AP42 Section: 11.1

Reference Number: 71

Title: Results Of The June 17, 1993 NSPS Particulate And Opacity Compliance Tests On The Bemidji Blacktop Portable Asphalt Plant Stationed North Of Bemidji, Minnesota,

Interpoll Laboratories, Inc., Circle Pines, MN,

July 28, 1993.

AP-42 Section 11.1
Reference
67 Report Sect. 4
Reference 71

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

TEL: (612) 786-6020
FAX: (612) 786-7854

Printed 8/3/93 cjh

RESULTS OF THE JUNE 17, 1993 NSPS PARTICULATE AND OPACITY COMPLIANCE TESTS CONDUCTED ON THE BEMIDJI BLACKTOP PORTABLE ASPHALT PLANT STATIONED NORTH OF BEMIDJI, MINNESOTA

Submitted to:

BEMIDJI BLACKTOP
Highway 2 West
Bemidji, Minnesota 56601

Attention:

Scott Gesell

Approved by:

Daniel Despen
Manager
Stationary Source Testing Department

Report Number 3-9132
July 28, 1993
SP/slp

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/10^6BTU	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 17, 1993 Interpoll Laboratories Personnel conducted a NSPS Particulate and Visible Emission Compliance Test on the Bemidji Blacktop Portable Asphalt Plant stationed north of Bemidji, Minnesota. Ed Trowbridge, Ken Rosenthal and Bob Aschenbach performed the on-site portion of the test. Coordination between testing activities and plant operation was provided by Leonard Sherick of Bemidji Blacktop. The test was not witnessed by a member of the Minnesota Pollution Control Agency.

The unit tested is a Barber Greene Model DM-65 portable asphalt plant which has a rated capacity of 320 TPH with 5% moisture. The particulate emissions are controlled by a Stan Steel PA960M Baghouse. The unit was tested processing 100% virgin aggregate. The plant was fired with No. 6 Fuel Oil 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

rotameter. Bags with any detectable inleakage are discarded.

Testing was conducted from 6 test ports situated horizontally on the stack. The test ports are located 5 diameters downstream and 0.8 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 Ken Rosenthal, 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)	0.0159	2.87
Virgin	(Dry Catch Only)	0.0102	1.85

Opacity averaged 2 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 17, 1993 NSPS Particulate Emission Compliance Test on the Bemidji Blacktop Portable Asphalt Plant Stationed north of Bemidji, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		06-17-93	06-17-93	06-17-93
Time runs were done	(HRS)	1115/1328	1355/1501	1520/1623
Process rate	(TON/HR)			
recycle		0.0	0.0	0.0
aggregate		290.0	288.0	315.0
asphalt		14.9	15.7	16.6
total		304.9	303.7	331.6
Volumetric flow				
actual	(ACFM)	50833	50398	51420
standard	(DSCFM)	21339	20690	21380
Gas temperature	(DEG-F)	273	282	285
Moisture content	(%V/V)	38.86	39.43	38.44
Gas composition	(%V/V,dry)			
carbon dioxide		10.00	10.00	9.40
oxygen		8.60	8.60	9.40
nitrogen		81.40	81.40	81.20
Isokinetic variation	(%)	107.5	100.0	98.5
Part. emission rate	(LB/HR)	3.41	2.92	2.29
Particulate concentration				
actual	(GR/ACF)	.00781	.00676	.00519
standard	(GR/DSCF)	.0186	.0165	.0125

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 17, 1993 NSPS Particulate Emission Compliance Test on the Bemidji Blacktop Portable Asphalt Plant Stationed north of Bemidji, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		06-17-93	06-17-93	06-17-93
Time runs were done	(HRS)	1115/1328	1355/1501	1520/1623
Process rate	(TON/HR)			
recycle		0.0	0.0	0.0
aggregate		290.0	288.0	315.0
asphalt		14.9	15.7	16.6
total		304.9	303.7	331.6
Volumetric flow				
actual	(ACFM)	50833	50398	51420
standard	(DSCFM)	21339	20690	21380
Gas temperature	(DEG-F)	273	282	285
Moisture content	(%V/V)	38.86	39.43	38.44
Gas composition	(%V/V,dry)			
carbon dioxide		10.00	10.00	9.40
oxygen		8.60	8.60	9.40
nitrogen		81.40	81.40	81.20
Isokinetic variation	(%)	107.5	100.0	98.5
Part. emission rate	(LB/HR)	2.20	1.75	1.59
Particulate concentration				
actual	(GR/ACF)	.00506	.00404	.00361
standard	(GR/DSCF)	.0121	.00985	.00869

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	06-17-93	06-17-93	06-17-93
Dry basis (orsat)			
carbon dioxide.....	10.00	10.00	9.40
oxygen.....	8.60	8.60	9.40
nitrogen.....	81.40	81.40	81.20
Wet basis (orsat)			
carbon dioxide.....	6.11	6.06	5.79
oxygen.....	5.26	5.21	5.79
nitrogen.....	49.77	49.31	49.99
water vapor.....	38.86	39.43	38.44
Dry molecular weight.....	29.94	29.94	29.88
Wet molecular weight.....	25.30	25.23	25.31
Specific gravity.....	0.874	0.872	0.874
Water mass flow.....(LB/HR)	38037	37778	37445
FO	1.230	1.230	1.223

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	06-17-93	06-17-93	06-17-93
Time run start/end.....(HRS)	1115/1328	1355/1501	1520/1623
Static pressure.....(IN.WC)	-0.85	-0.85	-0.85
Cross sectional area (SQ.FT)	13.99	13.99	13.99
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	443.0	410.0	395.0
desiccant.....(GRAMS)	16.0	14.0	19.0
total.....(GRAMS)	459.0	424.0	414.0
Total particulate material..			
.....collected(grams)	0.0411	0.0328	0.0253
Gas meter coefficient.....	0.9984	0.9984	0.9984
Barometric pressure..(IN.HG)	28.56	28.56	28.56
Avg. orif.pres.drop..(IN.WC)	1.22	1.00	1.04
Avg. gas meter temp..(DEF-F)	71.9	83.5	87.7
Volume through gas meter....			
at meter conditions...(CF)	35.90	33.10	33.95
standard conditions.(DSCF)	34.06	30.71	31.26
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.252	.252	.252
Avg.stack gas temp ..(DEG-F)	273	282	285
Volumetric flow rate.....			
actual.....(ACFM)	50833	50398	51420
dry standard.....(DSCFM)	21339	20690	21380
Isokinetic variation.....(%)	107.5	100.0	98.5
Particulate concentration...			
actual.....(GR/ACF)	0.00781	0.00676	0.00519
dry standard.....(GR/DSCF)	0.01862	0.01648	0.01249
Particle mass rate...(LB/HR)	3.406	2.922	2.288

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	9.17
5	0.0223	90.83
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00

Avg Opac 4.54 Avg OD 0.0203 Time average

Observer: Kenneth A. Rosenthal
Cert. Date: 04-01-93
Date of Observation: 06-17-93
Time of Observation: 1115-1325

Test No. 2
Asphalt Plant Stack

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

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	81.25
5	0.0223	18.75
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00

Avg Opac 0.94 Avg OD 0.0042 Time average

Observer: Kenneth A. Rosenthal
Cert. Date: 04-01-93
Date of Observation: 06-17-93
Time of Observation: 1355-1455

Test No. 3
Asphalt Plant Stack

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

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	83.00
5	0.0223	17.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 0.85	Avg OD 0.0038	Time average

Observer: Kenneth A. Rosenthal
Cert. Date: 04-01-93
Date of Observation: 06-17-93
Time of Observation: 1520-1620

4 RESULTS OF FUEL AND AGGREGATE ANALYSES

INTERPOLL LABORATORIES, INC.
(612)786-6020

Bemidji Blacktop
Laboratory Log No. 9132

Results of Moisture Analysis[1]

Log No.	Test/Run	Sample Type	% Moisture
9132-16	Test 1 Run 1	Virgin Aggregate	4.04
9132-17	Test 1 Run 2	Virgin Aggregate	3.71
9132-18	Test 1 Run 3	Virgin Aggregate	4.39

Respectfully submitted,

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

JFO/cg

[1]Analysis by ASTM Method D3173

INTERPOLL LABORATORIES, INC.
(612)786-6020

Bemidji Blacktop
Sample Log No. 9132-19

Results of Fuel Analysis

Test: 1

Sample Type: No. 6 Fuel Oil

Parameter		Method	As Received
Gross heating value	BTU/GAL	ASTM D240	155694
Sulfur	%	ASTM D3177[a]	1.61
Ash	%	ASTM D482	0.05
Specifc gravity	60/60 ^{0}F	ASTM D1298	1.0295

Respectfully submitted,

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

JFO/cg

[a]Modified ASTM Method

APPENDIX A

PRELIMINARY VOLUMETRIC FLOW RATE DETERMINATION

Test No. 1
Asphalt Plant Stack

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

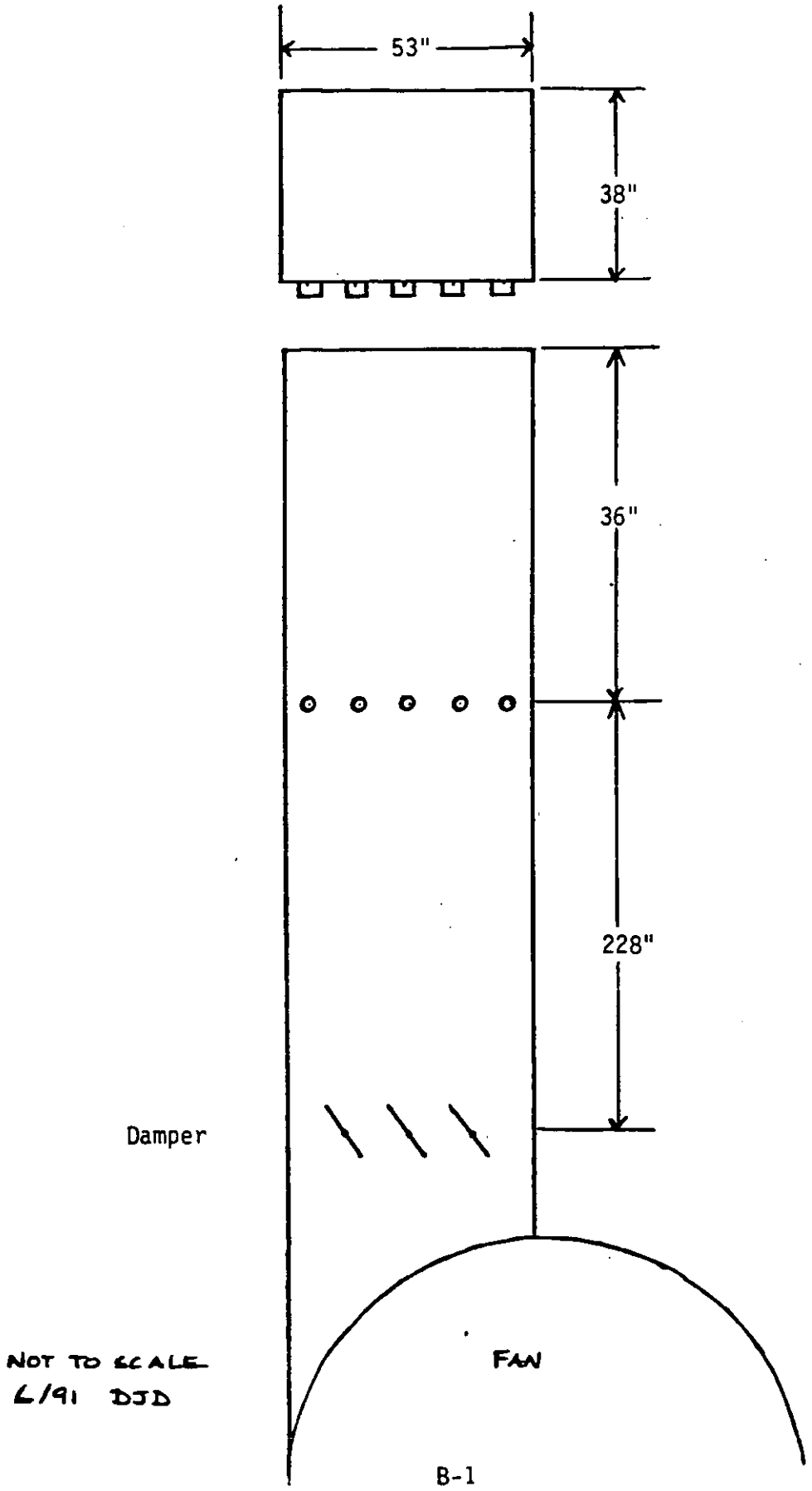
Date of Determination.....	06-17-93
Time of Determination.....(HRS)	0
Barometric pressure.....(IN.HG)	28.56
Pitot tube coefficient.....	.84
Number of sampling ports.....	6
Total number of points.....	24
Shape of duct.....	Rectangular
Duct width.....(IN)	38
Duct length.....(IN)	53
Duct area.....(SQ.FT)	13.99
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.85
Avg. gas temp.....(DEG-F)	245
Moisture content.....(% V/V)	38.86
Avg. linear velocity.....(FT/SEC)	50.2
Gas density.....(LB/ACF)	.04689
Molecular weight.....(LB/LBMOLE)	29.94
Mass flow of gas.....(LB/HR)	118536
Volumetric flow rate.....	
actual.....(ACFM)	42129
dry standard.....(DSCFM)	18383

APPENDIX B

LOCATION OF TEST PORTS

BEMIDJI BLACKTOP COMPANY

BOEING LITTLE CAT



NOT TO SCALE
6/91 DJD

APPENDIX C

FIELD DATA SHEETS

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job BENDT; BLACKTOP

Source ASPHALT PLANT, - STACK

Test 1 Run 1 Date 6-17-93

Stack dimen. 39 X 53 IN.

Dry bulb 70 °F Wet bulb 66 °F

Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

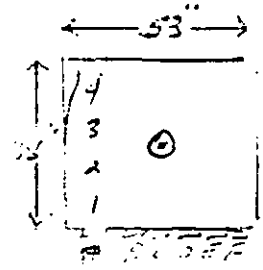
Barometric pressure 28.56 in Hg

Static pressure -.85 in WC

Operators E. TELLWRIDGE - B. ASHENBACH

Pitot No. 31V-4 Cp .840

Cross-section View | Elevation View



Drawing of Test Site

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: 13/4 in.		Time start: 0900 hrs	
A	1		4.69	6.44	.68	
	2		14.06	15.81	.30	
	3		23.43	25.18	.25	197
	4		32.81	34.56	.25	
B	1				.55	
	2				1.5	237
	3				2.1	
	4				1.9	
C	1				.25	
	2				.65	
	3				1.7	254
	4				2.0	
D	1				.22	
	2				.70	
	3				.90	265
	4				.50	
E	1				.05	
	2				.38	
	3				.50	
	4				.15	
F	1				.04	
	2				.08	
	3				.03	250
	4				.03	

Temp. meas. device & S/N: TDT-12

Time end: 0920 hrs

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

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Bonnati Blacktop
Source Asphalt Plant Stack
Method 5 Filter holder: 4" Glass

Date 4-17-93 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 15 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 5453

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	643	100	443
Impinger No. 3		0	
Condenser			
Desiccant	1434	1423	16
Total			459

Integrated Gas Sampling Data:

Bag Pump No. 31A Box No. 16 Bag No. 1

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

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

Time start: 1116 (HRS) Time end: 1327 (HRS)

Sampling rate: 400 cc/min Operator: ET

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

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: BRADY, BLACK TOP — Operators: E. TROWBRIDGE - R. ASHNBACH — Pitot No.: 51V-41 — Cp: .540
Source: ASPHALT PLANT STACK — Meter Box No.: 2 — ΔH: 1.74 IN WC — Bar. Press.: 28.56 inHg H2O x
Date: 6-17-93 — Test: 1 — Run: 1 — Coefficient: .9954 — Nozzle No.: 4-41 — Nozzle Dia.: .252 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/v)
	1115	636.50											
A 4	2.5	638.76	1.20	1.83	8.78	8.4	265	237	238	50	64	63	8.0
3	✓	641.25	1.80	2.66	1.14	14.0	274	237	243	47	66	64	7.5
2	7.5	643.15	1.50	2.21	3.29	14.0	277	235	252	45	66	65	8.0
1	10	645.01	1.00	1.48	5.06	9.0	276	240	255	40	67	65	8.4
B 4	12.5	646.40	.70	1.04	6.54	6.0	273	240	259	37	69	65	8.1
3	15	648.81	1.80	2.66	8.91	14.0	279	251	260	37	71	65	8.2
2	17.5	651.30	2.00	2.95	1.40	14.8	280	268	261	39	74	66	8.5
1	20	653.12	1.00	1.49	3.18	9.0	279	269	255	57	74	66	8.5
1138 Back ✓ 1245 ✓ C 4	22.5	655.33	.45	.69	4.39	4.0	253	269	249	35	68	67	8.7
3	25	656.40	1.4	2.12	6.51	10.0	261	265	245	55	70	69	8.3
2	27.5	658.60	1.5	2.27	8.70	12.0	264	268	243	55	73	67	8.5
1	30	660.47	.92	1.39	0.43	9.0	266	262	249	56	75	68	8.5
D 4	32.5	661.55	.35	.53	1.49	3.8	265	259	251	37	75	69	8.2
3	35	663.21	.70	1.05	2.99	5.8	270	258	252	37	77	70	8.4
2	37.5	664.67	.85	1.28	4.65	7.0	276	257	254	37	78	69	8.7
1	40	665.95	.50	.75	5.42	4.5	275	260	261	38	80	70	8.2
E 4	42.5	666.85	.23	.35	6.79	3.0	270	264	267	40	81	71	8.6
3	45	667.98	.40	.60	7.93	3.8	274	260	264	39	82	71	8.8
2	47.5	669.25	.50	.75	9.21	4.4	280	256	262	38	83	71	9.0
1	50	670.22	.30	.45	0.19	3.3	280	260	260	38	83	72	8.7
F 4	52.5	670.75	.08	.12	0.71	2.0	277	265	264	37	93	72	8.4
3	✓	671.35	.10	.15	1.28	2.0	275	264	265	37	83	73	8.8
2	57.5	672.04	.18	.27	2.05	2.2	278	246	262	37	83	73	8.6
1	60	672.70	.12	.18	2.68	2.0	273	265	260	37	83	73	8.5
	(1328)												
	θ = 60	Vm = 55.90		ΔH = 1.22							Avg. = 72.5		

C-3

S-0037R

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job BEMIDJI BLACKTOP
Source ASPHALT PLANT STACK
Method 5 Filter holder: 4"GLASS
Date 6-17-93 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 15 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 5434

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	610	100	410
Impinger No. 3		0	
Condenser			
Desiccant	1372	1358	14
Total			424

Integrated Gas Sampling Data:

Bag Pump No. 31A Box No. 16 Bag No. 2

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

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

Time start: 1356 (HRS) Time end: 1500 (HRS)

Sampling rate: 400 cc/min Operator: ET

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

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job Bandit, Blackfoot
Source Asphalt Plant Stack
Date 6-17-93 Test 1 Run 2

Operators ET-RA
Meter Box No. 2 ΔH 1.74 IN WC
Coeff. .9884

Pitot No. 31V-4 Cp .840
Bar. Press. 28.56 inHg H2O X
Nozzle No. 4-4 Nozzle Dia .252 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry Gas Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (x y/v)
	135	673.10											
A 4	2.5	674.45	.40	.78	4.40	4.0	276	240	244	40	79	75	9.5
3	5	676.53	1.80	2.31	6.63	11.0	280	245	246	40	82	75	9.2
2	7.5	678.40	1.50	1.91	8.66	12.0	281	248	251	41	83	75	9.2
1	10	680.15	.75	.97	0.11	5.0	275	255	260	40	84	76	8.9
B 4	12.5	681.75	.90	1.15	1.69	6.0	280	264	245	38	84	77	8.8
3	15	683.90	1.80	2.31	3.93	15.0	279	262	240	41	86	77	9.3
2	17.5	685.44	1.50	1.93	5.97	12.5	278	264	235	44	87	77	9.2
1	20	687.75	1.10	1.42	7.75	9.0	276	261	258	45	87	78	8.7
C 4	22.5	689.10	.55	.71	8.98	4.0	280	262	240	42	87	78	8.5
3	25	690.80	1.20	1.54	0.81	7.8	285	260	245	42	88	78	8.5
2	27.5	692.82	1.60	2.04	2.91	11.0	286	260	248	42	90	78	8.5
1	30	694.60	1.00	1.28	4.59	9.0	285	258	250	41	90	79	8.5
D 4	32.5	695.62	.35	.45	5.58	3.0	282	256	252	40	90	79	8.6
3	35	697.00	.70	.90	6.99	5.0	282	260	261	40	90	79	8.5
2	37.5	698.55	.90	1.16	8.58	6.0	285	269	265	40	92	80	9.0
1	40	699.78	.50	.64	9.77	4.0	285	267	263	40	92	81	9.0
E 4	42.5	700.68	.25	.32	0.62	2.0	284	265	262	40	92	81	8.5
3	45	701.79	.42	.54	1.71	2.5	282	264	260	40	92	81	8.6
2	47.5	702.95	.50	.64	2.90	3.7	285	268	257	41	92	81	8.6
1	50	703.90	.30	.38	3.83	3.0	284	267	260	41	91	81	9.0
F 4	52.5	704.32	.08	.10	4.32	2.0	284	264	260	40	90	82	8.6
3	55	704.95	.12	.15	4.89	2.0	282	262	258	40	90	82	8.5
2	57.5	705.65	.18	.23	5.60	2.0	286	260	255	40	90	82	8.6
1	60	706.20	.12	.15	6.19	2.0	285	259	254	40	90	82	8.6
	(501)												
	0 -60	Vm = 33.10		^H =							Avg.	= 85.5	

C-5

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Bondi T. Blacktop
Source Asphalt Plant Stack
Method 5 Filter holder: 4" Glass

Date 6-17-93 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 15 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5485

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	595	100	395
Impinger No. 3		0	
Condenser			
Desiccant	1356	1337	19
Total			414

Integrated Gas Sampling Data:

Bag Pump No. 31A Box No. 16 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1521 (HRS) Time end: 1622 (HRS)
Sampling rate: 400 cc/min Operator: ET
S/N of O_2 Analyzer used to monitor train outlet: 5

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job Ewald / Black Top
Source Asphalt Plant Stack
Date 6-12-93 Test 1 Run 3

Operators ET - RA
Meter Box No. 2 ΔH@ 1.74 IN WC
Coeuntor coeff. .9984

Pitot No. 31V-4 Cp .840
Bar. Press. 28.86 inHg H2O x
Nozzle No. E-4 Nozzle Dia. .252 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Out/In	Out/Out	Oxygen (xx/x)
	1520	706.50											
A 4	2.5	707.95	.70	.91	7.90	4.0	277	242	253	45	84	83	9.8
3	5	710.10	1.80	2.32	0.15	11.5	279	245	250	45	86	83	9.6
2	7.5	712.12	1.50	1.95	2.20	11.0	284	250	251	40	88	81	8.6
1	10	713.45	.80	1.03	3.70	9.0	285	253	254	40	89	81	8.6
5 4	12.5	715.40	1.00	1.29	5.58	9.0	284	256	254	40	91	82	9.4
3	15	717.55	1.80	2.32	7.63	13	285	258	251	42	91	82	9.4
2	17.5	719.70	1.60	2.06	9.75	12.5	285	262	258	45	91	82	9.9
1	20	721.55	1.10	1.42	1.52	10	284	262	260	44	91	82	10.1
C 4	22.5	722.90	.60	.77	2.82	4.5	284	260	262	44	91	83	9.2
3	25	724.68	1.20	1.54	4.66	8.0	290	263	260	40	91	83	8.9
2	27.5	726.78	1.40	2.05	6.78	10.5	290	265	260	40	91	83	9.9
1	30	728.50	1.00	1.29	8.46	8	287	262	257	40	93	83	9.8
D 4	32.5	729.52	.36	.46	9.48	5.0	285	264	268	40	94	85	9.3
3	35	730.95	.78	1.01	0.97	5.0	286	265	265	40	94	84	9.1
2	37.5	732.60	.92	1.19	2.59	6.5	285	262	268	42	94	84	9.7
1	40	733.82	.52	.67	3.81	4	284	257	260	42	94	84	9.7
E 4	42.5	734.77	.30	.39	4.71	3.0	284	259	262	42	94	84	9.7
3	45	735.90	.42	.54	5.84	3.5	286	260	258	42	94	84	9.8
2	47.5	737.10	.52	.67	7.06	3.7	286	262	260	43	95	85	9.6
1	50	738.05	.30	.39	7.99	2.8	286	260	257	43	95	85	9.3
F 4	52.5	738.50	.08	.10	8.47	2.0	285	257	254	42	94	85	10.2
3	55	739.15	.15	.19	9.12	2.0	285	259	259	42	94	85	10.3
2	57.5	739.84	.18	.23	9.84	2.0	285	255	252	40	94	85	9.9
1	60	740.45	.12	.15	0.45	2.0	285	250	247	40	94	85	9.9
	(1623)												
	0 = 60	Vm = 33.95		ΔH = 1.04							Avg. = 87.7		

C-7

S-0037R

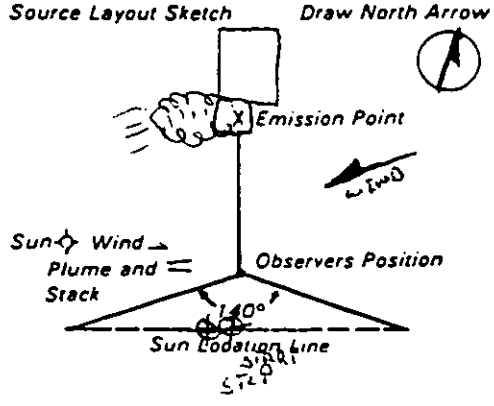
Interpoll Laboratories
(612)786-6020

Visible Emissions Form

Test 1

SOURCE NAME: REMIX Blacktop	OBSERVATION DATE: 6-17-93	START TIME: 1115
ADDRESS:		STOP TIME: 1325
CITY:	STATE: MN	ZIP:
PHONE:	SOURCE ID NUMBER:	
PROCESS EQUIPMENT: ASPHALT PLANT	OPERATING MODE: 100%	
CONTROL EQUIPMENT: BAG HOUSE	OPERATING MODE: 100%	
DESCRIBE EMISSION POINT: START STACK	STOP ✓	
HEIGHT ABOVE GROUND LEVEL: START 30'±	STOP ✓	HEIGHT RELATIVE TO OBSERVER: START 30'± STOP ✓
DISTANCE FROM OBSERVER: START 100'±	STOP ✓	DIRECTION FROM OBSERVER: START SOUTH STOP ✓
DESCRIBE EMISSIONS: START FUMAGATING	STOP ✓	
EMISSION COLOR: START BROWN	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 AFTER STEAM PLUME	STOP ✓	
DESCRIBE BACKGROUND: START LIGHT GREY	STOP LIGHT BLUE	
BACKGROUND COLOR: START GREY	STOP BLUE	SKY CONDITIONS: START cloudy STOP scattered
WIND SPEED: START GENTLE	STOP ✓	WIND DIRECTION: START EAST STOP ✓
AMBIENT TEMP.: START 60	STOP 64	WET BULB TEMP.: RH,percent

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



AVERAGE OPACITY FOR HIGHEST PERIOD: 5%	NUMBER OF READINGS ABOVE: 20 % WERE 0
RANGE OF OPACITY READINGS: 0 MINIMUM	5 MAXIMUM
OBSERVER'S NAME (PRINT): ROSENTHAL KENNETH A	
COMMENTS: Delayed at 1135 to 1245	OBSERVER'S SIGNATURE: Kenneth A Rosenthal — DATE: 6-17-93
	ORGANIZATION: INTERPOLL LABS
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	CERTIFIED BY: ETA — DATE: APR. 1. 93
TITLE / DATE	VERIFIED BY / DATE

S-0079R

Interpoll Laboratories
(612)786-6020

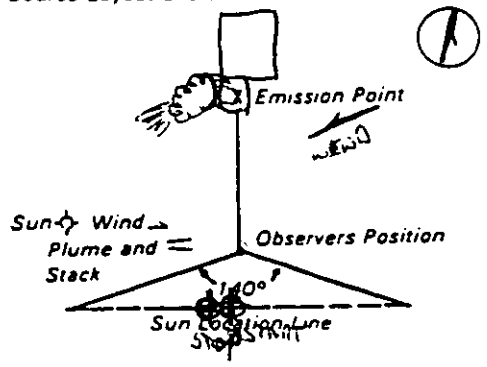
Visible Emissions Form

Test 2

SOURCE NAME: BEMIDJI Blacktop	OBSERVATION DATE: 6-17-93	START TIME: 1355 / STOP TIME: 1453
ADDRESS:		
CITY:	STATE: MN	ZIP:
PHONE:	SOURCE ID NUMBER:	
PROCESS EQUIPMENT: ASPHALT PLANT	OPERATING MODE: 100%	
CONTROL EQUIPMENT: BAG HOUSE	OPERATING MODE: 100%	
DESCRIBE EMISSION POINT: START STACK ✓	STOP ✓	
HEIGHT ABOVE GROUND LEVEL: START 30'~ STOP 30'~	HEIGHT RELATIVE TO OBSERVER: START 30'~ STOP 30'~	
DISTANCE FROM OBSERVER: START 100'~ STOP	DIRECTION FROM OBSERVER: START SOUTH STOP ✓	
DESCRIBE EMISSIONS: START FUMIGATING STOP ✓		
EMISSION COLOR: START BROWN 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 STACK 1' ABOVE STOP ✓		
DESCRIBE BACKGROUND: START SKY BLUE STOP ✓		
BACKGROUND COLOR: START BLUE STOP ✓	SKY CONDITIONS: START SCATTERED STOP ✓	
WIND SPEED: START GENTLE STOP ✓	WIND DIRECTION: START EAST STOP ✓	
AMBIENT TEMP: START 65 STOP ✓	WET BULB TEMP.	RH.percent

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

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD: 2.5%	NUMBER OF READINGS ABOVE 20 % WERE 0
RANGE OF OPACITY READINGS: 0 MINIMUM	5 MAXIMUM
OBSERVER'S NAME (PRINT): ROSENTHAL KENNETH A	
COMMENTS	OBSERVER'S SIGNATURE: Kenneth A Rosenthal — DATE: 6-17-93
	ORGANIZATION: INTERPOLL LABS
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS — SIGNATURE	CERTIFIED BY: ETA — DATE: JUN-1-93
TITLE — DATE	VERIFIED BY — DATE

S-0079R

Interpoll Laboratories
(612)786-6020

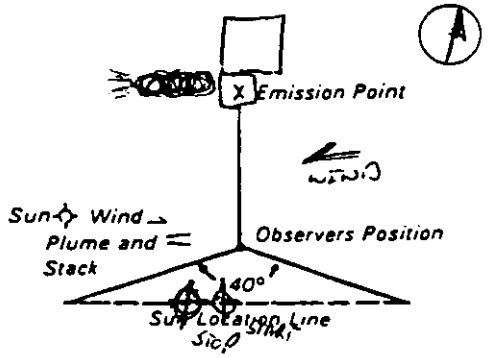
Visible Emissions Form

Test 3

SOURCE NAME: BEMIDJI Blacktop	OBSERVATION DATE: 6-17-93	START TIME: 1520 / STOP TIME: 1620
ADDRESS:		
CITY:	STATE: MN	ZIP:
PHONE:	SOURCE ID NUMBER:	
PROCESS EQUIPMENT: ASPHALT PLANT	OPERATING MODE: 100%	
CONTROL EQUIPMENT: BAG HOUSE	OPERATING MODE: 100%	
DESCRIBE EMISSION POINT: START STACK ✓ STOP		
HEIGHT ABOVE GROUND LEVEL: START 30' ~ STOP ✓	HEIGHT RELATIVE TO OBSERVER: START 30' ~ STOP ✓	
DISTANCE FROM OBSERVER: START 100' ~ STOP ✓	DIRECTION FROM OBSERVER: START SOUTH STOP ✓	
DESCRIBE EMISSIONS: START FUMIGATING STOP ✓		
EMISSION COLOR: START BROWN 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 ABOVE STACK STOP ✓		
DESCRIBE BACKGROUND: START BLUE SKY STOP ✓		
BACKGROUND COLOR: START BLUE STOP ✓	SKY CONDITIONS: START SCATTERED STOP ✓	
WIND SPEED: START GENTLE STOP ✓	WIND DIRECTION: START EAST STOP ✓	
AMBIENT TEMP. START 65 STOP ✓	WET BULB TEMP.	RH.percent

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

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD: 2.0%

NUMBER OF READINGS ABOVE: 20 % WERE 0

RANGE OF OPACITY READINGS: 0 MINIMUM 5 MAXIMUM

OBSERVER'S NAME (PRINT): ROSENTHAL KENNETH A

OBSERVER'S SIGNATURE: Kenneth A Rosenthal DATE: 6-17-93

ORGANIZATION: INTERPOLL LABS

CERTIFIED BY: ETA DATE: APR-1-93

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE

TITLE DATE

VERIFIED BY DATE

S-0079R

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Kenneth Rosenthal

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

Thomas Lore
President

238305
Certificate Number

Vice President

Minneapolis
Location

David B. Savage, Jr.
Program Manager

April 1, 1993
Date of Issue

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL DATA

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job Bemidji Blacktop
Team Leader CT
Date Submitted 6-18-93
Test No. 1
Date of Analysis 6-18-93

Source Asphalt Plant
Test Site Stack
Date of Test 6-17-93
No. of Runs Completed 3
Technician C. Helgeson

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		1	0.00	10.00	18.60	10.00	8.60	1.23
	9132-07	2	0.00	10.00	18.60	10.00	8.60	1.23
	☒ B ☐ F	Avg				10.00	8.60	
1/2		1	0.00	10.00	18.60	10.00	8.60	1.23
	-11	2	0.00	10.00	18.60	10.00	8.60	1.23
	☒ B ☐ F	Avg				10.00	8.60	
1/3		1	0.00	9.40	18.80	9.40	9.40	1.22
	-15	2	0.00	9.40	18.80	9.40	9.40	1.22
	☒ B ☐ F	Avg				9.40	9.40	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

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

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

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

EPA Method 3 Guidelines

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

LSC-04-BR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job Bemidji Blacktop — Source Asphalt Plant
Team Leader CT — Test Site Stack
Date Submitted 6-18-93 — Date of Test 6-17-93
Test No. 1 — No. of Runs Completed 3
Date of Analysis 6-7-93 — Technician C. Nelson

0	Test 1 Run 0 Field Blank Log Number 9132-03 Comments	Dish No. 608 Dish Tare Wt. 46.1311 g Dish+Sample Wt. 46.1316 g Sample Wt. 0.0005 g
1	Test 1 Run 1 Log Number -06 Comments	Dish No. 609 Dish Tare Wt. 45.5613 g Dish+Sample Wt. 45.5763 g Sample Wt. 0.0150 g
2	Test 1 Run 2 Log Number -10 Comments	Dish No. 610 Dish Tare Wt. 48.4390 g Dish+Sample Wt. 48.4527 g Sample Wt. 0.0137 g
3	Test 1 Run 3 Log Number -14 Comments	Dish No. 611 Dish Tare Wt. 50.0094 g Dish+Sample Wt. 50.0176 g Sample Wt. 0.0082 g
4	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

Blank Solvent Wt. 0.0005 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0145	0.0132	0.0077		

LSC-03.GR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job Bemidji Blacktop
Team Leader ET
Date Submitted 6-18-93
Test No. 1
Date of Analysis 6-30-93
Transport Leakage ☐ None ☒ _____ ml

Source Asphalt Plant
Test Site Stack
Date of Test 6-17-93
No. of Runs Completed 3
Technician C. Helgeson
Solvent Acetone

0	Test 1 Run 0 Field Blank Log Number 9132-01 Vol. of Solvent 160 ml *Solvent Residue 4.4 ug/ml	Dish No. 1 Dish Tare Wt. 51.9695 g Dish+Sample Wt. 51.9702 g Sample Wt. 0.0007 g
1	Test 1 Run 1 Vol. of Solvent 95 ml Log Number -04 Comments	Dish No. 608 Dish Tare Wt. 48.2801 g Dish+Sample Wt. 48.2979 g Sample Wt. 0.0178 g
2	Test 1 Run 2 Vol. of Solvent 90 ml Log Number -08 Comments	Dish No. 619 Dish Tare Wt. 47.5515 g Dish+Sample Wt. 47.5636 g Sample Wt. 0.0121 g
3	Test 1 Run 3 Vol. of Solvent 95 ml Log Number -12 Comments	Dish No. 621 Dish Tare Wt. 49.9340 g Dish+Sample Wt. 49.9446 g Sample Wt. 0.0106 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 4.4 ug/ml = [(Sample Wt. 0.0007 g)(10^6)]/Vol. of Sol. 160 ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0174	0.0117	0.0102 D-3		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job: Bemidji Blacktop
Team Leader: ET
Date Submitted: 6-18-93
Test No.: 1
Date of Analysis: 6-30-93

Source: Asphalt Plant
Test Site: Stack
Date of Test: 6-17-93
No. of Runs Completed: 3
Technician: Blank

0 Test 1 Run 0
Field Blank
Log Number: 9132-02
Comments:
Filter No.: 5505
Filter Type: 4"GF
Filter Tare Wt.: .9175 g
Filter+Sample Wt.: .9177 g
Sample Wt.: 0.0002 g

1 Test 1 Run 1
Log Number: -05
Comments:
Filter No.: 5483
Filter Type: 4"GF
Filter Tare Wt.: .9521 g
Filter+Sample Wt.: .9613 g
Sample Wt.: 0.0092 g

2 Test 1 Run 2
Log Number: -09
Comments:
Filter No.: 5484
Filter Type: 4"GF
Filter Tare Wt.: .9527 g
Filter+Sample Wt.: .9606 g
Sample Wt.: 0.0079 g

3 Test 1 Run 3
Log Number: -13
Comments:
Filter No.: 5485
Filter Type: 4"GF
Filter Tare Wt.: .9371 g
Filter+Sample Wt.: .9445 g
Sample Wt.: 0.0074 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
	0.0092	0.0079	0.0074		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0411	0.0328	0.0253		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job BRIGHT - BLACKTOP
Field Engineer E TOWBRIDGE
Date Submitted 6-17-93
Test No. 1

Source ASPHALT PLANT
Test Site STACK
Date of Test 6-17-93
No. of Runs Completed

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 _____	
1 3	☑ 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 _____

S-278

G:\STACK\WP\FORMS\S-278.LAS

APPENDIX E

ASPHALT PLANT OPERATING DATA

#1

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) [illegible]-93

Plant Mfr. & Model Barber Greene DM65 x 211 Type (circle one): (Drum Mix) Conventional

Other (list): ____

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

If wet scrubbing: ____% scrubber water recycled

List model: Stan Steel [illegible] Normal pressure drop across control equipment: [illegible] inches water

Air flow through control equipment: [illegible] acfm at [illegible] F Was control equipment operating normally during testing? yes

Date & procedures of last maintenance/cleaning of control equipment [illegible]-93

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) #6. 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		154,000		4.7%		
Run 2				4.7		
Run 3				4.7		

Is the above fuel substantially the highest sulfur containing fuel normally burned? yes **No.6 Fuel oil**

Production specific fuel usage: (circle one) measured or (calculated:) 1.58 [illegible] cubic foot/(ton hot mix)

1.4 gal/ton hot mix

No. of Burners: 1 Burner(s) rating: 105 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)
[illegible]:15	100	[illegible]		[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		[illegible]	312	[illegible]		
[illegible]	[illegible]	240		14.5	316	3.[illegible]		
[illegible]	[illegible]	[illegible]		[illegible]	322	3.[illegible]		
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		

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: [illegible signature], Phone: (218) [illegible]-2262

Position: Plant Operator

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.

#2

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) 6-17-93

Plant Mfr. & Model Barber Greene DM 55

Type (circle one): (Drum Mix) Conventional

Other (list): _____

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

(circle one)

List model: Standard Steel DF 46 CM

If wet scrubbing: _____% scrubber water recycled

Normal pressure drop across control equipment: 3.5" inches water

Air flow through control equipment: 45,000 acfm at 300 F

Was control equipment operating normally during testing? _____

Date & procedures of last maintenance/cleaning of control equipment 6-14-93

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) _____. 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		154,000		4.7		
Run 2		154,000		4.7		
Run 3		154,000		4.7		

Is the above fuel substantially the highest sulfur containing fuel normally burned? yes No. 6 Fuel Oil

Production specific fuel usage: (circle one) measured or (calculated): 1.58 gal/ton cubic foot/ ton hot mix

1.4 gal/ton hot mix

No. of Burners: 1 Burner(s) rating: 105 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)
1:55	100	245	—	15.5	314	3.5"		
2:10	100	290	—	15.7	301	3.5"		
2:25	100	240	—	15.4	310	3.25"		—
2:40	100	286		16.0	296	3.50"		
2:55	100	280		15.7	304	3.50"		

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: Leonard Lucek, Phone: (218) 760-2262

Position: Plant Operator

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.

E-3

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) 6-17-93

Plant Mfr. & Model Barber Greene DM65 Type (circle one): Drum Mix Conventional

Other (list): _____

Pollution Control Equipment: Baghouse Venturi Scrubber wet scrubber cyclone multiclone

(circle one)

List model: Stainless Steel 9' x 60' If wet scrubbing: _____ % scrubber water recycled

Normal pressure drop across control equipment: 3.5 inches water

Air flow through control equipment: 66000 acfm at 270 F Was control equipment operating normally during testing? _____

Date & procedures of last maintenance/cleaning of control equipment 6-14-93

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) _____. 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		154,000		4.7		
Run 2		154000		4.7		
Run 3		154,000		4.7		

Is the above fuel substantially the highest sulfur containing fuel normally burned? No. 6 Fuel Oil

Production specific fuel usage: (circle one) measured or calculated: 1.58 gal/Ton cubic foot/ ton hot mix

1.4 gal/ton hot mix

No. of Burners: 1 Burner(s) rating: 105 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)
[illegible]								
1:35		304		16.[illegible]	22[illegible]	3.5		
2:50		32[illegible]		17.[illegible]	21[illegible]	[illegible]		
4:05		[illegible]				3.25		
5:20		[illegible]		[illegible]	[illegible]	[illegible]		

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: Leonard Hancock, Phone: (318) 766-2262

Position: Plant Operator

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).

Interpoll Laboratories
(612)786-6020

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 ^{o}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.

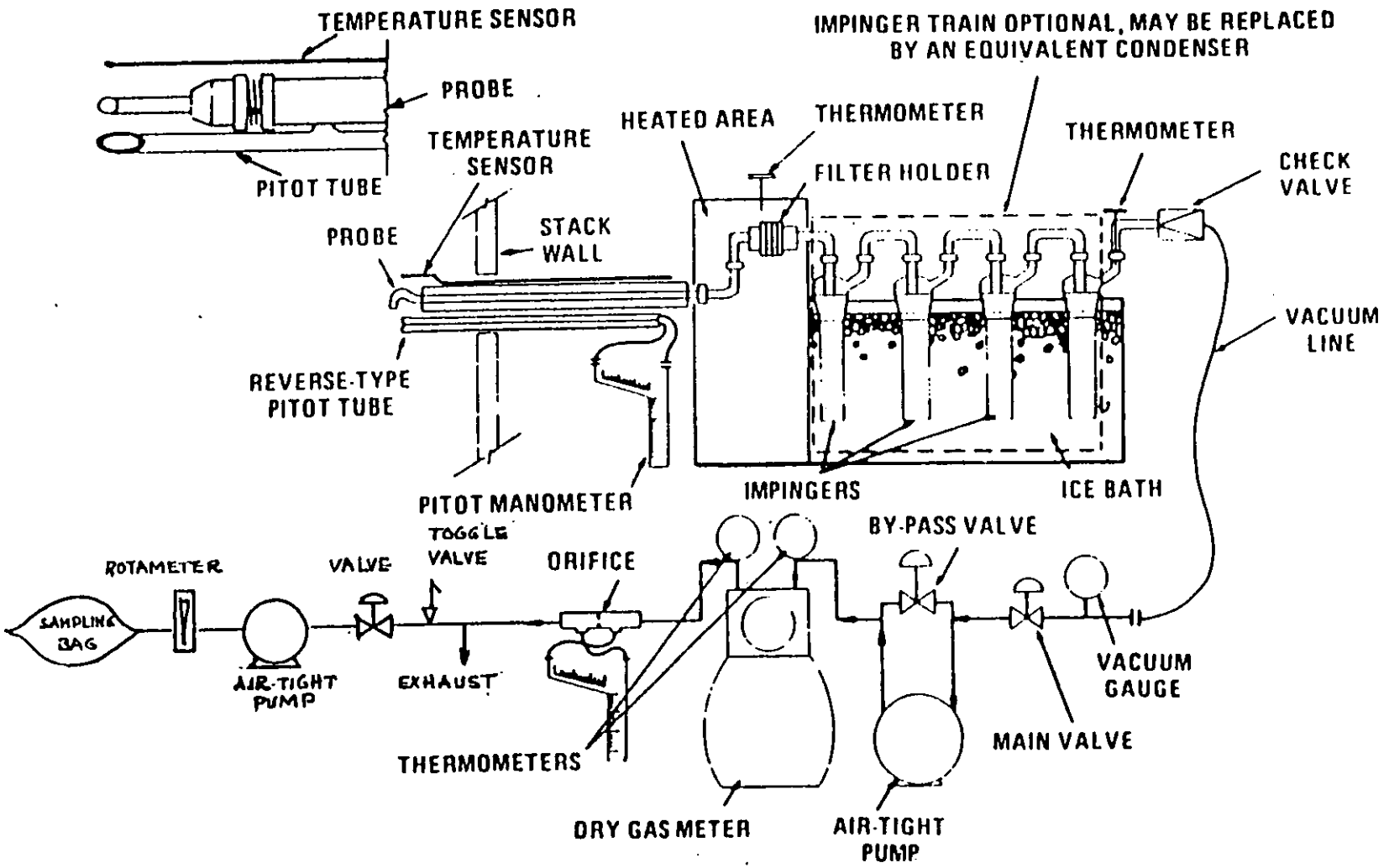
   Wisconsin - Use Method II-8672-WI.

   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.

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, ^oF

T_{wb} = Wet bulb temperature of stack gas, ^oF

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

$T_{s(avg)}$ = Absolute average stack temperature, ^oF

T_{std} = Standard absolute temperature, 528 ^oF (68 ^oF)

θ = Total sampling time, min.

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

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

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

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

$\bar{V}_s$ = 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

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

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

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

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

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

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

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

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

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

SYMBOLS

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

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

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

C_p = Pitot tube coefficient, dimensionless

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

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

EA = Excess air, percent by volume

γ = Dry test meter correction factor, dimensionless

G_d = Specific gravity (relative to air), dimensionless

I = Isokinetic variation, percent by volume

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

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

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

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

M_p = Total amount of particulate matter collected, g

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

P_g = Stack static gas pressure, IN. WC.

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

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

A_a = Actual volumetric stack gas flow rate, ACFM

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

RH = Relative humidity, %

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

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

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

$T_{s(avg)}$ = Absolute average stack temperature, ^{o}F

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

θ = Total sampling time, min.

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

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

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

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

$\bar{V}_s$ = 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 Bandaji Televisions Date 6-16-93

Operator Eduardo Module No. 2

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

Bar press 28.56 in. Hg. γ = .9984 ^H@ 1.74 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(629.00)	[redacted]	
2.5	630.91	64	61
5.0	632.83	67	62
7.5	634.70	70	62
10	636.57	71	62
[redacted]	V_m= 7.57	Avg(t_m)= 64.9	°F

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(.9984)(7.57)}\left[\frac{(64.9) + 460}{(28.56)}\right]^{0.5} \quad 0.2163$$

$$Y_{cn} = .9949$$

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 21, 1993

Meter Box No. : 2 (Rockwell Dry Test Meter Serial No. 964549)

Date of Last Calibration: June 4 , 1993
Calibration Technician: B. Aschenbach
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.)
06-08-93	3-9052	700.40	1462.65	762.25	762.25
06-14-93	3-9129	1475.00	1625.55	150.55	912.80
06-16-93	3-9132	1629.00	1740.45	111.45	1024.25

* Total volume through meter since last calibration.

Date 6-4-95

Bar. Press. 29.08 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 2
Serial No. DTM 964549
Wet Test Meter No. AL-20
Technician B. ASCHENBACH

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index Φ (%)	* Diff. Wet Test Meter ΔP_w (in. WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔHθ	C_f
nominal	actual				V_{di}	V_{df}	Wet Test t_w (°F)	Dry Test t_{di} (°F)	Dry Test t_{do} (°F)				
0.5	.50	2	99.85	0.01	683.000	685.050	68.5	86.0	75.0	4.54	.9950	1.70	
1.2	1.20	3	99.91	0.025	679.000	682.082	68.5	87.0	74.0	4.47	.9915	1.72	
2.0	2.00	3	99.93	0.055	675.000	678.069	68.5	84.0	74.0	3.43	.9912	1.74	
3.3	3.30	5	100.00	0.09	694.506	699.576	68.5	95.0	76.0	4.54	1.0080	1.77	
4.7	4.70	5	100.02	0.12	687.500	692.554	68.5	93.0	75.0	4.07	1.0063	1.78	
										11/13	.9984	1.74	

Positive leak check performed by BA
Meter was in tolerance ☑
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

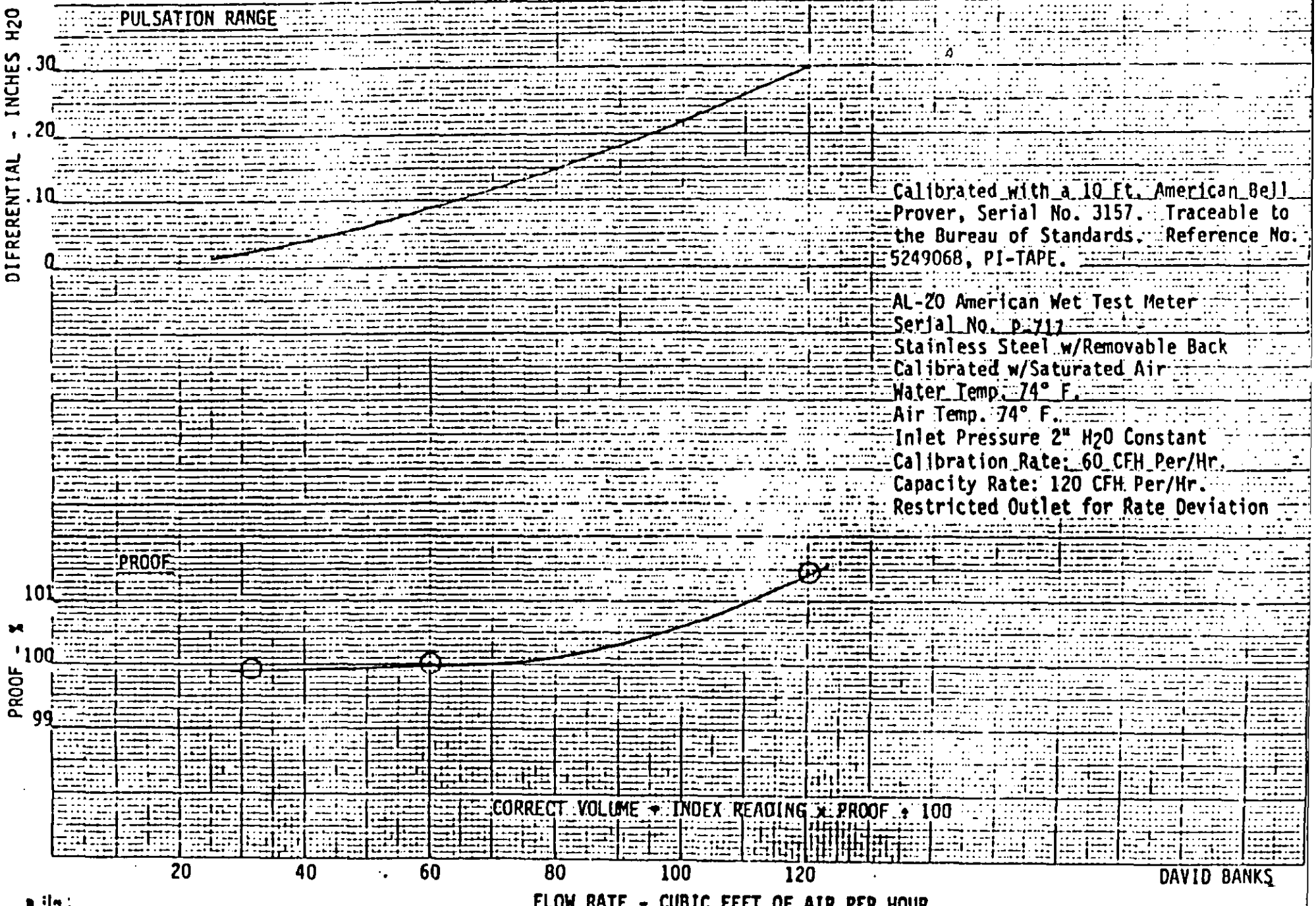
Approved by Dennis R. Dean Date 6/4/93

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

S0102RR 11/91

DIFERENTIAL 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.711
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H_2O Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation

DAVID BANKS

November 1991

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 6-17-93 Nozzle Number 9-4
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	.252
2	.252
3	.251
Average:	.252

Interpoll Laboratories, Inc.

Temperature Measurement Device Calibration Sheet

Unit under test: # 12

Vendor Fluke

Model 51

Serial Number 6030375

Range 0-2100 °F

Thermocouple Type K

Date of Calibration 4-1-93

Technician [signature]

Method of Calibration:

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

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

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	1	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	.050
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 A.D	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. 31-4

Pitot tube dimensions:

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

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" 0
9. W <.0625" .01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .755 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: 4-8-93

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

4-7-93 G:\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

TEST PLAN FOR ASPHALT PLANTS

I. GENERAL INFORMATION

Permittee: Bemidji Blacktop
Permittee's contact person and telephone number: Scott Gesell, (218)751-5114
Permittee's mailing address: 5151 Highway 2 West
Bemidji, Minnesota 56601

DAQ File No.: 677C

MPCA permitting engineer: Toni Stevens

Applicable regulations for each source tested (be specific):
Minn. Rules pt. 7005.2020, subp. A
40 CFR 60, subp. I

3 HRS VE

Reason for testing: Required by NSPS

Is this test for initial compliance demonstration: Yes

Drawings showing location of sampling ports included: To be submitted to Tom Kosevich

Location of the plant at the time of the test:

Date when test plan was discussed and agreed upon with the Permittee, or Pre-test meeting needed: To be determined

II. NOTIFICATION REQUIREMENTS:

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.

one composite sample per test run.

2. 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.

B. Operating Conditions during the Test

1. 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.

2. Must burn 100% of the highest emitting fuel to be listed in and allowed by the permit: No. 6 fuel oil

3. 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: To be determined

4. If normal operation of the plant will be with recycling of collected ashes from the baghouse into the dryer, the test must be conducted under the same conditions.

F. 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.

1. During testing the following measurements must be made:

a) Pressure drop across the baghouse.

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

c) Moisture content of the aggregate, and if applicable, the recycling material.

2. Please provide the following data:

a) Average fuel consumption rate (calculated or measured)

b) Cleaning cycles of the baghouse

c) Operating data sheet enclosed

G. Testing schedules and testing firm: June 15, 1993
Kathy Eickstadt, (612)786-6020

E. Permitting engineer to witness the test: No