
Average	0.193

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 05-22-96
Technician: Bob Aschenbach
Nozzle Number: Glass

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

Position	Diameter (inches)
1	0.245
2	0.245
3	0.245
Average	0.245

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 05-22-96
Technician: Duane Van Hoever
Nozzle Number: Glass

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

Position	Diameter (inches)
1	0.278
2	0.278
3	0.277
Average	0.278

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 05-22-96
Technician: Bob Aschenbach
Nozzle Number: 9-4

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

Position	Diameter (inches)
1	0.245
2	0.245
3	0.245
Average	0.245

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 05-22-96
Technician: Mark Kaehler
Nozzle Number: G-4

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

Position	Diameter (inches)
1	0.248
2	0.251
3	0.250
Average	0.251

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:
Vendor: Omega
Model: HH-81
Serial Number:
Range: 0-2100 °F
Thermocouple Type: K
Date of Calibration: 3-8-96
Technician: LH
Method of Calibration:
PDT No.: 31

☐ 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	-1.4	1.4	.30
100	100	97.5	2.5	.45
200	200	199	1	.15
300	300	297	3	.39
400	400	398	2	.23
500	500	498	2	.21
600	600	600	0	0
700	700	698	2	.17
800	800	800	0	0
900	900	899	1	.074
1000	1000	999	1	.068
1100	1100	1097	3	.19
1200	1200	1199	1	.060
1300	1300	1297	3	.170
1400	1400	1400	0	0
1500	1500	1498	2	.102
1600	1600	1601	1	.049
1700	1700	1699	1	.046
1800	1800	1800	0	0
1900	1900	1897	3	.127
2000	2000	1999	1	.040
2100	2100	2095	5	.195
		Averages:	1.63	.137

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.

011995-G:\STACK\WP\FORMS\S-433

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:
Vendor: Omega
Model: HH 21
Range: 0-2200 °F
Date of Calibration: 2-2-96
Serial Number: 74JX0723
Thermocouple Type: K
Technician: BA
PDT No.: 33

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 ∆t (°F)	Deviation (%)
0	0	-4	-4	.008
100	100	97	3	.535
200	200	199	1	.151
300	300	298	2	.263
400	400	397	3	.348
500	500	497	3	.312
600	600	599	1	.094
700	700	698	2	.172
800	800	800	0	0
900	900	899	1	.073
1000	1000	999	1	.068
1100	1100	1098	2	.128
1200	1200	1199	1	.060
1300	1300	1298	2	.113
1400	1400	1400	0	0
1500	1500	1499	1	.051
1600	1600	1602	2	.097
1700	1700	1699	1	.046
1800	1800	1802	2	.088
1900	1900	1899	1	.042
2000	2000	2000	0	0
2100	2100	2097	3	.117
		Averages:	1.272	.125

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

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

011995-C:\STACK\WP\FORMS\S-433

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test: 35
Vendor: OMEGA
Model: HH81 — Serial Number: 74JX0332
Range: 0 - 2100 °F — Thermocouple Type: K
Date of Calibration: 2/20/96 — Technician: MARK PETERSEN
Method of Calibration: — PDT No. 35

☐ 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 ∆t (°F)	Deviation (%)
0	0	-3	3	0.65
100	100	98	2	0.36
200	200	200	0	0
300	300	298	2	0.26
400	400	398	2	0.23
500	500	499	1	0.10
600	600	600	0	0
700	700	699	1	0.09
800	800	801	1	0.08
900	900	900	0	0
1000	1000	1000	0	0
1100	1100	1100	0	0
1200	1200	1201	1	0.06
1300	1300	1299	1	0.06
1400	1400	1402	2	0.11
1500	1500	1500	0	0
1600	1600	1603	3	0.15
1700	1700	1701	1	0.05
1800	1800	1803	3	0.13
1900	1900	1901	1	0.04
2000	2000	2001	1	0.04
2100	2100	2099	1	0.04
		Averages:	1.18	0.111

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

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

011995-G:\STACK\WP\FORMS\S-433

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 23-5

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" .02
9. W <.0625" .01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

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

Date of Inspection: 2/-8-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 23-6

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" .02
9. W <.0625" .025

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

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

Date of Inspection: 4-8-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 3/-5

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" 0
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .757 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

S-348

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

S-348

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date: 2-2-96
Technician: BoB
Mercury Column Barometer No.: Company 1
Aneroid Barometer No.: 10713029

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (P_{ba} - P_{bm})
29.79	69	.107	29.68	29.69	.01

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

Has problem been alleviated? Yes/No. How?

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 4-8-96
Technician Mark Koehler
Mercury Column Barometer No. Lab 1
Aneroid Barometer No. 21029004

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (P_{ba} - P_{bm})
29.260	70	.111	29.149	29.14	.009

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

Has problem been alleviated? Yes/No. How?

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date: 5/9/96
Technician: D. Van Hoever
Mercury Column Barometer No.:
Aneroid Barometer No.: Dut's

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (P_{ba} - P_{bm})
29.19	69	.109	29.08	29.06	-.02

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

Has problem been alleviated? Yes/No. How?

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

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Test Protocol for Air Emission Compliance Testing at Louisiana-Pacific's Two Harbors Oriented Strandboard Plant

Prepared by
Mike Anderson - 218-834-2363
Susan Somers - 715-634-3332
Louisiana-Pacific Corporation

March 1996

TEST PLAN FOR DRYER/PAINT OVENS AND PRESS VENTS

PART I. GENERAL INFORMATION

1. **Louisiana-Pacific Corporation**
   Industrial Park North, Highway 2
   Two Harbors, MN 55616

2. **Permit File Number:** draft permit number 07500019-006 (1995-95-OT-1)

3. **Reason for testing:** Compliance test pursuant to Air Emission Permit No. 0750019-006 and USEPA Clean Air Act Consent Decree entered into with Louisiana-Pacific Corporation on September 30, 1993. The Decree requires RTO outlet testing for PM and efficiency testing for VOC. The remainder of the testing described in the plan is to satisfy Minnesota's Air Permit.

4. **Physical description and layout of emission units to be tested:**

   A. MEC Model 1260 TNW/L Wafer dryer; triple pass drum. Primary burner McConnell Model no 48 wood fired cyclonic suspension burner. Control equipment: 1) Geoenergy Wet Electrostatic Precipitator, 2) Wheelabrator Clean Air Systems Inc., RTO Stack: 001
   B. Fourteen high velocity convection ovens. Twelve ovens on the lap line and two ovens on the panel line. Ovens used for drying low voc water based coatings. Control equipment: Wheelabrator Clean Air Systems Inc. RTO. Stack 001.
   C. Motala Board Press. 8' X 16' X 8 openings. Control equipment: none. Stack: 003.

   Note: The Minnesota permit also requires testing of the thermal oil heater and baghouses. These compliance demonstrations will be performed at a later date.

5) **Test Plan Drawing list:**

   A-1 process description
   A-2 process flow diagram.
   A-3 Plan view of dryer, paint ovens, control equipment and test port locations
   A-4 Detail of port location A - Primary outlet
   A-5 Detail of port locations B - E-tube outlet, and C - paint dryer outlet
   A-6 Detail of port location D - RTO stack
   A-7 Press Elevation
   A-8 Press Vent detail

PART II. TESTING REQUIREMENTS

1. The following is a description of the pollutants to be tested, and the applicable emission limits and the applicable rules or regulations as cited in the current draft permit. The limitations for VOC efficiency and PM grain loading also reflect the first amendment to the EPA consent decree.

Stack Vent No.: Emission Unit No.	Limitation Basis of Pollutant Tested	Pollutant Tested and Applicable Emission Limit	Specific Methods/Procedures Required Citation
Stack Vent#001 Dryer #001 Burner #002	Consent Decree: to remain a non-major source (40 CFR Part 52.21) Minn. Rules pt. 7011.0610, subp. 1	1) PM: 8.76 lb/hr (0.015 gr/dscf) or as revised pursuant to EPA Consent Decree. PM10: 8.76 LB/hr VOCs: 6.67 LB/hr or 95% capture and control efficiency, which ever is less stringent CO: 30.1 LB/hr NOx: 20.6 LB/hr Formaldehyde: 0.235 LB/hr Opacity 20 percent except that a maximum of 60 percent opacity shall be permissible for four minutes in any 60 minute period and that a maximum of 40 percent opacity shall be permissible for four additional minutes in any 60 minute period	Performance Tests PM & PM 10: **EPA 5*** NOx: **EPA 7 or 7E** CO: **EPA 10** VOCs: **EPA 25A** HCHO: **EPA 0011** OPACITY: **EPA 9** *EPA method 5 as amended by Minn. R. 7011/0725. These results will be counted as PM and PM10.
Stack Vent # 003 Press # 020	To remain a non-major source (40 CFR Part 52.21 Minn. Rules pt. 7011.0715, subp. 1	PM: 7.03 lb/hr PM10: 7.03 lb/hr VOCs: 16.3 lb/hr CO: 5.08 lb/hr NOx: 9.65 lb/hr Opacity: 20%	PM & PM10: **EPA 5*** NOx : **EPA 7 or 7E** CO: **EPA 10** VOCs: **EPA 25A** OPACITY: **EPA 9**

The efficiency of the pollution control equipment for VOC's will be determined by samples taken at four locations:

A = After the dryer primary cyclone.
B = After the WESP
C = After the introduction of paint oven exhaust
D = RTO stack.

Results from location A, after the primary cyclone, will determine the VOC contribution from the dryer. The quantity of VOC added by the paint drying operation will be determined by subtracting the mass rate obtained at location B from the mass rate obtained at location C. The efficiency of the pollution control system will be determined as follows:

VOC EFFICIENCY = 1- ((VOC @D) / ((VOC@A + (VOC@C-VOC@B)))

PART II. TESTING REQUIREMENTS

The following sections contain a detailed description of the emission units to be tested. Included in the description are anticipated operating parameters along with descriptions of the record keeping to be performed during the tests.

1. **Stack Vent No.001: Dryer and paint ovens controlled by an RTO**

Process Equipment Description for units to be tested:
One MEC model 1260 TNW/L triple pass rotary drum wafer dryer with a rated capacity of 32,600 lb./hr. of wafers @ 6 ½ % moisture. Primary burner is a McConnell model no 48 wood fired cyclonic suspension burner with a rated capacity of 40 mmbtu/hr.

Fourteen high velocity convection ovens including twelve1.2 mmbtu/hr ovens on lap line and two 1.6 mmbtu/hr ovens on the panel line. Emissions from these ovens are also ducted to the RTO.

Dryer Process Rates/Operating Conditions During Testing:
The dryer will be operated at a rate sufficient to maintain press production within 90% of the maximum rate of 13.02 tons of finished product per hour. It is anticipated that while running 7/16" board the forming line will operate at 35 ft/min.

The dryer McConnell burner will use dry fines as fuel during testing. Fuel counts will be recorded during testing. Counts will be factored by the current quarterly fuel calibration to obtain pounds of fuel burned. A dry fuel sample will be sent to the laboratory for analysis. Wafers will be dried to 4.5% - 5.5% moisture by weight. The following dryer operating parameters will be recorded at a ten minute frequency:

- dryer inlet temp. °F
- dryer outlet temp. °F
- dryer outlet temp °F
- wet bin live bottom speed as % of maximum
- fuel count.

Dryer production rate in pounds of dry furnish per hour will be determined based on press production plus screened fines and board trim using the following formula:

$$\frac{\text{lb. Dryer Production}}{\text{Hr}} = \frac{\text{Tons press production/hr.}}{1 - (0.07 + 0.08)} / 2000$$

Where: Board trim = 7% of finished product weight
screened fines = 8% of finished product weight.
Trim and fines percentages will be verified during testing.

Paint oven Process Rates/Operating Conditions During Testing
Products to be run during testing will include 7/16 lap and panel siding. The production rate and paint application rate will be maximized considering production schedules at the time of testing. The following operating parameters will be recorded during testing:

- The type and quantity, on an hourly average, of coatings used.
- The type and quantity, on an hourly average, of product produced.
- Lap line speed
- Panel line speed

Vendor product specification sheets for VOC content of coatings will be included in the final test report.

Control equipment description and anticipated operating parameters
Emissions from the dryer are controlled by a wet electrostatic precipitator (WESP) manufactured by Geoenergy followed by a Wheelabrator regenerative thermal oxidizer (RTO). Emissions from the paint dyers are ducted directly to the RTO.

Wet Electrostatic Precipitator - model 1013-378 2 T/R *GEOENERGY* E-tube®
Operating specifications included:

- Primary and secondary volts >40KV
- Primary and secondary amperes 150-300mA
- Number of fields on line: 2
- Flue gas conditioning: saturation of gas stream.
- Voltages, amperes, flush cycles, and blowdown information will be recorded on a ten minute frequency or by a continuous recorder during testing.

Regenerative Thermal Oxidizer. Wheelabrator Clean Air Systems Inc.
Operating specifications include:

- Combustion temperature: >1500°F
- Primary fuel: natural gas
- Combustion chamber temperature will be recorded continuously during testing.

2. Stack Vent No. 003 Press

Process Equipment Description for units to be tested:
One Motala Board Press, 8' x 16' x 8 openings which is vented by two roof mounted exhaust fans with an estimated airflow of 36,800 acfm each. Emissions from the press vents are uncontrolled. The press vents are two rectangular ducts which transition into round stacks.

These vents will be treated as one source during testing. One half of the test run will be conducted per vent.

Press Process Rates/Operating conditions During Testing:
It is anticipated that the press will be operated at a rate which produces within 90% of the maximum permit rate of 13.02 tons of finished product per hour. Production will consist of 7/16" siding product with paper overlay and backer. Line speed at this rate is anticipated to be 35 feet per minute. The following operating parameters will be recorded during testing:

- Pounds of resin used per hour using micro motion totalizer readings.
- Pounds of wax used per hour.
- Pounds of zinc borate used per hour.
- Press temperature each hour.
- Number of pressloads will be continuously recorded by the press chart.

PART IV. TEST METHODS

1. The following is a description of the methods, number of test runs, length of test runs, and sampling rate of each pollutant:
   A. EPA Method 1 for the location of sampling ports and points.
   B. EPA Method 2 for velocity and volumetric flow rate. One measurement concurrently with each test run for every pollutant.
   C. EPA Method 3 for gas analysis. One test run on an integrated sample taken concurrently with each test run for every pollutant.
   D. EPA Method 4 for the determination of moisture in the flue gasses. One test run concurrently with each test run for every pollutant.
   E. EPA Method 5 as amended by Minn. R. 7011.0725 for the concentration of particulate matter including organic condensibles. Results are to be reported both as filterable particulate matter containing organic condensible (where the limit includes organic condensable), and as filterable particulate matter excluding organic condensable (where the limit does not include organic condensable). Run time: 60 minutes, Sample volume: 32dscf (0.90 dscm) No. Runs: 3.
   F. EPA Method 9 as amended by Minn. R. 7017.2060 for visual determination of opacity. One hour of observations, concurrently with a test run for particulate.
   G. EPA Method 10 Carbon monoxide concentration and emission rate (three (3) one-hour determinations).
   H. EPA Method 25A Total hydrocarbons (THC) concentration and emission rate (three (3) one-hour determinations).
   I. EPA Method 0011 Formaldehyde concentration and emission rate (three (3) 60-minute determinations).
   J. VOC capture and control efficiency for the dryer/paint ovens shall be determined by comparing the quantity of emissions from the effluent of the product separation cyclone with emissions from the WESP before the drying ovens tie in and after the drying ovens tie in, with the emissions from the RTO stack.

PART V. CEM data to be collected - NONE

PART VI. OTHER INFORMATION

1) Pollutants to be tested will be reported in terms of the applicable emission limit units.
2) Testing dates: May 7th and 8th, 1996.
3) Exact schedule and firm are yet to be determined. It is anticipated that testing will be performed by Interpoll Laboratories of Circle Pines Minnesota. Minnesota and The USEPA will be notified in the event that an alternate firm is used.
4) Description and date of last maintenance work done before the test will be included in the final test report. The pollution control equipment is currently in the shakedown and debugging phase.
5) One complete test report (one hard copy) shall be submitted within 45 days after the date of the test to the MPCA. A copy of the microfiche report shall be submitted to the MPCA within 105 days after the date of the test. MPCA submittals will be addressed as follows:

Supervisor, Compliance Determination Unit
Compliance & Enforcement Section/AQD
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194

In addition, two copies of the complete test report (hard copy) will be submitted to each of the following no later than July 15, 1996.

Director
Air Enforcement Division
U.S. EPA
Arial Rios Building, Room 1119
Mail Code 2242A
12th St. and Pennsylvania Ave., NW
Washington D. C. 20004

Regional Administrator
U.S. EPA - Region 5
Air and Radiation Division
77 West Jackson Blvd.
Chicago IL 60604-3590

PROCESS AND SOURCE DESCRIPTION

The Louisiana-Pacific facility in Two Harbors, Minnesota, is an oriented strand board manufacturing facility that produces structural panel used for various construction applications. The facility is identified by the Standard Industrial Classification Code 2493.

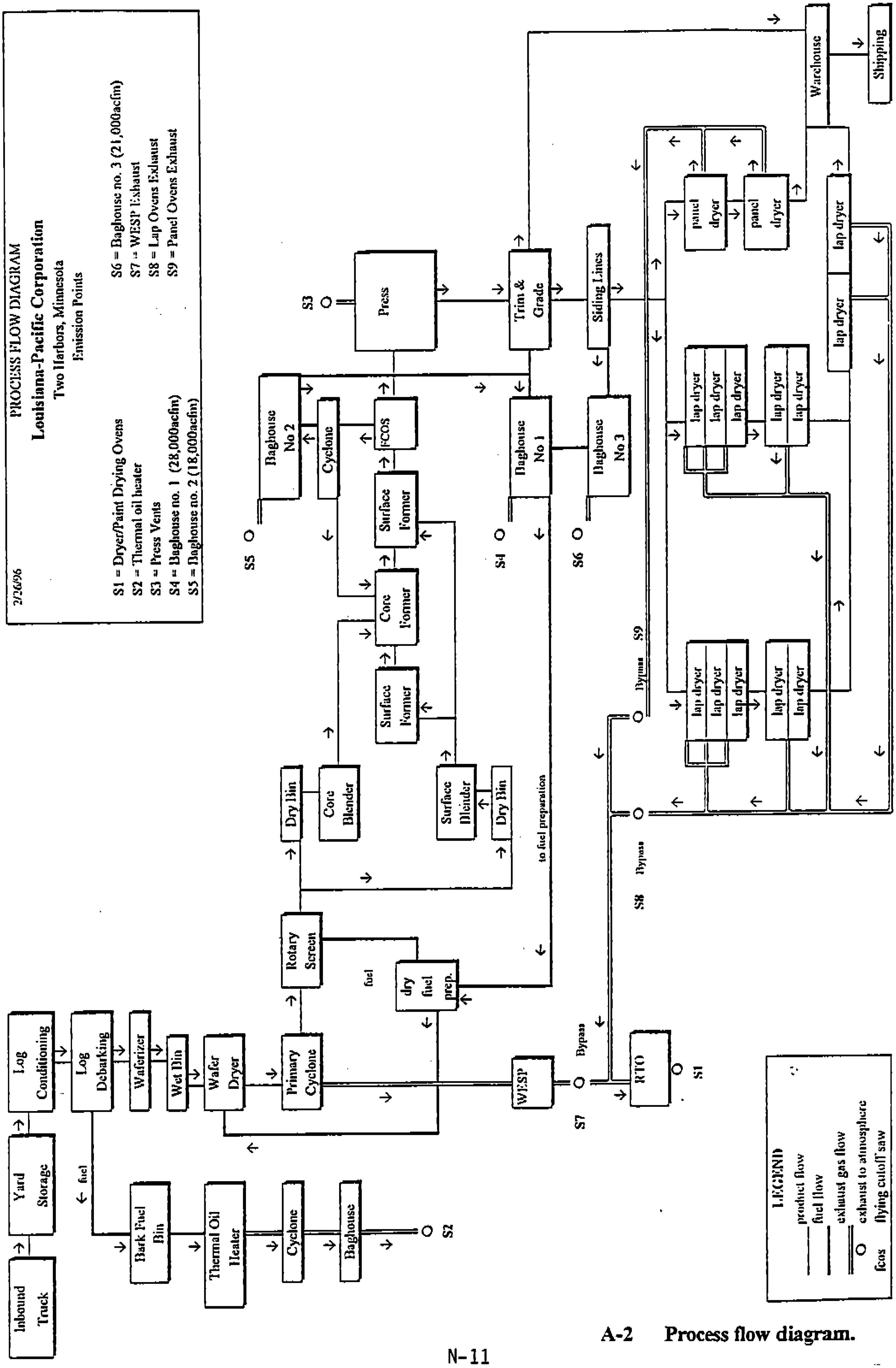
The plant purchases small diameter logs that are debarked and fed to a waferizer. The bark is used as fuel for the thermal oil heater. The waferizer flakes the logs into thin pieces, which are approximately 3 inches long by 1 inch wide by 1/32 inch thick. The freshly cut pieces have a moisture content of approximately 50%. The wet flakes go through a rotary dryer which reduces the moisture content to between 4 and 8 percent. The flakes are then captured by the primary cyclone and the exhaust gas passes through a wet electrostatic precipitator followed by a regenerative thermal oxidizer.

The flakes collected by the primary cyclone drop into a rotary screen, which separates the correctly sized flakes for further processing. The material passing through the screen is used as fuel in the dryer. Wax, resin, and fungicide (for siding products) are mixed with the flakes in rotary blenders. Formers then evenly distribute the flakes onto a moving conveyor. A separate former is used to orient the bottom, core and top layers of the board. The continuous mat of flakes is separated into press size segments by the flying cut-off saw. Paper backer and overlay are applied for siding products.

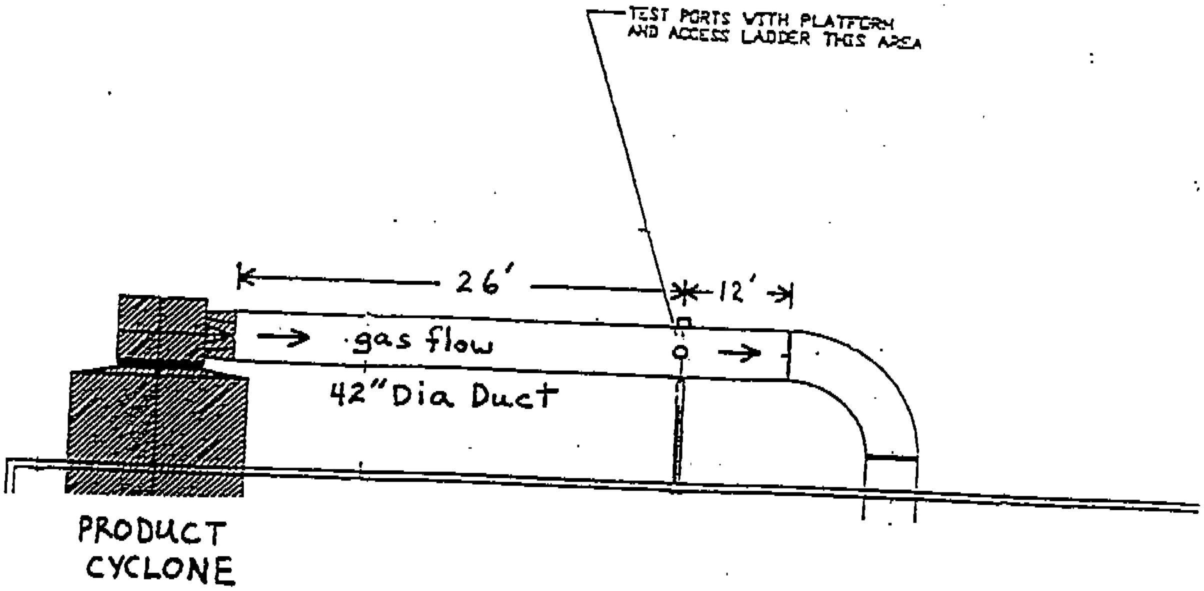
The loader loads the boards into the press and with the combination of heat (supplied by the thermal oil heater) and pressure, the wafer mats are turned into solid boards. These boards are unloaded and cut by the trim saw to the desired sizes. The dust formed by this process is collected and used as fuel in the wafer dryer.

The boards may then be further processed into lap or panel siding. Boards will be cut to the desired lap size, edges profiled and sanded, and edge seal and face primer applied. Panel siding is grooved and edge seal applied to the grooves. Finished boards pass through drying ovens. Dust formed by this process is collected and used as fuel in the wafer dryer.

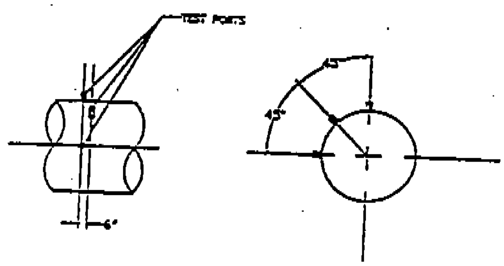
The facility operates several pollution control devices to control emissions. As mentioned previously, the rotary dryer exhaust is controlled by a wet electrostatic precipitator and regenerative thermal oxidizer. Emissions generated by the thermal oil heater pass through a cyclone and baghouse. Emissions from the board press is uncontrolled. Particulate emissions from the saws, conveyors, internal transfer points, etc., are controlled by a number of baghouses. The emissions generated by the drying ovens are controlled by the regenerative thermal oxidizer. The paint spray booth is a three-walled room which exhausts through a fiberglass and fabric filter to plant air.



A-2 Process flow diagram.

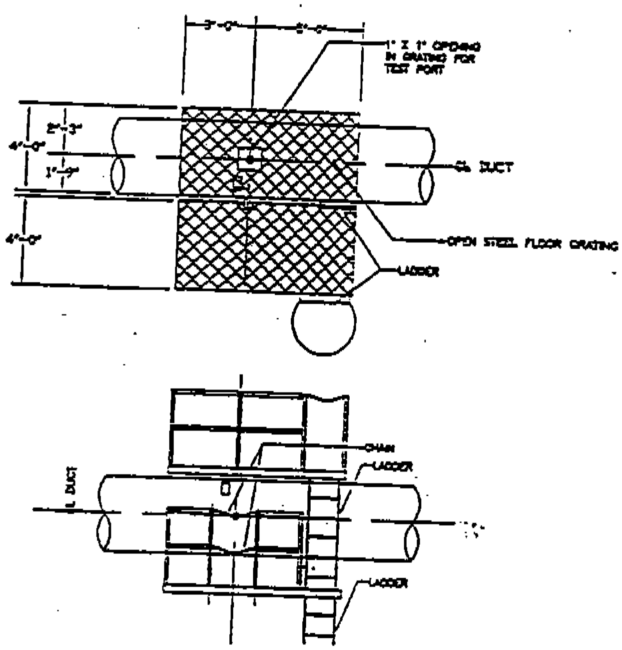


Test port location after product cyclone.
Three 4" test ports,
two ports in line at 90°,
one port offset 6" at 45°.
42" Dia Duct.



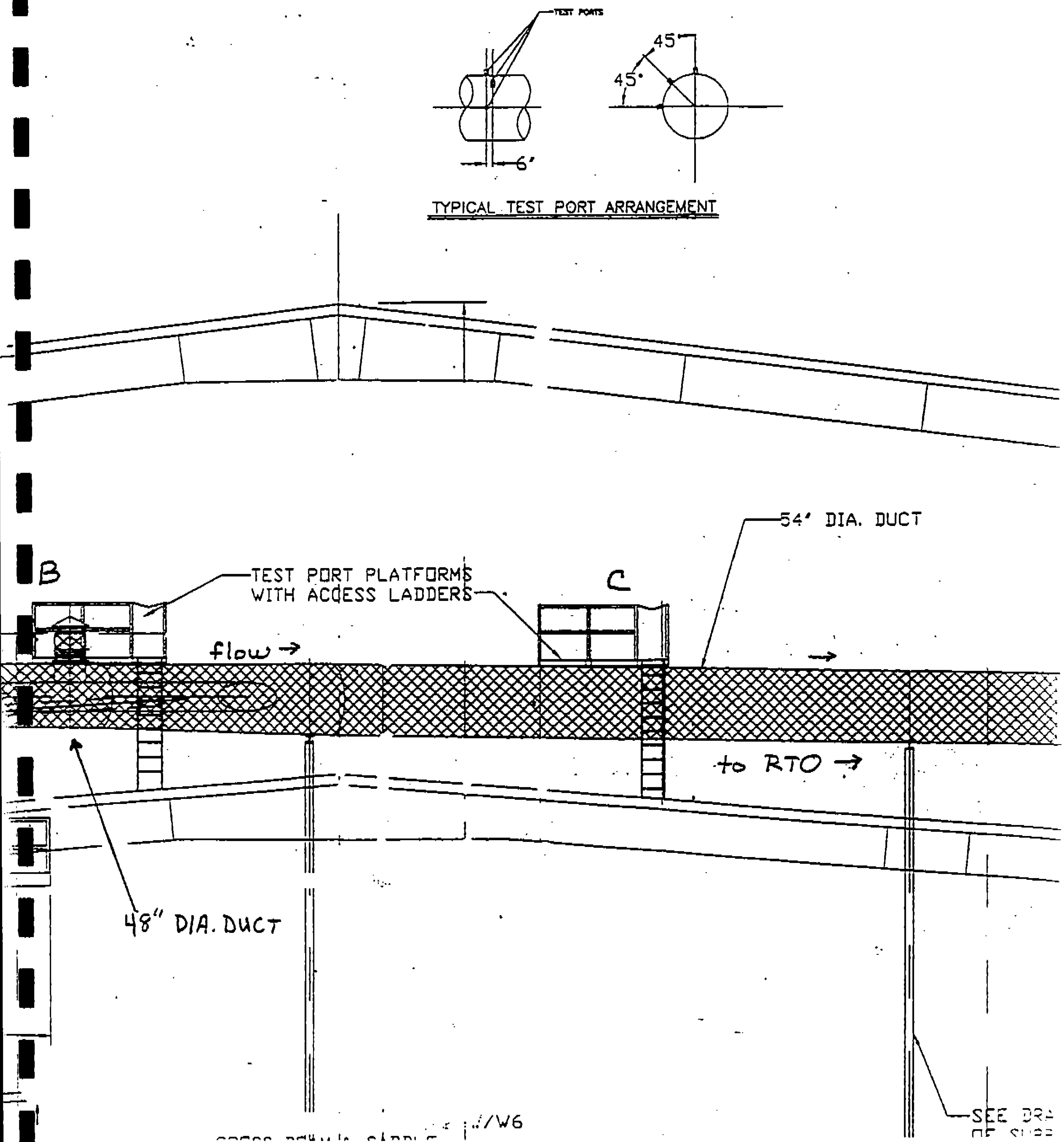
TYPICAL TEST PORT ARRANGEMENT

TWO HARBORS, MN
3/11/96

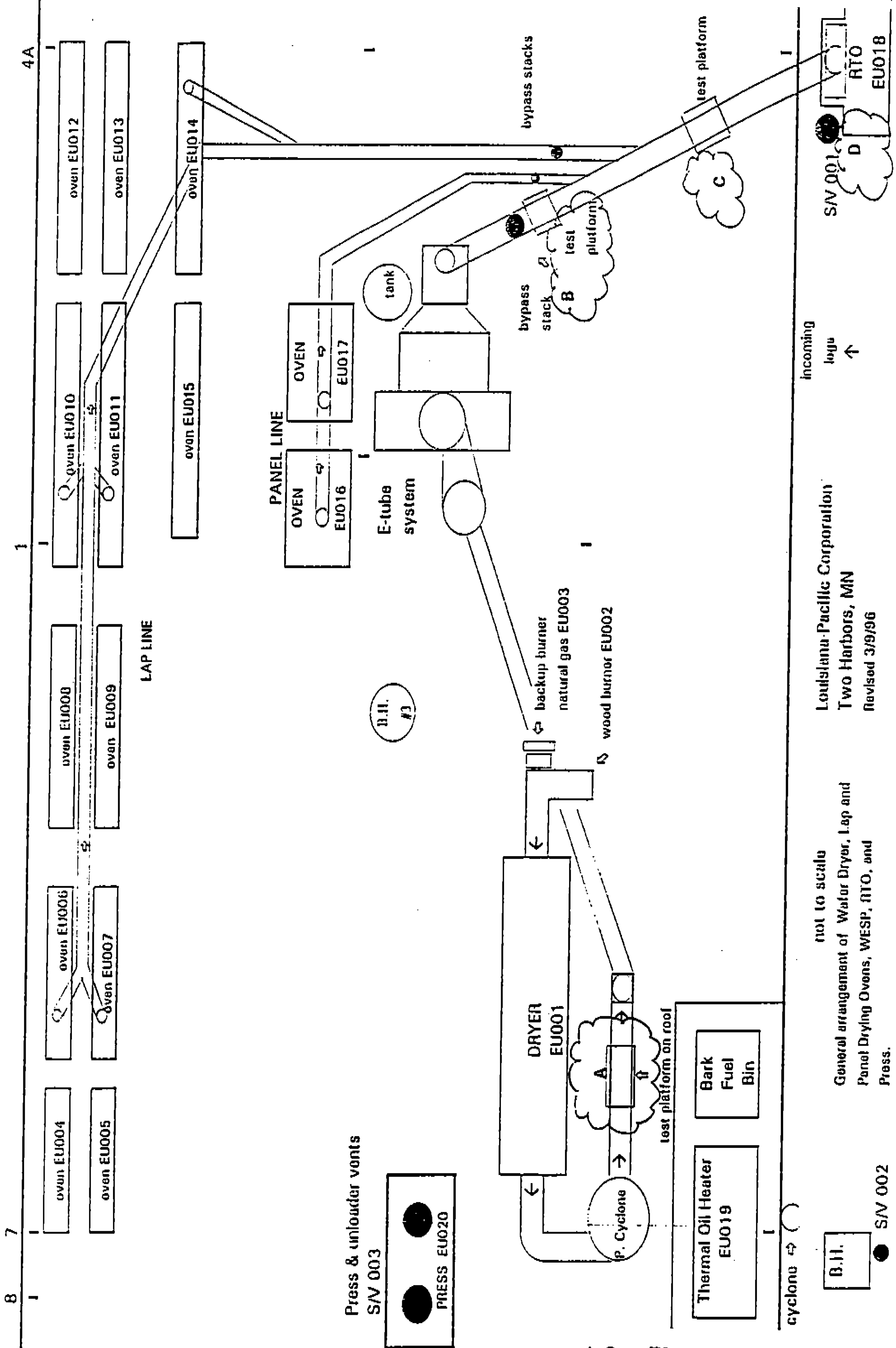


TYPICAL TEST PORT PLATFORM

A-4 Detail of port location A - Primary outlet



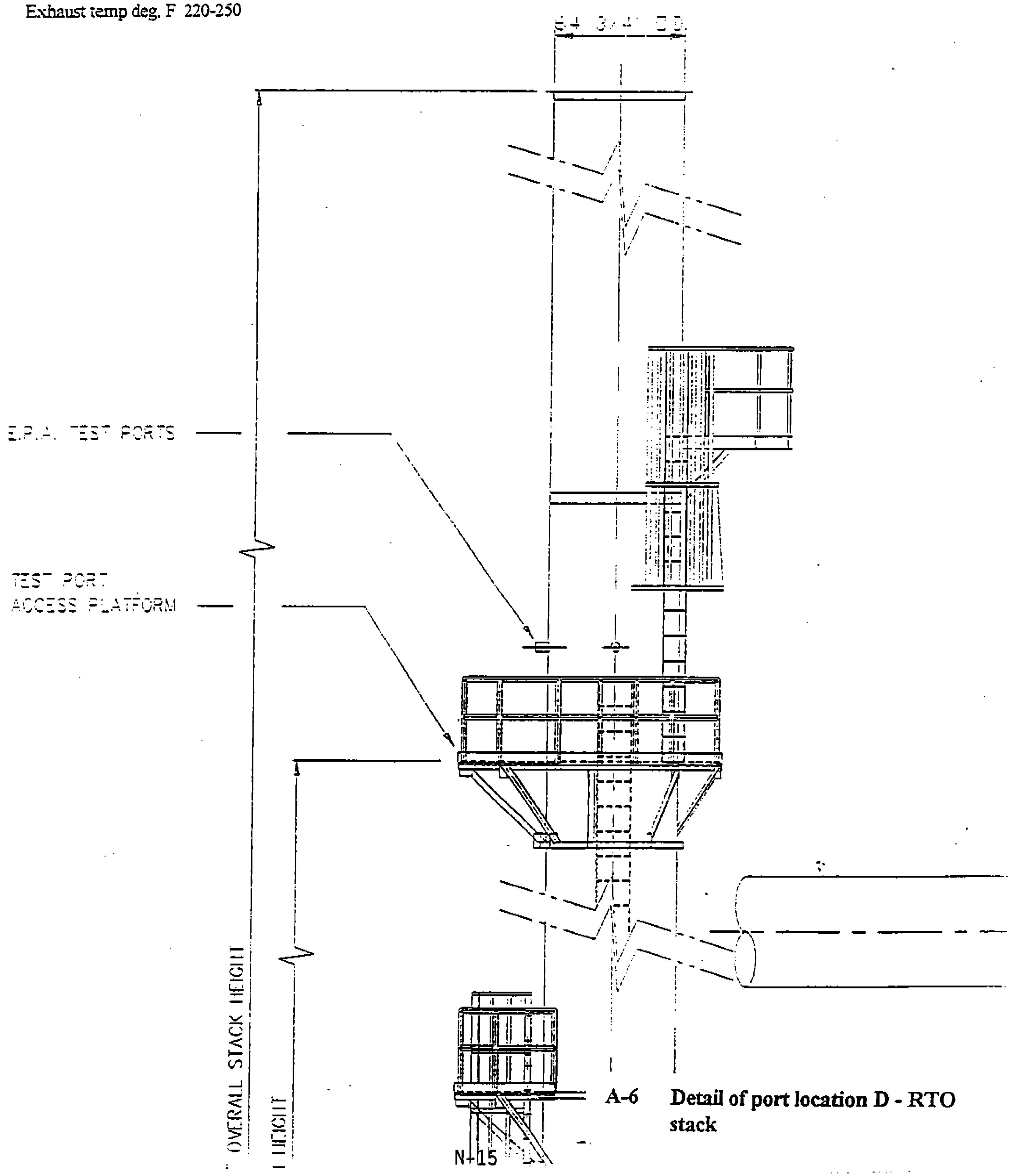
A-5 Detail of port locations B - E-tube outlet, and C - paint dryer outlet



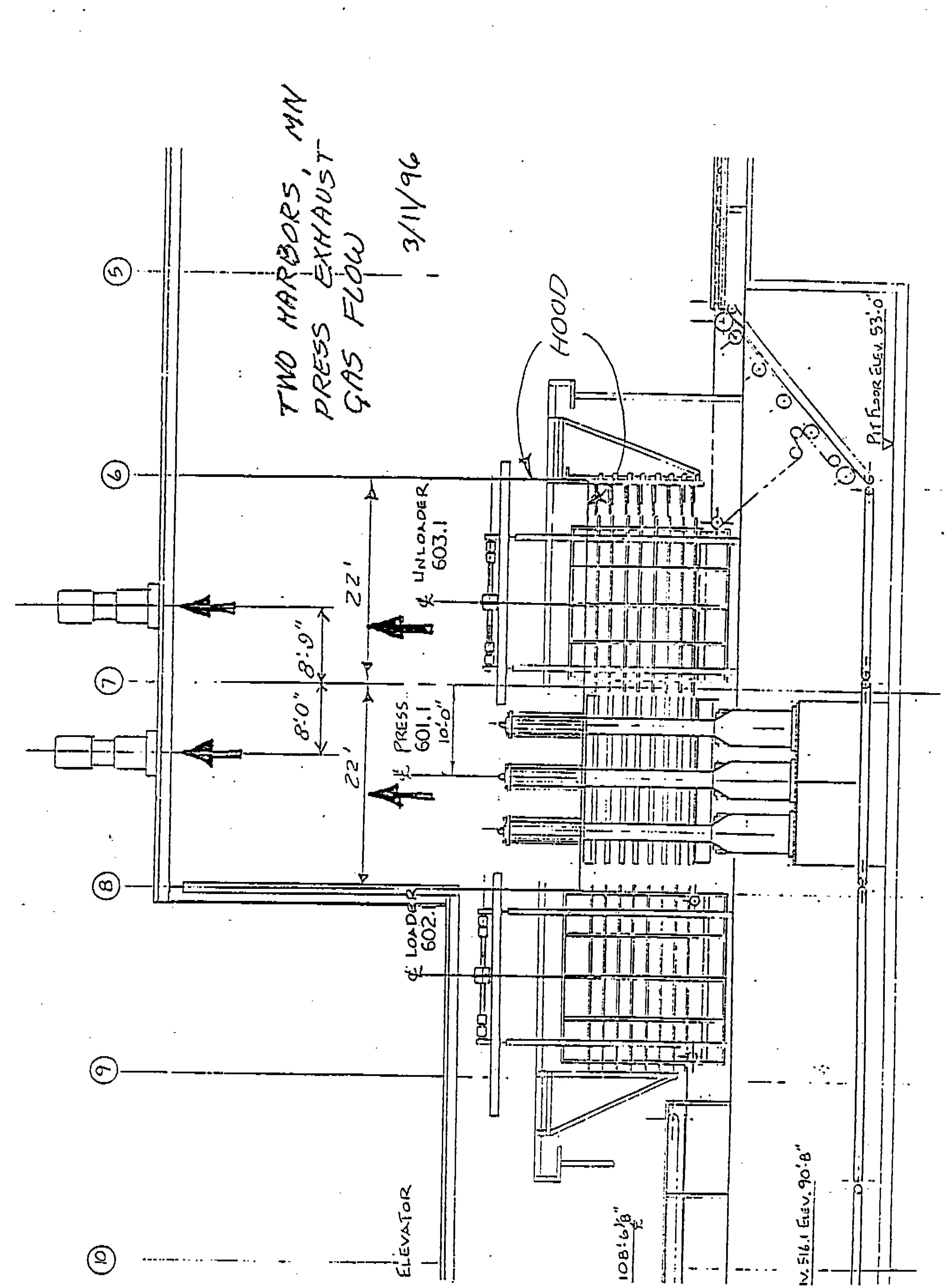
A-3 **Plan view of dryer, paint ovens, control equipment and test port locations**

RTO STACK S/V 001
(Wafer Dryer and paint drying ovens)
Stack height: 100'
Stack Diam.: 64" (ID)
Two 4" test ports at 90°
test ports 35' from flow disturbance
Exhaust temp deg. F 220-250

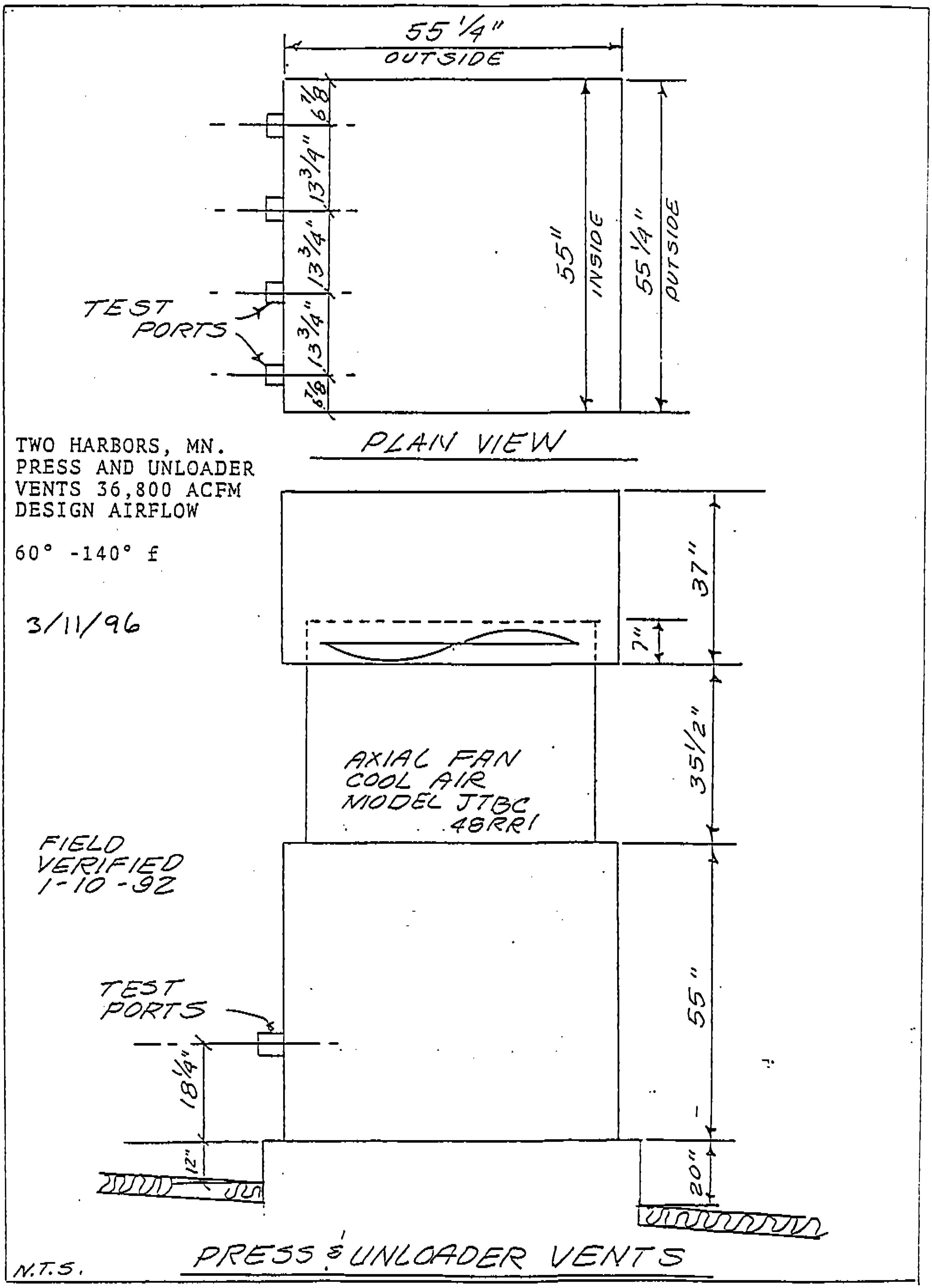
TWO HARBORS, MN
3/11/96



A-6 **Detail of port location D - RTO stack**



A-7 Press Elevation



A-8 Press Vent detail

Minnesota Pollution Control Agency

May 16, 1996

FILE COPY

Ms. Susan Sommers
Louisiana Pacific Corporation
Route 8, Box 8263
Hayward, Wisconsin 54843

RE: April 25, 1996, Test Plan Submittal for the May 21-23, 1996, Performance Test on the Dryer and Press Vent Stacks Pursuant to the First Amendment of the Federal Consent Decree Originally Entered on September 30, 1993

Dear Ms. Sommers:

This letter and its enclosures confirm my facsimile transmission of May 14, 1996, and conclude the pretest requirements for the Louisiana Pacific Corporation (Company) facility located in Two Harbors, Minnesota, as discussed during our telephone conversation of May 3, 1996. Please discuss and provide your consultant with a copy of this letter.

The testing is being conducted pursuant to the above Consent Decree but may also be used to demonstrate compliance with the applicable conditions in draft air emission permit number 07500019-006 (1995-95-OT-1).

The Air Quality Division (AQD) staff of the Minnesota Pollution Control Agency (MPCA) has reviewed the submittal, and has approved the test plan with the following provisions:

1. The process units will be operated at 90-100 percent of capacity. If a unit is operated below this level, it will be subject to an operating limit pursuant to Minn. R. 7017.2025, subp. 3.

2. The RTO will be subject to a limit pursuant to Minn. R. 7017.2025, subp. 3 based on the operating temperature of the unit recorded during the performance test. This will be an instantaneous limit as there is no equipment in place to show compliance with a time averaged temperature limit.

520 Lafayette Rd. N.; St. Paul, MN 55155-4194; (612) 296-6300 (voice); (612) 282-5332 (TTY)
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3. Both method 5 and method 201A will be utilized at the dryer stack, to quantify total particulate and PM10 emissions respectively. Method 201A will not be required at the press vent stack due to sampling limitations and anticipated high moisture content of the exhaust gas.

4. The dryer production rate will be calculated from press production and fuel usage data. All calculations must be documented in the test report.

These provisions are modifications to the test plan, and are to be incorporated into the proposed test.

Copies of the Operating Data Summary For Combustion Sources, Process Sources, Certifications Required For Performance Test Reports, and Microfiche Submittal forms are enclosed. These forms will help you to comply with the submittal requirements of Minn. R. 7017.2035 and 7017.2040. A copy of the test plan, including this letter, should be included as part of the performance test report.

Please remember that it is not the testing consultant's responsibility to submit the test report or microfiche copy of the test report or to certify that the microfiche submitted is an exact copy of the original test report by the deadlines specified in the applicable compliance document (i.e. permit, stipulation agreement, administrative penalty order, etc.). The responsibility for these submittals lies solely with the Company.

Please be aware that enforcement action, which may include a monetary penalty assessment, will be taken for performance test failures. Escalated enforcement action will result following noncompliance with a retest. Action will not normally be initiated until the results of the first retest are reviewed. Upon written notice of a second performance test failure, the Company shall voluntarily shut down the noncompliant unit(s) unless the Company meets the requirements of Minn. R. 7017.2025, subp. 5. For the purposes of enforcing an emission limit, the period of noncompliance begins at the date of the initial noncompliant performance test. Results of a performance test are not final until AQD staff provides written compliance determination.

If you have any questions regarding this letter or the enclosures, please contact me at (612)296-7774.

Sincerely,

Stuart Arkley
Performance Test Coordinator
Compliance Determination Unit
Compliance and Enforcement Section
Air Quality Division

SA:lat

Enclosures

cc: Bob Beresford, MPCA Duluth Regional Office
AQD File No. 1995