#37

4-58

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FILE COPY

RESULTS OF THE JULY 19 & 20, 1994 AIR EMISSION COMPLIANCE TESTS AT THE LOUISIANA PACIFIC OSB PLANT IN MONTROSE, COLORADO

Submitted to:

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

Attention:

Sue Somers

Approved by:

Daniel J. Despen
Manager
Stationary Source Testing Department

Report Number 4-3396
August 17, 1994
SB/sab

TABLE OF CONTENTS

APPENDICES:

ABBREVIATIONS

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

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

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

1 INTRODUCTION

On July 19 & 20, 1994 Interpoll Laboratories personnel conducted air emission compliance tests at the Louisiana Pacific Corporation (LP) OSB Plant located in Montrose, Colorado. A particulate emission determination was conducted on the Dryer E-Tube Outlet. Carbon monoxide concentrations and emission rates were simultaneously determined at the Dryer E-Tube Outlet and McConnel Burner Outlet. On-site testing was performed by E. Trowbridge, D. Vaaler, and K. Nuessmier. Coordination between testing activities and plant operation was provided by Sue Somers of LP. The test was witnessed by Charles D. Cox and Scott Miller of the Colorado Department of Health, Air Pollution Control Division.

The Wafer Dryer tested is a Model 1260 TNW/L dryer manufactured by MEC Company, heat is supplied by a McConnel Burner. It is equipped with a pneumatic injection system for firing wood fines and has a design heat input capacity of 40 10^6BTU/HR. Particulate emissions from the Wafer Dryer are controlled by a primary cyclone followed by a secondary multicyclone also manufactured by MEC Company in series with an E-Tube wet electrostatic precipitator manufactured by Geoenergy, Inc. Cleaned flue gas is emitted to the atmosphere by a 103-foot high radial steel stack which has a diameter of 48 inches.

Particulate evaluations were performed in accordance with EPA Methods 2-5, CFR Title 40, Part 60, Appendix A (revised July 1, 1993). A preliminary determination of the gas linear velocity profile was made at each test location before the first particulate determination to allow selection of the appropriate nozzle diameter for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to isokinetically extract particulate samples by means of a heated glass-lined probe. Wet catch samples were collected in the back half of the Method 5 sampling train and analyzed in accordance with EPA Method 202.

Carbon monoxide determinations were performed in accordance with Method 10. A slip stream of sample gas was withdrawn from the exhaust gas stream using a heated stainless steel probe equipped with a filter to remove interfering particulate material. The particulate-free gas was transported to the 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 the carbon monoxide analyzer was recorded with a strip chart recorder. The analyzer was calibrated with Linde Gases and Certified Master standard gases. The instrument was calibrated before and after each run as per EPA Method 10. The sample probe was moved through a three-point traverse (1/6, 3/6, 5/6 of the stack diameter) to measure carbon monoxide concentrations.

Integrated flue gas samples were extracted simultaneously with each of the above-referenced sampling trains at the dryer test site using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags housed in a protective aluminum container. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis. Prior to sampling, the Tedlar bags are leak checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable inleakage are discarded.

Testing on the Dryer was conducted from two test ports oriented at 90 degrees on the stack. These test ports are located 3.4 stack diameters downstream of the nearest flow disturbance and 10.5 stack diameters upstream of the stack exit. A 24-point traverse was used to collect the particulate and formaldehyde samples. Each traverse point was sampled 3 minutes for the particulate sampling for a total of 72 minutes per run.

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

2 SUMMARY AND DISCUSSION

The important results of the particulate emission compliance test are summarized in Table 1. The particulate results have been calculated using the dry catch only ("a" Table) and again with the dry plus wet catch ("b" Table). As will be noted, the Dryer particulate emission rate averaged 4.34 LB/HR for the (dry catch only).

The carbon monoxide results are summarized in Table 2. The Dryer E-Tube Outlet emission rate averaged 14.7 LB/HR. The carbon monoxide concentration at the McConnel Burner Outlet averaged 39 ppm,d.

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

Table 1a. Summary of the Results of the July 19, 1994 Particulate Emission Compliance Test on the Dryer E-Tube Outlet at the Louisiana Pacific Corporation Plant Located in Montrose, Colorado.

ITEM		Run 1	Run 2	Run 3
Date of test		07-19-94	07-19-94	07-19-94
Time runs were done	(HRS)	1532/1646	1809/1924	2010/2122
Process rate	(TONS/HR)	11.0	11.0	11.0
Volumetric flow				
actual	(ACFM)	60376	62102	59024
standard	(DSCFM)	34956	36554	33236
Gas temperature	(DEG-F)	144	143	143
Moisture content	(%V/V)	19.99	18.81	22.25
Gas composition	(%V/V,dry)			
carbon dioxide		2.55	2.20	2.80
oxygen		18.40	18.80	18.10
nitrogen		79.05	79.00	79.10
Isokinetic variation	(%)	99.7	98.4	103.2
Particulate concentration				
actual	(GR/ACF)	.0100	.00703	.00806
standard	(GR/DSCF)	.0174	.0120	.0143
Part. emission rate	(LB/HR)	5.20	3.74	4.08
Part. emission factor	(LB/TON FP)	0.47	0.34	0.37

Note: Dry Catch Only

Table 1b. Summary of the Results of the July 19, 1994 Particulate Emission Compliance Test on the Dryer E-Tube Outlet at the Louisiana Pacific Corporation Plant Located in Montrose, Colorado.

ITEM		Run 1	Run 2	Run 3
Date of test		07-19-94	07-19-94	07-19-94
Time runs were done	(HRS)	1532/1646	1809/1924	2010/2122
Process rate	(TONS/HR)	11.0	11.0	11.0
Volumetric flow				
actual	(ACFM)	60376	62102	59024
standard	(DSCFM)	34956	36554	33236
Gas temperature	(DEG-F)	144	143	143
Moisture content	(%V/V)	19.99	18.81	22.25
Gas composition	(%V/V,dry)			
carbon dioxide		2.55	2.20	2.80
oxygen		18.40	18.80	18.10
nitrogen		79.05	79.00	79.10
Isokinetic variation	(%)	99.7	98.4	103.2
Particulate concentration				
actual	(GR/ACF)	.0157	.0137	.0147
standard	(GR/DSCF)	.0271	.0233	.0262
Part. emission rate	(LB/HR)	8.11	7.31	7.45
Part. emission factor	(LB/TON FP)	0.74	0.67	0.68

Note: Dry + Method 202 Condensible Particulate Materials

Table 2. Summary of the July 19 & 20, 1994 **Carbon Monoxide** Emission Compliance Tests at the Louisiana Pacific OSB Plant in Montrose, Colorado.

Date	Time (HRS)	Concentration (ppm,d)	Emission Rate (LB/HR)	Emission Rate (LB/TFP)
(Dryer E-Tube Outlet)				
7-19-94	2200-2300	60	8.65	0.82
7-19-94	2330-0030	125	18.12	1.72
7-20-94	0050-0150	119	17.25	1.64
Avg.		101	14.67	1.39
(McConnel Burner Outlet)				
7-19-94	2200-2300	42	N/A	N/A
7-19-94	2330-0030	40	N/A	N/A
7-20-94	0050-0150	35	N/A	N/A
Avg.		39	N/A	N/A

TFP = Ton Finished Product (10.55 TON/HR 7-19-94)

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition (orsat and moisture) are presented first followed by the computer printout of the particulate results. Preliminary measurements including test port locations are given in the appendices.

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

3.1 Results of Orsat and Moisture Determinations

Test No. 1
Dryer E-Tube Outlet

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

	Run 1	Run 2	Run 3
Date of run	07-19-94	07-19-94	07-19-94
Dry basis (orsat)			
carbon dioxide............	2.55	2.20	2.80
oxygen....................	18.40	18.80	18.10
nitrogen..................	79.05	79.00	79.10
Wet basis (orsat)			
carbon dioxide............	2.04	1.79	2.18
oxygen....................	14.72	15.26	14.07
nitrogen..................	63.24	64.14	61.50
water vapor...............	19.99	18.81	22.25
Dry molecular weight........	29.14	29.10	29.17
Wet molecular weight........	26.92	27.02	26.69
Specific gravity............	0.930	0.933	0.922
Water mass flow......(LB/HR)	24505	23753	26686
FO	0.980	0.955	1.000

$\frac{61.05}{3} = 20.35$

3.2 Results of Particulate Determinations

Test No. 1
Dryer E-Tube Outlet

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

	Run 1	Run 2	Run 3
Date of run	07-19-94	07-19-94	07-19-94
Time run start/end.....(HRS)	1532/1646	1809/1924	2010/2122
Static pressure......(IN.WC)	0.32	0.32	0.32
Cross sectional area (SQ.FT)	12.44	12.44	12.44
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	196.0	170.0	209.0
desiccant..........(GRAMS)	9.0	26.0	22.0
total..............(GRAMS)	205.0	196.0	231.0
Total particulate material.. ....collected(grams)	0.0679	0.0603	0.0645
Gas meter coefficient.......	1.0008	1.0008	1.0008
Barometric pressure..(IN.HG)	24.74	24.74	24.74
Avg. orif.pres.drop..(IN.WC)	1.13	1.21	1.10
Avg. gas meter temp..(DEF-F)	97.6	98.3	95.2
Volume through gas meter....			
at meter conditions...(CF)	49.21	50.81	48.21
standard conditions.(DSCF)	38.68	39.89	38.05
Total sampling time....(MIN)	72.00	72.00	72.00
Nozzle diameter.........(IN)	.188	.188	.188
Avg.stack gas temp ..(DEG-F)	144	143	143
Volumetric flow rate........			
actual..............(ACFM)	60376	62102	59024
dry standard.......(DSCFM)	34956	36554	33236
Isokinetic variation.....(%)	99.7	98.4	103.2
Particulate concentration...			
actual...........(GR/ACF)	0.01567	0.01372	0.01472
dry standard.....(GR/DSCF)	0.02708	0.02332	0.02615
Particle mass rate...(LB/HR)	8.115	7.305	7.450

3.3 Results of Carbon Monoxide Determinations

Test No. 2
Dryer E-Tube Outlet

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

	Run 1	Run 2	Run 3
Date of run	07-19-94	07-19-94	07-20-94
Time run start/end.....(HRS)	2200/2300	2330/0030	0050/0150
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content......(%V/V)	22.25	22.25	22.26
O2 Concentration......(%V/V)	18.10	18.10	18.10
Volumetric flow rate (DSCFM)	33236	33236	33236
CO concentration............			
(GR/DSCF).................	0.0304	0.0636	0.0606
(MG/DSCM).................	69.55	145.63	138.64
(PPM-WET).................	46.42	97.19	92.51
(PPM-DRY).................	59.70	125.00	119.00
(PPM-DRY @ 7% O2).........	288.21	603.45	574.48
CO emission rate.....(LB/HR)	8.654	18.119	17.250

CO = Carbon monoxide

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

APPENDIX A

PRELIMINARY VOLUMETRIC FLOW RATE DETERMINATION

Test No. 1
Dryer E-Tube Outlet

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

Date of Determination............	07-19-94
Time of Determination.......(HRS)	1539
Barometric pressure.......(IN.HG)	24.74
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	24
Shape of duct....................	Round
Stack diameter...............(IN)	47.75
Duct area.................(SQ.FT)	12.44
Direction of flow................	UP
Static pressure...........(IN.WC)	.32
Avg. gas temp............(DEG-F)	144
Moisture content..........(% V/V)	19.99
Avg. linear velocity.....(FT/SEC)	80.1
Gas density.............(LB/ACF)	.05057
Molecular weight......(LB/LBMOLE)	29.14
Mass flow of gas..........(LB/HR)	181397
Volumetric flow rate.............	
actual...................(ACFM)	59782
dry standard............(DSCFM)	34605

APPENDIX B

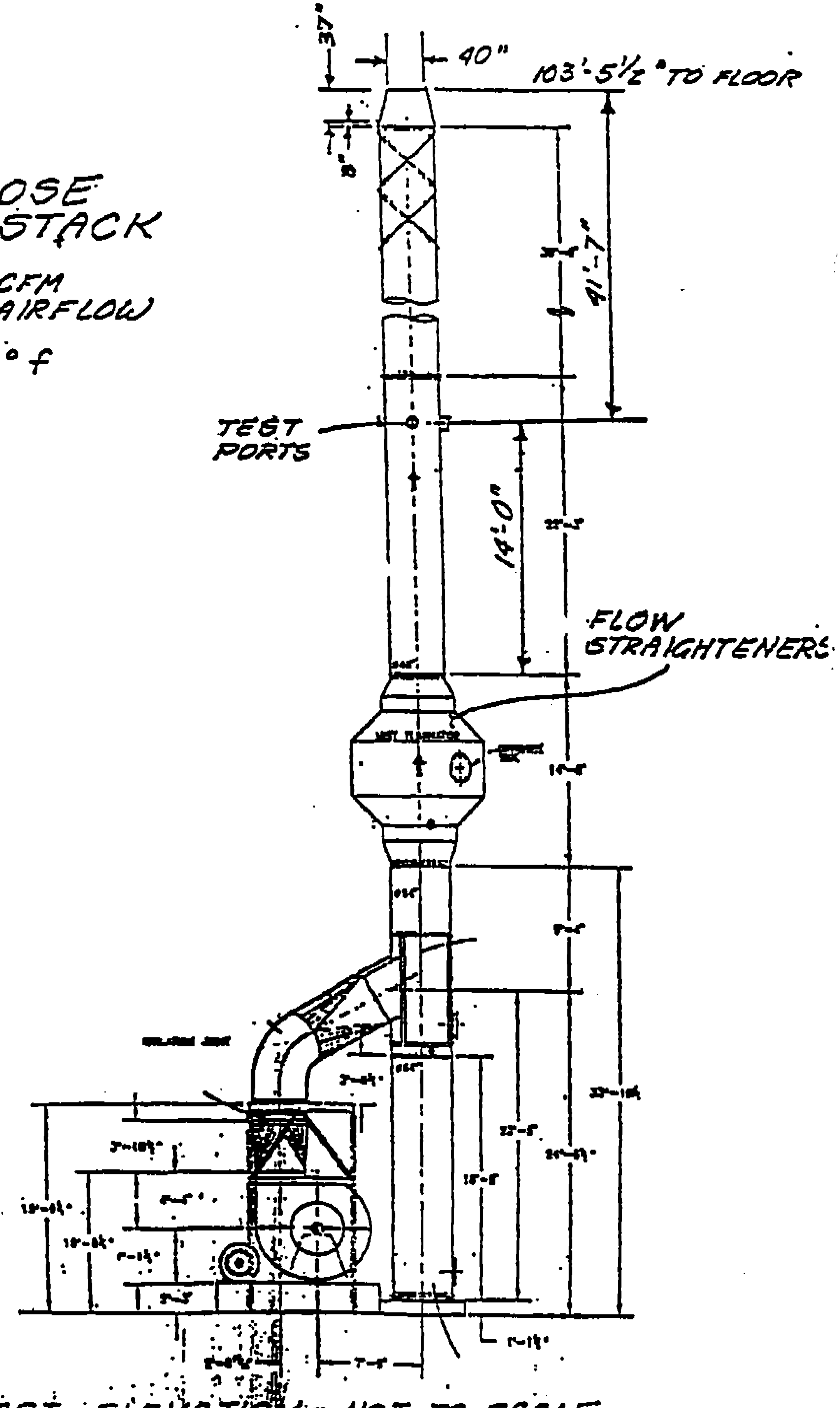
LOCATION OF TEST PORTS

MONTROSE
DRYER STACK

60,000 ACFM
DESIGN AIRFLOW

140° - 160° f

12-2-92



EAST ELEVATION - NOT TO SCALE

APPENDIX C

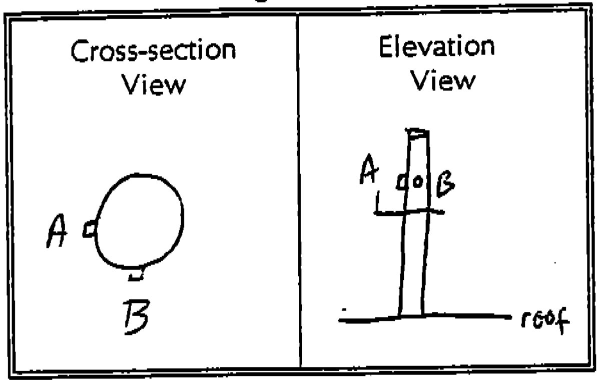
DRYER E-TUBE FIELD DATA SHEETS

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job L. P Martrosen
Source
Test 1 Run 1 Date 7-19-94
Stack Dimen. 47.75 IN.
Dry Bulb ____ °F Wet bulb ____ °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 24.74 IN.HG
Static Pressure +.32 IN.WC
Operators David Van Eck Ken Neuringer
Pitot No. 770 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 (°F)
▨		Port Length: 6"	IN.	Time Start: 15:39	HRS
A-1	.021	1.6	7.0	1.08	144
2	.067	3.20	9.2	1.25	
3	.118	5.63	11.63	1.30	
4	.177	8.45	14.45	1.31	
5	.250	11.93	17.93	1.32	
6	.356	16.99	230	1.40	
7	644	30.75	36.75	1.21	
8	.750	35.81	41.81	1.38	
9	.823	39.3	45.3	1.42	
10	.882	42.12	48.12	1.47	
11	.933	44.55	50.55	1.49	
12	.979	46.75	52.74	1.25	
B-1				1.09	144
2				1.29	
3				1.36	
4				1.31	
5				1.27	
6				1.18	
7				1.38	
8				1.65	
9				1.70	
10				1.74	
11				1.76	
12				1.50	
Temp. Meas. Device & S/N: 37				1545 Time End:	HRS

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

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Montrose
Source Dryer E Tube outlet
Method 5 Filter holder: glass
Date 7-19 Test 1 Run 1
No. of traverse points 24
Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☑
Post test: 6.0 cfm at 5.0 in. Hg. (vac) ☑

Particulate Catch Data:

No. of filters used: 1
10776

Recovery solvent(s)
☑ acetone 1
☐ other(s)

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	690	} 494	196
Impinger No. 3			
Condenser			
Desiccant	1555	1546	9
Total	▨	▨	205

Integrated Gas Sampling Data:

Bag Pump No. 22 A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0.0 cc/min at 15.0 in. Hg.
Time start: 1532 (HRS) Time end: 1646 (HRS)
Sampling rate: 450 cc/min Operator: DV
Box No. 24 Bag No. 1
Size: 44 L

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

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. Mutrose
Source Dryer E Tube outlet
Date 7-14-92 Test 1 Run 1

Operators D.V &KN
Meter Box No. 9 ΔH@ 1.79 IN WC
Calculator coeff. 1.0008

Pitot No. V22-6 Cp .84
Bar. Press. 24.74 in Hg H2O 20 %
Nozzle No. 8-3 Nozzle Dia .1825 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (in WC)	Orifice Meter (in WC)	Dev. Vol. (cf)	VAC. in Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1532	761.74											
B-12	3	763.78	1.52	1.21	3.84	3	145	238	241	38	95	92	18.1
11	6	766.02	1.72	1.38	6.08	4	145	241	239	40	96	92	18.3
10	9	768.25	1.70	1.76	8.32	4	145	242	231	39	97	92	18.1
9	12	770.49	1.67	1.34	0.54	4	145	235	235	41	97	92	18.2
8	15	772.66	1.62	1.30	2.73	4	145	233	238	42	98	92	18.0
7	18	774.90	1.66	1.33	4.94	4	145	231	237	39	99	93	18.3
6	21	777.00	1.44	1.16	7.01	4	145	237	239	38	99	94	18.4
5	24	778.82	1.10	0.88	8.82	3	145	241	239	37	99	94	18.3
4	27	780.68	1.18	0.95	0.70	3	143	240	241	40	100	94	18.4
3	30	782.64	1.33	1.08	2.70	3	142	242	238	39	100	94	18.7
2	33	784.68	1.36	1.10	4.72	3	140	240	237	40	101	95	18.6
1	36	786.73	1.35	1.09	6.73	3	142	240	238	41	101	95	18.7
A-12	39	788.02	1.28	1.04	8.70	3	142	242	239	42	100	94	18.7
11	42	790.75	1.50	1.21	0.81	3	141	239	240	42	101	95	18.4
10	45	792.88	1.44	1.16	2.89	3	144	241	238	41	102	95	18.3
9	48	794.97	1.41	1.14	4.95	3	142	240	233	39	103	96	18.4
8	51	797.02	1.36	1.10	6.97	3	144	244	235	38	103	96	18.4
7	54	798.90	1.16	0.94	8.84	3	144	246	234	38	104	96	18.2
6	57	800.81	1.32	1.07	0.84	3	145	243	235	38	103	97	18.5
5	60	802.77	1.34	1.08	2.85	3	145	244	235	39	104	97	18.6
4	63	804.80	1.33	1.08	4.85	3	144	239	234	39	104	97	18.7
3	66	806.86	1.31	1.06	6.85	3	144	245	235	39	104	97	18.6
2	69	808.90	1.33	1.08	8.85	3	144	241	235	39	102	97	18.7
1	72	810.95	1.32	1.07	0.85	3	144	244	238	40	102	96	18.7
	1646												
	θ = 72	Vm = 49.21		ΔH = 1.13							Avg. =	97.6	

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.A. Montrose
Source Dryer ETube OUTLET
Method 5 Filter holder: glass
Sample Train Leak Check:

Date 7-19 Test 1 Run 2
No. of traverse points 24
Filter type: glass fiber

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: ___ cfm at ___ in. Hg. (vac) ☒ .025 CFM in 1 min

Particulate Catch Data:

No. of filters used: 1
6774

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

No. of probe wash bottles: 1
Sample recovered by: DV & KN

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	667	497	170
Impinger No. 3			
Condenser			
Desiccant	1462	1436	26
Total	▨	▨	196

Integrated Gas Sampling Data:

Bag Pump No. 22 A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0.0 cc/min at 15.0 in. Hg.
Time start: 1809 (HRS)
Sampling rate: 400 cc/min

Box No. 24 Bag No. 2
Size: 44 L
Time end: 1924 (HRS)
Operator: DV

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

INTERPOLL LABORATORIES   EPA METHOD 5 FIELD DATA SHEET

Job L.P Montrose
Source River E Fibe Outlet
Date 7-19-92 Test 1 Run 2

Operators DV & KN
Meter Box No. 9 ΔH@ 1.79 IN WC
Gasmeter coeff. 1.0008

Pitot No. V22-6 Cp .84
Bar. Press. 29.74 inHg H2O 20 %
Nozzle No. 8-3 Nozzle Dia .185 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)*	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (%v/v)
	1809	811.25											
A-12	3	813.28	1.46	1.19	3.34	3	139	241	234	40	92	89	19.1
11	6	815.37	1.51	1.20	5.44	3	145	244	235	40	95	90	19.0
10	9	817.52	1.57	1.23	7.56	3	143	240	236	38	96	91	19.1
9	12	819.64	1.38	1.11	9.58	3	144	242	238	41	98	91	19.1
8	15	821.69	1.42	1.14	1.63	3	143	245	236	37	99	92	19.1
7	18	823.76	1.44	1.16	3.70	3	143	249	235	38	100	93	19.0
6	21	825.71	1.28	1.03	5.66	3	143	243	238	39	101	94	18.9
5	24	827.51	1.09	0.88	7.47	3	141	246	243	41	101	94	19.0
4	27	829.29	1.11	0.90	9.29	3	142	245	242	38	101	94	18.8
3	30	831.26	1.34	1.08	1.30	3	142	236	242	39	102	95	18.7
2	33	833.26	1.35	1.10	3.32	3	140	237	241	40	102	95	18.6
1	36	835.31	1.32	1.08	5.32	3	139	238	241	39	103	95	18.6
B-12	39	837.52	1.68	1.37	7.57	4	139	241	243	40	101	96	18.8
11	42	839.74	1.61	1.31	9.77	4	142	237	232	40	103	96	18.6
10	45	841.97	1.69	1.37	2.03	4	143	238	235	41	104	96	18.7
9	48	844.18	1.63	1.32	4.25	4	145	241	234	39	104	97	18.5
8	51	846.47	1.70	1.38	6.51	3	144	240	236	37	104	97	18.5
7	54	848.76	1.69	1.37	8.77	3	144	239	233	38	105	98	18.7
6	57	851.02	1.71	1.39	1.04	3	145	241	232	39	105	97	18.7
5	60	853.27	1.68	1.36	3.30	3	145	242	234	39	105	98	18.5
4	63	855.53	1.71	1.39	5.57	3	145	242	232	39	105	98	18.5
3	66	857.82	1.70	1.38	7.84	3	144	241	235	38	105	98	18.5
2	69	860.14	1.74	1.41	0.14	3	144	240	233	39	105	98	18.4
1	72	862.06	1.18	0.96	2.03	3	143	241	234	40	105	98	18.3
	(1924)												
	θ = 72	Vm = 50.81		ΔH = 1.21							Avg. = 98.3		

C-5

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P Mantrose
Source Dryer E Tube Outlet
Method 5 Filter holder: glass
Sample Train Leak Check:

Date 7-19-92 Test 1 Run 3
No. of traverse points 24
Filter type: glass fiber

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0.0 cfm at 5.0 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used: 1
6523

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

No. of probe wash bottles: 1
Sample recovered by: DV & KN

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	714	505	209
Impinger No. 3			
Condenser			
Desiccant	1448	1426	22
Total	▨	▨	231

Integrated Gas Sampling Data:

Bag Pump No. 22A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0.0
Time start: 2010
Sampling rate: 400

Box No. 24 Bag No. 3
Size: 44 L
cc/min at 15.0 in. Hg.
(HRS) Time end: 2122 (HRS)
cc/min Operator: DV

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

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. Montrose
Source Dryer E Tube Outlet
Date 7-19-94 Test 1 Run 3

Operators DV + KN
Meter Box No. 9 ΔH@ 1.79 IN WC
Gasmeter coeff.: 1.0008

Pitot No. V22-6 Cp .84
Bar. Press. 2474 inHg H2O 19 %
Nozzle No. 8-3 Nozzle Dia. .1875 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	(2010)	862.55											
B-12	3	864.74	1.58	1.31	4.75	3	141	240	233	38	91	90	19.1
11	6	866.88	1.61	1.31	6.94	3	143	241	236	39	93	90	18.5
10	9	869.17	1.64	1.34	9.15	3	144	242	238	41	95	90	18.5
9	12	871.15	1.39	1.13	1.19	3	144	238	236	37	96	91	18.5
8	15	873.53	1.61	1.31	3.39	3	145	243	241	38	97	91	18.5
7	18	875.49	1.61	1.32	5.59	3	144	237	245	41	98	91	18.4
6	21	877.64	1.39	1.14	7.64	3	144	243	247	42	98	92	18.4
5	24	879.54	1.18	0.97	9.53	3	144	240	243	39	99	92	18.3
4	27	881.38	1.11	0.91	1.37	3	144	237	241	38	99	93	18.3
3	30	883.16	1.08	0.89	3.18	3	144	238	240	41	99	93	18.5
2	33	885.10	1.23	1.01	5.12	3	144	244	242	39	99	92	18.4
1	36	887.11	1.40	1.15	7.18	3	144	246	241	38	99	93	18.7
A-12	39	889.08	1.31	1.08	9.17	3	144	244	243	37	97	92	18.7
11	42	891.08	1.32	1.09	1.18	3	139	246	245	4	98	92	18.5
10	45	893.25	1.44	1.18	3.27	3	142	249	244	38	99	93	18.5
9	48	895.28	1.33	1.10	5.28	3	142	252	242	39	100	93	18.6
8	51	897.35	1.44	1.18	7.37	3	144	254	246	38	100	93	18.6
7	54	899.44	1.48	1.22	9.49	3	144	255	246	38	101	93	18.5
6	57	901.41	1.26	1.04	1.46	3	143	249	243	38	100	94	18.2
5	60	903.32	1.19	0.98	3.36	3	143	252	247	38	100	93	18.2
4	63	905.18	1.15	0.95	5.24	3	143	254	243	39	100	93	18.4
3	66	907.11	1.18	0.97	7.13	3	144	253	245	39	100	93	18.3
2	69	908.95	1.04	0.85	8.91	3	144	254	245	39	100	93	18.1
1	72	910.76	1.08	0.89	0.73	3	144	254	243	39	100	93	18.0
	(2122)												
	θ = 72	Vm = 48.21		ΔH = 1.10							Avg. = 95.2		

S-0037R

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL DATA

2''

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L. P. Montrose
am Leader DV
te Submitted 7-25-94
Test No. 1
Date of Analysis 7-27-94

Source Dryer E Tube Outlet
Test Site Stack
Date of Test 7-19-94
No. of Runs Completed 3
Technician C. Helseser

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml)			Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
			Zero Pt.	After CO_2	After O_2			
1/1	3396-05	1	0.00	2.60	21.00	2.60	18.40	0.96
		2	0.00	2.50	20.90	2.50	18.40	1.00
	☑ B ☐ F	Avg				2.55	18.40	
1/2	-06	1	0.00	2.20	21.00	2.20	18.80	0.96
		2	0.00	2.20	21.00	2.20	18.80	0.96
	☑ B ☐ F	Avg				2.20	18.80	
1/3	-07	1	0.00	2.80	20.90	2.80	18.10	1.00
		2	0.00	2.80	20.90	2.80	18.10	1.00
	☑ B ☐ F	Avg				2.80	18.10	
		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 $F_o = \frac{20.9 - O_2}{CO_2}$

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

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

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/~~Wisconsin Protocol~~

M-202

Job L. P. Montrose
Source Dryer E-Tube Outlet
Team Leader DV
Test Site Stack
Date Submitted 7-25-94
Date of Test 7-19-94
Test No. 1
No. of Runs Completed 3
Date of Analysis 7-29-94
Technician C. Helgeson

		Solvent Phase	Aqueous Phase
0	Test 1 Run 0 Field Blank Log Number 3396-01I Comments	Dish No. 8 Dish Tare Wt. 479755 g Dish+Sample Wt. 47.9757 g Sample Wt. 0.0002 g	Dish No. 18 Dish Tare Wt. 49.9867 g Dish+Sample Wt. 49.9871 g Sample Wt. 0.0004 g
1	Test 1 Run 1 Log Number -02I Comments	Dish No. 9 Dish Tare Wt. 47.9753 g Dish+Sample Wt. 47.9883 g Sample Wt. 0.0130 g	Dish No. 38 Dish Tare Wt. 48.6498 g Dish+Sample Wt. 48.6624 g Sample Wt. 0.0126 g
2	Test 1 Run 2 Log Number -03I Comments	Dish No. 22 Dish Tare Wt. 51.3596 g Dish+Sample Wt. 51.3762 g Sample Wt. 0.0166 g	Dish No. 115 Dish Tare Wt. 45.0679 g Dish+Sample Wt. 45.0819 g Sample Wt. 0.0140 g
3	Test 1 Run 3 Log Number -04I Comments	Dish No. 27 Dish Tare Wt. 52.4441 g Dish+Sample Wt. 52.4673 g Sample Wt. 0.0232 g	Dish No. 41 Dish Tare Wt. 45.3222 g Dish+Sample Wt. 45.3294 g Sample Wt. 0.0072 g
4	Test Run Log Number Comments	Dish No. 14 Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test Run Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

Results Solvent Phase:

Blank Solvent Wt. 0.0002 g

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0128	0.0164	0.0230		

Results Aqueous Phase:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0122	0.0136	0.0068	D-2	

LSC-03WYR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job L.P. Montrose	Source Dryer E Tube Outlet
Team Leader DV	Test Site Stack
Date Submitted 7-25-94	Date of Test 7-19-94
Test No. 1	No. of Runs Completed 3
Date of Analysis 7-26-94	Technician C. Gierke
Transport Leakage [✓ ☒ None] ☐ ______ ml	Solvent Acetone

0	Test 1 Run 0 Field Blank Log Number 3396-01P Vol. of Solvent 90 ml *Solvent Residue 3.33 ug/ml	Dish No. 512 Dish Tare Wt. 49.3559 g Dish+Sample Wt. 49.3562 g Sample Wt. 0.0003 g
1	Test 1 Run 1 Vol. of Solvent 230 ml Log Number -02P Comments	Dish No. 513 Dish Tare Wt. 47.4140 g Dish+Sample Wt. 47.4479 g Sample Wt. 0.0339 g
2	Test 1 Run 2 Vol. of Solvent 170 ml Log Number -03P Comments	Dish No. 520 Dish Tare Wt. 48.5261 g Dish+Sample Wt. 48.5446 g Sample Wt. 0.0185 g
3	Test 1 Run 3 Vol. of Solvent 200 ml Log Number -04P Comments	Dish No. 532 Dish Tare Wt. 47.0007 g Dish+Sample Wt. 47.0215 g Sample Wt. 0.0208 g
4	Test ____ Run ____ Vol. of Solvent ____ ml Log Number Comments	Dish No. Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number Comments	Dish No. Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

*Solvent Residue 3.33 ug/ml=[(Sample Wt. 0.0003 g)(10^6)]/Vol. of Sol. 90 ml
EPA-MS Acetone Residue Blank Spec. ≤7.3 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0331	0.0179	0.0201		

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L. P. Montrose
Team Leader DV
Date Submitted 7-25-94
Test No. 1
Date of Analysis 7-27-94

Source Dryer E tube outlet
Test Site Stack
Date of Test 7-19-94
No. of Runs Completed 3
Technician C. Helgeson

0
Test 1 Run 0
Field Blank
Log Number 3396-01F
Comments
Filter No. 6524
Filter Type 4"6F
Filter Tare Wt. .9423 g
Filter+Sample Wt. .9424 g
Sample Wt. 0.0001 g

1
Test 1 Run 1
Log Number -02F
Comments
Filter No. 6776
Filter Type 4"6F
Filter Tare Wt. .9441 g
Filter+Sample Wt. .9545 g
Sample Wt. 0.0104 g

2
Test 1 Run 2
Log Number -03F
Comments
Filter No. 6774
Filter Type 4"6F
Filter Tare Wt. .9378 g
Filter+Sample Wt. .9508 g
Sample Wt. 0.0130 g

3
Test 1 Run 3
Log Number -04F
Comments
Filter No. 6523
Filter Type 4"6F
Filter Tare Wt. .9478 g
Filter+Sample Wt. .9630 g
Sample Wt. 0.0152 g

4
Test Run
Log Number
Comments
Filter No.
Filter Type
Filter Tare Wt. g
Filter+Sample Wt. g
Sample Wt. g

5
Test Run
Log Number
Comments
Filter No.
Filter Type
Filter Tare Wt. g
Filter+Sample Wt. g
Sample Wt. g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0104	0.0130	0.0152		

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

LSC-02PR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: KLJ

Date of Analysis: 8-4-94

Job: LP Montrose

Source: Dryer E Tube Outlet

Site: Stack

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	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
	3396-01	215	1	1.19	256	0.005
	-02	400	1	0.305	122	0.003
	-03	380	1	0.404	154	0.003
	-04	410	1	0.304	125	0.003

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

LSC-08RR

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job LP Montrose
Field Engineer David Vauley
Source Pryer E Tube Outlet
Date of Test 7-19-94
Site STACK
Test No. 1
Log No. 3396
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		
8	**Impingers:** ☒ DI Water ☐ $3\%H_2O_2$ ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☒ $MeCl_2$ (rinse)	☐ 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 (1 Box)	☐ ________	☒ 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:

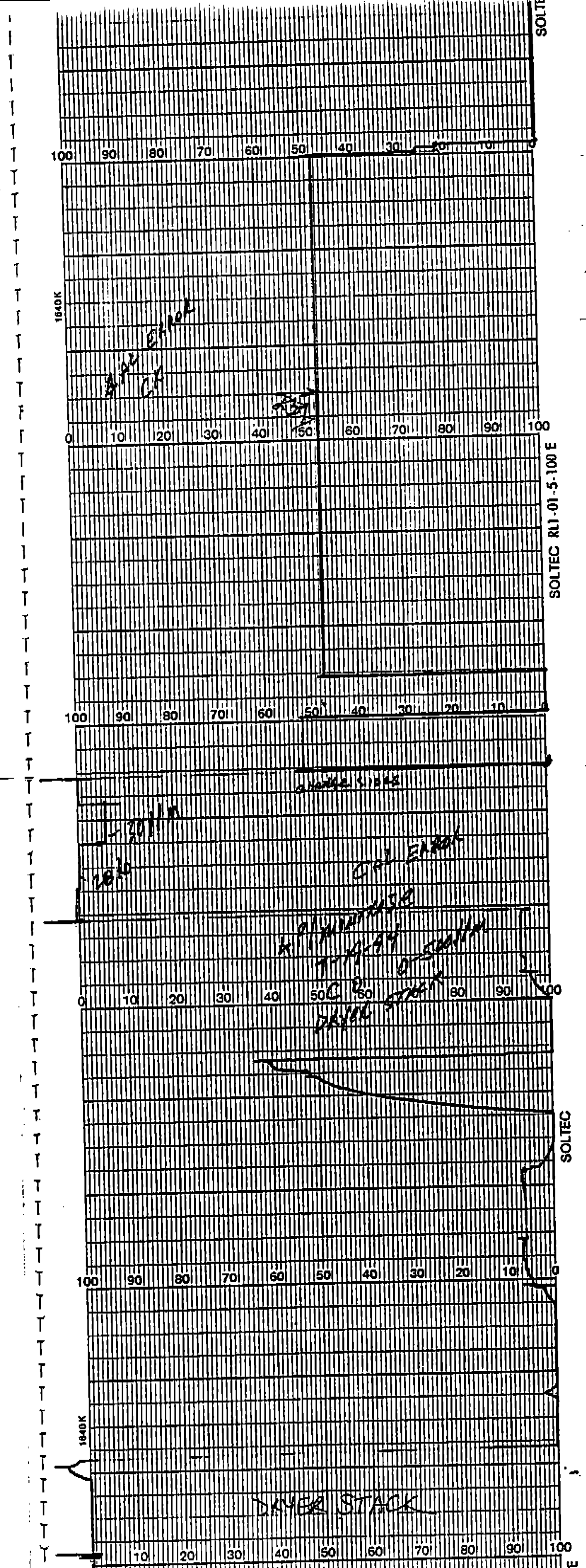
Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☐ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
Misc: ☐ Natural Gas ☐ RDF ☐ ________

Relinquished by/Affiliation	Accepted by/Affiliation	Date
David Vauley / INTERPOLL LABS	Bob Bay, Interpoll	0730 7/25/94

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

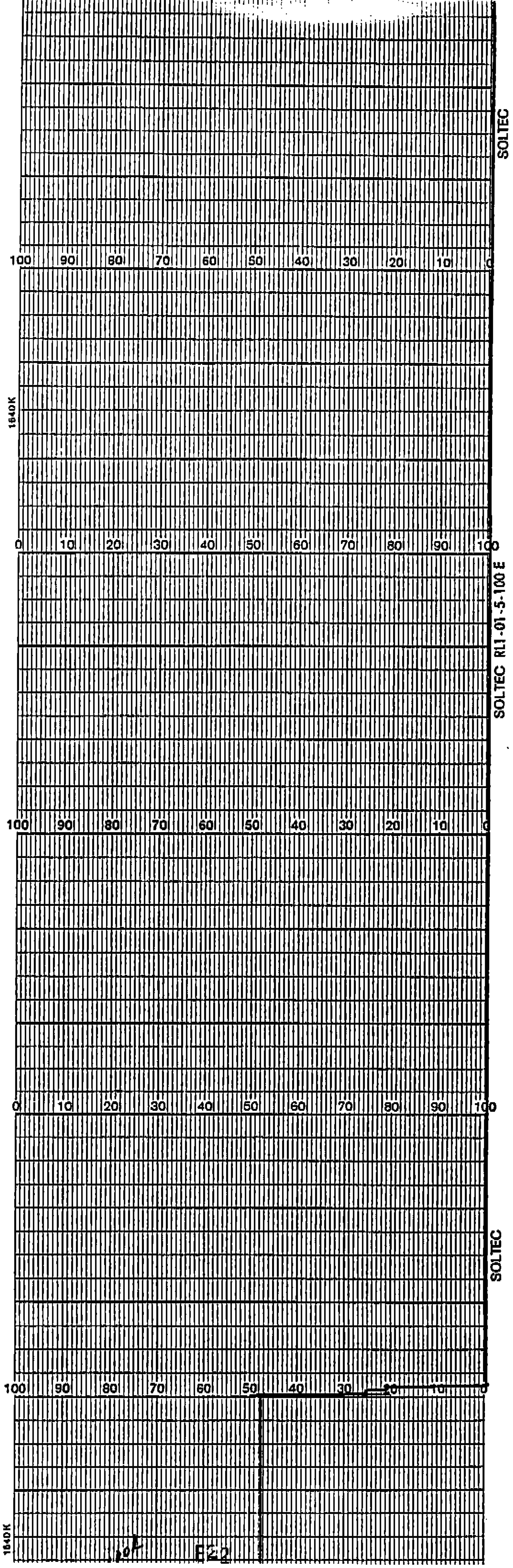
APPENDIX E

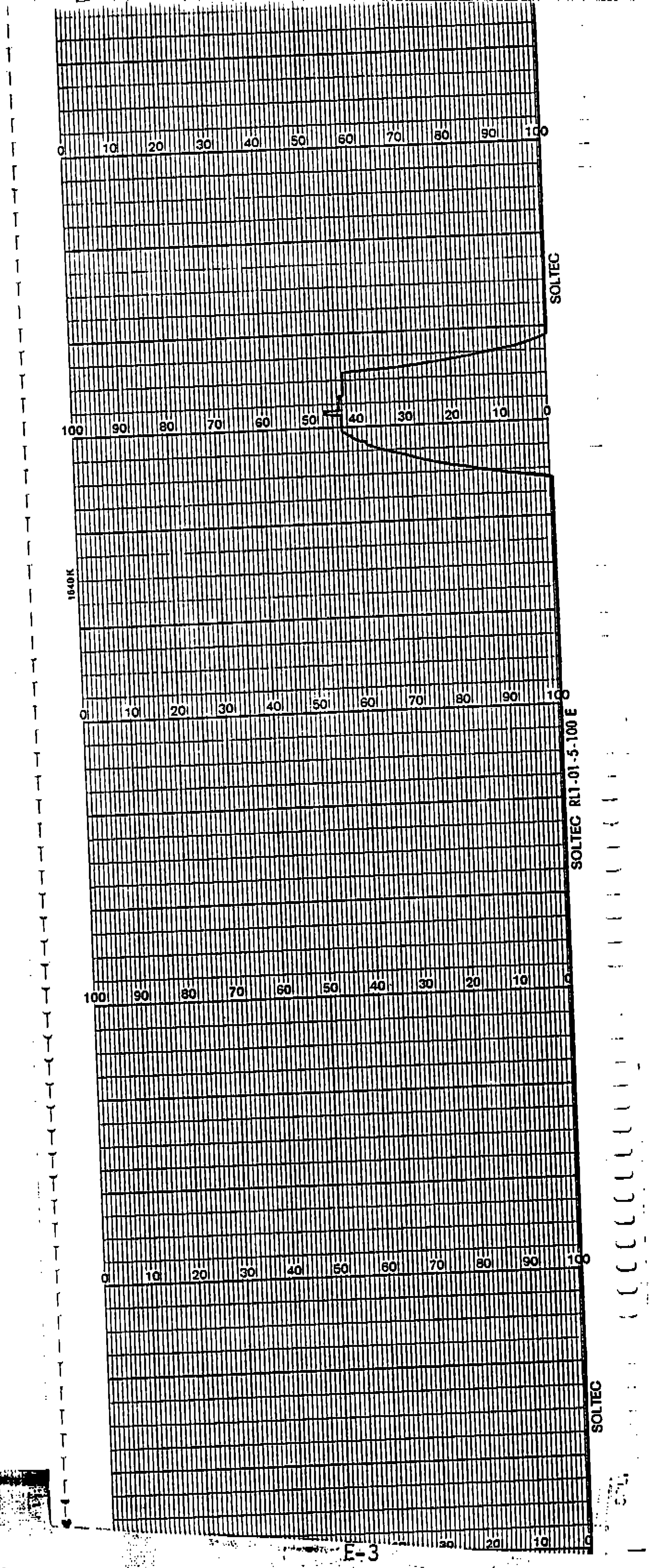
CARBON MONOXIDE STRIPCHART

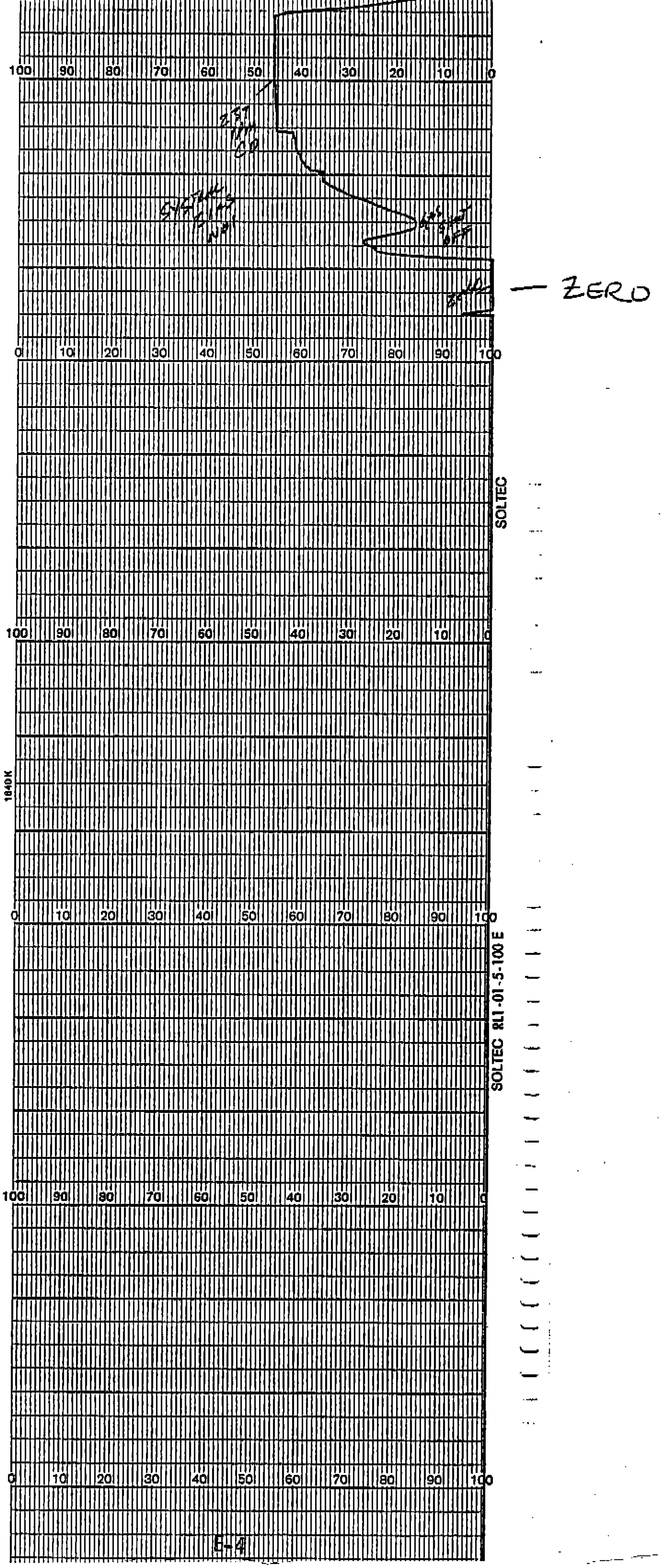


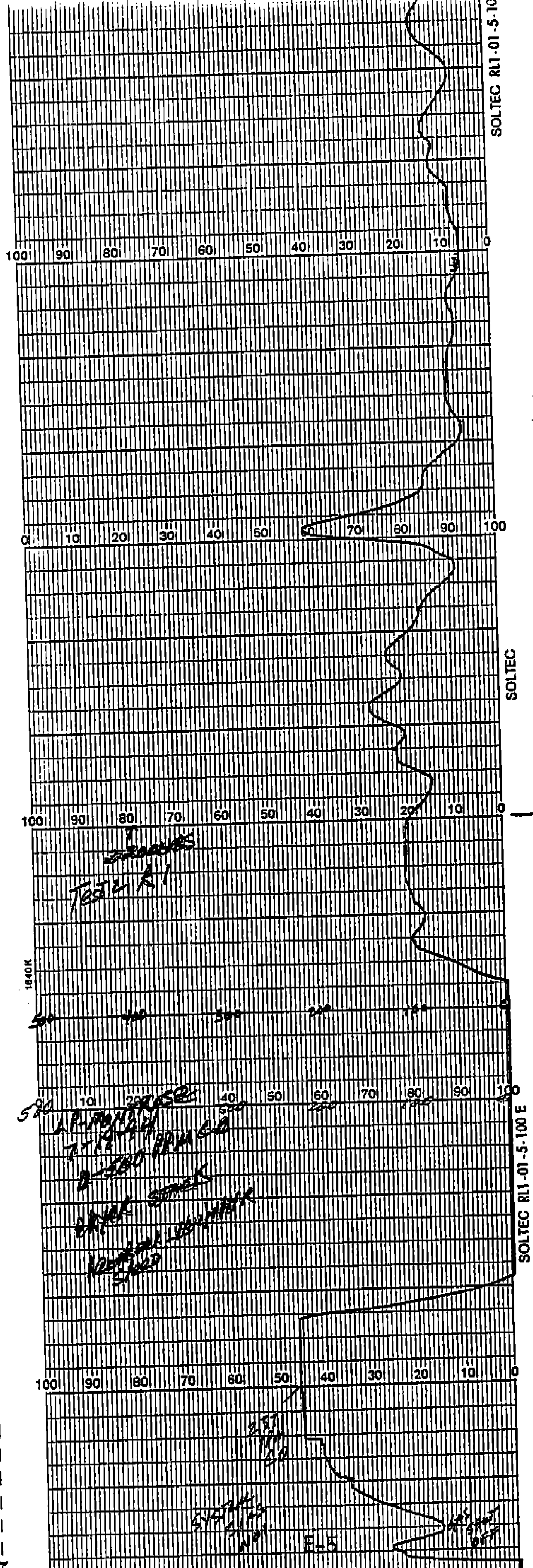
DRYER STACK
LP-Montrose
7-19-94
7-20-94
CO 0-500 PPM

E-1


SOLTEC
100 90 80 70 60 50 40 30 20 10 0
1840K
0 10 20 30 40 50 60 70 80 90 100
SOLTEC RL1-01-5-100 E
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
SOLTEC
100 90 80 70 60 50 40 30 20 10 0
1840K
E22

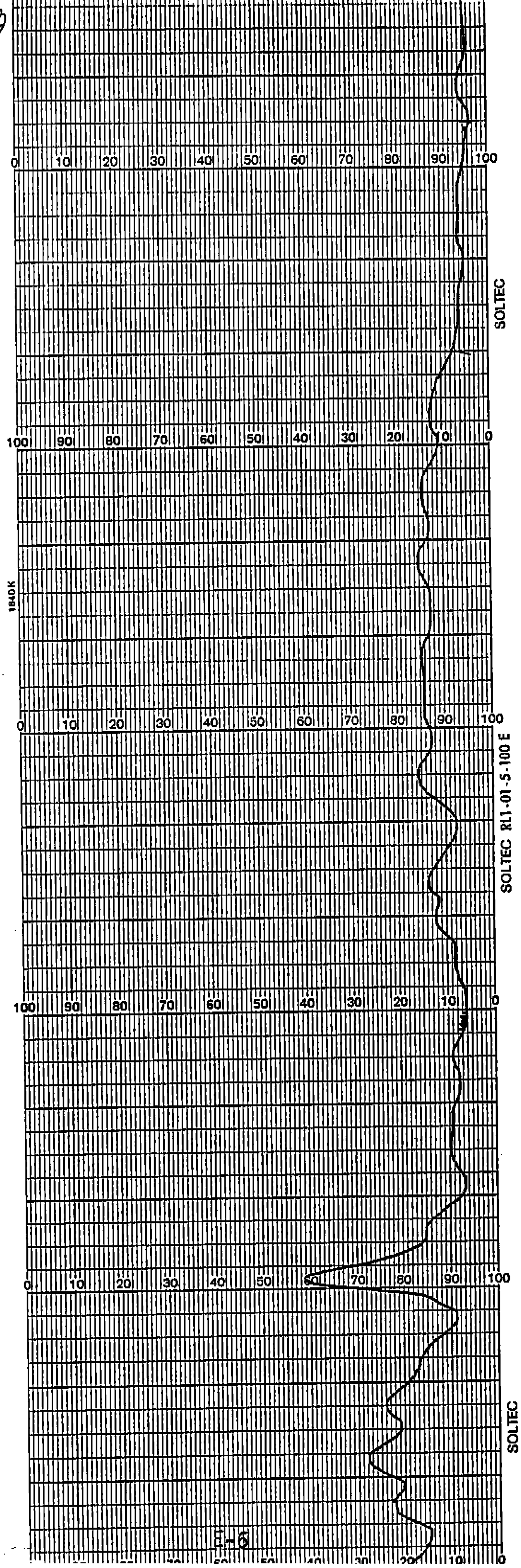

0 10 20 30 40 50 60 70 80 90 100
SOLTEC
100 90 80 70 60 50 40 30 20 10 0
1640K
0 10 20 30 40 50 60 70 80 90 100
SOLTEC RL1-01-5-100 E
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
SOLTEC
30 20 10 0


100 90 80 70 60 50 40 30 20 10 0
257 PPM CO
SYSTEM FLUSH N2
GAS SHUT OFF
ZERO
ZERO
0 10 20 30 40 50 60 70 80 90 100
SOLTEC
100 90 80 70 60 50 40 30 20 10 0
1840K
0 10 20 30 40 50 60 70 80 90 100
SOLTEC RL1-01-5-100 E
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

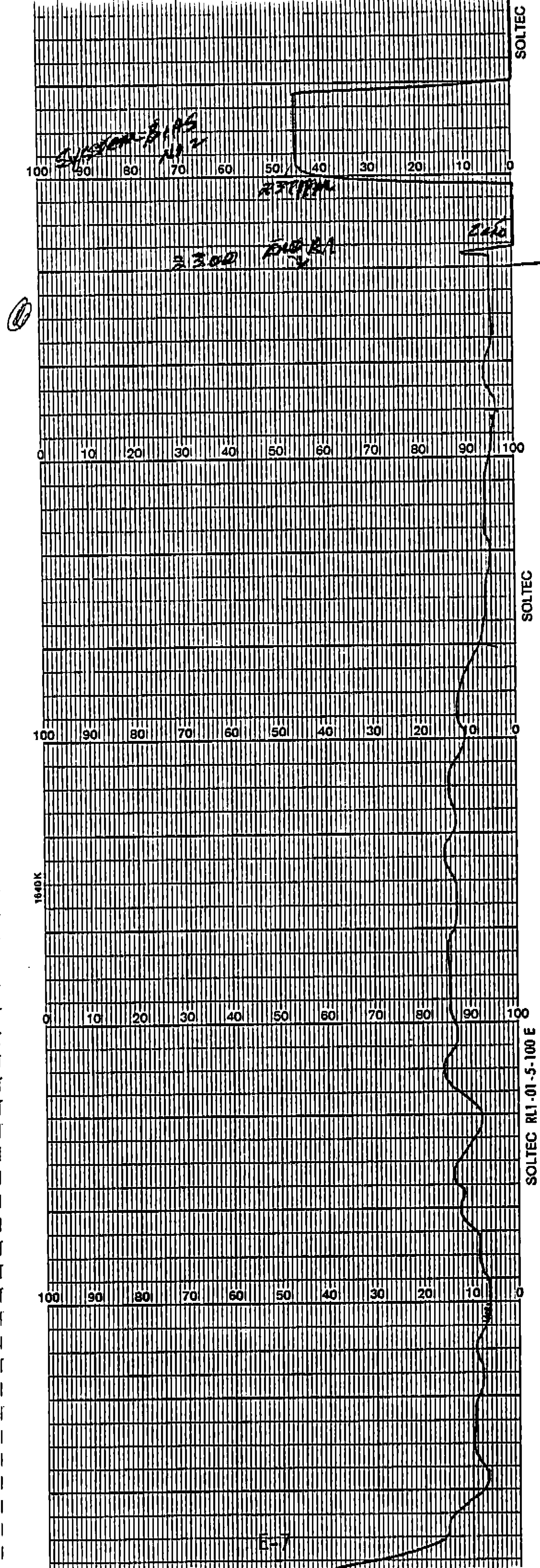


START
Test 2
Run 1

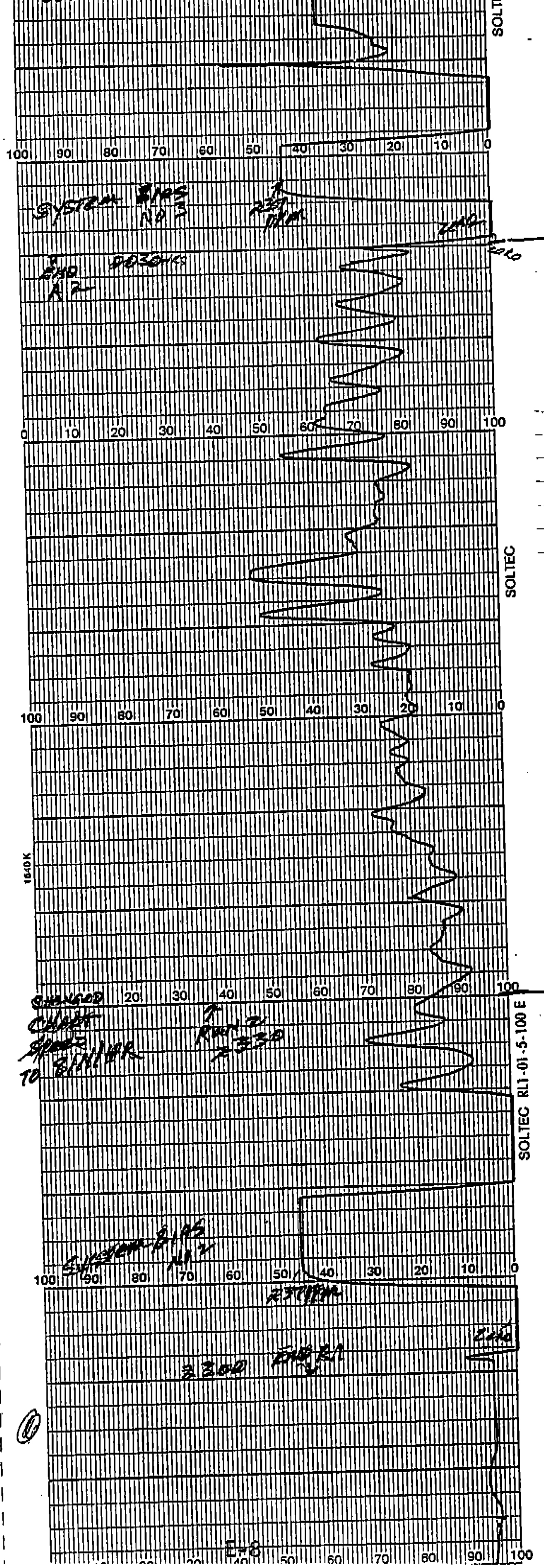
2200 HRS


0 10 20 30 40 50 60 70 80 90 100
SOLTEC
100 90 80 70 60 50 40 30 20 10 0
1840K
0 10 20 30 40 50 60 70 80 90 100
SOLTEC RL1-01-5-100 E
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
SOLTEC

E-6

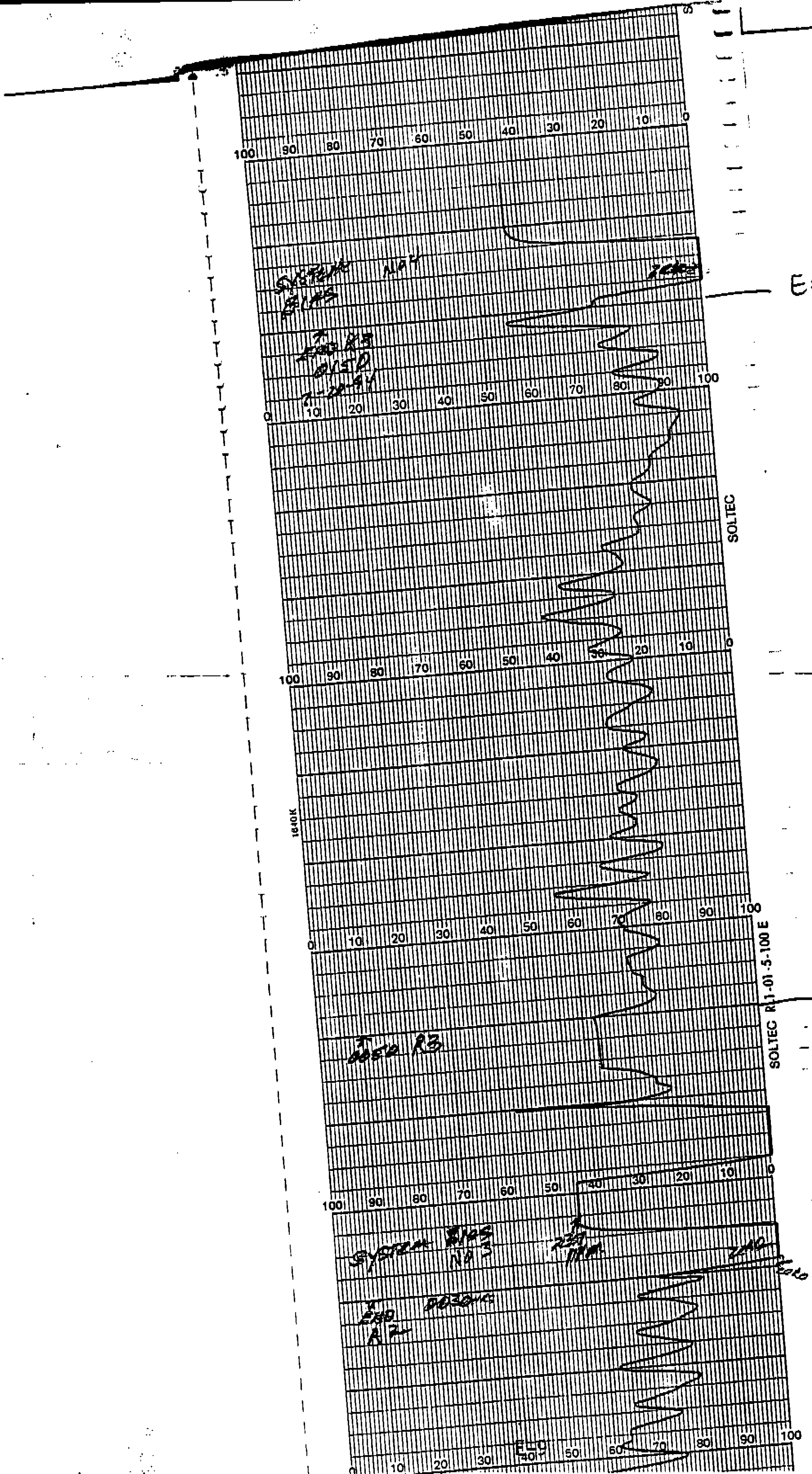


END Run1
2300 HRS



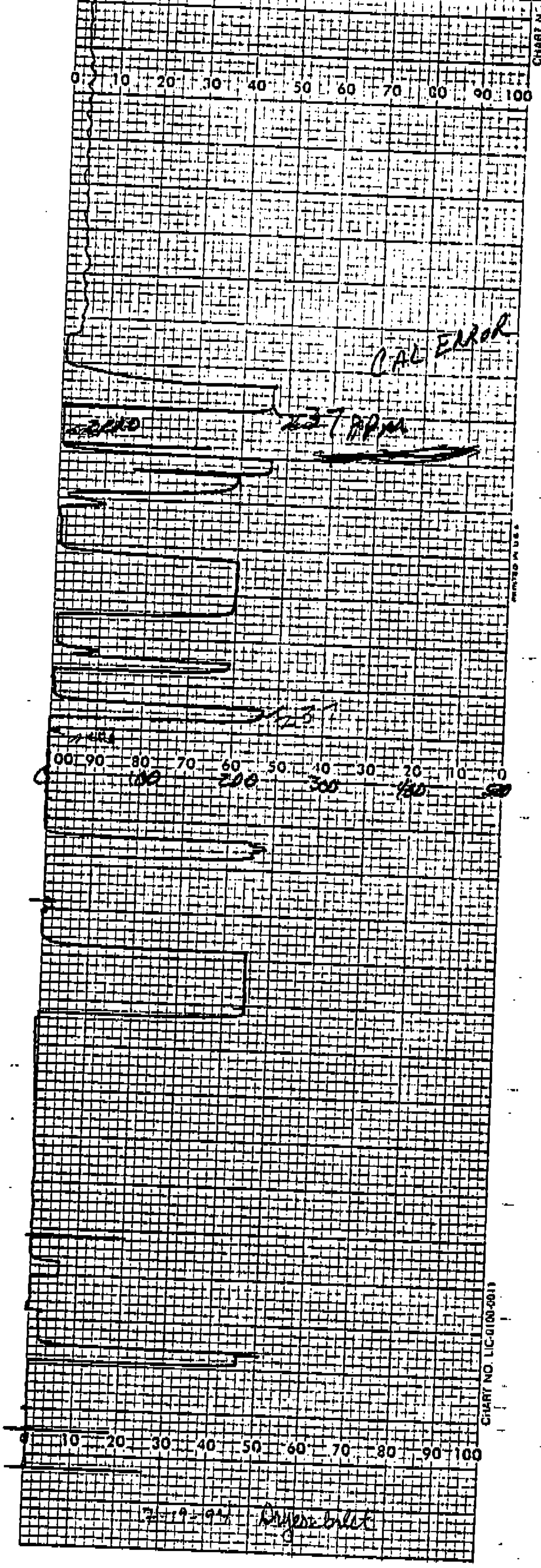
END
RUN 2
0030 HRS
7-20-94

START
Test 2
Run 2
2330 HRS

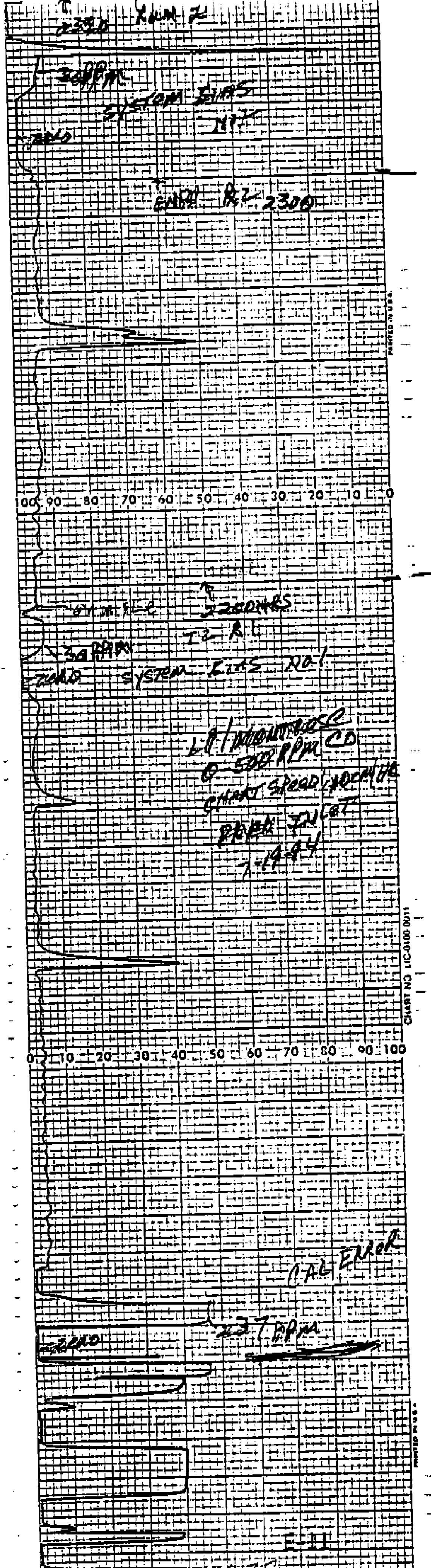


END RUN 3
0150

START TEST 2
RUN 3
0050 HRS

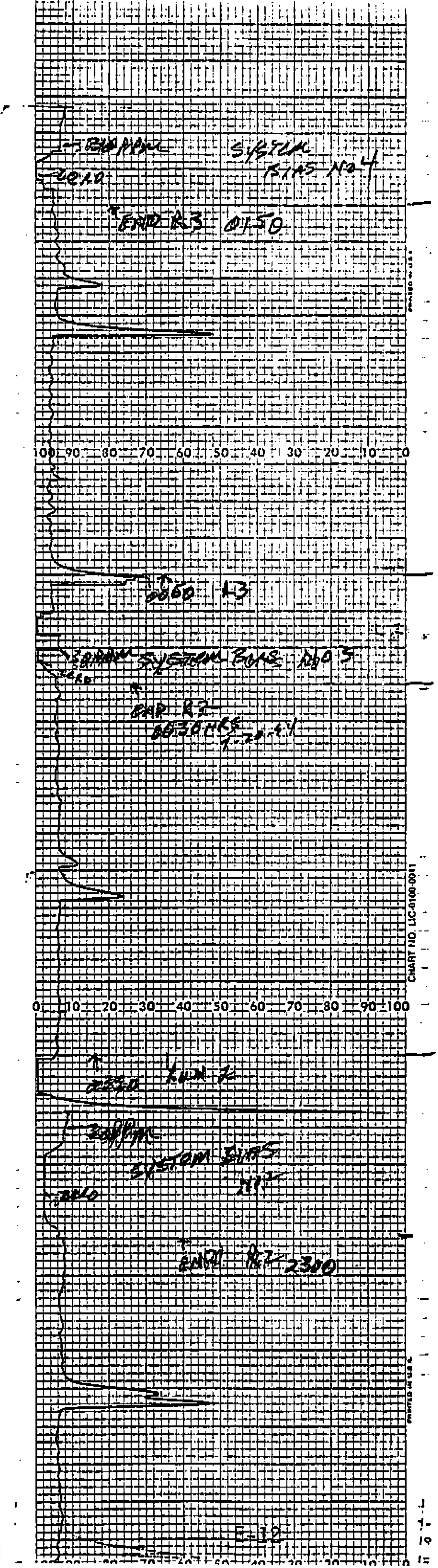


LP-MONTROSE
McCONNEL
BURNER OUTLET
7-19, 20-94
0-500 PPM CO



END RUN 1
2300 HRS

START
TEST 2 RUN 1
2200 HRS



END RUN 3
0150

START TEST 2
RUN 3 0050 HRS

END RUN 2
0030 HRS
7-20-91

START
TEST 2 RUN 2
2330 HRS

APPENDIX F

ANALYZER SPECIFICATIONS

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; CaF2 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.

APPENDIX G

MEASUREMENT SYSTEMS PERFORMANCE SPECIFICATIONS

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO System Bias Check

Job GP/Montrose
Source Dryer
Test 2 Run
Date 7-19-94
Site Inlet
Operator

Run	Time (HRS)	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
				Cal. Err.	Sys. Bias			
1	2130	Zero Gas	0	0	0	0	500	0
		Upscale	30	30	30	0	500	0
2	2302	Zero Gas	0	0	10	10	500	2
		Upscale	30	30	38	8	500	1.6
3	0032	Zero Gas	0	0	2	2	500	.4
		Upscale	30	30	32	2	500	.4
4	0152	Zero Gas	0	0	2	2	500	.4
		Upscale	30	30	30	0	500	0
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.

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO System Bias Check

Job LP/Montrose Source Dryer
Test 2 Run Date 7-19-94 Site Stack
Operator

Run	Time (HRS)	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
				Cal. Err.	Sys. Bias			
1	2120	Zero Gas	0	0	0	0	500	0
		Upscale	237	235	230	5	500	1
2	2302	Zero Gas	0	0	0	0	500	0
		Upscale	237	235	229	6	500	1.2
3	1032	Zero Gas	0	0	0	0	500	0
		Upscale	237	235	226	9	500	1.8
4	0152	Zero Gas	0	0	0	0	500	0
		Upscale	237	235	220	15	500	3
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

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

INTERPOLL LABORATORIES

Calibration Error Check

Job L-P/Montrose

Test 2 Run 1 Date 6-18-94

Operator

Calibration: Time(HRS) ______

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0	0	0	500	0
Mid level	30	30	0	500	0
High level	237	235	2	500	.4

NO$_x$ Calibration: Time(HRS) ______

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

O$_2$ Calibration: Time(HRS) ______

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

Must be within 2% of the span for each calibration gas

S-420-10

APPENDIX H

CALIBRATION GAS CERTIFICATION SHEETS

GS #
140

LINDE
UNION CARBIDE

Union Carbide Corporation
Linde Division
4550 Kennedy Avenue
East Chicago, IN 46312

DATE : SEPTEMBER 27, 1989

TO: UNION CARBIDE CORPORATION
LINDE DIVISION
2455 CLEVELAND AVENUE H
ROSEVILLE MN 55113

RECEIVED
OCT - 5 1989
INTERPOLL LABORATORIES

LINDE ORDER NUMBER : 265.041.01
CUSTOMER PO NUMBER : 8900SA
CUSTOMER REL NUMBER: 10576KE

DEAR SIR/MADAM:

THIS IS YOUR CERTIFICATE OF ANALYSIS FOR:

CYLINDER NUMBER	MIXTURE COMPONENTS	REQUESTED COMPOSITION	CERTIFIED COMPOSITION
CC 44243	CARBON MONOXIDE	30 PPM	30.0 PPM
	NITROGEN	BALANCE	BALANCE

Dale A. Kugler
APPROVED BY

COA-6MC

GS# 146

LINDE

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

DATE : JANUARY 9, 1990

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

LINDE ORDER NUMBER : 004.055.01
CUSTOMER PO NUMBER : 9723SA
CUSTOMER REL NUMBER :

DEAR SIR/MADAM:

THIS IS YOUR CERTIFICATE OF ANALYSIS FOR:

CYLINDER NUMBER	MIXTURE COMPONENTS	REQUESTED COMPOSITION	CERTIFIED COMPOSITION	CERTIFICATION ACCURACY
HA 8654	CARBON MONOXIDE	245 PPM	237 PPM	± 1% RELATIVE
	NITROGEN	BALANCE	BALANCE	

RECEIVED
JAN 18 1990
INTERPOLL LABORATORIES

Kevin E Cooper
APPROVED BY

COA-6MP

APPENDIX I

PROCESS RATE INFORMATION

Louisiana-Pacific Corporation
Northern Division
Rt. 8, Box 8263
Hayward, Wisconsin 54843
715) 634-3454

LETTER OF TRANSMITTAL

DATE: 8/19/94	JOB NO.
ATTENTION:	SHERI PALCHER
RE:	MONTROSE PROCESS DATA

TO INTERPOLL LABORATORIES
4500 BALL ROAD NE
CIRCLE PINES, MN 55014-1819

WE ARE SENDING YOU

☒ Attached ☐ Under separate cover via ____________ the following items:

☐ Shop Drwgs. ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of Letter ☐ Change Order ☐ ____________

COPIES	DATE	NO.	DESCRIPTION
1			REVISED PROCESS DATA FOR MONTROSE JULY 18, 1994 TEST (16 PAGES)

THESE ARE TRANSMITTED as checked below:

☒ For Approval
☒ For Your Use
☐ As Requested
☐ For Review & Comment
☐ FOR BIDS DUE ____________ 199 .

☐ Approved As Submitted
☐ Approved As Noted
☐ Returned For Corrections
☐ Resubmit ____ copies for approval

☐ Submit ____ copies for distribution
☐ Return ____ corrected prints
☐ ____________
☐ ____________

REMARKS

Copy To: FILE

Signed: SUE SOMERS

MONTROSE TESTING 7-19-94
PROCESS DATA

CONTENTS PAGE

MONTROSE DRYER TESTING 7-19-94, Pm, CO

/

MONTROSE TESTING 7-19-94

TEST SCHEDULE

MONTROSE TESTING 7-19-94

	DATE	POLLUTANT	RUN #1	RUN #2	RUN #3
8/19/94 SAB	7-~~18~~ 19	PM	1532-1646	1809-1924	2010-2122
SAB	7-~~18~~19	CO	2200-2300	2330-0030	~~0150~~-0150 0050 SAB

PROCESS DATA SUMMARY

MONTROSE TESTING 7-19-94 - pm

10.97 =Plant production rate in TONS per HOUR
1.61 =estimated TONS of dry fuel burned based on fuel measurement
26107 =LB per HOUR of furnish produced by the dryer
1089 =average dryer inlet temperature in deg. f.
36.8% =moisture content of incoming wood
4.5% =moisture content of wood after drying

MONTROSE TESTING 7-19-94 - co

10.55 =Plant production rate in TONS per HOUR
1.48 =estimated TONS of dry fuel burned based on fuel measurement
25111 =LB per HOUR of furnish produced by the dryer
1006 =average dryer inlet temperature in deg. f.
30.9% =moisture content of incoming wood
4.3% =moisture content of wood after drying

2

MONTROSE TESTING 7-19-94 PM testing

DATA TIME: START= 15:30 END= 21:30 HOURS= 6.00

TOTAL HOURS = 6.00

BOARD WEIGHTS - LBS

weight of approximately every 25th untrimmed board

178	189	178
190	187	185
192	191	185
187	186	187
183	183	187
187	189	181
193	186	182
193	195	191
186	179	175
193	187	182

186.23 lb = average untrimmed mat weight

171.33 lb = average finished board weight (untrimmed mat weight-weight of trim)

8.0% = TRIM

PLANT PRODUCTION RATE

6.00 =hours during testing
96 =pressloads
768 =No. of (8' X 16') boards produced (no. of pressloads x 8 boards per load)
131581 =Lbs. finished product (no. of boards x weight of finished board)
21930 =Lbs. finished product produced per hour (lbs. of finished product / testing hours)
10.97 =Tons finished product per hour (lbs. of finished product per hour / 2000 lb)

DRYER PRODUCTION RATE:

26107 = lbs of dryer production per hour (lb. of finished product / (1-%trim + % fines))
8.0% =%FINES
8.0% =%TRIM
1089 =average dryer inlet temperature
36.8% =moisture content of incoming wood
4.5% =moisture content of wood after drying

2607/2000 = 13.05 ODT/H

DRYER FUEL BURNING RATE

4.48 =fuel calibration on lbs. per count
4309 =total counts during testing
6.00 =hours during testing
19304 =total lbs. of fuel burned during testing (calibration x total counts)
3217 =lbs of fuel burned per hour (total lbs fuel burned / testing hours)
1.61 = Tons of fuel burned per hour (lbs of fuel burned per hour / 2000 lbs.)
8600 =estimated BTU content per lb. of wood fuel
27.7 =estimated mmbtu input per hour (BTU content per lb. x lb. per hour)

MONTROSE TESTING 7-19-94 CO testing

DATA TIME: START= 22:00 END= 01:50 HOURS= 4.00

TOTAL HOURS = 4.00

BOARD WEIGHTS - LBS

weight of approximately every 25th untrimmed board

189	191
189	183
168	191
171	187
176	190
183	191
181	192
182	193
190	185
187	179

184.9 lb = average untrimmed mat weight

170.11 lb = average finished board weight (untrimmed mat weight-weight of trim)

8.0% = TRIM

PLANT PRODUCTION RATE

4.00 =hours during testing
62 =pressloads
496 =No. of (8' X 16') boards produced (no. of pressloads x 8 boards per load)
84375 =Lbs. finished product (no. of boards x weight of finished board)
21094 =Lbs. finished product produced per hour (lbs. of finished product / testing hours)
10.55 =Tons finished product per hour (lbs. of finished product per hour / 2000 lb)

DRYER PRODUCTION RATE:

25111 = lbs of dryer production per hour (lb. of finished product / (1-%trim + % fines))
8.0% =%FINES
8.0% =%TRIM
1006 =average dryer inlet temperature
30.9% =moisture content of incoming wood
4.3% =moisture content of wood after drying

$\frac{25111}{2000}$ = 1256 ODTH)

DRYER FUEL BURNING RATE

4.48 =fuel calibration on lbs. per count
2634 =total counts during testing
4.00 =hours during testing
11800 =total lbs. of fuel burned during testing (calibration x total counts)
2950 =lbs of fuel burned per hour (total lbs fuel burned / testing hours)
1.48 = Tons of fuel burned per hour (lbs of fuel burned per hour / 2000 lbs.)
8600 =estimated BTU content per lb. of wood fuel
25.4 =estimated mmbtu input per hour (BTU content per lb. x lb. per hour)

4

DRYER DATA SHEET

DATE 19 JULY 1994
BY Sherry Roberts

PLANT: MONTROSE, COLORADO

READINGS EVERY 10 MIN.

FUEL CALIBRATION: 4.48

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL		EVERY HOUR FLAKE MOISTURE	
							SUR.	CORE	IN	OUT
15:00	250	92	1115	250	85517	Full	1/2	1/2		4%
15:10	250	92	1056	251.8	85624	Full	1/2	1/2		
15:20	248	92	1102	249.9	85740	3/4	1/2	1/2		
15:30	246	92	1118	246.9	85857	3/4	1/2	1/2	37%	
15:40	246	92	1119	246	85974	Full	1/2	1/2		
15:50	246	92	1115	246.3	86096	Full	1/2	1/2		
16:00	244	92	1072	246	86210	3/4	1/2+	1/2+		4.7%
16:10	242	92	1066	242.8	86323	3/4	1/2+	1/2+		
16:20	242	92	1088	242.7	86443	Full	1/2+	1/2+		
16:30	244	92	1084	243.7	86556	Full	1/2+	1/2+	36.6%	
16:40	244	92	1064	244.2	86676	Full	1/2+	1/2+		
16:50	244	92	1081	244.2	86787	3/4	1/2+	1/2+		
17:00	244	92	1073	243.6	86908	Full	2/3+	2/3+		4.2%
17:10	244	85	1070	245	87029	Full	2/3+	2/3		
17:20	246	85	1048	245.9	87139	Full	2/3	2/3		
17:30	246	88	1088	247.8	87271	Full	2/3	2/3	36%	
17:40	246	88	1086	245.4	87374	Full	2/3	2/3		
17:50	246	88	1052	247.1	87489	2/3	1/2+	1/2+		
18:00	246	90	1047	245.6	87604	1/4+	1/2+	1/2+		4.8%
18:10	246	90	1017	246.6	87715	1/2+	1/2	1/2		
18:20	246	90	987	246.8	87823	2/3	1/2	1/2		
18:30	246	92	976	245.6	87928	3/4	1/2	1/2	35.5%	
18:40	246	92	1049	245.1	88013	Full	1/2	1/2		
18:50	246	92	1039	246.5	88169	Full	1/2	1/2		
19:00	246	92	106.3	245.4	88279	Full	1/2	1/2		4.2%
19:10	246	92	106.6	246.0	88397	Full	1/2	1/2		
19:20	246	92	111.4	244.3	88526	3/4	1/2	1/2		
19:30	246	92	109.2	248.0	88658	Full	1/2	1/2	41.5%	
19:40	246	93	1121	246.1	88777	1/2	1/2	1/2		
19:50	246	93	1109	245.2	88906	Full	1/2	1/2	⑤	

DRYER DATA SHEET

DATE 19 JULY 1994
BY

PLANT: MONTROSE, COLORADO

READINGS EVERY 10 MIN.

FUEL CALIBRATION: 4.48

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL		EVERY HOUR FLAKE MOISTURE	
							SUR.	CORE	IN	OUT
20:00	246	93	1062	245.5	89022	Full	½	½		4.5%
20:10	246	93	1082	245.1	89150	Full	½	½		
20:20	246	93	1114	244.9	89266	Full	½	½		
20:30	246	93	1114	247.1	89396	Full	½	½	47%	
20:40	246	93	1091	246.4	89546	Full	½	½		
20:50	246	90	1103	246.6	89637	Full	½	½		
21:00	246	90	1149	245.3	89770	Full	½	½		4.6%
21:10	246	90	1183	245.9	89890	Full	½	½		
21:20	246	90	1242	244.1	90027	Full	½	½		
21:30	247	90	1242	246.9	90166	Full	½	½	24%	
21:40	248	88	1129	250.3	90291	½	½	½		
21:50	248	88	1017	248.6	90404	Full	½	½		
22:00	248	88	1032	247.3	90521	½	½	½		4.5%
22:10	251	85	992	254.4	90633	Full	2/3	2/3		
22:20	251	85	945	251.3	90733	Full	2/3	2/3		
22:30	251	85	981	250.6	90857	Full	2/3	2/3	30.4%	
22:40	251	85	962	251.5	90957	Full	2/3	2/3		
22.50	249	85	898	249.9	91067	Full	2/3	2/3		
23:00	249	85	872	247.4	91163	Full	2/3	2/3		4%
23:10	249	85	893	248.1	91264	Full	½	½		
23:20	249	90	938	248.6	91370	Full	½	½		
23:30	249	90	964	249.0	91499	½	½	½	33%	
23:40	247	92	978	247.2	91599	½	½	½		
23:50	247	92	1018	246.8	91715	½	½	½		
00:00	247	92	1048	246.7	91842	½	½	½		4.6%
00:10	247	92	104.9	248.0	91963	-½	½	½		
0:20	247	93	105.2	247.3	92084	½	½	½		
0:30	247	94	106.5	246.7	92213	½	½	½	26%	
0:40	247	94	1078	247.0	92341	Full	½	½		
0:50	247	94	1088	247.0	92465	½	½	½	⑥	

DRYER DATA SHEET

DATE 19 JULY 1994

BY

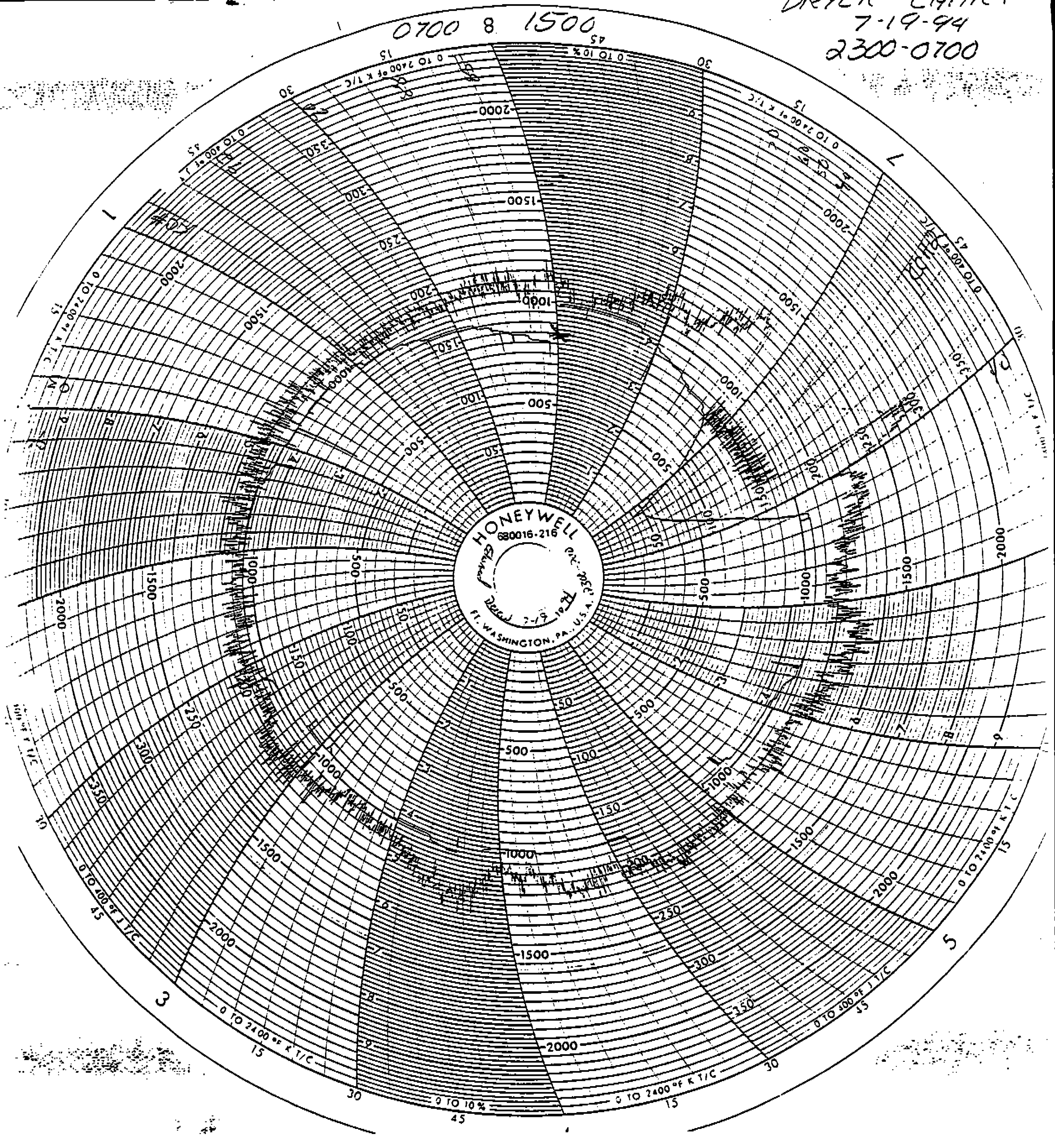
PLANT: MONTROSE, COLORADO

READINGS EVERY 10 MIN.

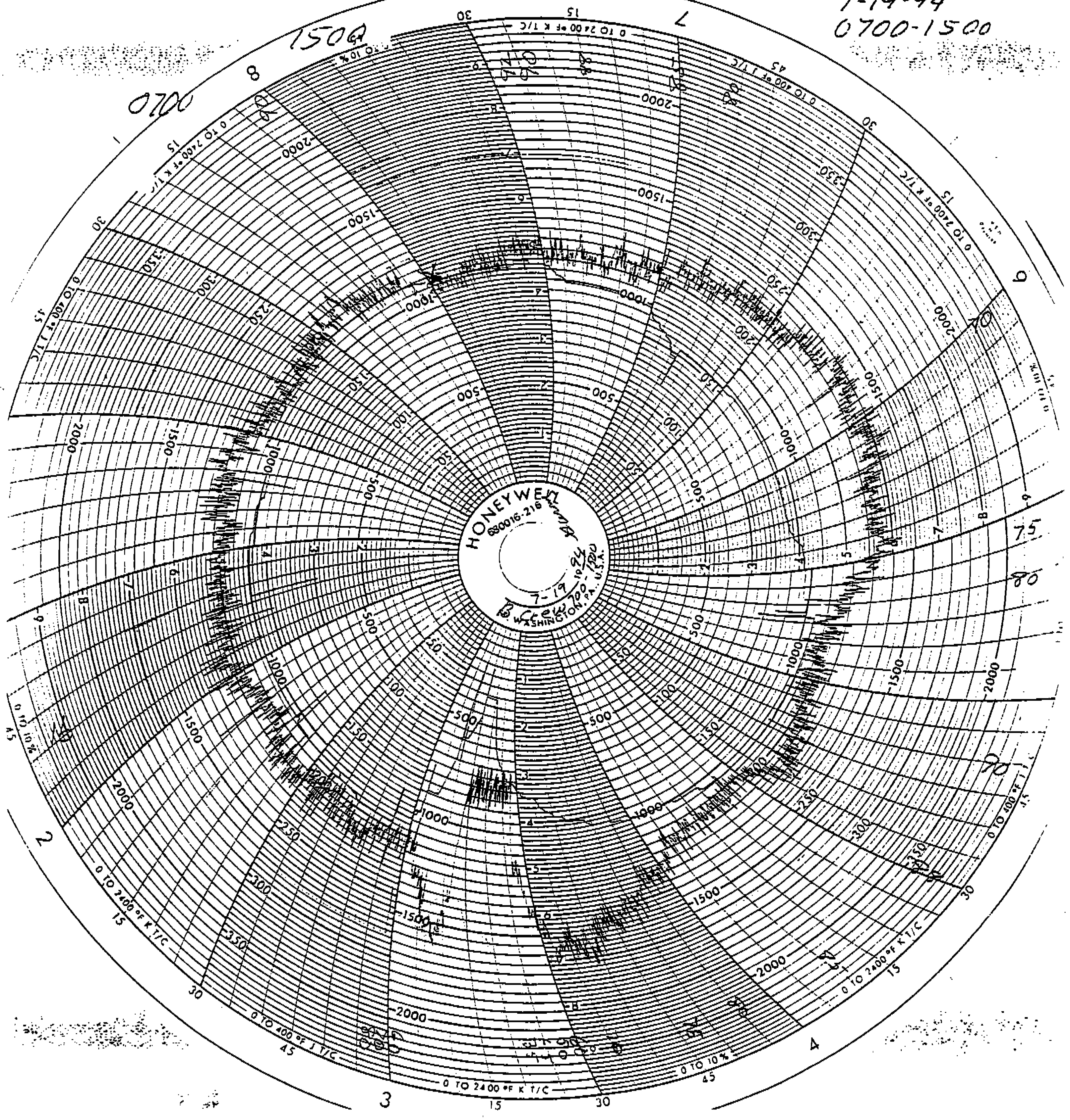
FUEL CALIBRATION: 4.48

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL		EVERY HOUR FLAKE MOISTURE	
							SUR.	CORE	IN	OUT
1:00	247	94	1080	248.0	92581	½	½	½		4.2%
1:10	247	94	1067	247.4	92693	Full	½	½		
1:20	246	94	1090	245.4	92814	Full	½	½		
1:30	246	94	1060	247.3	92929	Full	½	½	34%	
1:40	246	94	971	246.7	93042	Full	½	½		
1:50	246	94	1014	247.	93155	Full	½	½		
2:00										
2:10										
2:20										
2:30										
2:40										
2:50										
3:00										
									⑦	

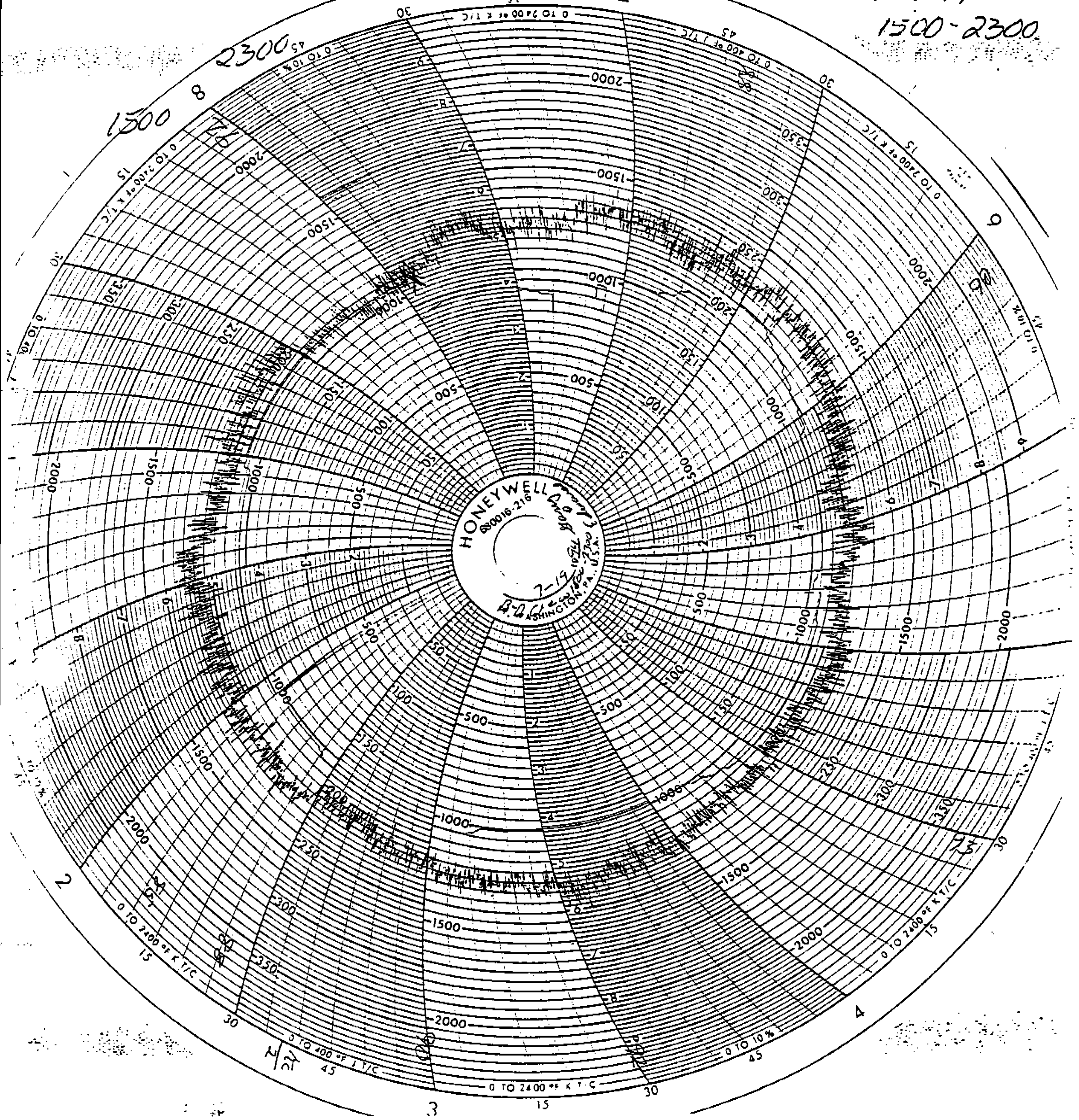
DRYER CHART
7-19-94
2300-0700



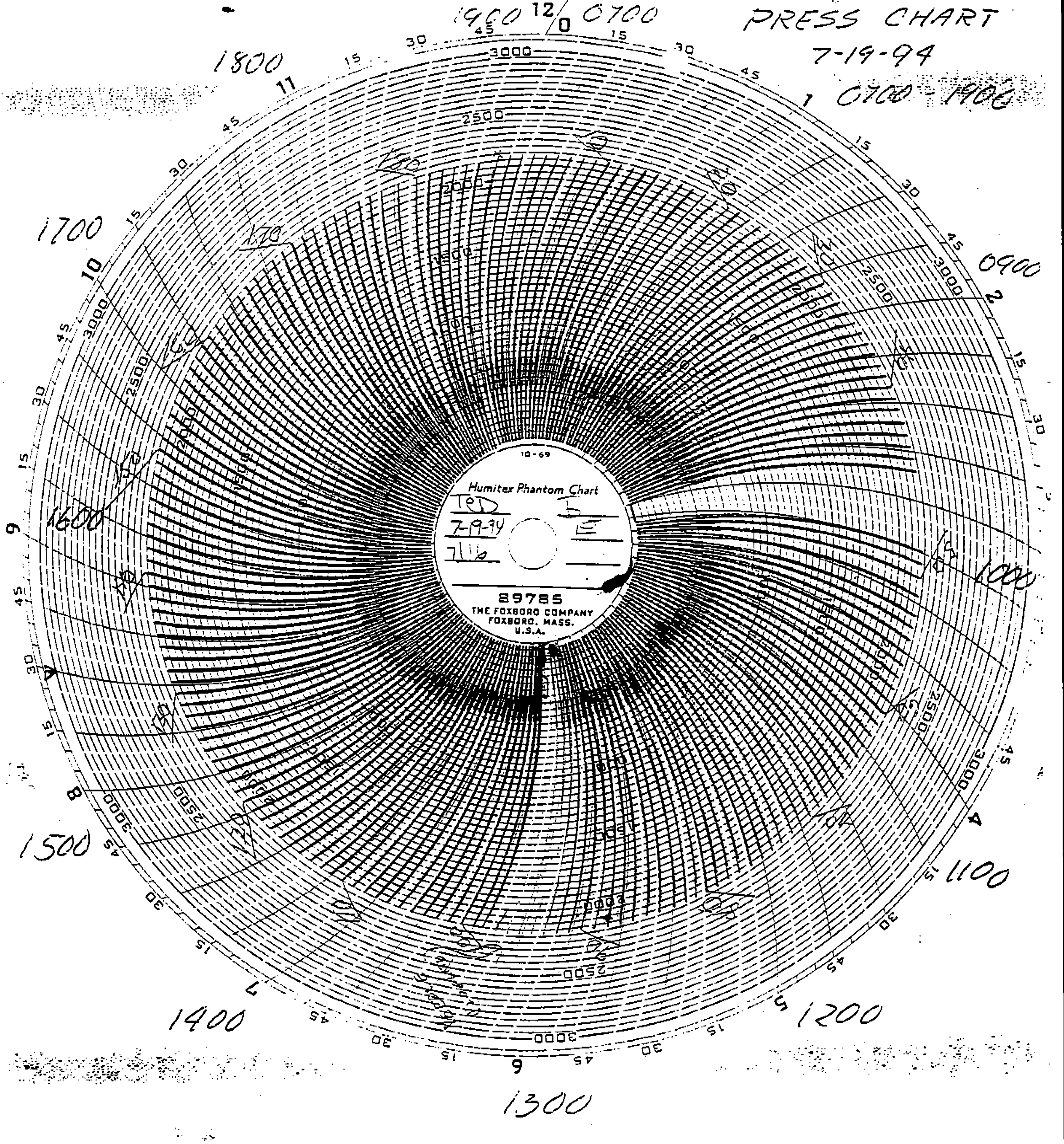
DRYER CHART
7-19-94
0700-1500



DRYER CHART
7-19-94
1500-2300



10

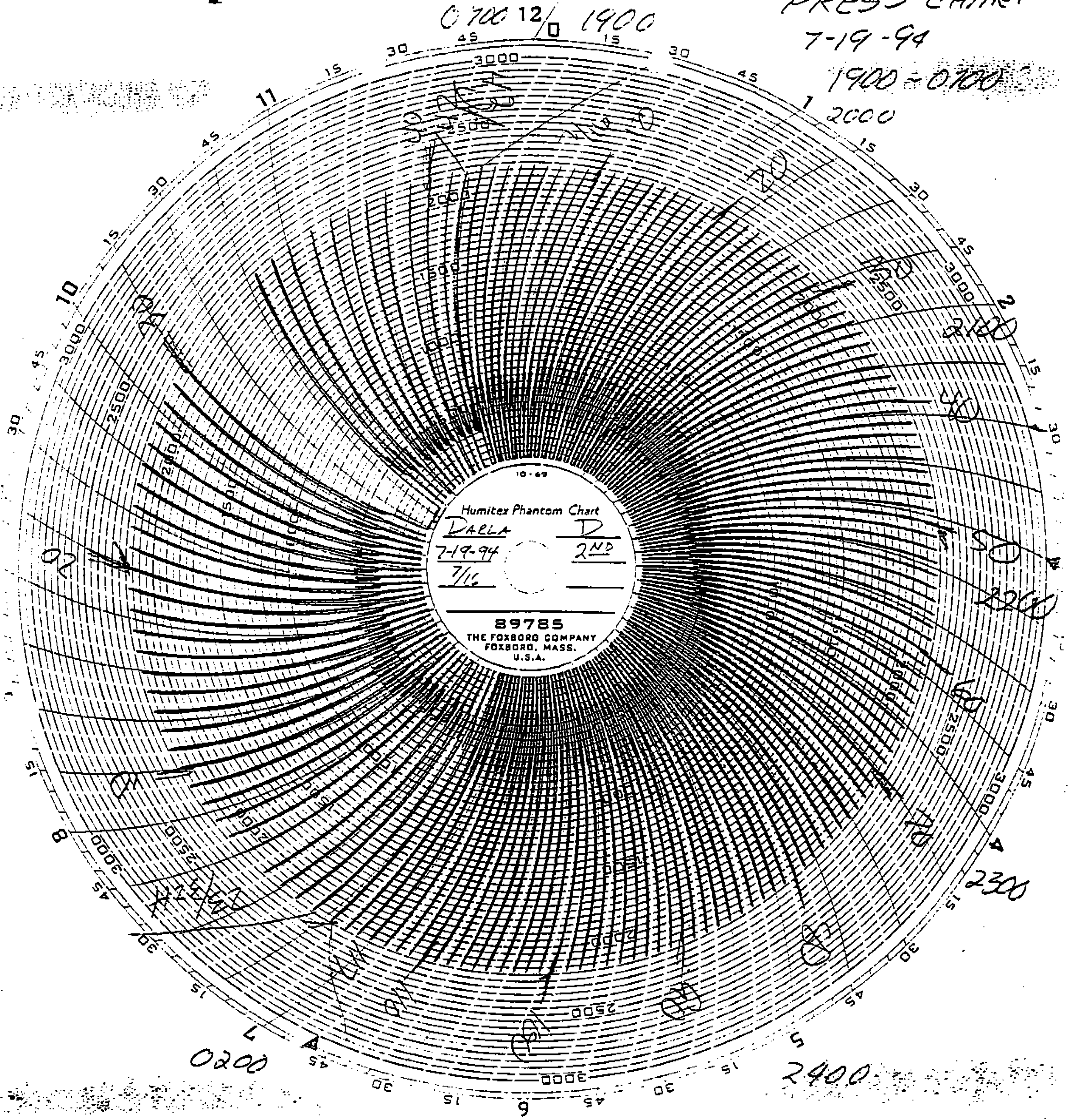


PRESS CHART
7-19-94
0700 - 1900

1530 - 1900 = 55

11

PRESS CHART
7-19-94
1900-0700



1900-2130 = 41
2200-0150 = 62

MONTROSE, COLORADO

OPERATOR Ted SHIFT 1 CREW B DATE 7-19-94

Thumbwheel Setting

Thickness 7/16

Surface ____ Core ____ Resin ____

Flowmeters

Press Temp 213

Surface ____ lb Core ____ lb

Pressloads 185

Highest Board Wt ____

Footage 221,020

Lowest Board Wt ____

Total Downtime minutes 27

Total Footage

Former Setting

TSL ____ Core ____ BSL ____

Dry Bin Thumbwheel Setting

Core ____ Surface ____

DOWNTIME		DOWNTIME (Mins.)				REASONS FOR DOWNTIME
FROM	TO	M	E	O	QC	
9:53	10:13	20				FeOS Ate A Mat
10:27	10:30		3.			CC Feed Not Running X F1
6:19	6:20	1			-	" " "
6:32	6:33	1				Stacker Infeed Jam
6:38	6:40	2				Stacker Jam

13

MONTROSE, COLORADO

Operator Darla Shift 2nd Crew D Date 7-19-94

hutbwheel Setting

urface ________ Core ______ Resin ______

lowmeters

urface ______ lb Core ______ lb

ighest Board Wt ________

owest Board Wt ________

Thickness 7/16 23/32H

Press Temp 213°

Pressloads 7/16-117 23/32H-42

Footage 139,780 82433

Total Downtime minutes 32

Total Footage 222213

Former Setting

TSL ________ Core ______ BSL ______

Dry Bin Thumbwheel Setting

Core ________ Surface ________

	DOWNTIME		DOWNTIME (Mins.)				REASONS FOR DOWNTIME
	FROM	TO	M	E	O	QC	
2	2:42	2:44	2				FCOS caused a cut
30	5:21	5:49	28				A Chain Broke
32	6:09	6:11	2				Timing A Chain

READINGS EVERY 10 MIN.

E-TUBE DATA SHEET

DATE 19 JULY 1994

PLANT: MONTROSE, COLORADO

BY Mike Kennedy

TIME	QUENCH CHAMBER TEMP	SOUTH TR SET			NORTH TR SET			INDICATE TIME O FLUSH CYCLE
		KV	MA	SPARK RATE	KV	MA	SPARK RATE	
1510	235.2 129.0	48	140	27.9	50	180	26.7	
1520	234.6 129.7	48	160	27.9	50	180	26.5	
1530	233.1 131.0	48	150	27.8	49	170	26.8	
1540	231.9 130.2	49	160	27.8	50	190	26.8	
1550	231.9 130.1	48	160	27.6	49	170	26.7	
1600	231.4 130.2	49	160	27.6	47	100	26.7	1555 NORTh
1610	230.0 129.6	48	160	27.8	50	160	26.6	
1620	228.4 130.0	46	170	28.0	49	160	26.7	
1630	228.4 131.9	48	180	27.9	50	150	26.8	
1640	228.9 129.2	47	170	27.9	50	150	26.7	
1650	227.9 128.7	46	160	28.1	50	160	26.6	
1700	227.8 130.3	46	170	27.7	50	175	26.8	
1710	227.5 130.1	46	170	27.9	50	180	26.8	1711 SOUTh
1720	228.2 130.1	48	110	27.8	50	170	26.5	
1730	229.4 129.1	48	130	27.6	50	160	26.7	
1740	229.8 128.5	50	150	27.8	50	180	26.7	
1750	229.7 128.3	50	160	28.0	49	180	26.8	
1800	228.9 128.5	48	160	27.8	50	190	26.9	
1810	228.5 127.1	48	160	27.8	49	180	26.8	
1820	228.1 125.5	48	150	27.9	49	170	26.7	1825 NORTh
1830	227.5 127.2	46	140	28.0	46	90	27.1	
1840	227.6 128.2	48	160	27.6	48	140	26.6	
1850	228.8 128.5	48	160	28.0	50	155	26.3	
1900	228.7 128.7	46	150	27.9	50	160	26.9	
1910	229.8 129.1	46	150	27.6	50	150	26.7	
1920	230.3 131.5	46	140	28.0	50	170	26.8	
1930	231.3 129.3	46	140	27.7	50	160	26.6	
1940	231.0 130.0	46	160	27.9	50	170	26.8	1940 SOUTh
1950	229.6 128.8	48	130	26.3	50	160	26.6	
2000	229.8 130.6	49	130	27.7	49	170	26.7	⑮

READINGS EVERY 10 MIN.

E-TUBE DATA SHEET

DATE 19 JULY 1994

PLANT: MONTROSE, COLORADO

BY Mike Kennedy

TIME	QUENCH CHAMBER TEMP	SOUTH TR SET			NORTH TR SET			INDICATE TIME O FLUSH CYCLE
		KV	MA	SPARK RATE	KV	MA	SPARK RATE	
2010	230.5 129.9	50	140	27.7	50	160	26.9	
2020	229.7 131.3	48	140	27.7	49	176	26.6	
2030	230.4 131.8	48	150	28.2	49	190	26.6	
2040	230.5 130.3	48	160	27.8	49	185	26.6	
2050	229.8 130.4	49	160	27.8	49	170	26.9	2055 NORTH
2100	229.8 131.8	46	150	27.8	48	110	26.9	
2110	229.7 134.7	46	160	27.8	50	140	26.3	
2120	229.7 135.2	46	140	27.8	50	160	26.8	
2130	230.3 135.7	46	150	27.8	50	150	26.7	
0030	230 129	46	150	27.9	50	160	26.7	
0110	231 129	49	140	28.1	49	170	26.5	

APPENDIX J

PROCEDURES

Particulate Loading and Emission Rates

The particulate emission rates were determined per EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). In this procedure a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

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

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

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each test point maintaining isokinetic sampling conditions. Nomographs are used for rapid determination of the sampling rate.

Particulate Loading and Emission Rates

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

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

030894-G:\STACK\WP\PROCEDURES\PM3aP2(6)

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 51

[AD-FRL-3977-4]

Preparation, Adoption, and Submittal of State Implementation Plans, Method for Measurement of Condensible Particulate Emissions From Stationary Sources

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: Method 202 for the measurement of condensible particulate matter (CPM) was proposed in the Federal Register on October 12, 1990, at (55 FR 41546). This action promulgates this method. On April 17, 1990 at (55 FR 14246) EPA promulgated two methods for measuring particulate matter (PM) with an aerodynamic diameter of 10 μm or less (PM_{10}). Since CPM emissions form very fine particles in the PM_{10} size range and are considered PM_{10} emissions, the Agency is adding a method for measuring CPM emissions from stationary sources to appendix M in 40 CFR part 51. The purpose of this

rule is to provide the States with a method for measuring CPM.

EFFECTIVE DATE: December 17, 1991.

ADDRESSES: Background Information Document. The Background Information Document for the promulgated test methods may be obtained from Candace Sorrell or Peter Westlin, MD–19, U.S. EPA, Research Triangle Park, North Carolina 27711, telephone number (919) 541–1064. Please refer to "Summary of Comments and Responses for Method 202."

Docket. Docket No. A–90–03, containing materials relevant to this rulemaking, is available for public inspection and copying between 8:30 a.m. to 12 Noon and 1:30 to 3:30 p.m., Monday through Friday, at EPA's Air Docket Section, Waterside Mall, room M1500, 1st Floor, Gallery 1, 401 M Street SW., Washington, DC 20460. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Candace Sorrell or Peter Westlin, Emission Measurement Branch (MD–19), Technical Support Division, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541–1064.

SUPPLEMENTARY INFORMATION:

I. The Rulemaking

The EPA is proposing to add a method for measuring CPM emissions to appendix M in 40 CFR part 51 to provide a method that States can use in their State implementation plans.

II. Public Participation

The opportunity to hold a public hearing on November 2, 1990 at 10 a.m. was presented in the proposal notice, but no one desired to make an oral presentation. The public comment period was from October 12, 1990 to December 17, 1990.

III. Significant Comments and Changes to the Proposed Rulemaking

Six comment letters were received from the proposal rulemaking. A detailed discussion of these comments is contained in the background document entitled "Summary of Comments and Responses for Method 202" which is referred to in the ADDRESSES section of this preamble. The major comments raised in these letters and the Agency's responses follow.

One commenter suggests that EPA determine the chemical composition of the material collected in the sampling train to verify that it will form ambient condensibles.

The EPA believes that material will collect in the impingers only by condensation or dissolution. Dissolved gases will evaporate during analysis and will not be measured unless the gases react to form a solid or liquid while they are in solution. The EPA has designed Method 202 to prevent the formation of reaction materials from dissolved gases. The EPA believes that any remaining material collected and measured by Method 202 represents the material that would condense in the ambient air. Additional analysis of chemical composition is not necessary.

Another comment raises the concern that the method may collect some portion of the sulfur dioxide (SO_2) as condensible.

The dissolution of SO_2 in water does not lead immediately to the formation of sulfuric acid (H_2SO_4), but tends to lower the solution pH, which further inhibits sulfate or H_2SO_4 formation. The method includes a purging procedure which effectively removes SO_2 before significant oxidation occurs. No additional revisions are necessary.

The commenter feels that if EPA is allowing Method 202 to be used in conjunction with Method 201 or 201A or another dry catch procedure to determine the total PM_{10} measurement, the combined methods should be tested for precision.

The imprecision associated with combining Method 202 with Method 201 or 201A or any other dry catch procedure is not additive because each train provides a separate measurement. Since the total precision associated with the combined methods cannot be larger than the least precise sampling method, a precision evaluation of a combined sampling system is unnecessary.

A commenter suggests that EPA add specific language to the applicability section of the method stating that Method 202 cannot be used on wet sources. He notes that Method 17 is excluded from use on wet sources, and Methods 201 and 201A are not recommended for wet sources.

The EPA agrees that Method 202 with an in-stack filter is not recommended for wet sources, and such a statement has been added to the applicability. However, a heated Method 5 filter could be used in Method 202 instead of the in-stack filter which would allow application to wet sources.

One commenter requests that EPA clearly state that Method 202 should not be used for assessing compliance with emission limits set on the basis of data derived from a different measurement approach.

The EPA agrees that a violation must be shown, in the first instance, by means of measurements made with the applicable test method. Once such a showing is made, however, section 113(e) of the Clean Air Act allows the Agency to rely on any credible evidence, including evidence other than the applicable test method, to establish th duration of the period of noncompliance for the purposes of assessing a penalty.

A commenter believes that the sample collection efficiency and method precision may be affected by the sampling conditions such as impinger temperature and sampling flow rate and the method should address this possibility.

The EPA agrees that the nature of the material in the sample gas may affect collection efficiency. For example, a field demonstration of Method 202 at an oil-fired boiler resulted in about 75 percent impinger collection efficiency. This collection efficiency can be improved with the addition of a second filter place between the second and third impinger. This option has been included in the method with a discussion of applicability.

The commenter feels the 1-hour nitrogen (N_2) purge is too long. He believes the majority of the SO_2 is removed in the first few minutes. He suggests the method be revised to reduce the purge time in conjunction with maintaining the sample under cold conditions and analyzing it within 48 hours.

The EPA does not agree with reducing the purge time. Laboratory tests have shown that a 1-hour purge time is necessary to ensure the adequate removal of SO_2 from the impinger solution.

Another commenter suggests that the method should be revised to give credi for ammonium sulfate ($(NH_4)_2SO_3$) dihydrte and other condensible particulate matter formed in the gas stream due to ammonia (NH_3) injectio used to enhance the efficiency of a control device.

The EPA does not agree. The condensible particulate matter formed the gas stream due to NH_3 injection is emitted to the atmosphere. The EPA believes that condensible particulate matter emitted from the source should be counted as such even if it is a produ of a pollution-control technique.

The commenter suggests that EPA consider an alternative to $MeCl_2$ consistent with the Montreal Protocol.

The EPA investigated the effectiveness of a chloroform-ether extraction during the method development phase. The chloroform-ether was not as effective as the in removing organic materials; how the chloroform-ether procedure was found to be acceptable for organic extraction. The method has been revised to allow a chloroform-ether extraction.

The commenter supports the exclusion of ammonium chloride as a condensible: ever. he expresses concern about $(NH_4)_2SO_4$ forming in the impingers.

The N_2 purge removes SO_2 before significant oxidation occurs. If NH_3 is present in the flue gas, the $(NH_4)_2SO_4$ formed in the impingers would not be counted as a condensible, although the H_2SO_4, which reacted with NH_3, would be counted as a condensible. Method 202 corrects for the NH_3 by measuring the sulfate using an IC analysis and subtracting out the ammonium ion (NH_4^+) mass.

The commenter agrees that the NH_3 added during the titration should be subtracted from the final weight. However, he does not agree with adding back in the water removed by the acid-base reaction.

Because H_2SO_4 is hygroscopic, the H_2SO_4 mass found in the atmosphere would have the water attached to it. The method has been revised to allow the source to correct for only the NH_4^+ or for both NH_4^+ and water as an option depending on the basis for the regulation.

A. Docket

The docket is an organized and plete file of all the information submitted to or otherwise considered by EPA in the development of this proposed rulemaking. The principle purposes of the docket are to: (1) Allow interested parties to identify and locate documents so that they can effectively participate in the rulemaking process, and (2) serve as the record in case of judicial review except for interagency review materials (Section 307(d)(7)(A)).

B. Office of Management and Budget Review

Under Executive Order 12291, EPA must judge whether a regulation is "major" and, therefore, subject to the requirement of a regulatory impact analysis. This rulemaking would not result in any of the adverse economic effects set forth in Section 1 of the Order as grounds for finding a "major rule." It will neither have an annual effect on the economy of $100 million or more, nor will it result in a major increase in costs or prices. There will be no significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S.-sed enterprises to compete with ign-based enterprises in domestic or export markets. This rulemaking was submitted to the Office of Management and Budget (OMB) for review as required by Executive Order 12291.

C. Regulatory Flexibility Act Compliance

Pursuant to the provisions of 5 U.S.C. 605(b), I hereby certify that this attached rule, if promulgated, will not have any economic impact on small entities because no additional costs will be incurred.

This rule does not contain any information collection requirements subject to OMB review under the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.*

Dated: December 6, 1991.

F. Henry Habicht II,

Acting Administrator.

List of Subjects in 40 CFR Part 51

Administrative practice and procedure,
Air pollution control,
Carbon Monoxide,
Inter-governmental relations,
Lead,
Nitrogen dioxide,
Ozone,
Particulate matter,
Reporting and recordkeeping requirements,
Sulfur Oxides,
Volatile Organic Compounds.

The EPA amends title 40, chapter I, part 51 of the Code of Federal Regulations as follows:

PART 51—[AMENDED]

1. The authority citation for part 51 continues to read as follows:

Authority: Section 110 of the Clean Air Act as amended (42 U.S.C. 7410).

2. Appendix M, to part 51 Table of Contents is amended by adding an entry to read as follows:

Method 202—Determination of Condensible Particulate Emissions From Stationary Sources

3. By adding Method 202 to Appendix M to part 51 to read as follows:

Method 202—Determination of Condensible Particulate Emissions From Stationary Sources

1. Applicability and Principle

1.1 Applicability. 1.1.1 This method applies to the determination of condensible particulate matter (CPM) emissions from stationary sources. It is intended to represent condensible matter as material that condenses after passing through a filter and as measured by this method (Note: The filter catch can be analyzed according to the appropriate method).

1.1.2 This method may be used in conjunction with Method 201 or 201A if the probes are glass-lined. Using Method 202 in conjunction with Method 201 or 201A, only the impinger train configuration and analysis is addressed by this method. The sample train operation and front end recovery and analysis shall be conducted according to Method 201 or 201A.

1.1.3 This method may also be modified to measure material that condenses at other temperatures by specifying the filter and probe temperature. A heated Method 5 out-of-stack filter may be used instead of the in-stack filter to determine condensible emissions at wet sources.

1.2 Principle. 1.2.1 The CPM is collected in the impinger portion of a Method 17 (appendix A, 40 CFR part 60) type sampling train. The impinger contents are immediately purged after the run with nitrogen (N_2) to remove dissolved sulfur dioxide (SO_2) gases from the impinger contents. The impinger solution is then extracted with methylene chloride ($MeCl_2$). The organic and aqueous fractions are then taken to dryness and the residues weighed. The total of both fractions represents the CPM.

1.2.2 The potential for low collection efficiency exist at oil-fired boilers. To improve the collection efficiency at these type of sources, an additional filter placed between the second and third impinger is recommended.

2. Precision and Interference

2.1 Precision. The precision based on method development tests at an oil-fired boiler and a catalytic cracker were 11.7 and 4.8 percent, respectively.

2.2 Interference. Ammonia. In sources that use ammonia injection as a control technique for hydrogen chloride (HCl), the ammonia interferes by reacting with HCl in the gas stream to form ammonium chloride (NH_4Cl) which would be measured as CPM. The sample may be analyzed for chloride and the equivalent amount of NH_4Cl can be subtracted from the CPM weight. However, if NH_4Cl is to be counted as CPM, the inorganic fraction should be taken to near dryness (less than 1 ml liquid) in the oven and then allowed to air dry at ambient temperature to prevent any NH_4Cl from vaporizing.

3. Apparatus

3.1 Sampling Train. Same as in Method 17, section 2.1, with the following exceptions noted below (see Figure 202–1). *Note:* Mention of trade names or specific products does not constitute endorsement by EPA.

3.1.1 The probe extension shall be glass-lined or Teflon.

3.1.2 Both the first and second impingers shall be of the Greenburg-Smith design with the standard tip.

3.1.3 All sampling train glassware shall be cleaned prior to the test with soap and tap water, water, and rinsed using tap water, water, acetone, and finally, $MeCl_2$. It is important to completely remove all silicone grease from areas that will be exposed to the $MeCl_2$ during sample recovery.

3.2 Sample Recovery. Same as in Method 17, section 2.2, with the following additions:

3.2.1 N_2 Purge Line. Inert tubing and fittings capable of delivering 0 to 28 liters/min of N_2 gas to the impinger train from a standard gas cylinder (see Figure 202–2). Standard 0.95 cm (⅜-inch) plastic tubing and compression fittings in conjunction with an adjustable pressure regulator and needle valve may be used.

3.2.2 Rotameter. Capable of measuring gas flow at 20 liters/min.

3.3 Analysis. The following equipment is necessary in addition to that listed in Method 17, section 2.3:

3.3.1 Separatory Funnel. Glass, 1-liter.

3.3.2 Weighing Tins. 350-ml.

3.3.3 Dry Equipment. Hot plate and oven with temperature control.

3.3.4 Pipets. 5-ml.

3.3.5 Ion Chromatograph. Same as in Method 5F, Section 2.1.6.

4. Reagents

Unless otherwise indicated, all reagents must conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society. Where such specifications are not available, use the best available grade.

4.1 Sampling. Same as in Method 17, section 3.1, with the addition of deionized distilled water to conform to the American Society for Testing and Materials Specification D 1193–74, Type II and the omittance of section 3.1.4.

4.2 Sample Recovery. Same as in Method 17, section 3.2, with the following additions:

4.2.1 N_2 Gas. Zero N_2 gas at delivery pressures high enough to provide a flow of 20 liters/min for 1 hour through the sampling train.

4.2.2 Methylene Chloride, ACS grade. Blanks shall be run prior to use and only methylene chloride with low blank values (0.001 percent) shall be used.

4.2.3 Water. Same as in section 4.1.

4.3 Analysis. Same as in Method 17, section 3.3, with the following additions:

4.3.1 Methylene Chloride. Same as section 4.2.2.

4.3.2 Ammonium Hydroxide. Concentrated (14.8 M) NH_4OH.

4.3.3 Water. Same as in section 4.1.

4.3.4 Phenolphthalein. The pH indicator solution, 0.05 percent in 50 percent alcohol.

5. Procedure

5.1 Sampling. Same as in Method 17, section 4.1, with the following exceptions:

5.1.1 Place 100 ml of water in the first three impingers.

5.1.2 The use of silicone grease in train assembly is not recommended because it is very soluble in $MeCl_2$ which may result in sample contamination. Teflon tape or similar means may be used to provide leak-free connections between glassware.

5.2 Sample Recovery. Same as in Method 17, section 4.2 with the addition of a post-test N_2 purge and specific changes in handling of individual samples as described below.

5.2.1 Post-test N_2 Purge for Sources Emitting SO_2. (Note: This step is recommended, but is optional. With little or no SO_2 is present in the gas stream, i.e., the pH of the impinger solution is greater than 4.5, purging has been found to be unnecessary.) As soon as possible after the post-test leak check, detach the probe and filter from the impinger train. Leave the ice in the impinger box to prevent removal of moisture during the purge. If necessary, add more ice during the purge to maintain the gas temperature below 20 °C. With no flow of gas through the clean purge line and fittings, attach it to the input of the impinger train (see Figure 202–2). To avoid over- or under-pressurizing the impinger array, slowly commence the N_2 gas flow through the line while simultaneously opening the meter box pump valve(s). When using the gas cylinder pressure to push the purge gas through the sample train, adjust the flow rate to 20 liters/min through the rotameter. When pulling the purge gas through the sample train using the meter box vacuum pump, set the orifice pressure differential to $\Delta H_@$ and maintain an overflow rate through the rotameter of less than 2 liters/min. This will guarantee that the N_2 delivery system is operating at greater than ambient pressure and prevents the possibility of passing ambient air (rather than N_2) through the impingers. Continue the purge under these conditions for 1 hour, checking the rotameter and ΔH value(s) periodically. After 1 hour, simultaneously turn off the delivery and pumping systems.

5.2.2 Sample Handling.

5.2.2.1 Container Nos. 1, 2, and 3. If filter catch is to be determined, as detailed in Method 17, section 4.2.

5.2.2.2 Container No. 4 (Impinger Contents). Measure the liquid in the first three impingers to within 1 ml using a clean graduated cylinder or by weighing it to within 0.5 g using a balance. Record the volume or weight of liquid present to be used to calculate the moisture content of the effluent gas. Quantitatively transfer this liquid into a clean sample bottle (glass or plastic); rinse each impinger and the connecting glassware, including probe extension, twice with water, recover the rinse water, and add it to the same sample bottle. Mark the liquid level on the bottle.

5.2.2.3 Container No. 5 ($MeCl_2$ Rinse). Follow the water rinses of each impinger and the connecting glassware, including the probe extension with two rinses of $MeCl_2$; save the rinse products in a clean, glass sample jar. Mark the liquid level on the jar.

5.2.2.4 Container No. 6 (Water Blank). Once during each field test, place 500 ml of water in a separate sample container.

5.2.2.5 Container No. 7 ($MeCl_2$ Blank). Once during each field test, place in a separate glass sample jar a volume of $MeCl_2$ approximately equivalent to the volume used to conduct the $MeCl_2$ rinse of the impingers.

5.3 Analysis. Record the data required on a sheet such as the one shown in Figure 202–3. Handle each sample container as follows:

5.3.1 Container Nos. 1, 2, and 3. If filter catch is analyzed, as detailed in Method 17, section 4.3.

5.3.2 Container Nos. 4 and 5. Note the level of liquid in the containers and confirm on the analytical data sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in Container No. 4 either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Remove a 5-ml aliquot and set aside for later ion chromatographic (IC) analysis of sulfates. (Note: Do not use this aliquot to determine chlorides since the HCl will be evaporated during the first drying step; Section 8.2 details a procedure for this analysis.)

5.3.2.1 Extraction. Separate the organic fraction of the sample by adding the conten of Container No. 4 ($MeCl_2$) to the contents o Container No. 4 in a 1000-ml separatory funnel. After mixing, allow the aqueous and organic phases to fully separate, and drain off most of the organic/$MeCl_2$ phase. Then add 75 ml of $MeCl_2$ to the funnel, mix well, and drain off the lower organic phase. Repeat with another 75 ml of $MeCl_2$. This extraction should yield about 250 ml of organic extract. Each time, leave a small amount of the organic/$MeCl_2$ phase in the separatory funnel ensuring that no water is collected in the organic phase. Place the organic extract in a tared 350-ml weighing tin.

5.3.2.2 Organic Fraction Weight Determination (Organic Phase from Container Nos. 4 and 5). Evaporate the organic extract at room temperature and pressure in a laboratory hood. Following evaporation, desiccate the organic fraction for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight and report the results to the nearest 0.1 mg.

5.3.2.3 Inorganic Fraction Weight Determination. (Note: If NH_4Cl is to be counted as CPM, the inorganic fraction should be taken to near dryness (less than 1 ml liquid) in the oven and then allow to air dry at ambient temperature. If multiple acid emissions are suspected, the ammonia titration procedure in section 8.1 may be preferred.) Using a hot plate, or equivalen evaporate the aqueous phase to approximately 50 ml; then, evaporate to dryness in a 105 °C oven. Redissovle the residue in 100 ml of water. Add five drops of phenolphthalein to this solution; then, add concentrated (14.8 M) NH_4OH until the sample turns pink. Any excess NH_4OH will be evaporated during the drying step. Evaporate the sample to dryness in a 105 °C oven, desiccate the sample for 24 hours, weigh to a constant weight, and record the results to the nearest 0.1 mg. (Note: The addition of NH_4OH is recommended, but is optional when little or no SO_2 is present in the gas stream, i.e., when the pH of the impinger solution is greater than 4.5, the addition of NH_4OH is not necessary.)

5.3.2.4 Analysis of Sulfate by IC to Determine Ammonium Ion (NH_4^+) Retained in the Sample. (Note: If NH_4OH is not added, omit this step.) Determine the amount of sulfate in the aliquot taken from Container No. 4 earlier as described in Method 5F (appendix A, 40 CFR part 60). Based on the I SO_4^{-2} analysis of the aliquot, calculate the correction factor to subtract the NH_4^+ retained in the sample and to add the combined water removed by the acid-base reaction (see section 7.2).

5.3.3 Analysis of Water and $MeCl_2$ Blank (Container Nos. 6 and 7). Analyze thes sample blanks as described above in s[illegible]ns 5.3.2.3 and 5.3.2.2, respectively.

5.3.4 Analysis of Acetone Blank Container No. 8). Same as in Method 17, section 4.3.

6. bration

Same as in Method 17, section 5, except for the following:

6.1 IC Calibration. Same as Method 5F, section 5.

6.2 Audit Procedure. Concurrently, analyze the audit sample and a set of compliance samples in the same manner to evaluate the technique of the analyst and the standards preparation. The same analyst, analytical reagents, and analytical system shall be used both for compliance samples and the EPA audit sample. If this condition is met, auditing of subsequent compliance analyses for the same enforcement agency within 30 days is not required. An audit sample set may not be used to validate different sets of compliance samples under the jurisdiction of different enforcement agencies, unless prior arrangements are made with both enforcement agencies.

6.3 Audit Samples. Audit Sample Availability. Audit samples will be supplied only to enforcement agencies for compliance tests. The availability of audit samples may be obtained by writing:

Source Test Audit Coordinator (MD-77B),
Quality Assurance Division, Atmospheric
Research and Exposure Assessment
Laboratory, U.S. Environmental Protection
Agency, Research Triangle, Park, NC 27711

or by calling the Source Test Audit Coordinator (STAC) at (919) 541-7834. The request for the audit sample must be made at least 30 days prior to the scheduled compliance sample analysis.

6.4 Audit Results. Calculate the audit sample concentration according to the calculation procedure described in the audit instructions included with the audit sample. Fill in the audit sample concentration and the analyst's name on the audit response form included with the audit instructions. Send one copy to the EPA Regional Office or the appropriate enforcement agency and a second copy to the STAC. The EPA Regional Office or the appropriate enforcement agency will report the results of the audit to the laboratory being audited. Include this response with the results of the compliance samples in relevant reports to the EPA Regional Office or the appropriate enforcement agency.

7. Calculations

Same as in Method 17, section 6, with the following additions:

7.1 Nomenclature. Same as in Method 17, section 6.1 with the following additions.

C_{cpm} = Concentration of the CPM in the stack gas, dry basis, corrected to standard conditions, g/dscm (g/dscf).
C_{SO_4} = Concentration of SO_4^{-2} in the sample, mg/ml.
m_b = Sum of the mass of the water and $MeCl_2$ blanks, mg.
m_c = Mass of the NH_4^+ added to sample to form ammonium sulfate, mg.
m_i = Mass of inorganic CPM matter, mg.
m_o = Mass of organic CPM, mg.
m_r = Mass of dried sample from inorganic fraction, mg.
V_b = Volume of aliquot taken for IC analysis, ml.
V_{ic} = Volume of impinger contents sample, ml.

7.2 Correction for NH_4^+ and H_2O. Calculate the correction factor to subtract the NH_4^+ retained in the sample based on the IC SO_4^{-2} and if desired, add the combined water removed by the acid-base reaction.

$$m_c = K \, C_{SO_4} \, V_{ic} \qquad \text{Eq. 202-1}$$

where:
K = 0.0205, when correcting for NH_4^+ and H_2O.
= 0.1840, when only correcting for NH_4^+.

7.3 Mass of Inorganic CPM.

$$m_i = m_r \frac{V_{ic}}{V_{ic} - V_b} - m_c \qquad \text{Eq. 202-2}$$

7.4 Concentration of CPM.

$$C_{cpm} = \frac{m_o + m_i - m_b}{V_{m_{std}}} \qquad \text{Eq. 202-3}$$

8. Alternative Procedures

8.1 Determination of NH_4^+ Retained in Sample by Titration.

8.1.1 An alternative procedure to determine the amount of NH_4^+ added to the inorganic fraction by titration may be used. After dissolving the inorganic residue in 100 ml of water, titrate the solution with 0.1 N NH_4OH to a pH of 7.0, as indicated by a pH meter. The 0.1 N NH_4OH is made as follows: Add 7 ml of concentrated (14.8 M) NH_4OH to 1 liter of water. Standardize against standardized 0.1 N H_2SO_4 and calculate the exact normality using a procedure parallel to that described in section 5.5 of Method 6 (appendix A, 40 CFR part 60). Alternatively, purchase 0.1 N NH_4OH that has been standardized against a National Institute of Standards and Technology reference material.

8.1.2 Calculate the concentration of SO_4^{-2} in the sample using the following equation.

$$CSO_4 = \frac{48.03 \, V_t \, N}{100} \qquad \text{Eq. 202-4}$$

where
N = Normality of the NH_4OH, mg/ml.
V_t = Volume of NH_4OH titrant, ml.
48.03 = mg/meq.
100 = Volume of solution, ml.

8.3.1 Calculate the CPM as described in section 7.

8.2 Analysis of Chlorides by IC. At the conclusion of the final weighing as described in section 5.3.2.3, redissolve the inorganic fraction in 100 ml of water. Analyze an aliquot of the redissolved sample for chlorides by IC using techniques similar to those described in Method 5F for sulfates. Previous drying of the sample should have removed all HCl. Therefore, the remaining chlorides measured by IC can be assumed to be NH_4Cl, and this weight can be subtracted from the weight determined for CPM.

8.3 Air Purge to Remove SO_2 from Impinger Contents. As an alternative to the post-test N_2 purge described in section 5.2.1, the tester may opt to conduct the post-test purge with air at 20 liter/min. Note: The use of an air purge is not as effective as a N_2 purge.

8.4 Chloroform-ether Extraction. As an alternative to the methylene chloride extraction described in section 5.3.2.1, the tester may opt to conduct a chloroform-ether extraction. Note: The Chloroform-ether was not as effective as the $MeCl_2$ in removing the organics, but it was found to be an acceptable organic extractant. Chloroform and diethylether of ACS grade, with low blank values (0.001 percent), shall be used. Analysis of the chloroform and diethylether blanks shall be conducted according to Section 5.3.3 for $MeCl_2$.

8.4.1 Add the contents of Container No. 4 to a 1000-ml separatory funnel. Then add 75 ml of chloroform to the funnel, mix well, and drain off the lower organic phase. Repeat two more times with 75 ml of chloroform. Then perform three extractions with 75 ml of diethylether. This extraction should yield approximately 450 ml of organic extraction. Each time, leave a small amount of the organic/$MeCl_2$ phase in the separatory funnel ensuring that no water is collected in the organic phase.

8.4.2 Add the contents of Container No. 5 to the organic extraction. Place approximately 300 ml of the organic extract in a tared 350-ml weighing tin while storing the remaining organic extract in a sample container. As the organic extract evaporates, add the remaining extract to the weighing tin.

8.4.3 Determine the weight of the organic phase as described in Section 5.3.2.2.

8.5 Improving Collection Efficiency. If low impinger collection efficiency is suspected, the following procedure may be used.

8.5.1 Place an out-of-stock filter as described in Method 8 between the second and third impingers.

8.5.2 Recover and analyze the filter according to Method 17, Section 4.2. Include the filter holder as part of the connecting glassware and handle as described in sections 5.2.2.2 and 5.2.2.3.

8.5.3 Calculate the Concentration of CPM as follows:

$$C_{cpm} = \frac{m_o + m_i + m_f - m_b}{V_{m_{std}}} \qquad \text{Eq. 202-5}$$

where:
m_f = amount of CPM collected on out-of-stack filter, mg.

8.6 Wet Source Testing. When testing at a wet source, use a heated out-of-stack filter as described in Method 5.

9. Bibliography

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Shigehara. "Laboratory and Field Evaluation of the EPA Method 5 Impinger Catch for Measuring Condensible Matter from Stationary Sources." Paper presented at the 1989 EPA/AWMA International Symposium on Measurement of Toxic and Related Air Pollutants. Raleigh, North Carolina. May 1–5, 1989.

2. DeWees, W.D. and K.C. Steinsberger. "Method Development and Evaluation of Draft Protocol for Measurement of Condensible Particulate Emissions." Draft Report. November 17, 1988.

3. Texas Air Control Board. Laboratory Division. "Determination of Particulate in Stack Gases Containing Sulfuric Acid and/or Sulfur Dioxide." *Laboratory Methods for Determination of Air Pollutants.* Modified December 3, 1978.

4. Nothstein, Greg. Masters Thesis. University of Washington. Department of Environmental Health. Seattle, Washington.

5. "Particulate Source Test Procedures Adopted by Puget Sound Air Pollution Control Agency Board of Directors." Puget Sound Air Pollution Control Agency. Engineering Division. Seattle, Washington. August 11, 1983.

6. Commonwealth of Pennsylvania. Department of Environmental Resources. Chapter 139, Sampling and Testing (Title 25, Rules and Regulations, Part I, Departmer Environmental Resources, Subpart C, Protection of Natural Resources, Article III, Air Resources). January 8, 1960.

7. Wisconsin Department of Natural Resources. *Air Management Operations Handbook, Revision 3.* January 11, 1988.

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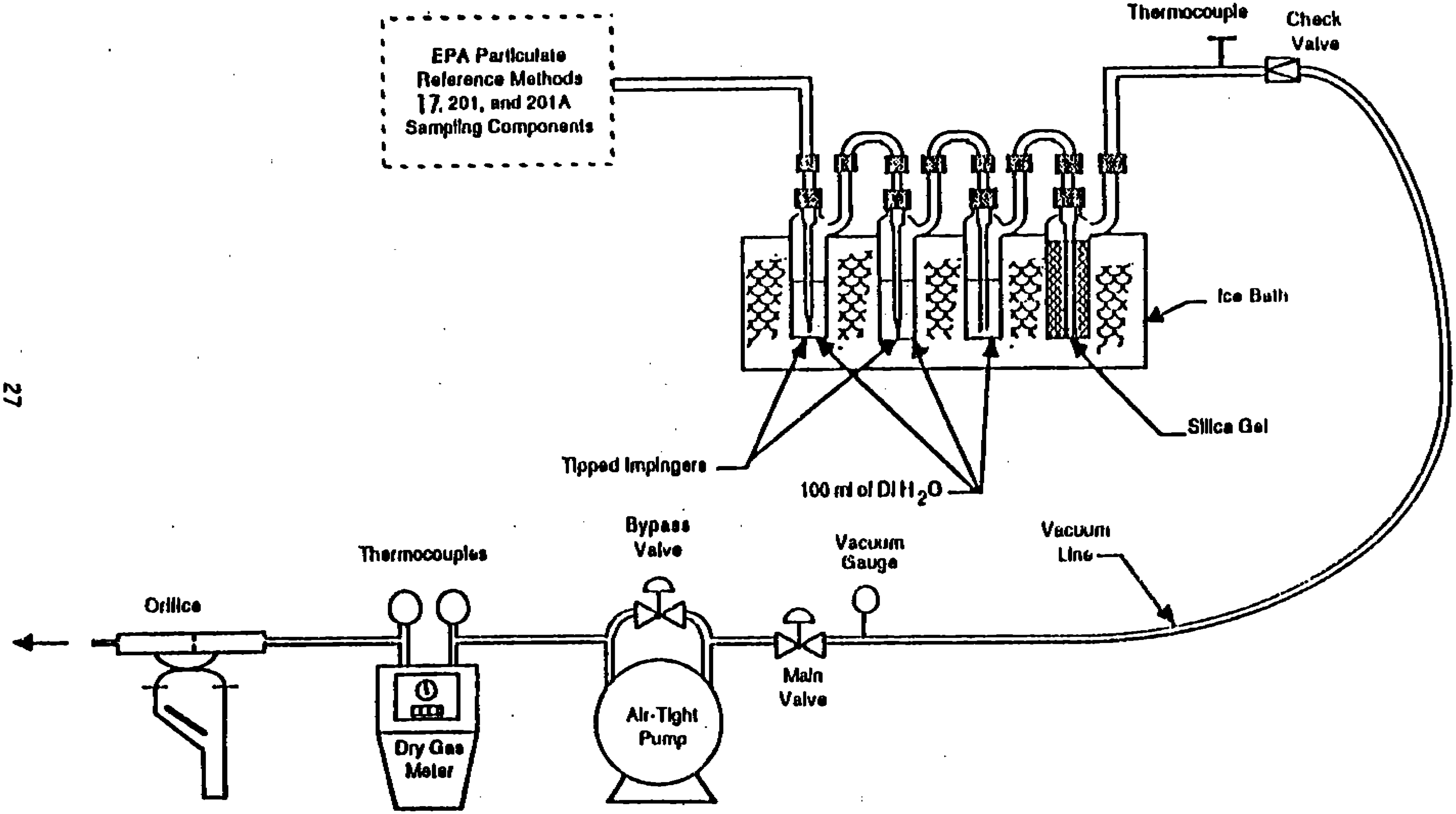

Figure 202-1. , Schematic of condensible particulate sampling train.

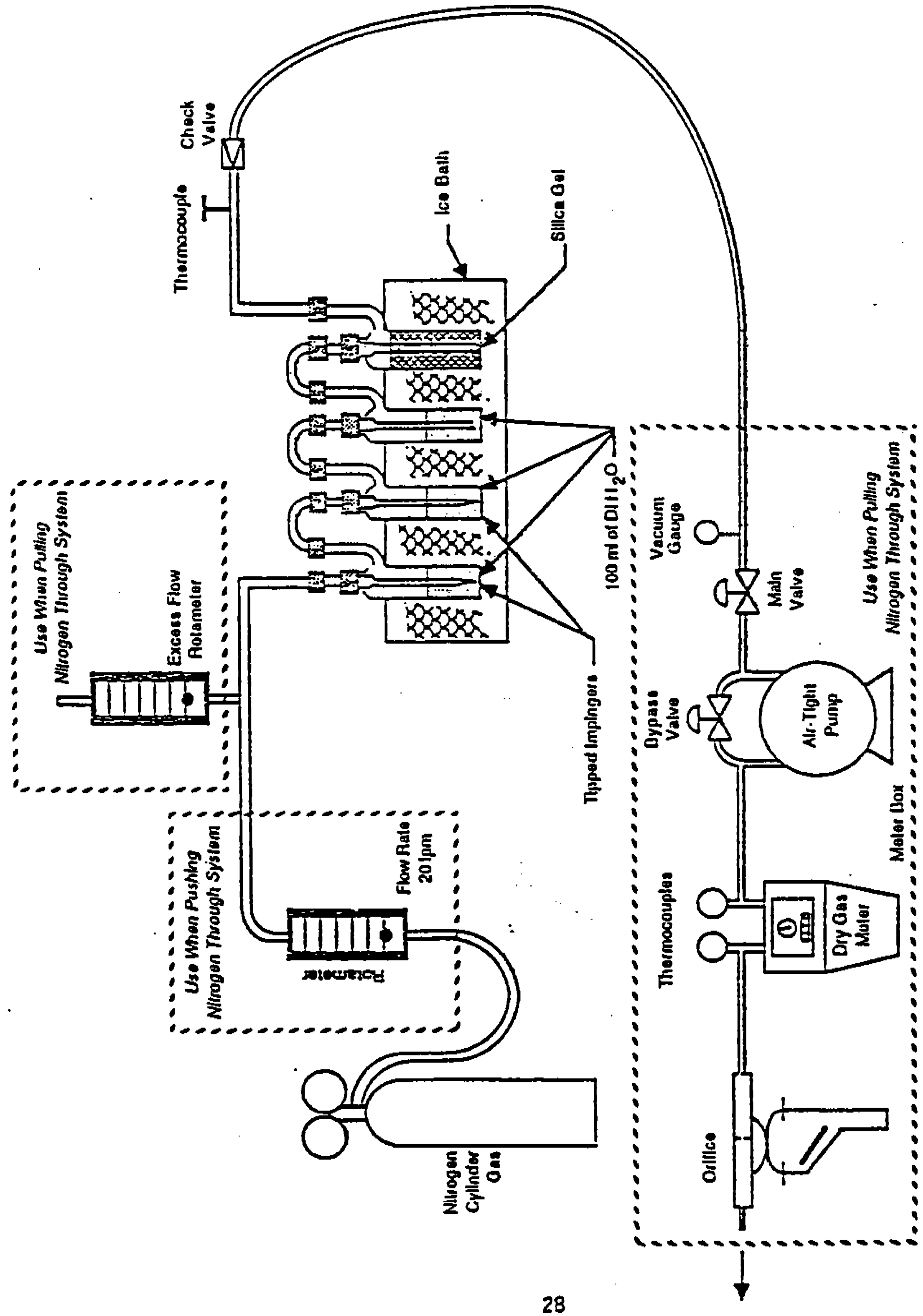

Figure 202-2. Schematic of post-test nitrogen purge system.

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Moisture Determination

Volume or weight of liquid in impingers: __________ ml or g

Weight of moisture in silica gel: __________ g

Sample Preparation (Container No. 4)

Amount of liquid lost during transport: __________ ml

Final volume: __________ ml

pH of sample prior to analysis: __________

Addition of NH_4OH required: __________

Sample extracted 2X with 75 ml $MeCl_2$?: __________

For Titration of Sulfate

Normality of NH_4OH: __________ N

Volume of sample titrated: __________ ml

Volume of titrant: __________ ml

Sample Analysis

Container number	Weight of condensible particulate, mg		
	Final weight	Tare weight	Weight gain
4 (Inorganic)			
4 & 5 (Organic)			

Total: __________

Less Blank: __________

Weight of Condensible Particulate: __________

Figure 202-3. Analytical data sheet.

[FR Doc. 91-29957 Filed 12-18-91; 8:45 am]

BILLING CODE 6560-50-M

4.2 Performance Evaluation Tests. The owner of a lidar system shall subject such a lidar system to the performance verification tests described in Section 3, prior to first use of this method. The annual calibration shall be performed for three separate, complete runs and the results of each should be recorded. The requirements of Section 3.3.1 must be fulfilled for each of the three runs.

Once the conditions of the annual calibration are fulfilled the lidar shall be subjected to the routine verification for three separate complete runs. The requirements of Section 3.3.2 must be fulfilled for each of the three runs and the results should be recorded. The Administrator may request that the results of the performance evaluation be submitted for review.

5. *References*

5.1 The Use of Lidar for Emissions Source Opacity Determination, U.S. Environmental Protection Agency, National Enforcement Investigations Center, Denver, CO. EPA-330/1-79-003-R, Arthur W. Dybdahl, current edition [NTIS No. PB81-246662].

5.2 Field Evaluation of Mobile Lidar for the Measurement of Smoke Plume Opacity, U.S. Environmental Protection Agency, National Enforcement Investigations Center, Denver, CO. EPA/NEIC-TS-128, February 1976.

5.3 Remote Measurement of Smoke Plume Transmittance Using Lidar, C. S. Cook, G. W. Bethke, W. D. Conner (EPA/RTP). Applied Optics 11, pg 1742, August 1972.

5.4 Lidar Studies of Stack Plumes in Rural and Urban Environments, EPA-650/4-73-002, October 1973.

5.5 American National Standard for the Safe Use of Lasers ANSI Z 136.1-176, March 8, 1976.

5.6 U.S. Army Technical Manual TB MED 279, Control of Hazards to Health from Laser Radiation, February 1969.

5.7 Laser Institute of America Laser Safety Manual, 4th Edition.

5.8 U.S. Department of Health, Education and Welfare, Regulations for the Administration and Enforcement of the Radiation Control for Health and Safety Act of 1968, January 1976.

5.9 Laser Safety Handbook, Alex Mallow, Leon Chabot, Van Nostrand Reinhold Co., 1978.

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 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).

---

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

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.

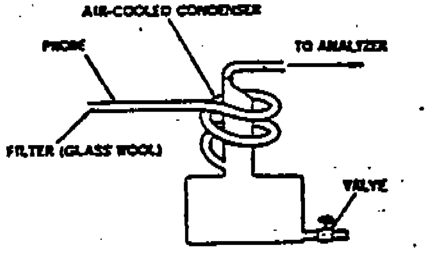

Figure 10-1. Continuous sampling train.

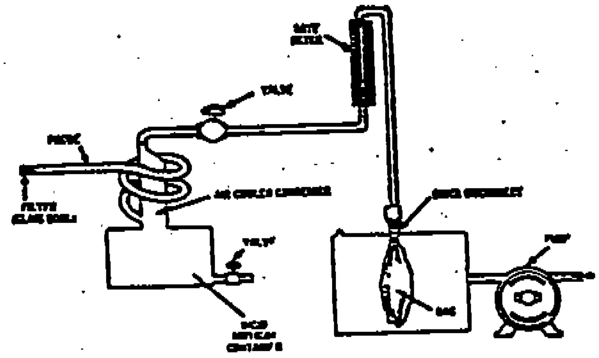

Figure 10-2. Integrated gas sampling train.

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.

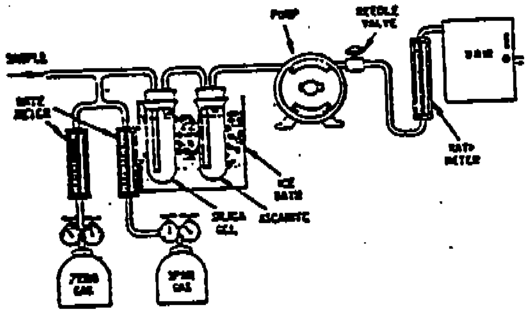

Figure 10-3. Analytical equipment.

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.

$$C_{CO\ stack} = C_{CO\ NDIR}(1 - F_{CO_2})$$

Eq. 10-1

Where:

$C_{CO\ stack}$ = Concentration of CO in stack, ppm by volume (dry basis).

$C_{CO\ NDIR}$ = Concentration of CO measured by NDIR analyzer, ppm by volume (dry basis).

F_{CO_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*

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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

ADDENDA

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.

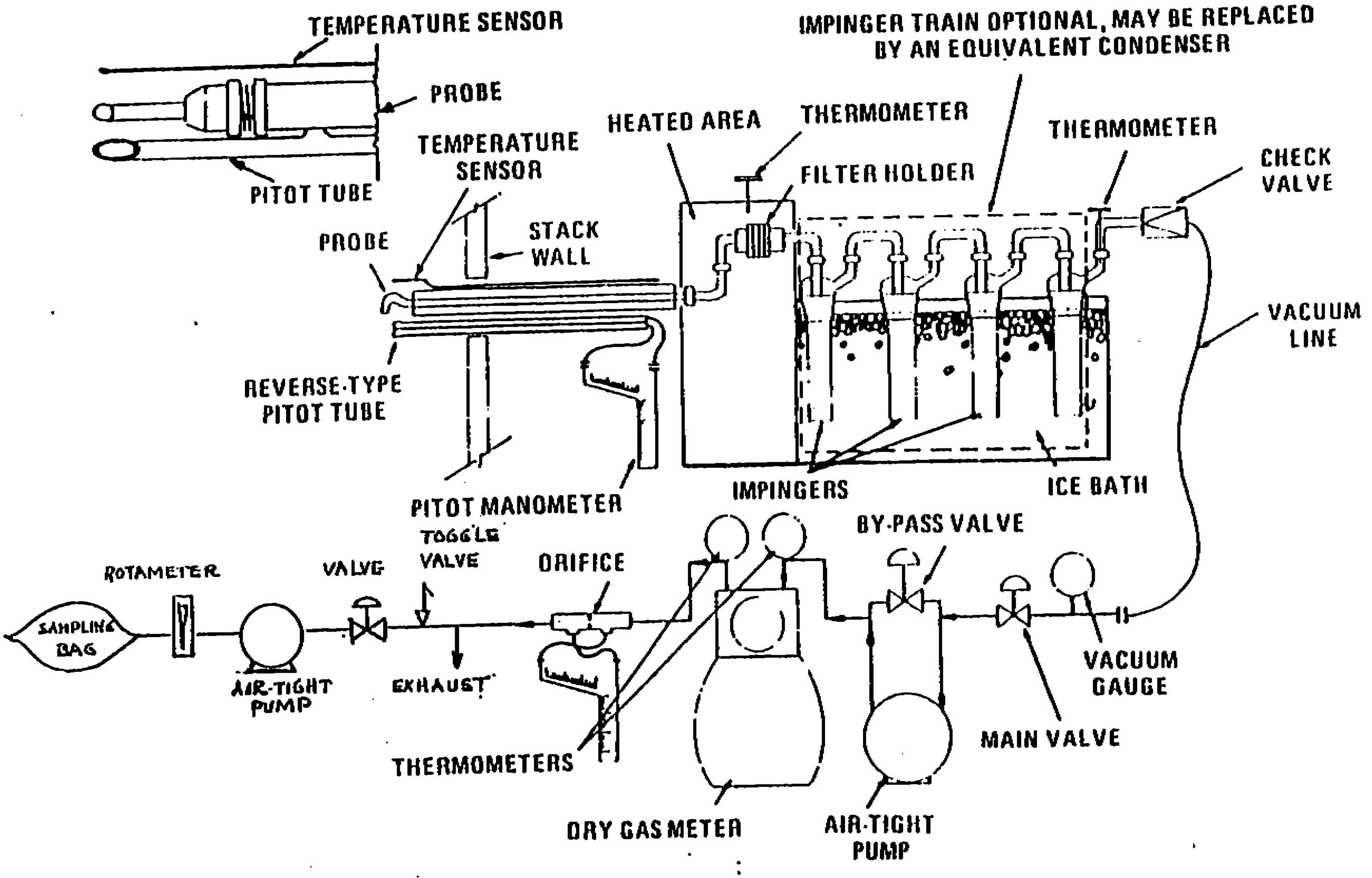
B. *Definitions of Performance Specifications.*

Range—The minimum and maximum measurement limits.

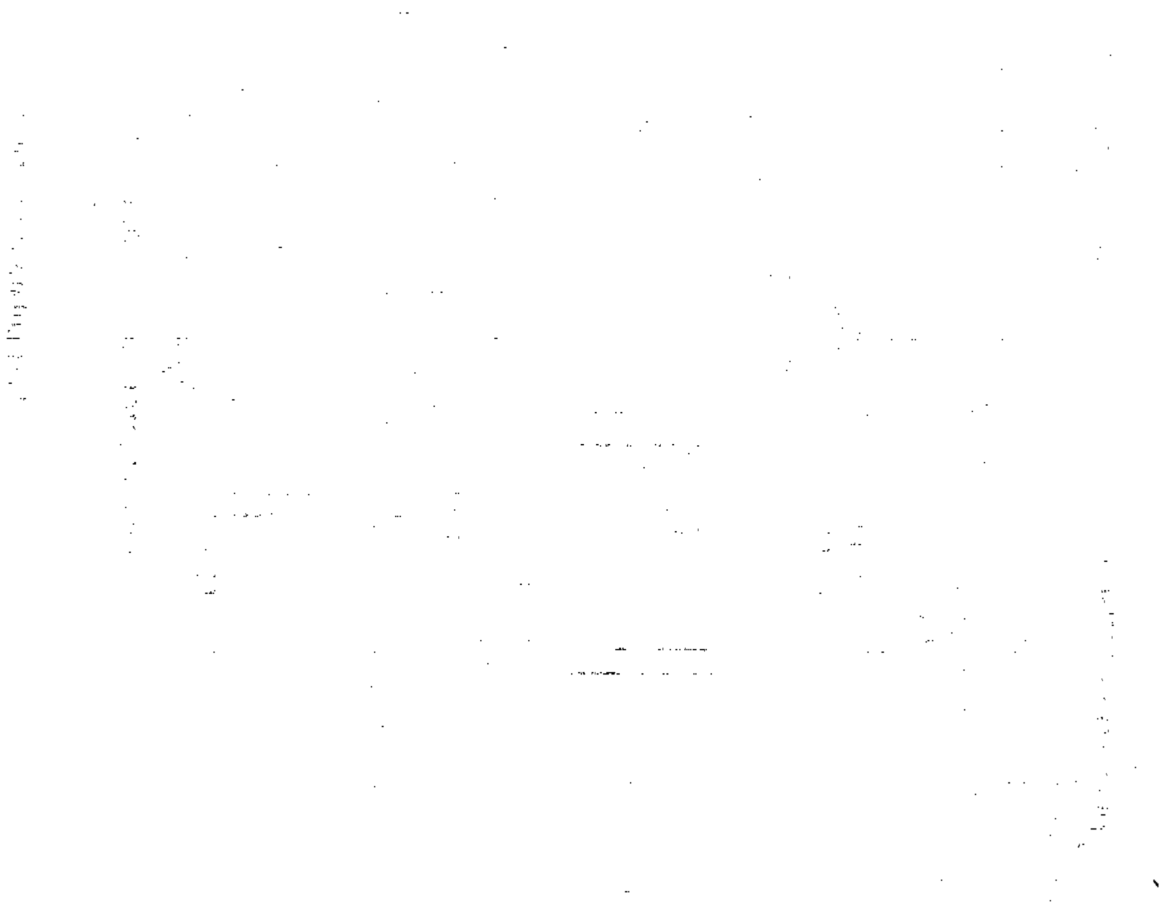
Output—Electrical signal which is proportional to the measurement; intended for connection to readout or data processing devices. Usually expressed as millivolts or milliamps full scale at a given impedance.

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.



Particulate-sampling train.



APPENDIX K

CALCULATION EQUATIONS

METHOD 2
CALCULATION EQUATIONS

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

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

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

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

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

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

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

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

SYMBOLS

A = Cross Sectional area of stack, SQ. FT.

A_n = Cross sectional area of nozzle, SQ. FT.

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

C_p = Pitot tube coefficient, dimensionless

C_a = Concentration of particulate matter in stack gas, wet basis, GR/ACF

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF

EA = Excess air, percent by volume

γ = Dry test meter correction factor, dimensionless

G_d = Specific gravity (relative to air), dimensionless

I = Isokinetic variation, percent by volume

M_d = Molecular weight of stack gas, dry basis, g/g - mole.

$\dot{m}_g$ = Mass flow of wet flue gas, LB/HR

$\dot{m}_p$ = Particulate mass flow, LB/HR

M_s = Molecular weight of stack gas, wet basis, g/g mole.

M_p = Total amount of particulate matter collected, g

P_{bar} = Atmospheric pressure, IN. HG. (uncompensated)

P_g = Stack static gas pressure, IN. WC.

P_s = Absolute pressure of stack gas, IN. HG.

P_{std} = Standard absolute pressure, 29.92 IN. HG.

A_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 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)

EPA Method 202 Calculations

Report No. 4-3396

Job: **LP - Montrose**
Date: 19-Jul-94

RUN	Vic (ml)	Sulfate (mg/ml)	Mc (mg)	Mr (mg)	Mi (mg)	Mo (mg)	Mb (mg)	CPM (mg)	ENTER IN COMPUTER (g)
1	250	3.05E-04	0.01	12.2	12.19	12.8	0.6	24.39	0.024386
2	250	4.04E-04	0.02	13.6	13.58	16.4	0.6	29.38	0.029381
3	250	3.04E-04	0.01	6.8	6.79	23	0.6	29.19	0.029186

EPA Method 201A/202 Totals

RUN	Probe (mg)	Filter (mg)	CPM (mg)	Total (mg)
1	33.1	10.4	24.39	67.88597
2	17.9	13	29.38	60.28142
3	20.1	15.2	29.19	64.48602

APPENDIX L

SAMPLING TRAIN CALIBRATION DATA

INTERPOLL LABORATORIES

EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job L.P. Montrose Date 7-19-94

Operator D.V Module No. 9

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

Bar press 24.74 in. Hg. γ = 1.0008 ^H@ 1.79 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(753.30)	[redacted]	
2.5	755.39	92	90
5.0	757.50	93	91
7.5	759.61	93	90
10	761.74	95	92
[redacted]	V_m= 8.44	Avg(t_m)= 92 °F	

Calculate Y_{cm} as follows:

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

$$Y_{cm} = \frac{1.786}{(1.0008)(8.44)}\left[\frac{(92.0) + 460}{(24.74)}\right]^{0.5}$$

.2114 4.72

Y_{cm} = 1.00

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

S-432

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: July 25, 1994

Meter Box No. : 9 (Rockwell Dry Test Meter Serial No. 964549)

Date of Last Calibration: July 08, 1994
Calibration Technician: S. Bainville
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.)
July 19, 1994	4-3396	761.74	910.76	149.02	149.02

* Total volume through meter since last calibration.

Date 7-8-94

Bar. Press. 28.72 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 6

Control Module No. 9

Serial No. DTM 964549

Wet Test Meter No. AL-20

Technician SBAINVILLE

ΔH (in. WC)		Gas Volume Wet Test Meter (ft³)	* Cal. Index ● (%)	* Diff. Wet Test Meter ΔP_w (in. WC)	Gas Volume Dry test meter (ft³)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
							Wet Test	Dry Test					
nominal	actual				V_{di}	V_{df}	t_w (°F)	t_{di} (°F)	t_{do} (°F)				
0.6	0.5	2	99.85	0.01	750.000	752.023	72	84	77	4/55	1.0246	1.75	
1.2	1.2	3	99.91	0.025	746.500	749.840	72	84	77	4/45	1.0004	1.74	
2.0	2.0	3	99.93	0.055	743.000	746.030	72	86	77	3/45	1.0018	1.80	
3.3	3.3	5	100.00	0.09	737.000	742.042	72	86	77	4/53	1.0007	1.81	
4.7	4.7	6.8	100.02	0.12	730.000	735.032	72	86	76	4/57	.9994	1.84	
	2	3	4	5	6	7	8	9	10	11/12	1.0008	1.79	

Positive leak check performed by SLB

Meter was in tolerance ☒

Meter was not in tolerance ☐: readjusted linkage

Meter was not in tolerance ☐: changed dry test meters

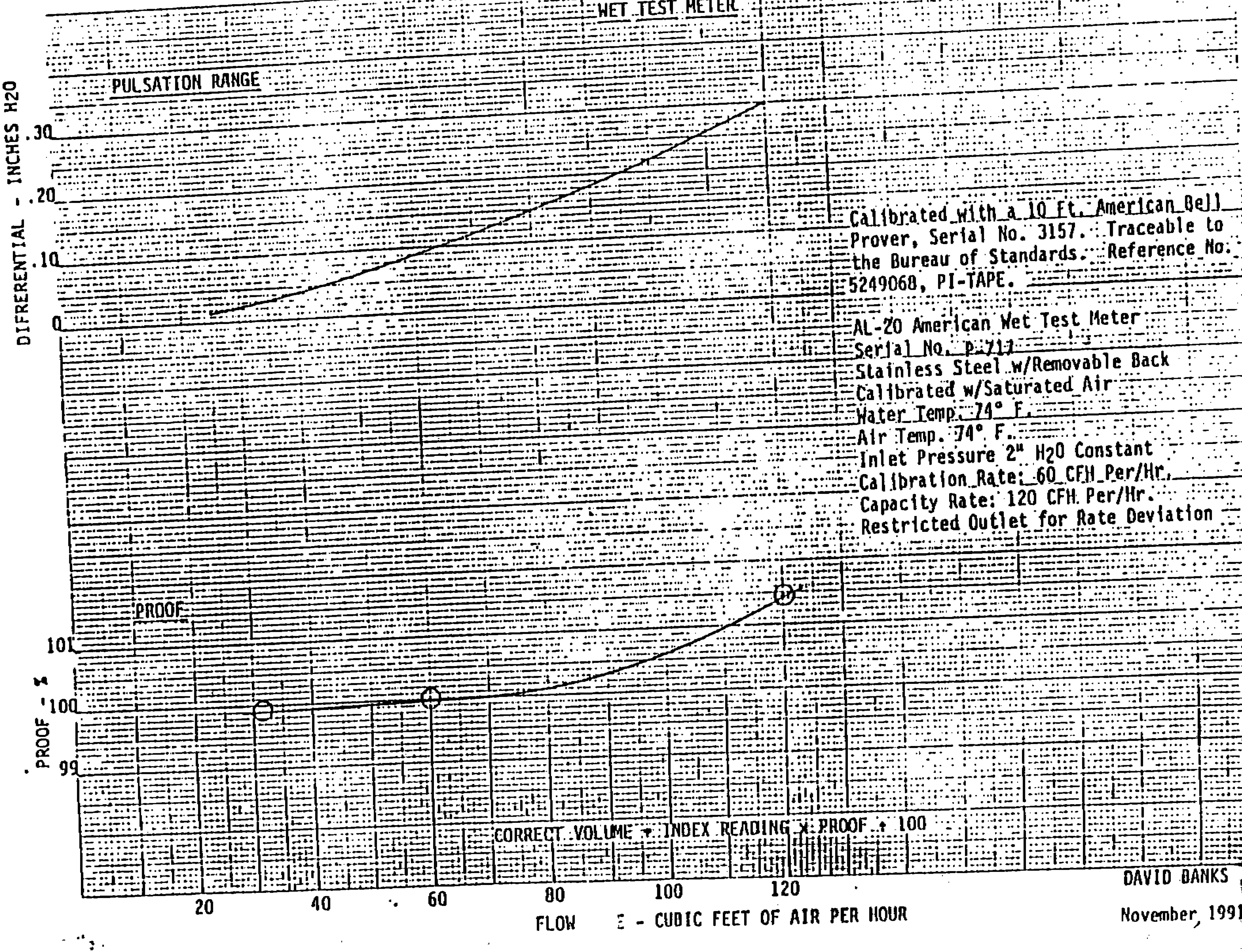
Approved by Date 7/8/94

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

S0102RR 11/91

DIFFERENTIAL PRESSURE AND PROOF CALIBRATION CURVES

WET TEST METER



Calibrated With a 10 Ft. American Bell Prover, Serial No. 3157. Traceable to the Bureau of Standards. Reference No. 5249068, PI-TAPE.

AL-20 American Wet Test Meter
Serial No. P-717
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H_2O Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation

CORRECT VOLUME = INDEX READING X PROOF ÷ 100

DAVID BANKS

November, 1991

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 07-19-94
Technician: David Vaaler

Nozzle Number 8-3

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	.188
2	.1875
3	.1872
Average:	.1875

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test: # 37

Vendor Omega

Model HH 81

Range 0-2100 °F

Date of Calibration 5-5-94

Serial Number 74JX 0225

Thermocouple Type K

Technician E TROWBRIDGE

Method of Calibration:

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

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

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0	.5	-.5	.11
100	100	98.7	-1.3	.23
200	200	200.6	.6	.09
300	300	298.6	1.4	.18
400	400	399	-1.0	.11
500	500	499	-1.0	.10
600	600	601	+1.0	.09
700	700	700	0	0
800	800	802	+2.0	.16
900	900	901	+1.0	.07
1000	1000	1001	+1.0	.07
1100	1100	1100	0	0
1200	1200	1201	+1.0	.06
1300	1300	1299	-1.0	.05
1400	1400	1402	+2.0	.10
1500	1500	1501	+1.0	.05
1600	1600	1604	+4.0	.19
1700	1700	1701	+1.0	.04
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:	1.218	.088

OF = off scale response by unit under test (°F)

% dev = 100 Δt / (460 + t)

☒ Unit in tolerance

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

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 22-6

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 $<.0625"$ .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

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

Date of Inspection: 4-8-94

Inspected by:

CFR Title 40 Part 60 Appenidix A Method 2

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

ET'S

Date 5-31-94
Technician
Mercury Column Barometer No. LAB 1
Aneroid Barometer No. ultimeter model 12 SN-0100-2.008

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.230	72	.115	29.115	29.12	.005

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

Has problem been alleviated? Yes/No. How?

*Note

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

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