Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section: 11.1

Reference Number: 69

Title: Results Of The May 26, 1993 Particulate Emission Compliance Test On The No. 7 Portable Asphalt Plant Stationed Near Appleton, Minnesota,

Interpoll Laboratories, Inc., Circle Pines, MN,

July 7, 1993.

AP-42 Section 11.1
Reference
Report Sect. 4
Reference 69

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
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RESULTS OF THE JUNE 3, 1993 STATE PARTICULATE AND OPACITY COMPLIANCE TESTS CONDUCTED ON THE MESABI BITUMINOUS PORTABLE ASPHALT PLANT STATIONED IN GILBERT, MINNESOTA

Submitted to:

MESABI BITUMINOUS
P.O. Box 728
Gilbert, Minnesota 55741

Attention:

Jerry Nemanich, President

Approved by:

Daniel Despen
Manager
Stationary Source Testing Department

Report Number 3-8982
July 14, 1993
SP/slp

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ABBREVIATIONS

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

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

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

1 INTRODUCTION

On June 3, 1993 Interpoll Laboratories Personnel conducted a State Particulate and Visible Emission Compliance Test on the Mesabi Bituminous Portable Asphalt Plant stationed in Gilbert, Minnesota. Duke Brennan, Ed Trowbridge, and Randy Madison performed the on-site portion of the test. Coordination between testing activities and plant operation was provided by Jerry Nemanich of Mesabi Bituminous. The test was witnessed by Bob Beresford of the Minnesota Pollution Control Agency.

The unit tested is a Barber Greene Model KA-70 portable asphalt plant which has a rated capacity of 250 TPH with 5% moisture. The particulate emissions are controlled by a venturi scrubber. The unit was tested processing 100% virgin aggregate. The plant burned propane and operated under normal conditions.

Particulate evaluations were performed in accordance with EPA Methods 1 - 5, and 9, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). A preliminary determination of the gas linear velocity profile was made before the first particulate determination to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to 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 as per Minnesota Rules part 7005.0500.

An integrated flue gas sample was extracted simultaneously with each particulate sample 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 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

Testing was conducted from 3 test ports oriented horizontally on the stack. The test ports are located 3.3 diameters downstream and 3.2 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run. Visible emissions determinations were performed by Randy Madison, an EPA-certified observer.

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 results of the particulate emission test are summarized in Tables 1 - 2. The results are summarized in the table below.

Process		Concentration (GR/DSCF)	Emission Rate (LB/HR)
Virgin	(Dry + Organic Wet Catch)	0.0354	9.4
Virgin	(Dry Catch Only)	0.0299	7.9

Opacity averaged 13 percent.

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

Table 1. Summary of the Results of the June 3, 1993 State Particulate *Emission Compliance* Test on the Mesabi Bituminous Portable Asphalt Plant Located in Gilbert, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		06-03-93	06-03-93	06-03-93
Time runs were done	(HRS)	930/1035	1103/1224	1252/1354
Process rate	(TON/HR)			
recycle		0.0	0.0	0.0
aggregate		266.0	283.0	263.0
asphalt		15.4	16.4	15.2
total		281.4	299.4	278.2
Volumetric flow				
actual	(ACFM)	45550	42936	45383
standard	(DSCFM)	32282	29041	30787
Gas temperature	(DEG-F)	135	138	142
Moisture content	(%V/V)	16.03	19.41	18.64
Gas composition	(%V/V,dry)			
carbon dioxide		3.00	3.30	3.00
oxygen		16.30	15.80	16.20
nitrogen		80.70	80.90	80.80
Isokinetic variation	(%)	98.8	103.6	102.2
Part. emission rate	(LB/HR)	11.33	8.60	8.14
Particulate concentration				
actual	(GR/ACF)	.0290	.0234	.0209
standard	(GR/DSCF)	.0410	.0345	.0308

Note: Dry + Organic Wet Catch

* Federal regulations restrict particulate emissions from portable asphalt plants to .04 GR/DSCF, CFR Title 40, Part 60, Subpart I.

Table 2. Summary of the Results of the June 3, 1993 State Particulate Emission Compliance Test on the Mesabi Bituminous Portable Asphalt Plant Located in Gilbert, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		06-03-93	06-03-93	06-03-93
Time runs were done	(HRS)	930/1035	1103/1224	1252/1354
Process rate	(TON/HR)			
recycle		0.0	0.0	0.0
aggregate		266.0	283.0	263.0
asphalt		15.4	16.4	15.2
total		281.4	299.4	278.2
Volumetric flow				
actual	(ACFM)	45550	42936	45383
standard	(DSCFM)	32282	29041	30787
Gas temperature	(DEG-F)	135	138	142
Moisture content	(%V/V)	16.03	19.41	18.64
Gas composition	(%V/V,dry)			
carbon dioxide		3.00	3.30	3.00
oxygen		16.30	15.80	16.20
nitrogen		80.70	80.90	80.80
Isokinetic variation	(%)	98.8	103.6	102.2
Part. emission rate	(LB/HR)	9.41	7.29	6.98
Particulate concentration				
actual	(GR/ACF)	.0241	.0198	.0179
standard	(GR/DSCF)	.0340	.0293	.0265

Note: Dry Catch Only

* Federal regulations restrict particulate emissions from portable asphalt plants to .04 GR/DSCF, CFR Title 40, Part 60, Subpart I.

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 and opacity 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 particulate emission rate has been calculated using the product of the concentration times flow method.

3.1 Results of Orsat & Moisture Determinations

Test No. 1
Asphalt Plant Stack

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

	Run 1	Run 2	Run 3
Date of run	06-03-93	06-03-93	06-03-93
Dry basis (orsat)			
carbon dioxide.....	3.00	3.30	3.00
oxygen.....	16.30	15.80	16.20
nitrogen.....	80.70	80.90	80.80
Wet basis (orsat)			
carbon dioxide.....	2.52	2.66	2.44
oxygen.....	13.69	12.73	13.18
nitrogen.....	67.76	65.20	65.74
water vapor.....	16.03	19.41	18.64
Dry molecular weight.....	29.13	29.16	29.13
Wet molecular weight.....	27.35	26.99	27.05
Specific gravity.....	0.945	0.932	0.935
Water mass flow.....(LB/HR)	17287	19616	19778
FO	1.533	1.545	1.567

3.2 Results of Particulate Loading Determinations

Test No. 1
Asphalt Plant Stack

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

	Run 1	Run 2	Run 3
Date of run	06-03-93	06-03-93	06-03-93
Time run start/end.....(HRS)	930/1035	1103/1224	1252/1354
Static pressure.....(IN.WC)	-1.80	-1.80	-1.80
Cross sectional area (SQ.FT)	8.56	8.56	8.56
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	160.0	190.0	191.0
desiccant.....(GRAMS)	9.0	11.0	9.0
total.....(GRAMS)	169.0	201.0	200.0
Total particulate material..			
.....collected(grams)	0.1108	0.0881	0.0823
Gas meter coefficient.....	1.0002	1.0002	1.0002
Barometric pressure..(IN.HG)	28.58	28.58	28.58
Avg. orif.pres.drop..(IN.WC)	1.66	1.48	1.63
Avg. gas meter temp..(DEF-F)	78.7	82.1	84.2
Volume through gas meter....			
at meter conditions...(CF)	44.40	42.15	44.25
standard conditions.(DSCF)	41.74	39.36	41.17
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.185	.185	.185
Avg.stack gas temp ..(DEG-F)	135	138	142
Volumetric flow rate.....			
actual.....(ACFM)	45550	42936	45383
dry standard.....(DSCFM)	32282	29041	30787
Isokinetic variation.....(%)	98.8	103.6	102.2
Particulate concentration...			
actual.....(GR/ACF)	0.02902	0.02335	0.02091
dry standard.....(GR/DSCF)	0.04096	0.03454	0.03084
Particle mass rate...(LB/HR)	11.334	8.598	8.139

3.3 Results of Opacity Observations

Test No. 1
Asphalt Plant Stack

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

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	0.00
5	0.0223	0.00
10	0.0458	48.75
15	0.0706	43.33
20	0.0969	7.92
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00

Avg Opac12.96 Avg OD 0.0606 Time average

Observer: Randy Madison
Cert. Date: 04-06-93
Date of Observation: 06-03-93
Time of Observation: 0930-1030

Test No. 2
Asphalt Plant Stack

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

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	0.00
5	0.0223	0.00
10	0.0458	43.33
15	0.0706	50.83
20	0.0969	5.83
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00

Avg Opac13.12 Avg OD 0.0614 Time average

Observer: Randy Madison
Cert. Date: 04-06-93
Date of Observation: 06-03-93
Time of Observation: 1100-1219

Test No. 3
Asphalt Plant Stack

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

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	0.00
5	0.0223	0.00
10	0.0458	48.75
15	0.0706	46.25
20	0.0969	5.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00

Avg Opac12.81 Avg OD 0.0598 Time average

Observer: Randy Madison
Cert. Date: 04-06-93
Date of Observation: 06-03-93
Time of Observation: 1250-1355

INTERPOLL LABORATORIES, INC.
(612)786-6020

Mesabi Bituminous
Laboratory Log No. 8982

Results of Moisture Analysis[1]

Log No.	Test/Run	Sample Type	% Moisture
8982-16	Test 1 Run 1	Virgin Aggregate	3.84
8982-17	Test 1 Run 2	Virgin Aggregate	2.86
8982-18	Test 1 Run 3	Virgin Aggregate	1.91

Respectfully submitted,

Jeannie F. O'Neil

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

JFO/cg

[1]Analysis by ASTM Method D3173

APPENDIX A

VOLUMETRIC FLOW RATE DETERMINATION

Test No. 1
Asphalt Plant Stack

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

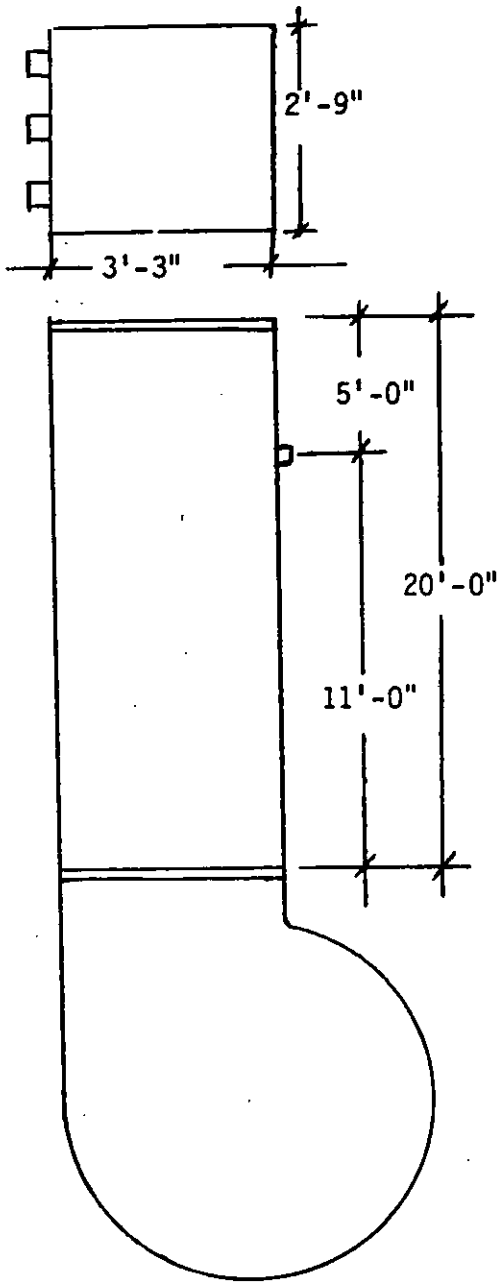
Date of Determination.....	06-03-93
Time of Determination.....(HRS)	905
Barometric pressure.....(IN.HG)	28.58
Pitot tube coefficient.....	.84
Number of sampling ports.....	3
Total number of points.....	24
Shape of duct.....	Rectangular
Duct width.....(IN)	32
Duct length.....(IN)	38.5
Duct area.....(SQ.FT)	8.56
Direction of flow.....	UP
Static pressure.....(IN.WC)	-1.8
Avg. gas temp.....(DEG-F)	128
Moisture content.....(% V/V)	16.03
Avg. linear velocity.....(FT/SEC)	89.0
Gas density.....(LB/ACF)	.06063
Molecular weight.....(LB/LBMOLE)	29.13
Mass flow of gas.....(LB/HR)	166141
Volumetric flow rate.....	
actual.....(ACFM)	45668
dry standard.....(DSCFM)	32740

APPENDIX B

LOCATION OF TEST PORTS

MESABI BITUMINOUS

BARBER GREENE MODEL KA-70



PS 7/93

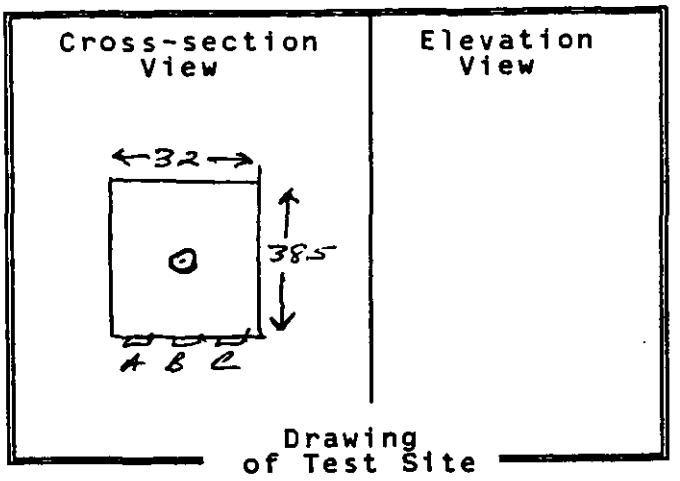
NOT TO SCALE

APPENDIX C

FIELD DATA SHEETS

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job MESABI BITUMINOUS
Source ASPHALT PLANT STACK
Test 1 Run 1 Date 6-3-93
Stack dimen. 32.0 X 38.5 IN.
Dry bulb 125 °F Wet bulb 123 °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 28.58 in Hg
Static pressure -1.80 in WC
Operators E. TOWBRIDGE - E. BROWNEN
Pitot No 24V-4 C_p .840



Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length:	3½ in.	Time start: 0905 hrs	
A	1		2.44	5.94	1.70	
	2		7.31	10.81	2.20	
	3		12.19	15.69	2.30	
	4		17.06	20.55	2.40	125
	5		21.94	25.44	2.30	
	6		26.81	30.31	2.20	
	7		31.69	35.19	2.10	
	8		36.56	40.06	2.20	
B	1				2.10	
	2				2.30	
	3				2.10	
	4				2.00	
	5				1.90	
	6				1.90	128
	7				1.90	
	8				2.10	
C	1				2.20	
	2				2.30	
	3				2.10	
	4				1.90	130
	5				1.70	
	6				1.70	
	7				1.80	
	8				1.50	
Temp. meas. device & S/N: PDT-12					Time end: 0912 hrs	

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

S-3921

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job MESABI BITUMINOUS
Source ASPHALT PLANT
Method 5 Filter holder: 4" GLASS

Date 6-3-93 Test 1 Run 1
No. of traverse points 24
Filter type: 4" GLASS FIBER

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 6 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5409

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

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2	260	100	160
Impinger No. 3		0	
Condenser			
Desiccant	1366	1357	9
Total			169

Integrated Gas Sampling Data:

Bag Pump No. 24B Box No. 25 Bag No. 1

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

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

Time start: 0931 (HRS) Time end: 1034 (HRS)

Sampling rate: 400 cc/min Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 12

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: MISABI BITUMINOUS INC
Source: ASPHALT PLANT - STACK
Date: 6-3-93 Test: 1 Run: 1

Operators: E. TROWBRIDGE - E. BONNIN
Meter Box No.: 5 ΔH: 1.80 IN WC
Gasmeter coeff.: 1.0002

Pitot No.: 24Y-4 Cp: .840
Bar. Press.: 28.58 inHg H2O %
Nozzle No.: 1-3 Nozzle Dia: .185 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	0930	238.10											
A-8	2.5	240.12	2.20	1.90	0.04	5.5	125	231	237	39	70	70	16.5
7	5	242.05	2.10	1.77	1.99	5.2	126	233	235	39	71	70	16.5
6	7.5	243.99	2.20	1.84	3.93	5.5	130	233	236	40	74	70	16.5
5	10	245.96	2.30	1.93	5.92	5.5	130	232	234	42	74	72	16.5
4	12.5	247.99	2.40	2.02	7.96	5.6	130	228	260	43	77	73	16.5
3	15	250.00	2.40	2.03	0.01	5.8	129	243	242	44	77	74	16.5
2	17.5	252.04	2.40	2.03	2.06	5.9	129	245	240	46	79	74	16.5
1	20	254.01	2.20	1.87	4.02	5.8	129	247	242	48	80	75	16.5
B-8	22.5	256.92	2.00	1.70	5.90	5.2	129	245	260	48	80	75	16.4
7	25	257.64	1.80	1.45	7.64	5.0	137	250	268	43	82	75	16.4
6	27.5	259.37	1.80	1.46	9.38	5.0	137	265	267	43	82	76	16.4
5	30	261.15	1.90	1.54	1.17	5.0	137	269	260	44	83	76	16.5
4	32.5	263.03	2.00	1.62	3.01	5.5	138	263	250	46	84	76	16.5
3	35	264.87	2.10	1.70	4.89	5.6	138	262	252	46	84	76	16.5
2	37.5	266.85	2.30	1.86	6.86	6.0	138	262	241	47	86	78	16.5
1	40	269.68	2.10	1.72	8.87	5.8	135	265	235	47	86	79	16.5
C 8	42.5	270.31	1.45	1.19	0.33	4.8	134	259	235	51	84	78	16.4
7	45	272.20	1.70	1.38	2.03	5.0	136	257	242	49	84	78	16.5
6	47.5	273.68	1.60	1.29	3.68	5.0	140	260	235	51	86	79	16.5
5	50	275.35	1.70	1.37	5.37	5.1	144	262	237	50	87	77	16.5
4	52.5	277.05	1.70	1.37	7.07	5.1	142	260	243	49	87	79	16.5
3	55	278.85	2.00	1.62	8.91	5.8	140	260	261	50	88	79	16.5
2	57.5	280.60	2.10	1.71	0.80	6.0	140	261	266	50	88	79	16.5
1	60	282.50	1.70	1.38	2.50	5.5	141	260	262	50	89	79	16.5
	(1035)												
	θ = 60	Vm = 44.40		ΔH = 1.64							Avg. = 78.7		

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job MESABI BITUMINOUS
Source ASPHALT PLANT STACK
Method 5 Filter holder: 4" GLASS

Date 6-3-93 Test 1 Run 2
No. of traverse points 24
Filter type: 4" GLASS FIBER

Sample Train Leak Check:

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

Particulate Catch Data:

No.s of filters used: 5411

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

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2	390	100	190
Impinger No. 3		0	
Condenser			
Desiccant	1340	1329	11
Total			201

Integrated Gas Sampling Data:

Bag Pump No. 248 Box No. 25 Bag No. 2

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

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

Time start: 1104 (HRS) Time end: 1223 (HRS)

Sampling rate: 400 cc/min Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 12

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: MESABI BITUMINOUS
Source: ASPHALT PLANT STACK
Date: 6-3-93 Test: 1 Run: 2

Operators: ET - EB
Meter Box No.: 5 ΔH@: 1.80 IN WC
Counter coeff.: 1.0002

Pitot No.: 24Y-4 Cp: .840
Bar. Press.: 28.58 inHg H2O %
Nozzle No.: 1-3 Nozzle Dia: .185 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Water (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1103	282.70											
A - 8	2.5	284.72	2.20	1.88	4.68	5.0	130	235	230	42	77	75	16.5
7	5	286.60	2.10	1.75	6.58	5.0	135	232	233	43	81	78	16.3
6	7.5	288.60	2.20	1.84	8.54	5.0	137	237	240	43	79	76	16.2
5	10	290.45	2.00	1.68	0.41	4.8	131	241	237	44	78	75	16.0
4	12.5	292.40	2.10	1.74	2.31	5.0	137	245	241	44	80	76	16.0
3	15	294.24	2.10	1.75	4.21	5.0	136	235	236	44	81	76	15.9
2	17.5	296.10	1.90	1.58	6.03	4.8	138	235	229	43	82	77	15.9
1	20	297.80	1.40	1.51	7.80	4.2	130	237	234	43	85	76	15.9
B - 8	22.5	299.63	1.80	1.52	8.58	4.8	133	230	232	41	83	78	15.9
7	25	301.29	1.60	1.34	1.26	4.5	137	230	235	40	87	80	15.9
6	27.5	303.00	1.60	1.34	2.93	4.5	141	232	237	40	87	80	15.9
5	30	304.63	1.70	1.41	4.65	4.5	146	243	235	44	87	80	15.9
4	32.5	306.35	1.70	1.42	6.38	4.5	142	240	258	44	87	80	15.9
3	35	308.18	1.90	1.59	8.20	5.0	142	248	247	46	87	80	15.9
2	37.5	310.10	2.10	1.75	0.12	5.5	142	247	249	46	87	80	15.9
1	40	311.80	1.70	1.42	1.85	5.0	140	251	258	47	89	81	15.9
C - 8	42.5	313.20	1.10	.93	3.25	4.0	138	260	247	45	89	89	15.9
7	45	314.78	1.50	1.26	4.88	4.5	140	252	246	45	88	80	15.9
6	47.5	316.46	1.50	1.25	6.50	4.6	142	252	230	45	89	81	15.9
5	50	318.07	1.40	1.18	8.08	4.5	140	250	233	45	90	80	15.9
4	52.5	319.65	1.40	1.19	9.66	4.5	135	251	240	45	88	82	15.9
3	55	321.40	1.80	1.51	1.44	5.0	142	256	264	45	88	81	15.9
2	57.5	323.24	1.80	1.51	3.22	5.2	142	257	266	45	90	80	15.9
1	60	324.85	1.50	1.26	4.85	5.0	140	258	260	46	91	82	15.9
	(1224)												
	θ = 60	Vm = 42.15		ΔH = 1.46							Avg. = 82.1		

1109 DOWN
1127 UP

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job MESABI BITUMINOUS
Source ASPHALT PLANT STACK
Method 5 Filter holder: 4" GLASS

Date 6-3-93 Test 1 Run 3
No. of traverse points 24
Filter type: 4" GLASS FIBER

Sample Train Leak Check:

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

Particulate Catch Data:

No.s of filters used: 5412

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

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2	391	100	191
Impinger No. 3		0	
Condenser			
Desiccant	1375	1366	9
Total			200

Integrated Gas Sampling Data:

Bag Pump No. 248 Box No. 25 Bag No. 3

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

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

Time start: 1253 (HRS) Time end: 1353 (HRS)

Sampling rate: 400 cc/min Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 12

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: MESABI BITUMINOUS
Source: ASPHALT PLANT - STACK
Date: 6-3-93 Test 1 Run 3

Operators: ET-EB
Meter Box No. 5 ΔH 1.80 IN WC
Gasmeter coeff. 1.00002

Pitot No. 244-4 Cp .840
Bar. Press. 28.58 inHg H2O %
Nozzle No. 1-3 Nozzle Dia .185 IN.

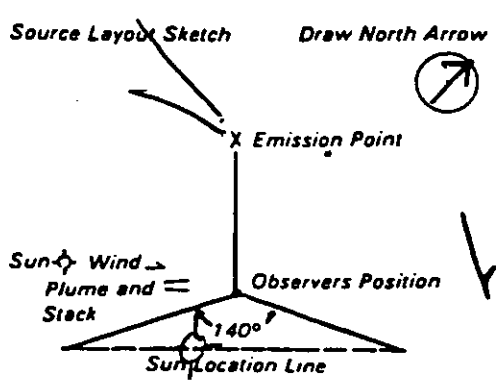
Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1252	325.20											
A 8	2.5	327.17	2.10	1.77	7.12	5.0	134	268	242	45	78	77	16.3
7	5	329.10	2.10	1.76	9.03	5.0	134	265	250	45	80	76	16.3
6	7.5	331.08	2.20	1.84	0.99	5.4	133	260	254	40	81	76	16.2
5	10	333.02	2.25	1.89	2.97	5.5	133	254	260	40	84	77	16.3
4	12.5	334.99	2.30	1.93	4.97	5.9	134	252	262	45	86	78	16.3
3	15	337.05	2.30	1.92	6.98	5.9	140	255	254	45	86	78	16.3
2	17.5	339.08	2.30	1.91	8.98	5.9	142	250	249	47	88	80	16.3
1	20	340.95	2.20	1.84	0.94	5.8	140	245	247	47	88	80	16.3
B 8	22.5	342.80	1.80	1.50	2.72	5.0	145	252	260	49	89	81	16.3
7	25	344.51	1.80	1.48	4.48	5.0	151	250	264	49	89	81	16.3
6	27.5	346.33	1.80	1.49	6.26	5.0	149	254	267	49	88	81	16.4
5	30	348.10	1.90	1.57	8.07	5.2	150	250	265	49	90	80	16.4
4	32.5	350.05	2.00	1.65	9.94	5.5	149	245	257	47	90	81	16.4
3	35	351.95	2.10	1.74	1.85	6.0	148	251	260	47	90	81	16.4
2	37.5	353.93	2.30	1.91	3.85	6.2	148	254	266	45	92	82	16.4
1	40	355.77	2.00	1.67	5.73	5.8	145	260	270	43	92	82	16.5
C 8	42.5	357.40	1.40	1.18	7.31	4.6	142	255	251	40	90	81	16.5
7	45	358.98	1.50	1.26	8.94	4.9	140	260	254	38	90	82	16.4
6	47.5	360.65	1.50	1.26	0.57	4.9	143	262	257	40	90	82	16.4
5	50	362.25	1.50	1.26	2.20	4.9	142	258	263	40	90	82	16.4
4	52.5	363.99	1.70	1.43	3.93	5.2	142	261	266	40	90	82	16.4
3	55	365.80	1.90	1.60	5.77	5.9	141	257	268	40	91	83	16.3
2	57.5	367.70	2.10	1.76	7.70	6.0	143	260	265	40	91	83	16.3
1	60	369.45	1.70	1.43	9.43	5.8	143	262	262	40	91	83	16.4
	(1354)												
	θ = 60	Vm = 44.25		ΔH = 1.63							Avg. = 84.2		

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

Test #1

SOURCE NAME	MESABI BITUMINOUS INC
ADDRESS	
CITY	GILBERT
STATE	MN
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	PORTABLE ASPHALT PLANT
OPERATING MODE	
CONTROL EQUIPMENT	SCRUBBER
OPERATING MODE	
DESCRIBE EMISSION POINT START	RECTANGULAR METAL STACK
DESCRIBE EMISSION POINT STOP	RECTANGULAR METAL STACK
HEIGHT ABOVE GROUND LEVEL START	30'
HEIGHT ABOVE GROUND LEVEL STOP	30'
HEIGHT RELATIVE TO OBSERVER START	5'
HEIGHT RELATIVE TO OBSERVER STOP	5'
DISTANCE FROM OBSERVER START	100'
DISTANCE FROM OBSERVER STOP	100'
DIRECTION FROM OBSERVER START	NW
DIRECTION FROM OBSERVER STOP	NW
DESCRIBE EMISSIONS START	LOOPING
DESCRIBE EMISSIONS STOP	LOOPING
EMISSION COLOR START	WHITE
EMISSION COLOR STOP	
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☐ YES ☒	
IF WATER DROPLET PLUME: ATTACHED ☒ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	END OF STEAM
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	END OF STEAM
DESCRIBE BACKGROUND START	CLEAR SKY
DESCRIBE BACKGROUND STOP	CLEAR SKY
BACKGROUND COLOR START	BLUE
BACKGROUND COLOR STOP	BLUE
SKY CONDITIONS START	CLEAR
SKY CONDITIONS STOP	CLEAR
WIND SPEED START	0-5 MPH CALM
WIND SPEED STOP	CALM
WIND DIRECTION START	SE
WIND DIRECTION STOP	SE
AMBIENT TEMP. START	65°F
AMBIENT TEMP. STOP	70°F
WET BULB TEMP.	
RH.percent	



OBSERVATION DATE	6-3-93	START TIME	0930	STOP TIME	1030

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	10	10	15	10	31	10	10	15	10
2	15	15	10	10	32	10	15	15	10
3	15	15	20	15	33	10	10	15	15
4	15	10	10	15	34	15	20	15	15
5	10	15	10	10	35	15	10	10	15
6	15	10	10	15	36	15	15	10	10
7	10	15	20	15	37	10	15	10	15
8	15	20	15	15	38	15	20	15	15
9	10	15	10	10	39	20	15	10	10
10	10	10	10	15	40	10	15	10	10
11	10	15	20	10	41	15	15	10	10
12	15	15	10	10	42	10	15	15	20
13	10	10	10	10	43	20	15	15	15
14	15	20	15	15	44	20	15	15	10
15	20	15	10	10	45	10	10	15	10
16	10	15	15	10	46	15	15	10	10
17	10	10	10	15	47	10	15	15	10
18	15	10	15	15	48	10	10	10	10
19	15	20	15	10	49	10	10	10	10
20	10	10	10	15	50	10	15	15	15
21	20	15	15	20	51	10	15	15	10
22	15	15	10	10	52	10	10	10	15
23	10	10	10	15	53	20	15	15	20
24	15	15	15	10	54	10	15	20	15
25	15	15	20	15	55	20	15	15	10
26	15	15	10	10	56	10	15	10	15
27	10	15	15	10	57	15	15	10	10
28	10	10	10	15	58	10	10	10	15
29	15	15	10	15	59	15	15	10	10
30	10	10	10	10	60	15	15	10	10

13.95

AVERAGE OPACITY FOR HIGHEST PERIOD	3.5%
NUMBER OF READINGS ABOVE % WERE	20 % WERE 0
RANGE OF OPACITY READINGS MINIMUM	10%
MAXIMUM	20%
OBSERVER'S NAME (PRINT)	RANDY MADISON
OBSERVER'S SIGNATURE	Randy Madison
DATE	6-3-93
ORGANIZATION	INTERPOLL LABS
CERTIFIED BY	JOE PEREZ WDNR
DATE	4-6-93
VERIFIED BY	
DATE	
COMMENTS	
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	
TITLE	
DATE	

S-0079R

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

Test #2

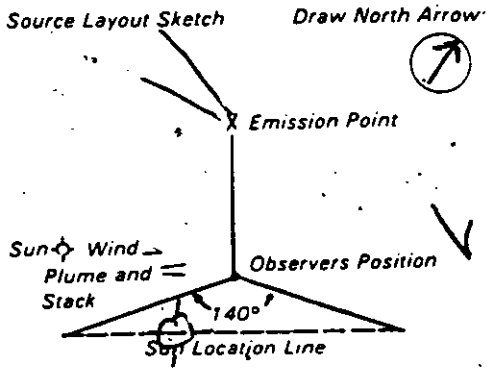
SOURCE NAME	MESABI
ADDRESS	
CITY	GILBERT
STATE	MN
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	PORTABLE ASPHALT PLANT
OPERATING MODE	
CONTROL EQUIPMENT	SCRUBBER
OPERATING MODE	
DESCRIBE EMISSION POINT START	RECTANGULAR METAL STACK
STOP	RECTANGULAR METAL STACK
HEIGHT ABOVE GROUND LEVEL START	30 FT
STOP	30 FT
HEIGHT RELATIVE TO OBSERVER START	5 FT
STOP	5 FT
DISTANCE FROM OBSERVER START	100 FT
STOP	100 FT
DIRECTION FROM OBSERVER START	NW
STOP	NW
DESCRIBE EMISSIONS START	LOOPING
STOP	LOOPING
EMISSION COLOR START	WHITE
STOP	WHITE
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☐ YES ☒	
IF WATER DROPLET PLUME: ATTACHED ☒ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	END OF STEAM
STOP	END OF STEAM
DESCRIBE BACKGROUND START	SKY
STOP	SKY
BACKGROUND COLOR START	BLUE
STOP	BLUE
SKY CONDITIONS START	PT SUN
STOP	PT SUN
WIND SPEED START	0-5 MPH CALM
STOP	CALM
WIND DIRECTION START	SE
STOP	SE
AMBIENT TEMP. START	71°F
STOP	71°F
WET BULB TEMP.	
RH, percent	

OBSERVATION DATE	START TIME	STOP TIME
6-3-93	1100	1219

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	10	10	10	10	31	15	10	15	10
2	10	10	10	15	32	10	10	15	15
3	10	10	15	15	33	10	15	10	10
4	10	15	10	15	34	10	10	15	15
5	10	15	15	20	35	15	20	20	15
6	15	15	15	15	36	15	15	15	10
7	15	20	15	10	37	10	10	15	10
8	10	10	15	15	38	15	20	15	15
9	15	10	10	10	39	20	15	15	20
10	10	15	20	15	40	15	15	10	10
11	15	10	10	15	41	15	10	10	15
12	10	10	15	10	42	15	15	10	10
13	15	15	10	15	43	15	10	15	10
14	10	10	15	15	44	10	10	15	15
15	15	10	10	10	45	15	15	15	10
16	15	15	10	10	46	10	15	10	15
17	10	15	15	15	47	10	10	15	15
18	10	10	15	15	48	15	20	15	15
19	15	20	15	15	49	15	15	20	15
20	10	10	15	10	50	15	15	10	10
21	15	15	10	15	51	15	10	10	15
22	10	10	10	15	52	15	15	15	10
23	15	10	15	15	53	10	10	15	15
24	15	15	10	10	54	10	10	10	10
25	10	10	15	10	55	10	10	10	15
26	10	15	15	15	56	15	10	10	10
27	20	15	15	20	57	15	15	15	10
28	15	15	10	10	58	10	10	15	15
29	10	15	15	10	59	15	15	15	10
30	15	10	15	20	60	10	15	15	15

149

Source Layout Sketch



AVERAGE OPACITY FOR HIGHEST PERIOD	15.8%
NUMBER OF READINGS ABOVE 20 % WERE	0
RANGE OF OPACITY READINGS MINIMUM	10%
MAXIMUM	20%
OBSERVER'S NAME (PRINT)	RANDY MADISON
OBSERVER'S SIGNATURE	Randy Madison
DATE	6-3-93
ORGANIZATION	INTERPOLL LABS
CERTIFIED BY	JOE PEREZ WDNR
DATE	4-6-93
VERIFIED BY	
DATE	

COMMENTS: PLANT WAS DOWN FOR 19 MIN.

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TITLE
DATE

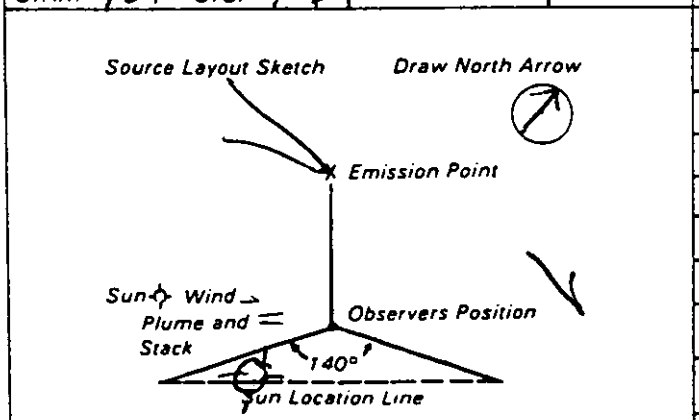
S-0079R

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

Test #3

SOURCE NAME	MESABI
ADDRESS	
CITY	GILBERT
STATE	MN
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	PORTABLE ASPHALT PLANT
OPERATING MODE	
CONTROL EQUIPMENT	SCRUBBER
OPERATING MODE	
DESCRIBE EMISSION POINT START	RECTANGULAR METAL STACK
STOP	RECTANGULAR METAL STACK
HEIGHT ABOVE GROUND LEVEL START	30 FT
STOP	30 FT
HEIGHT RELATIVE TO OBSERVER START	5 FT
STOP	5 FT
DISTANCE FROM OBSERVER START	100 FT
STOP	100 FT
DIRECTION FROM OBSERVER START	NW
STOP	NW
DESCRIBE EMISSIONS START	LOOPING
STOP	LOOPING
EMISSION COLOR START	WHITE
STOP	WHITE
PLUME TYPE. CONTINUOUS	X
FUGITIVE	☐
INTERMITTENT	☐
WATER DROPLETS PRESENT: NO	☐
YES	X
IF WATER DROPLET PLUME: ATTACHED	X
DETACHED	☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	AFTER STEAM
STOP	AFTER STEAM
DESCRIBE BACKGROUND START	SKY
STOP	SKY
BACKGROUND COLOR START	BLUE
STOP	BLUE
SKY CONDITIONS START	P. SUN
STOP	P. SUN
WIND SPEED	0-5 MPH
START	CALM
STOP	CALM
WIND DIRECTION START	SE
STOP	SE
AMBIENT TEMP. START	70°F
STOP	70°F
WET BULB TEMP.	
RH, percent	



OBSERVATION DATE	START TIME	STOP TIME
6-3-93	1250	1355

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	10	10	10	15	31	15	15	15	10
2	15	15	10	10	32	15	10	10	15
3	10	10	10	15	33	15	15	10	10
4	15	15	10	10	34	10	10	10	15
5	10	15	15	20	35	15	10	15	15
6	15	15	15	10	36	10	10	10	10
7	10	10	10	15	37	10	10	10	10
8	15	20	15	15	38	10	10	15	15
9	20	15	15	10	39	15	15	10	10
10	10	10	15	10	40	10	15	15	10
11	15	10	10	10	41	15	15	10	15
12	10	10	15	15	42	15	15	15	20
13	15	10	10	10	43	20	15	15	10
14	15	15	10	10	44	15	10	15	15
15	10	10	10	10	45	10	10	10	15
16	15	20	15	15	46	10	10	15	15
17	15	15	20	15	47	15	15	10	10
18	15	10	10	10	48	10	15	10	10
19	10	10	10	15	49	10	10	10	10
20	10	15	10	15	50	15	15	10	10
21	15	15	15	10	51	10	15	15	10
22	10	10	10	10	52	10	15	10	10
23	15	15	10	15	53	10	15	15	15
24	15	20	15	15	54	20	15	15	20
25	15	15	15	10	55	20	20	15	15
26	10	15	15	15	56	15	10	10	15
27	15	10	10	15	57	15	15	15	15
28	15	10	15	10	58	10	10	10	15
29	10	15	15	10	59	15	10	10	10
30	10	10	15	15	60	10	10	10	10

AVERAGE OPACITY FOR HIGHEST PERIOD	12.9%
NUMBER OF READINGS ABOVE % WERE	20 / 0
RANGE OF OPACITY READINGS MINIMUM	10%
MAXIMUM	20%
OBSERVER'S NAME (PRINT)	RANDY MADISON
OBSERVER'S SIGNATURE	Randy Madison
DATE	6-3-93
ORGANIZATION	INTERPOLL LABS
CERTIFIED BY	JOE PEREZ LIONIR
DATE	4-6-93
VERIFIED BY	
DATE	

COMMENTS: DOWN FOR 5 MIN.

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE
TITLE
DATE

S-0079R

WISCONSIN
DEPT. OF NATURAL RESOURCES

George E. Meyer
Secretary

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

101 South Webster Street
Box 7921
Madison, Wisconsin 53707
TELEPHONE 608-266-2621
TELEFAX 608-267-3579
TDD 608-267-6897

April 19, 1993

File Code: 4500

Mr. Randy Madison
Interpoll Labs.
4500 N.E. Ball Rd.
Circle Pines, MN 55014

Dear Mr. Madison:

Please be advised that you have successfully completed our recent Visible Emissions Evaluation course.

Having participated in the smoke evaluation sessions, you met the following certification criteria:

1. The average deviation for the sets of 25 black and 25 white smoke emissions was less than 7.5%.

2. The deviation of each reading was 15% or less.

This certification is valid until October 6, 1993.

Sincerely,

Andy Seeber, Environmental Specialist
Compliance Section
Bureau of Air Management

Enclosure

RECEIVED
APR 23 1993
INTERPOLL LABORATORIES

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL DATA

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job Mesabi Bituminous
Team Leader ET
Date Submitted 6-4-93
Test No.
Date of Analysis 6-4-93

Source Asphalt Plant
Test Site Stack
Date of Test 6-3-93
No. of Runs Completed 3
Technician Cittelgeson

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
1/1	8982-07	1	0.00	3.00	19.30	3.00	16.30	1.53
		2	0.00	3.00	19.30	3.00	16.30	1.53
	☑ B ☐ F	Avg				3.00	16.30	
1/2	-11	1	0.00	3.30	19.10	3.30	15.80	1.55
		2	0.00	3.30	19.10	3.30	15.80	1.55
	☑ B ☐ F	Avg				3.30	15.80	
1/3	-15	1	0.00	3.00	19.20	3.00	16.20	1.57
		2	0.00	3.00	19.20	3.00	16.20	1.57
	☑ B ☐ F	Avg				3.00	16.20	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

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

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

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

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-BR

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job Mesaib Bituminous
Team Leader CT
Date Submitted 6-4-93
Test No. 1
Date of Analysis 6-4-93

Source Asphalt Plant
Test Site Stack
Date of Test 6-3-93
No. of Runs Completed 3
Technician C. Helgeson

0	Test 1 Run 0 Field Blank Log Number 8482-03 Comments	Dish No. 409 Dish Tare Wt. 46.1913 g Dish+Sample Wt. 46.1916 g Sample Wt. 0.0003 g
1	Test 1 Run 1 Log Number -06 Comments	Dish No. 410 Dish Tare Wt. 50.5591 g Dish+Sample Wt 50.5782 g Sample Wt. 0.0191 g
2	Test 1 Run 2 Log Number -10 Comments	Dish No. 505 Dish Tare Wt. 48.4523 g Dish+Sample Wt. 48.4660 g Sample Wt. 0.0137 g
3	Test 1 Run 3 Log Number -14 Comments	Dish No. 518 Dish Tare Wt. 48.1030 g Dish+Sample Wt. 48.1150 g Sample Wt. 0.0120 g
4	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

Blank Solvent Wt. 0.0003 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0188	0.0134 D-2	0.0117		

LSC-03.GR

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job Aeschi Bituminous
Team Leader CT
Date Submitted 6-4-93
Test No. 1
Date of Analysis 6-4-93
Transport Leakage [X] None [ ] _____ ml

Source Asphalt Plant
Test Site Stack
Date of Test 6-3-93
No. of Runs Completed 3
Technician C. Helgeson
Solvent Acetone

0	Test 1 Run 0 ~ Field Blank Log Number 8982-01 Vol. of Solvent 135 ml *Solvent Residue 3.70 ug/ml	Dish No. 1 Dish Tare Wt. 51.9670 g Dish+Sample Wt 51.9675 g Sample Wt. 0.0005 g
1	Test 1 Run 1 Vol. of Solvent 170 ml Log Number -04 Comments	Dish No. 9 Dish Tare Wt. 47.9740 g Dish+Sample Wt. 47.9948 g Sample Wt. 0.0208 g
2	Test 1 Run 2 Vol. of Solvent 175 ml Log Number -08 Comments	Dish No. 17 Dish Tare Wt. 48.3900 g Dish+Sample Wt. 48.4217 g Sample Wt. 0.0317 g
3	Test 1 Run 3 Vol. of Solvent 135 ml Log Number -12 Comments	Dish No. 18 Dish Tare Wt. 49.9863 g Dish+Sample Wt 50.0085 g Sample Wt. 0.0222 g
4	Test ____ Run ____ Vol. of Solvent ____ ml Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

*Solvent Residue ___ ug/ml = [(Sample Wt. 0.0005 g)(10⁶)]/Vol. of Sol. 135 ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0202	0.0311 D-3	0.0217		

LSC-01YR

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job Mesabi Bituminous Mn.
Team Leader CT
Date Submitted 6-4-93
Test No. 1
Date of Analysis 6-4-93

Source Asphalt Plant
Test Site Stack
Date of Test 6-3-93
No. of Runs Completed 3
Technician C. Helgeson

0	Test 1 Run 0 Field Blank Log Number 8982-02 Comments	Filter No. 5354 Filter Type 4"6F Filter Tare Wt. .9568 g Filter+Sample Wt. .9570 g Sample Wt. 0.0002 g
1	Test 1 Run 1 Log Number -05 Comments	Filter No. 5409 Filter Type 4"6F Filter Tare Wt. .9544 g Filter+Sample Wt. 1.0262 g Sample Wt. 0.0718 g
2	Test 1 Run 2 Log Number -09 Comments	Filter No. 5411 Filter Type 4"6F Filter Tare Wt. .9596 g Filter+Sample Wt. 1.0032 g Sample Wt. 0.0436 g
3	Test 1 Run 3 Log Number -13 Comments	Filter No. 5412 Filter Type 4"6F Filter Tare Wt. .9161 g Filter+Sample Wt. .9650 g Sample Wt. 0.0489 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
	0.0718	0.0436	0.0489		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1108	0.0881	0.0823		

LSC-02PR

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FUEL SAMPLE ANALYSIS REQUEST SHEET

Job Name MESAB. B. TUMINOUS Date 4-3-93

Team Leader [illegible]

/X/ Sample analysis per proposal

/ / As requested by _____
Signature

of _____ on _____
Company Date

Type of fuel AGG

State of origin

Mine (if coal)

	Sample 1	Sample 2	Sample 3	Sample 4
Laboratory Log Number	8982	8982	8982	
Fuel Log Number				
Test/Run	1-1	1-2	1-3	
Sample Description				
Short Prox.				
Proximate				
Ultimate				
Ultimate + Proximate				
Loss-On-Ignition				
Carbon content				
4-Point Fusion				
8-Point Fusion				
Free Swelling Index				
Mineral Analysis				
Mineral Analysis + SO3				
Sieve Analysis				
BTU				
MOISTURE	✓	✓	✓	

S-0163RRR

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Sample Deposition

Job: MESABI BITUMINOUS
Source: ASPHALT PLANT
Field Engineer: E TROWBRIDGE
Test Site: STACK
Date Submitted: 6-3-93
Date of Test: 6-3-93
Test No.: 1
No. of Runs Completed: 3

No.	Sample Type	Analysis	Comments
4	Probe Wash: ☒ Acetone ☐ $MeCl_2$ ☐ DI Water ☐	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other	
4	Filter: ☒ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other	
4	Impingers: ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H_2SO_4 (HCl) ☐ 2,4-DNPH ☐ ☐	☒ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other	
3	Integrated Gas Sample ☒ Tedlar Bag ☐	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other	
	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other	
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other	
	Misc Samples ☐ ☐	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other	

Type of Source: Asphalt Plant

Fuel Type:

Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite

Wood: ☐ Wood Waste ☐ Dust ☐ Bark

Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6

☐ Natural Gas ☐ RDF ☒ Other Propane

S-278

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APPENDIX E

ASPHALT PLANT OPERATING DATA

Page #1

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) 6-3-93

Plant Mfr. & Model Barber Greene KA 70 & KD 70 Type (circle one): Drum Mix (Conventional) Other (list): _____

Pollution Control Equipment: Baghouse (Venturi Scrubber) wet scrubber cyclone multiclone

(circle one)

If wet scrubbing: 100 % scrubber water recycled

Last model: Barber Greene CV Series Normal pressure drop across control equipment: 12-12 inches water

Air flow through control equipment: - acfm at ____ F Was control equipment operating normally during testing? Yes

Date & procedures of last maintenance/cleaning of control equipment Weekly

Fuel:

Itemize all fuels and materials added to the combustion process during the test period. List fuel type used during testing (if oil, specify grade) Propane. If other units of measure are used, specify and calculate appropriate heat input.

Test No.	Fuel Input (Gal/hr)	BTU/GAL (as received)	Heat Input (BTU/HR)	%Moisture (as received in aggregate) Virgin	recycle	combined
Run 1	840		109.9 MMBTU HR	100	—	—
Run 2	1131				—	—
Run 3	1051				—	—

Is the above fuel substantially the highest sulfur containing fuel normally burned? Yes

Production specific fuel usage: (circle one) measured or calculated: _____ cubic foot/(ton hot mix)

4 gal/ton hot mix

No. of Burners: 1 Burner(s) rating: 109.9 MMBTU/HR = 100% setting

Operation:

	time 15 min. intervals	burner setting %	aggregate tons per hour	recycle tons per hour	asphalt tons per hour	Drum Mix temp. F	dust collector pressure drop inches water	scrubber water flow rate gpm	Other (list) Water Press.
	9:07	258	250	—	14.5	241	17	300	50
	9:38	250	260	—	15.08	258	16.5	300	50
N	9:55	268	265	—	15.37	268	16.5	300	50
#1	10:10	252	285	—	16.53	252	16.5	300	50
	10:25	253	270	—	15.66	253	17	300	50
	AVG		266	—	15.42				
	11:35	250	290	—	16.82	250	16.5	300	50
N	11:50	250	282	—	16.35	250	16.5	300	50
#2	12:10	300	277	—	16.06	250	15	300	50
	12:20	300	282	—	16.35	250	14.5	300	50

Plant Operator's Certification: I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By: Harlan Kinunen, Phone: (218) 741-9002

Position: ~~Jerry Remanuel~~ Plant Mgr. Mesab. Bituminous Inc. Box 728 Gilbert, MN 55741

Note: All information required must be completed and submitted as part of the performance test. Failure to submit the required information will result in an incomplete performance test report.

PAge# 2

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) 6-3-93

Plant Mfr. & Model Barber Greene KA 70 & KD 70 Type (circle one): Drum Mix (Conventional)
Other (list): _____

Pollution Control Equipment: Baghouse (Venturi Scrubber) wet scrubber cyclone multiclone
(circle one)
If wet scrubbing 100 % scrubber water recycled
List model: Barber Greene CV Series Normal pressure drop across control equipment: 12-17 inches water
Air flow through control equipment: 54000 acfm at ____ F Was control equipment operating normally during testing? yes
Date & procedures of last maintenance/cleaning of control equipment Weekly

Fuel:
Itemize all fuels and materials added to the combustion process during the test period. List fuel type used during testing (if oil, specify grade) Propane. If other units of measure are used, specify and calculate appropriate heat input.

Test No.___	Fuel Input (Gal/hr)	BTU/GAL (as received)	Heat Input (BTU/HR)	%Moisture (as received in aggregate) Virgin	recycle	combined
Run 1	840		109.7 MMBTU HR	100	—	—
Run 2	1131				—	—
Run 3	1051				—	—

Is the above fuel substantially the highest sulfur containing fuel normally burned? Yes
Production specific fuel usage: (circle one) measured or calculated: ____ cubic foot/ ton hot mix
4 gal/ton hot mix
No. of Burners: 1 Burner(s) rating: 109.8 MMBTU/HR = 100% setting

Operation:

RUN #3

time 15 min. intervals	burner setting %	aggregate tons per hour	recycle tons per hour	asphalt tons per hour	Drum Mix temp. F	dust collector pressure drop inches water	scrubber water flow rate gpm	Other (list) Water PSI
12:55	300	246	—	14.46	259	17	300	49
1:10	300	270	—	15.66	260	17	300	49
1:20	300	265	—	15.37	251	17	300	49
1:25	300	270	—	15.66	255	17	300	49
Adj		263		15.23				

Plant Operator's Certification: I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By: Marlon K. Nunon, Phone: (218) 741-9002 Box 728
Position: Gary Hermanson Pres. Mesabi Bituminous Inc. Gilbert, MN, 55

Note: All information required must be completed and submitted as part of the performance test. Failure to submit the required information will result in an incomplete performance test report.

APPENDIX F

PROCEDURES

Particulate Loadings and Emission Rates

The particulate emission rates were determined per EPA Methods 1-5, CFR title 40, Part 60, Appendix A (revised July 1, 1987). In this procedure, a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

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

Particulate samples were collected as follows: The sample gas was drawn in through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter. The particulates were removed at this point and collected on the filter. The gases then passed through an ice-cooled impinger train and a desiccant-packed drying column which quantitatively absorb all moisture from the sample gas stream after which the sample gas passes through the pump and the dry test gasmeter which integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides instantaneous flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each site such that an isokinetic sampling condition prevails. Nomographs are used to aid in the rapid determination of the sampling rate.

After sampling is complete, the filter is removed and placed in a clean container. The nozzle and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 °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 from the stack and from the breeching at the inlet to the wet scrubber. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

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Condensible Organic Compounds Analysis

(State of Minnesota - MPCA Exhibit C)

Method II-8672-MN

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a 17 mm stem

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

Reagents: Diethyl ether - reagent grade

Chloroform - reagent grade

Sodium sulfate - (ACS) granular anhydrous

Toluene - (if 3% hydrogen peroxide is used to collect the samples)

Glass wool (Pyrex microfiber)

PREPARATION

1. Place 1 kg of granular anhydrous sodium sulfate in a shallow tray and heat to 200 °C for at least four hours. Store in a tightly sealed glass container.

2. Place a plug of clean glass wool in the stem of the powder funnel. The plug must be of sufficient size so that it is held snuggly in place by its own pressure. Add a one-inch layer of dry sodium sulfate.

SAMPLING

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

ANALYSIS

I. Organics

Caution! Work in vented hood!!!

A. Organic Blank Determination

1. Pour 125 mL of ethyl ether and 125 mL of chloroform into a tared beaker.
2. Evaporate solvent in hood at 70 ^{o}F or less until no solvent remains.
3. Desiccate the sample in dish for two hours.
4. Weigh the sample to nearest 0.1 mg, record and report on Form LSC-036.

B. Organic Sample Determination

1. Test for peroxide in sample ether using KI strips. (If KI strip shows positive, contact your supervisor before proceeding.)
2. Transfer the sample solution quantitatively to a 500 mL separatory funnel. Use the first of three 25 mL chloroform aliquots to rinse the sample container.
3. Extract with three 25 mL portions of chloroform. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Bottom layer is chloroform.) Draw off the bottom layer, transferring the solvent with a funnel containing a plug of sodium sulfate into a tared beaker. (Do not draw off any of the aqueous layer.)

4. After the three chloroform extractions, use two 25 mL portions of chloroform to rinse the sodium sulfate, collecting the rinses in the same tared beaker as the extracts.

5. Next extract the sample three times with 25 mL aliquots of ethyl ether. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Top layer is ethyl ether.) Draw off the bottom layer (aqueous) into another separatory funnel taking less than 1 mL of the ethyl ether layer with. Decant the ethyl ether, passing it through sodium sulfate and collecting the ethyl ether in the same tared dish as the chloroform.

6. After the three ethyl ether extractions, take two 25 mL portions of ethyl ether and rinse the sodium sulfate collecting the rinses in the same tared beaker as the extracts.

7. Evaporate the solvents (chloroform and ethyl ether) in the tared beaker in the hood at 70 ^{o}F or less until no solvent remains. (Use no heat and have no sources of ignition in the hood when doing this procedure.) Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point of water, otherwise, water will be condensed out in the container.

8. Desiccate to constant weight (two hours). Record and report the final weight to the nearest 0.1 mg on Form LSC-036.

II. Inorganics

If inorganic residue information is required, the following procedure should be conducted:

A. Inorganic Blank Determination

1. Vent the remaining aqueous phase from the organic extraction in the hood to remove residual organic solvents (usually overnight).
2. Decant the impinger catch into a tared evaporating dish.
3. Evaporate all of the water in the sample in an oven at 100 ^{o}C. Take care not to boil to prevent bumping and loss of sample.
4. Cool the dried sample in the desiccator and desiccate until a constant weight is obtained.
5. Report the results to the nearest 0.1 mg on Form LSC-036.

B. Inorganic Sample Determination

Follow steps 1-5 in Section A above.

NOTES

1. For the organics determination, in the rare event that the impinger catch resulted from a Modified Method 6 determination (SO_2), whereby the solution contains dilute hydrogen peroxide ($\geq$ 3%), do not use ether as an extraction solvent. Substitute toluene for ethyl ether in Section I. (Ether in the presence of peroxide forms explosive hydroperoxide.)

2. In the organics determination, more than three extractions may be required to extract all of the organics. Additional extractions should be performed if the aqueous phase is still cloudy.

3. Special state requirements:

   Michigan - Total sample evaporated in tared evaporating dish on steam bath.

   Iowa - Organics and inorganics separately, as required.

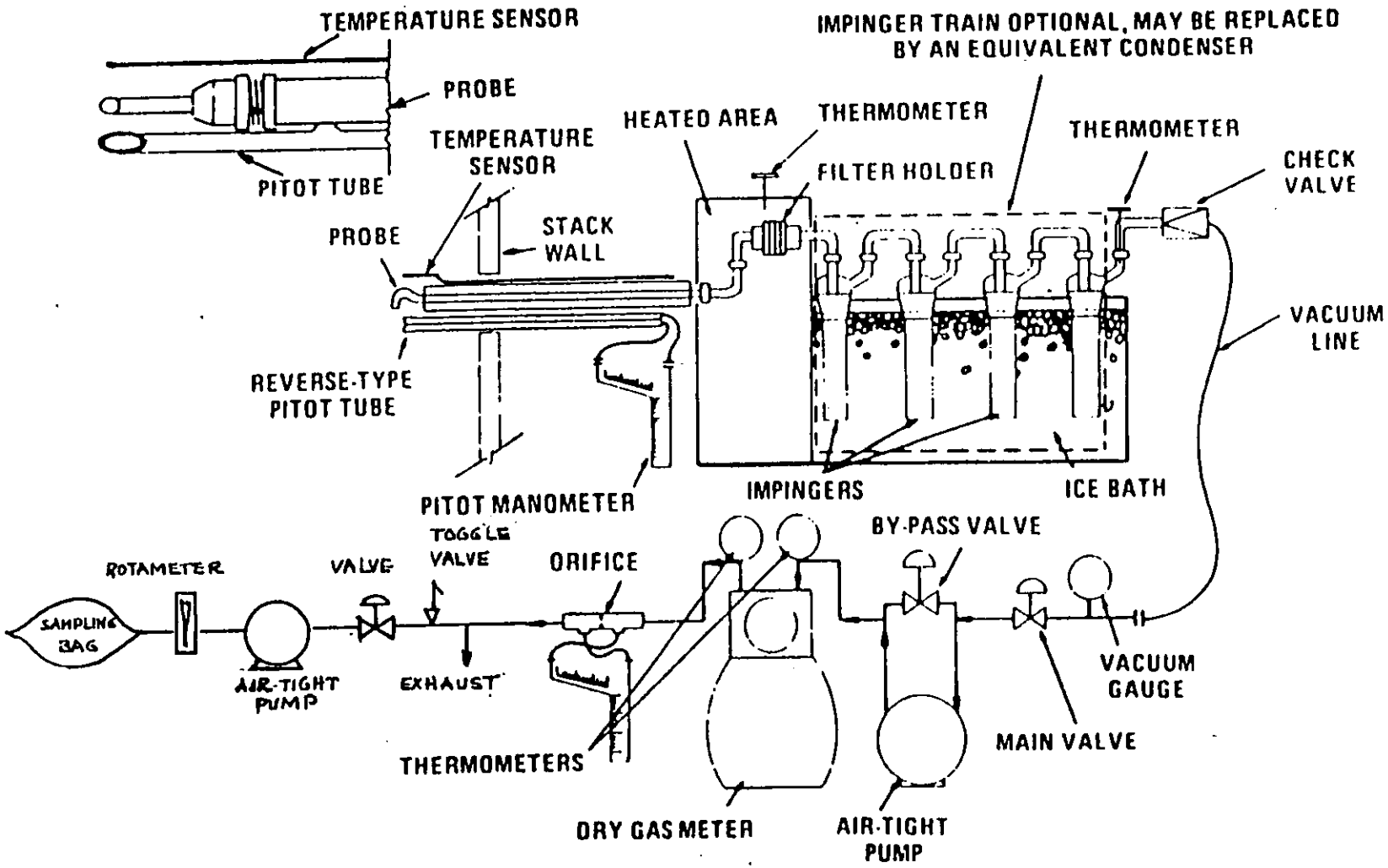
   Wisconsin - Use Method II-8672-WI.

   Rest of states - Organics only.

REFERENCES

Proposed Standards of Performance for New Stationary Sources, Federal Register 36(159) Part II, August 1, 1979.

Minnesota Pollution Control Agency, Exhibit C.



Particulate-sampling train.

ANALYSIS

I. Organics

Caution! Work in vented hood!!!

A. Organic Blank Determination

1. Pour 125 mL of ethyl ether and 125 mL of chloroform into a tared beaker.
2. Evaporate solvent in hood at 70 °F or less until no solvent remains.
3. Desiccate the sample in dish for two hours.
4. Weigh the sample to nearest 0.1 mg, record and report on Form LSC-036.

B. Organic Sample Determination

1. Test for peroxide in sample ether using KI strips. (If KI strip shows positive, contact your supervisor before proceeding.)
2. Transfer the sample solution quantitatively to a 500 mL separatory funnel. Use the first of three 25 mL chloroform aliquots to rinse the sample container.
3. Extract with three 25 mL portions of chloroform. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Bottom layer is chloroform.) Draw off the bottom layer, transferring the solvent with a funnel containing a plug of sodium sulfate into a tared beaker. (Do not draw off any of the aqueous layer.)

4. After the three chloroform extractions, use two 25 mL portions of chloroform to rinse the sodium sulfate, collecting the rinses in the same tared beaker as the extracts.

5. Next extract the sample three times with 25 mL aliquots of ethyl ether. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Top layer is ethyl ether.) Draw off the bottom layer (aqueous) into another separatory funnel taking less than 1 mL of the ethyl ether layer with. Decant the ethyl ether, passing it through sodium sulfate and collecting the ethyl ether in the same tared dish as the chloroform.

6. After the three ethyl ether extractions, take two 25 mL portions of ethyl ether and rinse the sodium sulfate collecting the rinses in the same tared beaker as the extracts.

7. Evaporate the solvents (chloroform and ethyl ether) in the tared beaker in the hood at 70 ^{o}F or less until no solvent remains. (Use no heat and have no sources of ignition in the hood when doing this procedure.) Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point of water, otherwise, water will be condensed out in the container.

8. Desiccate to constant weight (two hours). Record and report the final weight to the nearest 0.1 mg on Form LSC-036.

II. Inorganics

If inorganic residue information is required, the following procedure should be conducted:

A. Inorganic Blank Determination

1. Vent the remaining aqueous phase from the organic extraction in the hood to remove residual organic solvents (usually overnight).
2. Decant the impinger catch into a tared evaporating dish.
3. Evaporate all of the water in the sample in an oven at 100 ^{o}C. Take care not to boil to prevent bumping and loss of sample.
4. Cool the dried sample in the desiccator and desiccate until a constant weight is obtained.
5. Report the results to the nearest 0.1 mg on Form LSC-036.

B. Inorganic Sample Determination

Follow steps 1-5 in Section A above.

NOTES

1. For the organics determination, in the rare event that the impinger catch resulted from a Modified Method 6 determination (SO_2), whereby the solution contains dilute hydrogen peroxide ($\geq$ 3%), do <u>not</u> use ether as an extraction solvent. <u>Substitute toluene</u> for ethyl ether in Section I. (Ether in the presence of peroxide forms explosive hydroperoxide.)

2. In the organics determination, more than three extractions may be required to extract all of the organics. Additional extractions should be performed if the aqueous phase is still cloudy.

3. Special state requirements:

   <u>Michigan</u> - Total sample evaporated in tared evaporating dish on steam bath.

   <u>Iowa</u> - Organics and inorganics separately, as required.

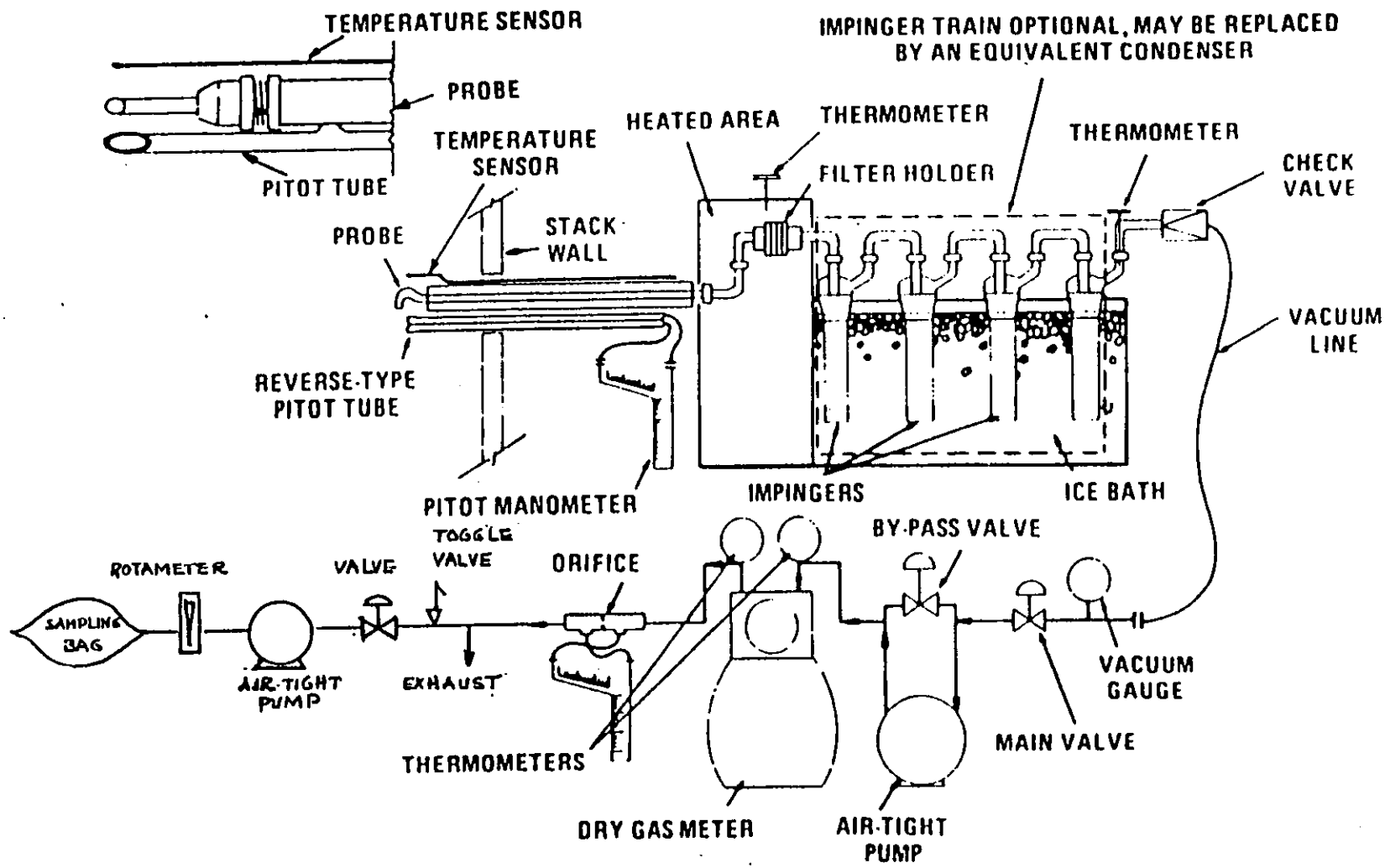
   <u>Wisconsin</u> - Use Method II-8672-WI.

   <u>Rest of states</u> - Organics only.

REFERENCES

Proposed Standards of Performance for New Stationary Sources, Federal Register <u>36</u>(159) Part II, August 1, 1979.

Minnesota Pollution Control Agency, Exhibit C.



Particulate-sampling train.

APPENDIX G

CALCULATION EQUATIONS

CALCULATION EQUATIONS

METHOD 2

$$\bar{V}_s = 85.48\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,d} = 60(1 - B_{ws})\ \bar{V}_s\ A\ \left(\frac{528}{T_{s(avg)}}\right)\ \left(\frac{P_s}{29.92}\right)$$

$$Q_a = 60\ \bar{V}_s\ A$$

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

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

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

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

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

SYMBOLS

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

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

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

A_a = Actual volumetric stack gas flow rate, ACFM

$Q_{s,d}$ = Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM

RH = Relative humidity, %

T_{db} = Dry bulb temperature of stack gas, °F

T_{wb} = Wet bulb temperature of stack gas, °F

$T_{m(avg)}$ = Absolute average dry gas meter temperature, °R

$T_s(avg)$ = Absolute average stack temperature, °F

T_{std} = Standard absolute temperature, 528 °F (68 °F)

θ = Total sampling time, min.

V_{lc} = Total volume of liquid collected in impingers and silica gel, ml

V_m = Volume of gas sample as measured by dry gas meter, CF

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF

$V_{w(std)}$ = Volume of water vapor in the gas sample corrected to standard conditions, SCF

$\bar{V}_s$ = Average actual stack gas velocity, FT/SEC

vP_{tdb} = Vapor pressure at T_{db}, IN. HG.

vP_{twb} = Vapor pressure at T_{wb}, IN. HG

$\overline{\Delta H}$ = Average pressure differential across the orifice meter, IN. WC.

ΔP = Velocity pressure of stack gas, IN. WC.

γ = Dry test meter correction coefficient, dimensionless

ρ = Actual gas density, LB/ACF

CALCULATION EQUATIONS

METHOD 3

$$\%EA = \frac{100(\%O_2 -).5\% \ CO)}{0.264\% \ N_2 - \%O_2 + 0.5\% \ CO}$$

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

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

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

CALCULATION EQUATIONS

METHOD 5

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

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

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

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1 - B_{ws})}\right)$$

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

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

$$(\dot{m}_p)_1 = 8.5714 \times 10^{-3}\ C_s\ Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228 \times 10^{-1}\ M_p\ A}{0\ A_n}$$

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

SYMBOLS

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

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

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

C_p = Pitot tube coefficient, dimensionless

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

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

EA = Excess air, percent by volume

γ = Dry test meter correction factor, dimensionless

G_d = Specific gravity (relative to air), dimensionless

I = Isokinetic variation, percent by volume

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

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

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

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

M_p = Total amount of particulate matter collected, g

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

P_g = Stack static gas pressure, IN. WC.

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

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

A_a = Actual volumetric stack gas flow rate, ACFM

$Q_{s,d}$ = Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM

RH = Relative humidity, %

T_{db} = Dry bulb temperature of stack gas, °F

T_{wb} = Wet bulb temperature of stack gas, °F

$T_{m(avg)}$ = Absolute average dry gas meter temperature, °R

$T_s(avg)$ = Absolute average stack temperature, °F

T_{std} = Standard absolute temperature, 528 °F (68 °F)

θ = Total sampling time, min.

V_{lc} = Total volume of liquid collected in impingers and silica gel, ml

V_m = Volume of gas sample as measured by dry gas meter, CF

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF

$V_{w(std)}$ = Volume of water vapor in the gas sample corrected to standard conditions, SCF

$\bar{V}_s$ = Average actual stack gas velocity, FT/SEC

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

APPENDIX H

SAMPLING TRAIN CALIBRATION DATA

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job MASAB I BITUMINOUS Date 6-3-93

Operator [illegible] Module No. 5

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 28.58 in. Hg. Υ = 1.0002 ^H@ 1.80 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(230.00)	[redacted]	
2.5	231.97	64	57
5.0	233.86	62	57
7.5	235.80	65	58
10	237.740	68	60
[redacted]	V_m= 7.74	Avg(t_m)=	61.4 °F

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(1.0002)(7.74)}\left[\frac{(61.4) + 460}{(28.58)}\right]^{0.5}$$

7.7384 1.2714

Y_{cn} = .9958

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

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

S-432

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: June 4, 1993

Meter Box No.: 5 (Rockwell Dry Test Meter Serial No. 35302)

Date of Last Calibration: May 28, 1993
Calibration Technician: D. Brennan
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.)
June 2, 1993	3-8981	85.00	225.10	140.10	140.10
June 3, 1993	3-8982	230.00	369.45	139.45	279.55

* Total volume through meter since last calibration.

Date 5/28/93

Bar. Press. 29.25 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 5
Serial No. DTM 35302
Wet Test Meter No. AL-20
Technician DUKE BRENNAN

ΔH (in. WC) nominal	ΔH (in. WC) actual	Gas Volume Wet Test Meter (ft^3)	* Cal. Index θ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3) V_{di}	Gas Volume Dry test meter (ft^3) V_{df}	Gas temperatures Wet Test t_w (°F)	Gas temperatures Dry Test t_{di} (°F)	Gas temperatures Dry Test t_{do} (°F)	Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔHθ	C_f
0.5	.50	2	99.85	0.01	71.500	73.547	67.5	81	74	5:01	.9928	1.77	
1.2	1.2	3	99.91	0.025	74.500	77.556	67.5	82	75.	4.51	.9982	1.76	
2.0	2.0	3	99.93	0.055	56.000	59.045	67.5	83	74	3:48	.9999	1.80	
3.3	3.3	5	100.00	0.09	59.500	64.558	67.5	86	75	4:59	1.0043	1.83	
4.7	4.7	6.8	100.02	0.12	65.000	70.064	67.5	88	77	5:64	1.0056	1.86	
	8	8	9	8	6	7	0	8	10	11/11	1.0002	1.80	

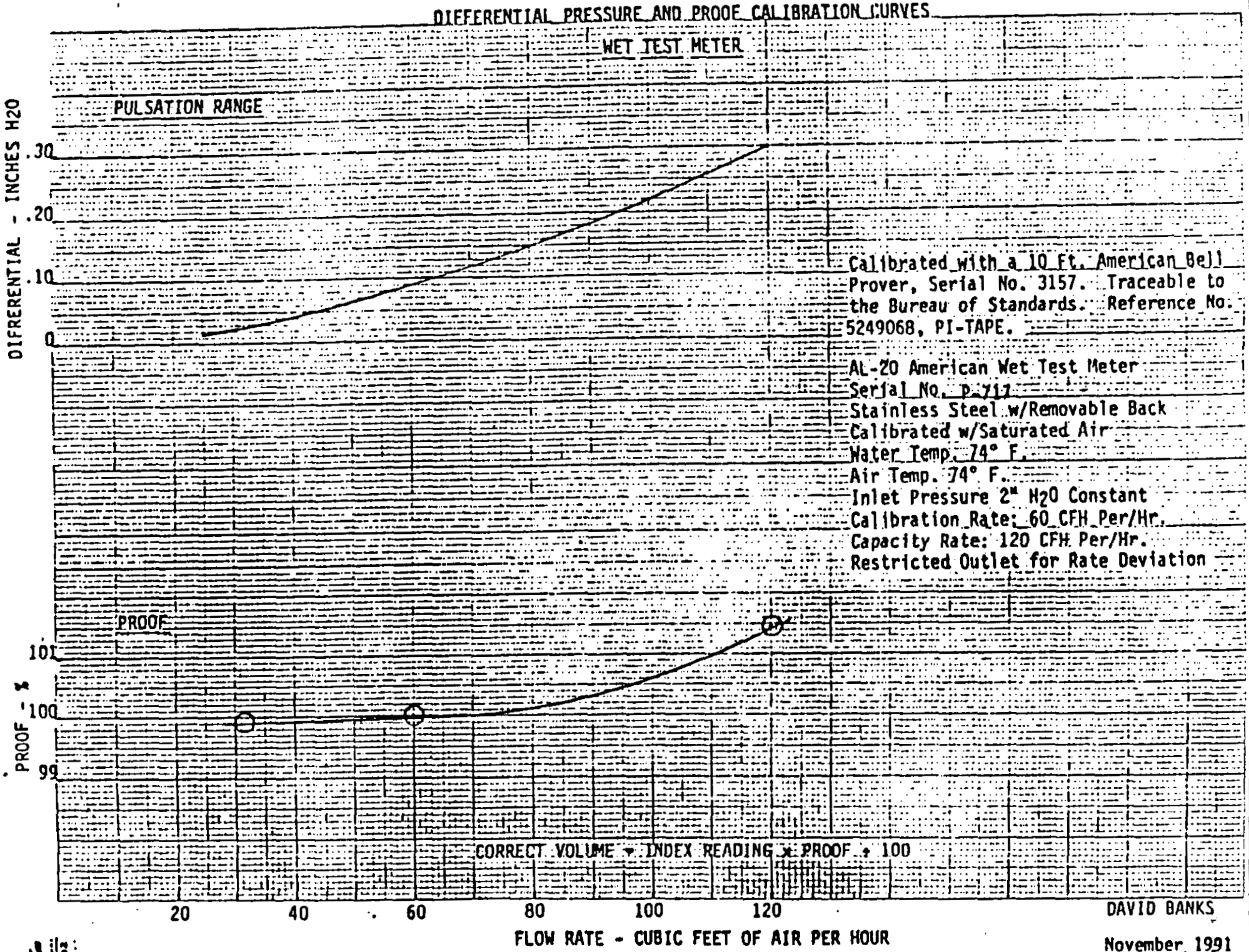
Positive leak check performed by D. BRENNAN
Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 6/3/93

* 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



DAVID BANKS

November, 1991

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 6-3-93 Nozzle Number 1-3
Technician: *Ed Trowbridge*

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.185
2	.186
3	.185
Average:	.185

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:
Vendor: Fluke #12
Model: 51 Serial Number: 6030375
Range: 0-2100 °F Thermocouple Type: K
Date of Calibration: 4-1-93 Technician: [illegible]

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	1	1	.21
100	100	100.2	.2	.03
200	200	202.4	2.4	.36
300	300	301.2	1.2	.15
400	400	399.6	.4	.06
500	500	500.2	.2	.02
600	600	602.0	2.0	.18
700	700	700.2	.2	.02
800	800	801.4	1.4	.11
900	900	899.4	.6	.04
1000	1000	1001.0	1.0	.06
1100	1100	1100.8	.8	.06
1200	1200	1203.2	3.2	.19
1300	1300	1300.4	.4	.02
1400	1400	1403.2	3.2	.17
1500	1500	1500.8	.8	.04
1600	1600	1601.8	1.8	.08
1700	1700	1699.6	.4	.01
1800	1800	1801.6	1.6	.07
1900	1900	1899.4	.6	.02
2000	2000	2001.2	1.2	.04
2100	2100.0	2098.6	1.4	.05
		Averages:	1.18	.09

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

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

S-433

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 24-4

Pitot tube dimensions:

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

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 1

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

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

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

Date of Inspection: 4-7-93

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

4-7-93 C:\STACK\WP\FORMS\S-348

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

ET's

Date 5-12-93
Technician E. TROWBRIDGE
Mercury Column Barometer No. 46
Aneroid Barometer No. SN-01002008

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.16	75	.12	29.04	29.04	

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

Has problem been alleviated? Yes/No. How?

*Note

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

S-312

APPENDIX I

MPCA TEST PLAN AND PROTOCOL

Minnesota Pollution Control Agency
Division of Air Quality
Stack Testing of Asphalt Plants

The permittee must contact the Agency at least two weeks before the scheduled test to have a pre-test meeting and obtain all necessary approvals.

It is very important to allow at least two weeks before the test to review the testing requirements in order to avoid last minute cancellations due to inadequate testing conditions.

Among the potential problems that may need to be solved before the test are:

1. Unsuitable location of sampling ports. The stack may need to be extended and/or straightening vanes be installed.

2. Permittee must schedule the test at a time when the plant can be operated at 100% of rated capacity, and at maximum recycle rate if applicable.

3. Permittee must be ready to burn specified fuel.

4. Permittee may have to install pressure drop taps and gauges, as well as water flow rate measuring devices.

5. Permittee may have to install sampling taps on the fuel feeding line to the burner.

The following is a summary of the testing requirements for the hot mix asphalt owned by Mesabe Bituminous (source subject to State regulations)

I. Test Methods

A. EPA Method 1 for the location of sampling ports and points. Location of the sampling ports must be approved before the test. Please submit drawings showing the inside stack diameter at the location of the ports, and distances between the sampling ports and any flow disturbance upstream and downstream the ports (fans, dust removal equipment, elbows, transitions, dampers, straightening vanes, exit of the stack, etc.).

The permittee submitted some drawings showing sampling locations, but it is not clear the path of the flow. Permittee will clarify this before the test.

Check for cyclonic flow must be done whenever there is a cyclonic type of device directly upstream of the sampling location. Correction of cyclonic flow by straightening vanes must also be verified by checking the cyclonic flow before the test.

If the location does not meet the minimum requirements in Method 1, the testing firm must conduct the flow pattern evaluation and testing according to the alternative procedures in part 2.5 of EPA Method 1 (Tree-dimensional directional probe).

B. EPA Method 2 for velocity and volumetric flow rate. Three determinations: one measurement concurrently with each test run for particulates.

C. EPA Method 3 for gas analysis. Three determinations: one measurement on an integrated sample taken concurrently with each test run for particulates.

D. EPA Method 4 for the determination of moisture in the flue gases. Three determinations: one measurement concurrently with each test for particulates.

E. EPA Method 5 as amended in Exhibit C for the concentration of particulate matter including organic condensibles. The sampling time for each run must be at least 60 minutes, and the sampling rate must be at least 0.9 DSCM/Hr (0.53 DSCF/min). Three runs must be conducted. Report results as dry catch only, and as dry plus wet catch.

F. EPA Method 9 as amended by Minnesota Rules part 7005.1860 for visual determination of opacity. One hour of observations, concurrently with the test for particulates.

II. Fuel sampling and analysis. (Fuel oils and used oil)

This is part of the compliance demonstration requirements. Please note that the test report will not be accepted without complete submittal of fuel analysis results of samples taken at the time of the test.

A. Sampling. One tap sample per particulate test run must be taken. Then sample must be taken as close as possible to the burner,(somewhere in feeding line) to be representative of the fuel burned at the time of the test. The sample may be taken in a pint-size clean container, and according to the procedures in ASTM Method D 270-2546. Mix the three samples taken into a composite.

B. Analysis. The composite must be analyzed for: (Exhibit D)

Parameter	Method	Fuels
Gross heating value, BTU/gal	ASTM-240	All fuel oils and used oil
Sulfur, % by weight	ASTM D-1552	All fuel oils and used oil
Ash, % by weight	ASTM D-874	All fuel oils and used oil
Specific gravity	ASTM D-1298	All fuel oils and used oil
Lead, % by weight	ASTM D-2788	Used oil
PCB, ppm by weight	EPA-600/4-81-045	Used oil
Halogens, ppm by weight	ASTM D-1317 or ASTM D-808	Used oil
Acidity, pH	ASTM D-1093	Used oil
Flash point, degrees Fahrenheit	ASTM D-93	Used oil

III. Moisture content in the virgin aggregate

A. Take two samples the virgin aggregate per test run of particulates. Sample must be taken as close as possible to the feeding conveyor and

during the corresponding run. Mix the two samples of virgin aggregate, this will give one composite sample per test run.

B. Perform one analysis of moisture content in each composite sample as per ASTM or other recognized methodologies. A total of three analysis shall be performed, one per test run for particulates.

IV. Operating Conditions during the Test

A. Operation must be at 100% of design capacity at the existing aggregate moisture content - no deliberate reduction of feed rate or fan speed during testing, except for nominal damper adjustment for proper combustion. - The test report must include copies of the manufacturer's specifications that define the design capacity of the plant as a function of the moisture content of the aggregate.

B. Must burn 100% of the highest emitting fuel to be listed in and allowed by the permit: Used oil (waste oil, crank oil).

C. If the permit is to authorize recycling, then testing must be conducted while recycling and at the maximum ratio of recycle to virgin aggregate to be allowed by the permit. Permittee runs only virgin aggregate, therefore this is not necessary.

D. If normal operation of the plant will be recycling of scrubber water, the test must be done under the same conditions.

V. Operating Data to Be Recorded during the Test

Operating data must be recorded during the test in its entirety i.e., particulates and visible emission observations. Operating data must be recorded every fifteen minutes. Please use the attached data sheet or equivalent.

Note: No test report will be accepted without a complete data sheet included.

A. During testing the following measurements must be made:

1. Pressure drop across the scrubber.

2. Scrubber water flow rate. If the measurement is done indirectly from a pump pressure gauge, the test report must include calculations, nomograms or calibration data used to compute gallons per minute of water.

3. Virgin aggregate input (ton per hour) as well as asphalt input (ton per hour). Provide the manufaturer's rating of the asphalt plant at different moisture contents in the aggregate.

4. Moisture content of the aggregate.

B. Please provide the following data:

1. Average fuel consumption rate (calculated or measured)

2. Quality of the scrubber water: recycling percent

VI. Operating data sheet enclosed

VII. Testing schedules: August 29, 1989

CKS:rul 9.44