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: 62

Title: Results Of The July 7, 1994 Particulate And Opacity Emission Compliance Testing Of The Shamrock Enterprises Stationary Asphalt Plant In Oronoco, Minnesota,

Interpoll Laboratories, Inc., Circle Pines, MN,

August 5, 1994.

120 AP-42 Section 11.1
Reference
Report Sect. 4
Reference 62

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

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

RESULTS OF THE JULY 7, 1994 PARTICULATE AND OPACITY EMISSION COMPLIANCE TESTING OF THE SHAMROCK ENTERPRISES STATIONARY ASPHALT PLANT IN ORONOCO, MINNESOTA (PERMIT FILE NO. 1204A-90-OT-1)

Submitted to:

SHAMROCK ENTERPRISES
6415 Bandel Road N.W.
Rochester, Minnesota 55901

Attention:

Carrol Kelly

Approved by:

Daniel Despen
Manager
Stationary Source Testing Department

Report Number 4-3292
August 5, 1994
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 conditions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

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

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certifications Required For Performance Test Reports

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

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

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

Signature: David Voatler Printed Name of Person Signing: DAVID VOATALER
Title: FIELD TECH Date: 8-8-94

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

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

Signature: David J. Schneider Printed Name of Person Signing: David Schneider
Title: QA Officer Date: 8/8/94

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

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

Signature: Daniel J. Desper Printed Name of Person Signing: Daniel J. Desper
Title: Mgr Stationary Source Date: 8/9/94

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

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

Signature: _____ Printed Name of Person Signing: _____
Title: _____ Date: _____

1-5-94-G:\STACK\WP\FORMS\S-480

1 INTRODUCTION

On July 7, 1994 Interpoll Laboratories personnel conducted particulate and opacity emission compliance tests of the Shamrock Enterprises Stationary Asphalt Plant Located in Oronoco, Minnesota. On-site testing was performed by Ron Rosenthal, Dave Vaaler, and Jon Johnson. Coordination between testing activities and plant operation was provided by Carrol Kelly of Shamrock Enterprises. The test was not witnessed by a member of the Minnesota Pollution Control Agency.

The source tested is a Madsen Model No. 408 Batch Asphalt Plant which was manufactured in 1957. The rated capacity of this plant is 200 TONS/HR at an aggregate moisture content of 5%. The normal production rate of the plant is 180-200 TONS/HR at an aggregate moisture content of 4.9%. The plant was fired with natural gas and processed 25% recycle material during the test. Particulate emissions from the asphalt plant are controlled by a Badger wet scrubber.

Particulate determinations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1993). 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 were used to extract particulate samples by means of a heated stainless steel-lined probe. Wet catch samples were collected in the back half of the Method 5 sampling train and analyzed as per Minnesota Rules, Part 7011.0725.

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

Testing was conducted from two test ports oriented at 90° on the stack. These test ports are located 3.7 diameters downstream of the flow straightener and 2.2 diameters

upstream of the stack exit. 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 emission determinations were performed by Dave Vaaler, 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 Table 1a and 1b. The particulate concentration averaged 0.098 GR/DSCF (Dry + Organic Wet Catch) and 0.088 GR/DSCF (Dry Catch Only). The corresponding emission rates averaged 19.6 and 17.7 LB/HR. The opacity averaged 0 percent. Please note, the asphalt plant tested met the particulate emission limit of 0.3 GR/DSCF and the opacity limit of 20%.

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 1a. Summary of the Results of the July 7, 1994 Particulate Emission Compliance Test on the Stationary Asphalt Plant Stack at the Shamrock Enterprises Facility Located in Oronoco, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	07-07-94	07-07-94	07-07-94
Time runs were done (HRS)	920/1024	1100/1208	1245/1348
Process rate (TON/HR)			
recycle	48.7	51.3	49.2
aggregate	137.8	145.0	138.8
asphalt	9.3	9.8	9.4
total	195.8	206.1	197.4
Volumetric flow			
actual (ACFM)	35239	41240	38184
standard (DSCFM)	22304	25294	22626
Gas temperature (DEG-F)	147	150	153
Moisture content (%V/V)	24.30	26.26	28.39
Gas composition (%V/V,dry)			
carbon dioxide	3.90	4.40	4.90
oxygen	14.20	13.50	12.70
nitrogen	81.90	82.10	82.40
Isokinetic variation (%)	100.3	101.2	101.7
Part. emission rate (LB/HR)	17.99	19.44	21.33
Particulate concentration			
actual (GR/ACF)	.0595	.0550	.0652
standard (GR/DSCF)	.0941	.0897	0.110

Note: Dry + Organic Wet Catch

Table 1b. Summary of the Results of the July 7, 1994 Particulate Emission Compliance Test on the Stationary Asphalt Plant Stack at the Shamrock Enterprises Facility Located in Oronoco, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	07-07-94	07-07-94	07-07-94
Time runs were done (HRS)	920/1024	1100/1208	1245/1348
Process rate (TON/HR)			
recycle	48.7	51.3	49.2
aggregate	137.8	145.0	138.8
asphalt	9.3	9.8	9.4
total	195.8	206.1	197.4
Volumetric flow			
actual (ACFM)	35239	41240	38184
standard (DSCFM)	22304	25294	22626
Gas temperature (DEG-F)	147	150	153
Moisture content (%V/V)	24.30	26.26	28.39
Gas composition (%V/V,dry)			
carbon dioxide	3.90	4.40	4.90
oxygen	14.20	13.50	12.70
nitrogen	81.90	82.10	82.40
Isokinetic variation (%)	100.3	101.2	101.7
Part. emission rate (LB/HR)	15.59	17.46	20.02
Particulate concentration			
actual (GR/ACF)	.0516	.0494	.0612
standard (GR/DSCF)	.0816	.0805	0.103

Note: Dry Catch Only

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 Analyses

Test No. 1
Stationary Asphalt Plant Stack

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

	Run 1	Run 2	Run 3
Date of run	07-07-94	07-07-94	07-07-94
Dry basis (orsat)			
carbon dioxide.....	3.90	4.40	4.90
oxygen.....	14.20	13.50	12.70
nitrogen.....	81.90	82.10	82.40
Wet basis (orsat)			
carbon dioxide.....	2.95	3.24	3.51
oxygen.....	10.75	9.95	9.09
nitrogen.....	62.00	60.54	59.01
water vapor.....	24.30*	26.26*	28.39*
Dry molecular weight.....	29.19	29.24	29.29
Wet molecular weight.....	26.47	26.29	26.09
Specific gravity.....	0.914	0.908	0.901
Water mass flow.....(LB/HR)	21989	30577	28208

* Free or condensed water in the gas stream.

FO	1.718	1.682	1.673

3.2 Results of Particulate Loading Determinations

Test No. 1
Stationary Asphalt Plant Stack

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

	Run 1	Run 2	Run 3
Date of run	07-07-94	07-07-94	07-07-94
Time run start/end.....(HRS)	920/1024	1100/1208	1245/1348
Static pressure.....(IN.WC)	-0.05	-0.05	-0.05
Cross sectional area (SQ.FT)	27.49	27.49	27.49
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	253.0	362.0	338.0
desiccant.....(GRAMS)	20.0	21.0	17.0
total.....(GRAMS)	273.0	383.0	355.0
Total particulate material..			
.....collected(grams)	0.2234	0.2435	0.2685
Gas meter coefficient.....	1.0069	1.0069	1.0069
Barometric pressure..(IN.HG)	28.75	28.75	28.75
Avg. orif.pres.drop..(IN.WC)	1.63	2.05	1.62
Avg. gas meter temp..(DEF-F)	93.6	101.8	101.5
Volume through gas meter....			
at meter conditions...(CF)	39.54	45.86	41.24
standard conditions.(DSCF)	36.62	41.90	37.66
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.371	.371	.371
Avg.stack gas temp ..(DEG-F)	147	150	153
Volumetric flow rate.....			
actual.....(ACFM)	35239	41240	38184
dry standard.....(DSCFM)	22304	25294	22626
Isokinetic variation.....(%)	100.3	101.2	101.7
Particulate concentration...			
actual.....(GR/ACF)	0.05955	0.05497	0.06516
dry standard.....(GR/DSCF)	0.09412	0.08966	0.11001
Particle mass rate...(LB/HR)	17.994	19.440	21.335

3.3 Results of Opacity Observations

Test No. 1
Stationary Asphalt Plant

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

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

Avg Opac 0.00 Avg OD 0.0000 Time average

Observer: David Vaaler
Cert. Date: 04-06-94
Date of Observation: 07-07-94
Time of Observation: 1100/1200

4 RESULTS OF AGGREGATE ANALYSES

INTERPOLL LABORATORIES, INC.
(612)786-6020

Shamrock Enterprises
Laboratory Log No. 3292

Results of Moisture Analysis

Sample Log No.	Test/Run	Sample Type	% Moisture
3292-08	Test 1 Run 1	Virgin Aggregate	3.56
3292-10	Test 1 Run 2	Virgin Aggregate	3.72
3292-12	Test 1 Run 3	Virgin Aggregate	2.75

Respectfully submitted,

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

JFO/cg

INTERPOLL LABORATORIES, INC.
(612)786-6020

Shamrock Enterprises
Laboratory Log No. 3292

Results of Moisture Analysis

Sample Log No.	Test/Run	Sample Type	% Moisture
3292-09	Test 1 Run 1	Recycled Aggregate	6.39
3292-11	Test 1 Run 2	Recycled Aggregate	6.17
3292-13	Test 1 Run 3	Recycled Aggregate	6.83

Respectfully submitted,

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

JFO/cg

APPENDIX A

PRELIMINARY VOLUMETRIC FLOW RATE DETERMINATIONS

Test No. 1
Stationary Asphalt Plant Stack

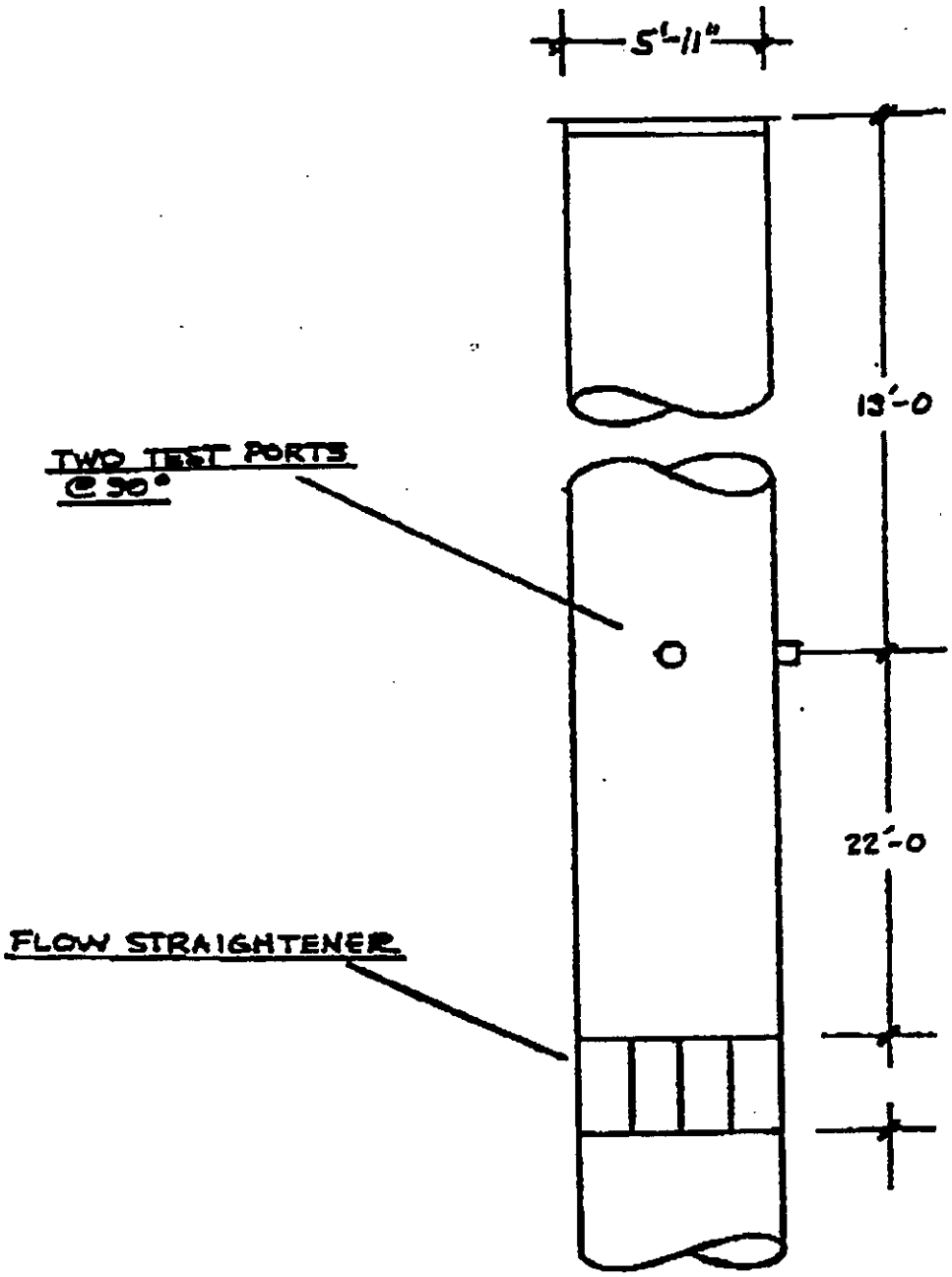
Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	07-07-94
Time of Determination.....(HRS)	907
Barometric pressure.....(IN.HG)	28.75
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	71
Duct area.....(SQ.FT)	27.49
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.05
Avg. gas temp.....(DEG-F)	151
Moisture content.....(% V/V)	24.30
Avg. linear velocity.....(FT/SEC)	22.2
Gas density.....(LB/ACF)	.05708
Molecular weight.....(LB/LBMOLE)	29.19
Mass flow of gas.....(LB/HR)	125373
Volumetric flow rate.....	
actual.....(ACFM)	36609
dry standard.....(DSCFM)	23010

APPENDIX B

LOCATION OF TEST PORTS

SHAMROCK ENTERPRISES
STATIONARY BATCH PLANT
ORONOCO, MN



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NOT TO SCALE

APPENDIX C

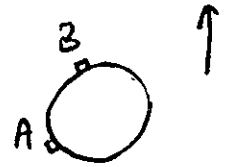
FIELD DATA SHEETS

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: Shamrock 3292
Source: Asphalt Plant Stack
Test: 1 Run 1 Date 7-7-94
Stack Dimen.: 71. IN.
Dry Bulb: 151 °F Wet bulb: 145 °F
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.
Barometric Pressure: 28.75 IN.HG
Static Pressure: -.05 IN.WC
Operators: DAVE VAALER / JON JOHNSON
Pitot No.: 3/V-81 C_p .840

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 4.625 IN.		Time Start: 0907	HRS
A 1	.021	1.50	6.125		
2	.067	4.78	9.40		
3	.118	8.42	13.05		
4	.177	12.33	17.26		
5	.250	17.84	22.47		
6	.356	25.41	30.04		
7	.644	45.96	50.59		
8	.750	53.53	58.16		
9	.823	58.74	63.37		
10	.882	62.95	67.58		
11	.933	66.59	71.22		
12	.979	69.87	74.50		
B 1				.23	
2				.33	
3				.33	
4				.29	
5				.24	
6				14	
7				.02	
8				.02	
9				.01	
10				.01	
11				.01	
12				.01	
Temp. Meas. Device & S/N: 39				Time End:	HRS

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

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job: Shamrock 3293
Source: Asphalt Stack
Method: 5 Filter holder: glass
Sample Train Leak Check:

Date: 7-7-94 Test: 1 Run: 1
No. of traverse points: 24
Filter type: glass fiber

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0.0 cfm at 16 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used: 1
6767

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

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

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	719	466	253
Impinger No. 3			
Condenser			
Desiccant	1523	1503	20
Total			273

Integrated Gas Sampling Data:

Bag Pump No. 318
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0.0 cc/min at 15 in. Hg.
Time start: 09:20 (HRS) Time end: 10:24 (HRS)
Sampling rate: 400 cc/min Operator: DV

Box No. 26 Bag No. 1
Size: 44 L

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

123095-G:\STACK\WP\METHODS\S-0046RR

INTERPOLL LABORATORIES, 1104 Meldrum St., FORT WORTH, TEXAS

Job: Schumacher — 3293
Source: Asphalt Stack
Date: 7-7-94 Test 1 Run 1

Operators: DVS/RR
Meter Box No. 18 ΔH@ 1.90 IN WC
Gasmeter coeff.: 1.0069

Pitot No. 318-8' Cp .840
Bar. Press. 28.75 Static H2O X
Nozzle No. 9-6 Nozzle Dia .371 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.	Gas/In	Gas/Out	Oxygen (%v/v)
	09:20	517.81											
B-12	2.5	518.36	.012	.14	8.33	1	148	244	240	57	84	79	16.4
11	5.0	518.95	.014	.16	8.90	1	144	244	247	55	89	79	16.3
10	7.5	519.49	.012	.14	9.43	1	146	242	248	58	91	79	14.2
9	10.0	520.19	.020	.24	0.12	1	147	244	242	58	92	80	14.7
8	12.5	520.83	.017	.20	0.76	1	145	249	248	56	95	80	15.1
7	15.0	521.55	.021	.25	1.47	1	146	247	242	56	96	80	15.0
6	17.5	522.55	.133	1.63	3.26	10	142	248	242	57	102	81	13.9
5	20.0	524.58	.165	2.01	5.25	10	148	251	247	58	107	82	13.9
4	22.5	527.02	.20	2.47	7.47	12	143	250	246	55	108	83	14.1
3	25.0	529.58	.225	2.78	9.82	16	143	248	242	54	108	83	14.2
2	27.5	532.17	.217	2.67	2.12	16	147	246	248	53	106	84	14.0
1	30.0	534.71	.270	3.33	4.68	16	144	247	245	54	104	85	14.4
A-12	32.5	536.64	.158	1.94	6.65	7	147	245	250	56	96	86	13.5
11	35.0	537.	.055	.67	7.80	3	147	236	242	51	100	86	13.2
10	37.5	539.37	.098	1.20	9.35	5	147	238	245	53	102	86	13.5
9	40.0	540.33	.058	.71	0.54	4	149	240	248	54	102	87	13.7
8	42.5	542.28	.165	2.03	2.54	8	147	232	262	44	110	87	13.5
7	45.0	543.41	.038	.47	3.51	4	147	238	258	48	111	88	13.6
6	47.5	545.47	.138	1.71	5.37	7	147	241	259	47	108	88	13.5
5	50.0	547.57	.205	2.51	7.60	10	152	236	267	45	110	88	13.5
4	52.5	550.08	.281	3.48	0.24	15	145	237	253	45	113	89	13.9
3	55.0	552.66	.280	3.43	2.86	17	153	237	254	48	112	90	13.5
2	57.5	555.19	.225	2.77	5.22	15	151	241	259	51	110	90	13.7
1	60.0	557.35	.175	2.17	7.30	10	147	244	258	53	109	90	13.9
	θ = 60	Vm = ~~39.44~~		ΔH = 1.63							Avg. =	93.6	

(10:24) 39.54

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job: Shamrock 3293
Source: Asphalt Plant Stack
Method: 5 Filter holder: Glass
Sample Train Leak Check:

Date: 7-7-94 Test: 1 Run: 2
No. of traverse points: 24
Filter type: Glass fiber

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

Particulate Catch Data:

No. of filters used: 1
6766

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

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

305 2c 3

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	784	3 464	320
Impinger No. 2			
Impinger No. 3	505	463	42
Condenser			
Desiccant	1478	1457	21
Total			383

Integrated Gas Sampling Data:

Bag Pump No. 31B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0.0 cc/min at 15.0 in. Hg.
Time start: 1100 (HRS) Time end: 1208 (HRS)
Sampling rate: 400 cc/min Operator: DV

Box No. 26 Bag No. 2
Size: 44 L

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

123093-G:\STACK\WP\METHODS\S-0046RR

INTERFUEL LABORATORIES EPA METHOD 5 FIELD WORK SHEET

Job: SHAMROCK 3252 Operators: R.P. / J.J. Pitot No. 31V-8 Cp .840
Source: ASPHALT PLANT STACK Meter Box No. 18 ΔH@ 1.80 in WC Bar. Press. 28.75 in Hg H2O 94 %
Date: 7-7-94 Test 1 Run 2 Gasmeter coeff. 1.0069 Nozzle No. 956 Nozzle Dia .377 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.	Gas/In	Gas/Out	Oxygen (%v/v)
	1100	557.70					151	233	228	58	95	89	13.4
A-12	2.5	559.48	.135	1.61	9.48	6	153	235	232	54	99	89	13.6
11	5	561.37	.155	1.84	1.39	7	151	239	230	50	104	90	13.6
10	7.5	562.70	.058	.69	2.56	3	151	242	235	49	104	90	13.6
9	10	564.08	.087	1.04	4.01	5	149	239	233	50	109	90	13.6
8	12.5	566.13	.223	2.68	6.32	9	152	239	229	50	110	91	13.7
7	15	567.36	.045	.54	7.36	4	147	239	228	50	109	91	13.6
6	17.5	568.69	.063	.76	8.61	4	152	242	230	47	113	91	13.6
5	20	570.74	.205	2.46	0.83	9	150	242	237	49	117	92	13.1
4	22.5	573.37	.280	3.38	3.43	12	146	238	229	52	117	93	13.2
3	25	575.95	.27	3.30	6.01	13	147	234	245	56	116	94	13.5
2	27.5	578.30	.22	2.70	8.34	12	150	236	242	57	115	94	13.9
1	30	580.38	.165	2.01	0.36	10	146	244	242	47	107	95	13.3
B-12	32.5	581.85	.095	1.16	1.90	5	146	245	249	45	108	96	13.5
11	35	582.75	.025	.30	2.68	3	151	244	251	39	106	96	13.7
10	37.5	583.46	.020	.24	3.39	3	149	253	247	38	108	96	13.5
9	40	584.52	.045	.54	4.44	3	147	256	253	38	111	96	13.4
8	42.5	585.70	.063	.77	5.68	4	148	254	234	38	115	96	13.6
7	45	587.37	.125	1.52	7.44	6	151	240	240	40	112	96	13.7
6	47.5	589.74	.235	2.86	9.84	10	155	231	232	46	118	97	13.8
5	50	592.59	.32	3.85	2.62	14	149	228	226	49	112	98	13.9
4	52.5	595.35	.31	3.79	5.38	14	156	230	228	52	111	98	13.5
3	55	598.18	.30	3.61	8.08	15	150	231	232	54	110	98	13.5
2	57.5	600.84	.34	4.12	0.96	16	150	227	246	53	109	99	13.6
1	60	603.56	.28	3.40	3.57	14							
	(1208)												
	θ 60	V. = 44.86		ΔH 2.05							Avg. = 101.8		

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job SHAMROCK 3292
Source ASPHALT PLANT STACK
Method 5 Filter holder: 4" glass
Sample Train Leak Check:

Date 7-7-94 Test 1 Run 3
No. of traverse points 24
Filter type: glass fiber

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ✓
Post test: .00 cfm at 16 in. Hg. (vac) ✓

Particulate Catch Data:

No. of filters used:
6765

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

No. of probe wash bottles: 1
Sample recovered by: R.R. / D.V

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	768	463	305
Impinger No. 3	230	197	33
Condenser			
Desiccant	1540	1523	17
Total			355

Integrated Gas Sampling Data:

Bag Pump No. #3B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1245
Sampling rate: 400

Box No. 26 Bag No. 3
Size: 44 L
cc/min at 5 in. Hg.
(HRS) Time end: 1348 (HRS)
cc/min Operator: D.V.

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

123093-G:\STACK\WP\METHODS\S-0046RR

INTERPRETIVE LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: SHAMROCK 3292 Operators: R.R. / J.J. Pitot No. 31y-5 Cp .840
Source: ASPHALT PLANT STACK Meter Box No. 18 / HP 1.90 IN WC Bar. Press. 28.25 inHg H2O 26 %
Date: 2-7-94 Test 1 Run 3 Counter coeff. 1.0069 Nozzle No. 8-6 Nozzle Dia 321 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)
	1245	603.85					152	235	228	63	94	94	14.0
B- 12	2.5	605.56	.125	1.44	5.55	5	151	234	228	51	96	93	14.1
11	5	606.71	.060	.68	6.72	3	150	234	231	49	98	93	14.3
10	7.5	607.67	.035	.40	7.62	2	150	233	230	48	99	93	13.6
9	10	608.50	.030	.34	8.45	2	148	236	236	49	100	93	13.4
8	12.5	609.26	.025	.28	9.21	2	157	230	237	48	101	93	12.8
7	15	610.64	.098	1.11	0.70	4	151	234	232	49	107	93	12.4
6	17.5	612.32	.120	1.38	2.36	5	155	227	229	51	114	94	12.9
5	20	614.54	.215	2.46	4.58	7	155	232	230	56	115	94	12.6
4	22.5	616.93	.270	3.11	7.08	12	156	227	233	58	115	95	12.8
3	25	619.52	.26	2.99	9.54	14	159	225	231	60	114	95	13.2
2	27.5	621.87	.25	2.87	1.94	14	153	231	230	59	114	95	13.2
1	30	624.45	.29	3.35	4.54	16	153	230	229	52	105	96	12.9
A- 12	32.5	626.03	.10	1.16	6.07	6	153	227	237	47	104	96	13.0
11	35	627.74	.13	1.50	7.80	6	153	232	250	44	104	96	12.8
10	37.5	629.12	.075	.86	9.12	4	154	232	243	42	103	96	12.9
9	40	630.22	.05	.57	0.20	3	150	229	248	40	103	96	13.0
8	42.5	631.23	.042	.48	1.19	3	154	226	249	39	107	96	12.5
7	45	632.83	.110	1.26	2.78	10	154	228	240	39	111	98	13.2
6	47.5	634.51	.120	1.38	4.45	6	152	230	245	41	114	96	13.0
5	50	636.93	.250	2.89	6.86	11	154	227	261	43	116	97	12.9
4	52.5	639.15	.22	2.54	9.13	10	150	227	254	43	118	97	12.7
3	55	641.35	.20	2.34	1.30	8	159	231	259	43	120	97	12.5
2	57.5	643.32	.16	1.85	3.24	8	150	231	265	43	121	98	12.5
1	60	645.09	.14	1.64	5.07	7							
	(1348)										Avg. = 101.5		
	θ = 60	Vm = 41.24		ΔH 1.62									

C-7

S-00378

Interpoll Laboratories
(612)786-6020

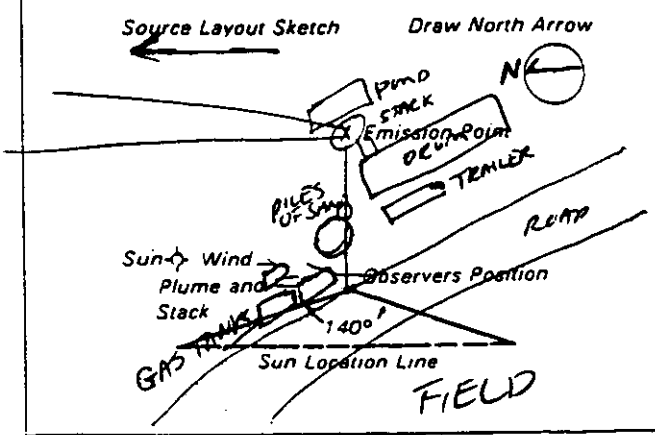
Visible Emissions Form

SOURCE NAME	Shamrock
ADDRESS	
CITY	Ormsco
STATE	MN
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Asphalt Plant
OPERATING MODE	100%
CONTROL EQUIPMENT	Wet Scrubber
OPERATING MODE	100%
DESCRIBE EMISSION POINT START	ROUND STACK, NEXT TO WATER PONDS
DESCRIBE EMISSION POINT STOP	SAME
HEIGHT ABOVE GROUND LEVEL START	50'
HEIGHT ABOVE GROUND LEVEL STOP	SAME
HEIGHT RELATIVE TO OBSERVER START	50'
HEIGHT RELATIVE TO OBSERVER STOP	Same
DISTANCE FROM OBSERVER START	200'
DISTANCE FROM OBSERVER STOP	Same
DIRECTION FROM OBSERVER START	E
DIRECTION FROM OBSERVER STOP	Same
DESCRIBE EMISSIONS START	LOOPING PLUME
DESCRIBE EMISSIONS STOP	SAME
EMISSION COLOR START	WHITE
EMISSION COLOR STOP	SAME
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	125'-150'
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	SAME
DESCRIBE BACKGROUND START	SKY
DESCRIBE BACKGROUND STOP	SAME
BACKGROUND COLOR START	WHITE
BACKGROUND COLOR STOP	SAME
SKY CONDITIONS START	OVERCAST
SKY CONDITIONS STOP	SAME
WIND SPEED START	0-5
WIND SPEED STOP	SAME
WIND DIRECTION START	N
WIND DIRECTION STOP	SAME
AMBIENT TEMP. START	75°F
AMBIENT TEMP. STOP	80°F
WET BULB TEMP.	
RH, percent	72%

OBSERVATION DATE: 7-7-94 START TIME: 11:00 STOP TIME: 12:00

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0		0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	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	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	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	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	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	0	0	60	0	0	0	0

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT)	DAVID VAALER
OBSERVER'S SIGNATURE	David Vaaler
DATE	7-7-94
ORGANIZATION	INTERPOLL LABS
CERTIFIED BY	ETA
DATE	4-6-94
VERIFIED BY	
DATE	

COMMENTS: READINGS ON PLUME TOOK PLACE AFTER MOISTURE DISAPPEARED @ 125' to 150'.

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

S-0079R

VISIBLE EMISSIONS EVALUATOR

This is to certify that

David Vaeler

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 Hoare
President

243003
Certificate Number

Vice President

Minneapolis
Location

David B. Savage, Jr.
Program Manager

April 6, 1994
Date of Issue

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL RESULTS

2-6

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job Shamrook
Team Leader DV
Date Submitted 7-8-94
Test No.
Date of Analysis 7-12-94

Source Asphalt Plant
Test Site Stack
Date of Test 7-7-94
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	3292-05	1	0.00	3.90	18.10	3.90	14.20	1.71
		2	0.00	3.90	18.10	3.90	14.20	1.71
	☑ B ☐ F	Avg				3.90	14.20	
1/2	-06	1	0.00	4.40	17.90	4.40	13.50	1.68
		2	0.00	4.40	17.90	4.40	13.50	1.68
	☑ B ☐ F	Avg				4.40	13.50	
1/3	-07	1	0.00	4.90	17.60	4.90	12.70	1.67
		2	0.00	4.90	17.60	4.90	12.70	1.67
	☑ B ☐ F	Avg				4.90	12.70	
		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: Shamrock
Team Leader: DV
Date Submitted: 7-8-94
Test No.: 1
Date of Analysis: 7-18-94

Source: Asphalt Plant
Test Site: Stack
Date of Test: 7-7-94
No. of Runs Completed: 3
Technician: C. Helgeson

0	Test 1 Run 0 Field Blank Log Number 3292-01I Comments	Dish No. 64 Dish Tare Wt. 47.2110 g Dish+Sample Wt. 47.2113 g Sample Wt. 0.0003 g
1	Test 1 Run 1 Log Number -02I Comments	Dish No. 65 Dish Tare Wt. 44.6564 g Dish+Sample Wt. 44.6865 g Sample Wt. 0.0301 g
2	Test 1 Run 2 Log Number -03I Comments	Dish No. 69 Dish Tare Wt. 47.9879 g Dish+Sample Wt. 48.0130 g Sample Wt. 0.0251 g
3	Test 1 Run 3 Log Number -04I Comments	Dish No. 509 Dish Tare Wt. 47.6231 g Dish+Sample Wt 47.6399 g Sample Wt. 0.0168 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
	0.0298	0.0248	0.0165		D-2

LSC-03.GR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job Shamrock
Team Leader DV
Date Submitted 7-8-94
Test No. 1
Date of Analysis 7-14-94
Transport Leakage ☒ None ☐ _____ ml

Source Asphalt Plant
Test Site Stack
Date of Test 7-7-94
No. of Runs Completed 3
Technician C. Halgeson
Solvent Acetone

0	Test 1 Run 0 ~ Field Blank Log Number 3292-01P Vol. of Solvent 120 ml *Solvent Residue 4.17 ug/ml	Dish No. 19 Dish Tare Wt. 48.9570 g Dish+Sample Wt. 48.9575 g Sample Wt. 0.0005 g
1	Test 1 Run 1 Vol. of Solvent 110 ml Log Number ~02P Comments	Dish No. 48 Dish Tare Wt. 47.8874 g Dish+Sample Wt. 47.9512 g Sample Wt. 0.0638 g
2	Test 1 Run 2 Vol. of Solvent 150 ml Log Number ~03P Comments	Dish No. 340 Dish Tare Wt. 47.9151 g Dish+Sample Wt. 47.9854 g Sample Wt. 0.0703 g
3	Test 1 Run 3 Vol. of Solvent 125 ml Log Number ~04P Comments	Dish No. 407 Dish Tare Wt. 47.9970 g Dish+Sample Wt. 48.0544 g Sample Wt. 0.0574 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 4.17 ug/ml = [(Sample Wt. 0.0005 g)(10⁶)]/Vol. of Sol. 120 ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0633	0.0697	0.0569		D-3

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job Shamrock
Team Leader RR
Date Submitted 7-8-94
Test No. 1
Date of Analysis 7-14-94

Source Asphalt Plant
Test Site Stack
Date of Test 7-7-94
No. of Runs Completed 3
Technician C. Helgeson

0	Test 1 Run 0 Field Blank Log Number 3292-01F Comments	Filter No. 6738 Filter Type 4"GF Filter Tare Wt. 0.9429 g Filter+Sample Wt. 0.9429 g Sample Wt. 0.0000 g
1	Test 1 Run 1 Log Number -02F Comments	Filter No. 6767 Filter Type 4"GF Filter Tare Wt. 0.9413 g Filter+Sample Wt. 1.0716 g Sample Wt. 0.1303 g
2	Test 1 Run 2 Log Number -03F Comments	Filter No. 6766 Filter Type 4"GF Filter Tare Wt. 0.9448 g Filter+Sample Wt. 1.0938 g Sample Wt. 0.1490 g
3	Test 1 Run 3 Log Number -04F Comments	Filter No. 6765 Filter Type 4"GF Filter Tare Wt. 0.9341 g Filter+Sample Wt. 1.1292 g Sample Wt. 0.1951 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
	0.1303	0.1490	0.1951		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.2234	0.2405	-0.2685		

LSC-02PR

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: SHAMROCK Source: Asphalt Plant Site: STACK Log No.: ____
Field Engineer: DAVE VANER Date of Test: 7-7-94 Test No.: 1 No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
4	**Probe Wash:** ☒ Acetone ☐ $MeCl_2$	☐ DI Water ☐ ____	☒ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☐ ____		
4	**Filter:** ☒ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☒ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
7	**Impingers:** ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ ____	☒ MN Protocol ☐ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ ____		
3	**Integrated Gas:** ☒ Tedlar Bag	☐ ____	☒ EPA M-3 ☐ ____	☐ EPA M-10		
—	**Oxides of Nitrogen:**		☐ EPA M-7A ☐ ____			
6	**Fuel Lab:** ☒ Fuel Sample (NO)	☒ Aggregate	☒ Per S-0163			
—	**Particle Sizing:**		☐ X-Ray Sdgraph ☐ ____	☐ Cascade Imp		
—	**Miscellaneous:**	☐ ____	☐ ____			

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

Relinquished by/Affiliation	Accepted by/Affiliation	Date
		7-7-94
Dave Vaner / Interpoll Labs	[illegible] / Interpoll	7/8/94 0830

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

APPENDIX E

ASPHALT PLANT INFORMATION SHEET

Interpoll Laboratories
(612)786-6020

Asphalt Plant Information Sheet

Manufacturer and Model No. of the Plant Madsen, manufactured date 1957, 406 model Dryer

Owner and Operator of the Plant Shamrock Enterprises 6415 Bandel RD NW Rochester, Mn 55701

Location of Plant at time of Test (State, County and Address) 3161 85th st. NW ~~Minnesota~~ Rochester, Mn 55701

Oronoco - CR 154

Estimated Total Time of the Plant at this Site (from when to when) 1979 - 1994

Type of Pollution Control Equipment (wet scrubber, mechanical collector, etc. Baffle Sprayer 3 compartment Scrubber

Model No. of Pollution Control Equipment Badger

If wet scrubber, provide the following information:

Percent recycle of scrubber water 100 %

Flow of water to scrubber 200 GPM

Manufacturer recommended pressure drop across venturi ~~[illegible]~~ IN.WC.

Rated Capacity of Asphalt Plant 180 - 200 TONS/HR

at an aggregate moisture content of 5.0 %

Type of Fuel Used to Fire Plant:

- [x] Natural Gas
- [ ] No. 2 Fuel Oil
- [ ] No. 5 Fuel Oil
- [ ] Propane

Normal Production Rate of Plant 180 - 200 TONS/HR

at an aggregate moisture content of 4.9 %

NOTE: Attach drawings of plant and pollution control equipment.

Name of Individual Supplying Information Eric Breitsprecher

Date 7-7-94

S-0150R(2)

APPENDIX F

ASPHALT PLANT OPERATING DATA

REQUIRED OPERATING DATA FOR ASPHALT PLANT

This form MUST BE COMPLETED , AND SUBMITTED with the performance stack test.

1. Itemize all fuels and materials that are added to the combustion process during the test period. Please label Run Number with Test Number. Fuel used during testing (if oil, please specify grade) Natural Gas If other units are used, specify and calculate heat input appropriately.

Test No. 1	FUEL INPUT (~~Gal/hr~~) CFH	% MOISTURE (as recv'd)	BTU/GAL (as recv'd)	HEAT INPUT (Btu/hr)
Run No. 1	83,600			
Run No. 2	83,600			
Run No. 3	83,600			

2. Are the above fuels substantially the same as those normally burned? yes . If not, explain _____ .

3. Are the above fuels normally burned in the proportions shown above? yes . If not, explain _____ .

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months. NONE

5. Is the plant operating at normal or maximum conditions? yes

AIR POLLUTION CONTROL EQUIPMENT

1. Type/Model control equipment Esters, wet scrubber .
2. Air pressure drop across the control equipment — .
3. Air flow through the control equipment _____ .
4. Was the control equipment operating normally? YES .
5. Date and procedures of last maintenance/cleaning of control equipment

7-1-94 clean out wet wash and pond

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 Eric Bu[illegible], Position Bituminous technician

Phone number where you may be reached 288-9494

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) 7-7-94

Plant Mfr. & Model Madsen, 908 Dryer

Type (circle one): Drum Mix (Conventional)

Other (list): _____

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

If wet scrubbing: 100 % scrubber water recycled

List model: ~~Burger~~ Estes

Normal pressure drop across control equipment: _____ 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 ~~7-7-94~~ 7-1-94 cleaned pond and wet wash

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) Natural Gas. If other units of measure are used, specify and calculate appropriate heat input.

Test No. ___	Fuel Input ~~(cu ft)~~ CFH	BTU/GAL (as received)	Heat Input (BTU/HR)	%Moisture (as received in aggregate) Virgin	recycle	combined
Run 1	83,600			4.9	5.5	5.05
Run 2						
Run 3						

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

Production specific fuel usage: (circle one) measured or calculated: 435.4 cubic foot/ ton hot mix

_____ gal/ton hot mix

No. of Burners: 1 Burner(s) rating: 103 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)
9:30	2.00	145	51	9.8	285	9.5	200	
9:40	2.25	136	48	9.2	289	9.5	200	
~~10:05~~ 9:50	2.50	136	48	9.2	293	9.5	200	
10:00	3.25	128	45	8.6	290	9.5	200	
10:10	2.50	141	50	9.5	289	9.5	200	
10:20	2.75	141	50	9.5	285	9.5	200	
10:30	2.75	141	50	9.5	286	9.5	200	

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: Eric Bustamente, Phone: (503) 282-9494

Position: Blending technician

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.

Asphalt Plant Operating Conditions During Stack Testing

Rev.YY/93

Test Date(s) _____

Plant Mfr. & Model _____

Type (circle one): Drum Mix Conventional
Other (list): _____

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

List model: _____ If wet scrubbing: ____ % scrubber water recycled

Normal pressure drop across control equipment: _____ inches water

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

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

SEE previous page

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						
* Run 2	83,600			5.5	5.5	5.5
Run 3						

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

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

No. of Burners: 1 Burner(s) rating: 103 MMBTU/HR = 100% setting

Operation: RUN # 2

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)
11:10	2.75	153	54	10.4	290	9.5	200	
11:20	2.75	141	50	9.5	283	9.5	200	
11:30	2.75	141	50	9.5	285	9.25	200	
11:40	2.75	141	50	9.5	283	9.5	200	
11:50	2.75	153	54	10.4	286	9.5	200	
12:00	2.75	141	50	9.5	287	9.5	200	

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: [signature], Phone: (507) 288-9499

Position: B. Luminosa technician

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.

Asphalt Plant Operating Conditions During Stack Testing

Rev.YR/93

Test Date(s) _____

Plant Mfr. & Model _____

Type (circle one): Drum Mix Conventional
Other (list): _____

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

If wet scrubbing: ____% scrubber water recycled

List model: _____

Normal pressure drop across control equipment: _____ inches water

Air flow through control equipment: _____ acfm at _____F Was control equipment operating normally during testing? _____

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

SEE previous page

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						
Run 2						
* Run 3	83,600			4.5	5.5	4.75

Is the above fuel [illegible] anti[illegible] / the highest sulfur containing fuel normally burned? _____

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

No. of Burners: 1 Burner(s) rating: 103 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)
12:55	2.0	141	50	9.5	275	8.0	200	
1:05	2.25	141	50	9.5	280	7.0	200	
1:15	2.25	141	50	9.5	275	7.5	200	
1:25	2.25	141	50	9.5	275	7.5	200	
1:35	2.0	141	50	9.5	280	7.5	200	
1:45	2.00	178	9.5	8.6	283	7.0	200	

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: Eric Butler, Phone: (507) 288-4494

Position: Emissions technician

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.

Time in 15 min. intervals	Burner Setting %	Aggregate Material TPH	Recycle Material TPH	Asphalt Material TPH	Total Material TPH (Aggregate+Recycle+Asphalt)	Temperature of Gases Exiting Dryer deg F	Baghouse Pressure Drop inches water	Scrubber Flow Rate GPM	Water Supply Pressure psi	Other (list)	Other (list)
9:30	2.0	145	51	9.8	204	310	9.5	200	82		
9:40	2.25	136	48	9.2		310	9.5	200	84		
9:50	2.50	136	48	9.2	192	310	9.5	200	83		
10:00	2.25	128	45	8.6	180	310	9.5	200	83		
10:10	2.50	141	50	9.5	198	310	9.5	200	84		
10:20	2.75	141	50	9.5	198	310	9.5	200	84		
10:30	2.75	141	50	9.5	198	310	9.5	200	84		
RUN #2											
11:10	2.75	153	54	10.4	216	310	9.5	200	84		
11:20	2.75	141	50	9.5	198	315	9.5	200	84		
11:30	2.75	141	50	9.5	198	315	9.25	200	83		
11:40	2.75	141	50	9.5	198	320	9.5	200	84		
11:50	2.75	153	54	10.4	216	320	9.5	200	84		
12:00	2.75	141	50	9.5	198	315	9.5	200	83		
RUN #3											
12:55	2.00	141	50	9.5	198	290	8.0	200	83		
1:05	2.25	141	50	9.5	198	295	7.0	200	84		
1:15	2.25	141	50	9.5	198	290	7.5	200	84		
1:25	2.25	141	50	9.5	198	290	7.5	200	84		
1:35	2.00	141	50	9.5	198	285	7.5	200	84		
1:45	2.00	128	45	8.6	180	290	7.0	200	83		

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: Eric Freitagreder, Position Bituminous Technician, Phone: (561) 288-9499

ASPHALT PLANT OPERATING CONDITIONS DURING STACK TESTING

Test Date(s) 7-7-94

lant Mfr. & Model Mansen, manufactured Oct 1957 Type(circle one): Drum Mix (Conventional)
his plant is (circle one): Portable Other _____ Batch 6000#

ollution Control Equipment(circle one): Baghouse Venturi Scrubber (Wet Scrubber) Cyclone Multicione
If wet scrubbing: 100 %scrubber water recycled

ist Model: Basic sprayer 3 Compartment Scrubber - Estees
Normal pressure drop across control equipment is _____ inches water
Was control equipment operating normally during test? Yes

Date & procedure of last maintenance/cleaning of control equipment: 6-1 - cleaned out wet wash and pond

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

Test No.	Fuel Input (~~Gal/hr~~ CFH)	Btu/gal(As Received)	Heat Input (Btu/hr)
Run 1	83,600		
Run 2	83,600		
Run 3	83,600		

Is the other fuel substantially the highest sulfur containing fuel normally burned? Yes
Production specific fuel usage: (circle one) measured or calculated 435.4 cubic foot/ton hot mix — gal/ton hot mix
No. of burners: 1 Burner(s) rating: 105 MMBTU/HR=100% setting

Test No.	% Recycle %R=Recycle ÷ (Aggregate + Recycle+Asphalt)	Estimated % moisture of aggregate (or aggregate & recycle)
Run 1	25 %	5.05
Run 2	25 %	5.50
Run 3	25 %	4.75

Other Control Equipment Parameters	Design	During Testing
Cleaning Cycles		
Air to Cloth Ratios		
No. of spray bars including delivery pressure		

Describe the location of the thermocouples reading exiting dryer temperature: _____

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: Eric Breitspreder, Phone: (507) 288-9494

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 G

PROCEDURES

Particulate Loading and Emission Rates

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

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

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

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

Particulate Loading and Emission Rates

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

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

Condensible Organic Compounds Analysis

(State of Minnesota - MPCA Exhibit C)

Method II-8672-MN

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a 17 mm stem

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

Reagents: Diethyl ether - reagent grade

Chloroform - reagent grade

Sodium sulfate - (ACS) granular anhydrous

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

Glass wool (Pyrex microfiber)

PREPARATION

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

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

SAMPLING

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

I. ORGANICS

Caution! Work in vented hood!!!

A. Organic Blank Determination

1. Pour 125 ml of ethyl ether and 125 ml of chloroform into a tared beaker.

2. Evaporate solvent in hood at 70°F or less until no solvent remains.

3. Desiccate the sample in dish for two hours.

4. Weigh the sample to nearest 0.1 mg, record and report on Form LSC-03G.

B. Organic Sample Determination

1. Test for peroxide in sample ether using KI strips. (If KI strip shows positive, contact your supervisor before proceeding.)

2. Transfer the sample solution quantitatively to a 500 ml separatory funnel. Use the first of three 25 ml chloroform aliquots to rinse the sample container.

3. Extract with three 25 ml portions of chloroform. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Bottom layer is chloroform.) Draw off the bottom layer, transferring the solvent with a funnel containing a plug of sodium sulfate into a tared beaker. (Do not draw off any of the aqueous layer.)

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

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

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

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

8. Desiccate to constant weight (two hours). Record and report the final weight to the nearest 0.1 mg on Form LSC-03G.

II. INORGANICS

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

A. Inorganic Blank Determination

1. Vent the remaining aqueous phase from the organic extraction in the hood to remove residual organic solvents (usually overnight).

2. Decant the impinger catch into a tared evaporating dish.

3. Evaporate all of the water in the sample in an oven at 100°C. Take care not to boil to prevent bumping and loss of sample.

4. Cool the dried sample in the desiccator and desiccate until a constant weight is obtained.

5. Report the results to the nearest 0.1 mg on Form LSC-03G.

B. Inorganic Sample Determination

Follow steps 1-5 in Section A above.

NOTES

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

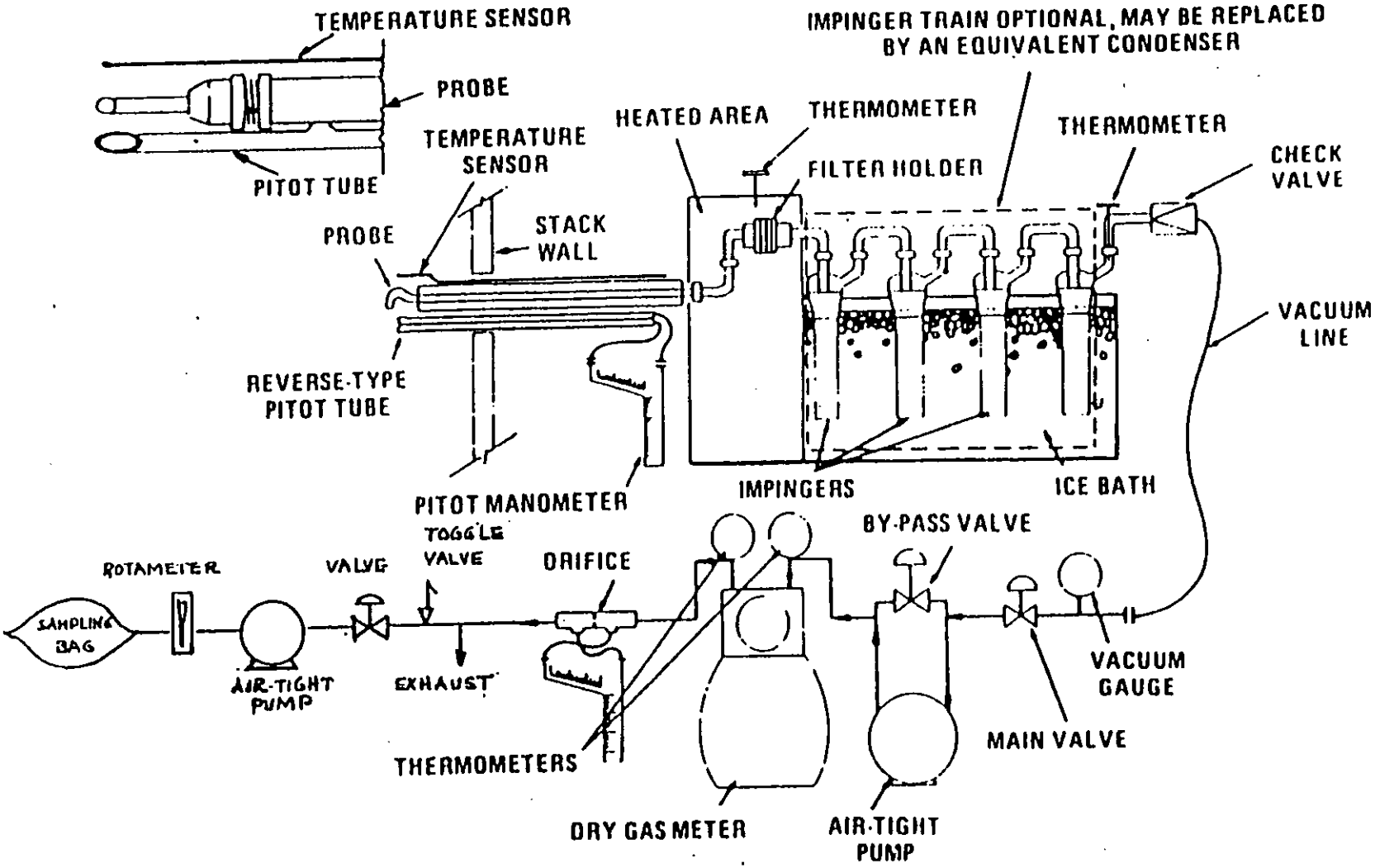
2. In the organics determination, more than three extractions may be required to extract all of the organics. Additional extractions should be performed if the aqueous phase is still cloudy.

3. Special state requirements:
   Michigan - Total sample evaporated in tared evaporating dish on steam bath.
   Iowa - Organics and inorganics separately, as required.
   Wisconsin - Use Method II-8672-WI.
   Rest of states - Organics only.

REFERENCES

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

Minnesota Pollution Control Agency, Exhibit C.



Particulate-sampling train.

APPENDIX H

CALCULATION EQUATIONS

METHOD 2
CALCULATION EQUATIONS

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

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

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

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

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

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

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

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

032294-G:\STACK\WP\METHODS\S-EQ.15

1

SYMBOLS

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

T_{db}	=	Dry bulb temperature of stack gas, °F
T_{wb}	=	Wet bulb temperature of stack gas, °F
$T_{m(avg)}$	=	Absolute average dry gas meter temperature, °R
$T_{s(avg)}$	=	Absolute average stack temperature, °R
T_{std}	=	Standard absolute temperature, 528 °R (68 °F)
θ	=	Total sampling time, min.
V_{lc}	=	Total volume of liquid collected in impingers and silica gel, ml
V_m	=	Volume of gas sample as measured by dry gas meter, CF
$V_{m(std)}$	=	Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF
$V_{w(std)}$	=	Volume of water vapor in the gas sample corrected to standard conditions, SCF
$\bar{V}_s$	=	Average actual stack gas velocity, FT/SEC
vp_{tdb}	=	Vapor pressure at T_{db}, IN. HG.
vp_{twb}	=	Vapor pressure at T_{wb}, IN. HG.
$\overline{\Delta H}$	=	Average pressure differential across the orifice meter, IN. WC.
ΔP	=	Velocity pressure of stack gas, IN. WC.
γ	=	Dry test meter correction coefficient, dimensionless
ρ	=	Actual gas density, LB/ACF

METHOD 3
CALCULATION EQUATIONS

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

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

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

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

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METHOD 5
CALCULATION EQUATIONS

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

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

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

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

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

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

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

032294-G:\STACK\WP\METHODS\S-EQ.15

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

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

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APPENDIX I

SAMPLING TRAIN CALIBRATION DATA

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

Job Shamrock Date 7-7-94

Operator DV Module No. 18

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 28.75 in. Hg. τ = 1.0069 ^H@ 1.90 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F) Inlet	Meter Temp. (°F) Outlet			
[redacted]	510.39	[redacted]		646.0		
2.5	512.26	85	73	647.89	71	70
5.0	514.11	89	74	649.79	75	70
7.5	515.96	92	75	651.69	78	70
10	517.81	94	76	653.58	80	71
[redacted]	V_m= 7.42	Avg(t_m)= ~~83.3~~ 82.25 °F		7.58	73.125	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(1.0069)(7.58)}\left[\frac{(73.125) + 460}{(28.75)}\right]^{0.5}$$

~~.191~~ .239 4.35

Y_{cn} = 1.01

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: July 11, 1994

Meter Box No. : 18 (Rockwell Dry Test Meter Serial No. 1334117)

Date of Last Calibration: April 25, 1994
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
June 21, 1994	4-3191	689.80	1015.80	326.00	326.00
June 28, 1994	4-3253	32.90	151.68	118.78	444.78
June 29, 1994	4-3254	152.39	338.34	185.95	630.73
July 06, 1994	4-3290	358.35	509.03	150.68	781.41
July 07, 1994	4-3292	517.81	645.09	127.28	908.69

* Total volume through meter since last calibration.

Date 1-25-94

Bar. Press. 28.66 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 6

Control Module No. 18
Serial No. DTM 1334117
Wet Test Meter No. AL-20
Technician [illegible]

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. ΔH@	C_f
0.6	.5	2	99.85	0.01	655.700	657.710	71	84	76	5/01	1.0090	1.82	
1.2	1.2	3	99.91	0.025	652.500	655.524	71	82	76	4/56	1.0024	1.88	
2.0	2.0	3	99.93	0.055	658.000	661.030	71	87	77	3/53	1.0046	1.93	
3.3	3.3	5	100.00	0.09	661.400	666.441	71	92	78	5/04	1.0092	1.94	
4.7	4.7	6	100.02	0.12	667.000	672.044	71	94	80	4/16	1.0088	1.95	
											1.0069	1.90	

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

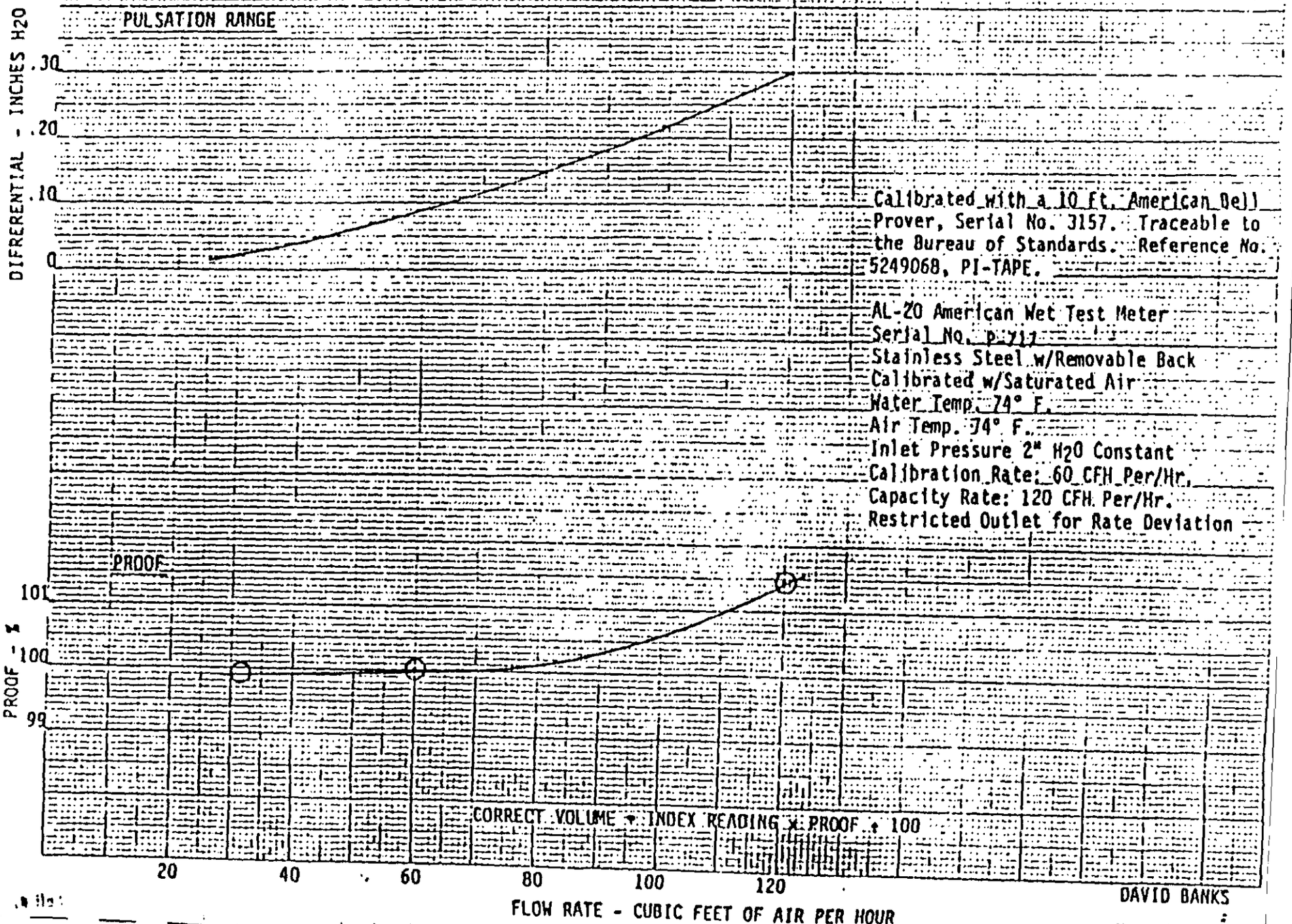
Approved by [signature] Date 5/2/94

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

S0102RR 11/91

DIFFERENTIAL PRESSURE AND PROOF CALIBRATION CURVES

WET TEST METER



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

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

DAVID BANKS

November, 1991

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 07-07-94 Nozzle Number 9-6
Technician: Dave Vaaler

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	.370
2	.374
3	.370
Average:	.371

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test: #35

Vendor Omega

Model HH51

Range 0 - °F

Date of Calibration 5-5-94

Serial Number 74TX0474

Thermocouple Type K

Technician E TRAUBRIDGE

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	-2	-2.0	.43
100	100	99.0	-1	.18
200	200	200	0	0
300	300	298	-2	.26
400	400	398	-2	.23
500	500	499	-1	.10
600	600	600	0	0
700	700	699	-1	.08
800	800	802	+2	.16
900	900	900	0	0
1000	1000	1001	+1	.07
1100	1100	1100	0	0
1200	1200	1201	+1	.06
1300	1300	1299	-1	.05
1400	1400	1402	+2	.10
1500	1500	1500	0	0
1600	1600	1603	+3	.14
1700	1700	1701	+1	.05
1800	1800	1802	+2	.09
1900	1900	1901	+1	.04
2000	2000	2001	+1	.04
2100	2100	2099	-1	.04
		Averages:	1.14	.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.

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 31-8

Pitot tube dimensions:

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

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" 0
9. W <.0625" .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) .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: 4-7-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 6-16-94
Technician SB
Mercury Column Barometer No. 1
Aneroid Barometer No. 9022200

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.20	70	.110	29.09	29.18	.09

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

Has problem been alleviated? Yes/No. How? _____

*Note

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

S-312

APPENDIX J

TEST PLAN

TEST PLAN FOR ASPHALT PLANT PERFORMANCE TEST

PART 1. GENERAL INFORMATION

Name and address of permittee: SHAMROCK ENTERPRISES
6415 Bandle Road
Rochester, Minnesota 55901

Permittee contact person: Carrol Kelly
(507)285-1211
FAX (507)285-0029

Permit File No.: 1204A-90-OT-1

Reason for Testing: Notice of Noncompliance Letter of June 7, 1994.

Sketches of stack source point to be tested showing test port location, stack diameter, and other pertinent information are included with this plan.

Physical location of the emission unit to be tested: Oronoco, Minnesota

Independent Testing Company: Interpoll Laboratories, Inc.
Contact: Kathy Eickstadt (612)786-6020

Test Plan Date: June 14, 1994
Test Date: July 7, 1994

PART II. TESTING REQUIREMENTS

EP#	Pollutant	Emission Limit	Applicable Rule	Method	Run Length
1	PM	Variable with process rate but not to exceed 39.9 LB/HR at design conditions and not to exceed 0.3 GR/DSCF	Minn. Rules pts. 7011.0700 through 7011.0730	5	60 min
1	Opacity	20% opacity, except that a maximum of 40% opacity shall be permissible for not more than four minutes in any 30-minute period and a maximum of 60% opacity shall be permissible for not more than 4 minutes in any 6-min. period	Minn Rules Pt. 7011.0905 Subp. B	9	60 min

Fuel Sampling and Analysis (as per Exhibit D): Natural-gas fired

Moisture Content in the Virgin and Recycle Aggregate:
Two samples of each (virgin and recycle aggregate) per test run of particulates. Samples must be taken as close as possible to the feeding conveyor and during the corresponding run. Mix samples of virgin aggregate with the samples of recycle material in the same proportion as they enter the dryer, this will give one composite recycle/virgin sample per test run.

One analysis of moisture content in each composite recycle/virgin aggregate sample as per ASTM or other recognized methodologies. A total of three analyses will be performed, one per test run for particulates.

PART III. OPERATING CONDITIONS

Rational for Worst Case: Natural gas is the only fuel available and piped to the plants. The recycled scrubber water supply remains full except the evaporation loss and small amount goes through the system. The daily amount added is approximately 2000 gallons. The plant is run at maximum capacity and dampers are adjusted for proper burner operation and efficiency.

Normal Range of Process or Operating Rate: 180 - 200 tons per hour at 5% moisture, 75% virgin aggregate, 25% recycled bituminous and 6% asphalt cement.

Description of Process Equipment: Type - Hot mix asphalt facility, Manuf./Model - Madsen, Year manufactured - 1957, Plant type - Conventional batch 6000#, Manuf./Model - Madsen dryer 408, Burner/Type/Model - Genco 103 million BTU/HR.

Description of How Process Equipment will be Monitored During Testing: The aggregate is monitored on a needle chart. Stack temperature and exit temperatures are monitored on needle gauges. The material volume control digital reads from load cells on weigh beams.

Description of Air Pollution Control Equipment: Type/Manuf. - Cyclone (Madsen), Type - Baffle Sprayer 3 Compartment Scrubber, Manuf. - Estees, Water Supply Pump - Rated 200 GPM @ 80 PSI.

Description of How Air Pollution Control Equipment will be Monitored During Testing: The scrubber is monitored with a magnehelic pressure drop gauge visible to the plant operators position. The water pressure gauge is located on the piping on the exterior of the scrubber. The water flow rate is on a gauge visible to the plant operators position. The opacity observation is performed by our quality control personnel at various times throughout the day. Also, the loader operator is a certified stack reader and observes continuously throughout the day.

PART IV. TEST METHODS

A. EPA Method 1 for location of sampling ports and points.

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

C. EPA Method 3 for gas analysis. One test run on an integrated sample taken concurrently with each test run for every pollutant.

D. EPA Method 4 for the determination of moisture in the flue gases. One test run concurrently with each test run for every pollutant.

E. EPA Method 5 as amended by Minn. Rules pt. 7005.2060 and 7011.0725 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 32 dscf (0.9 dscm). Three runs must be conducted. Results are to be reported both as total particulate matter containing condensibles where the limit includes organic condensibles and total particulate matter excluding condensibles where the limit does not include condensibles.

F. EPA Method 9 as amended by Minnesota Rules part 7017.2060 for visual determination of opacity. One hour of observations, concurrently with a test run for particulates.

PART V. CEMS RELATIVE ACCURACY

N/A

PART VI OTHER

1. Results to be presented in GR/DSCF and LB/HR for PM; percent for opacity.

2. One hard copy of the test report shall be submitted within 45 days after the date of the test.

3. A copy of the microfiche report shall be submitted within 105 days after the date of the test.

4. All submittals shall be addressed to:
   Supervisor, Compliance Determination Unit
   Compliance and Enforcement Section
   Air Quality Division
   Minnesota Pollution Control Agency
   520 Lafayette Road
   St. Paul, Minnesota 55155-4194

5. **MPCA Warning:** Given the seriousness of exceeding an emission limit, the Company is hereby provided notice that enforcement action will be taken for a first performance test failure. This enforcement action will not be initiated until the results of the retest have been reviewed by MPCA staff and will require the Company to pay a civil penalty.

Please be advised that upon receiving written notice of a second performance test failure, the Company will be required to either shut down the tested process unit(s) or to submit a compliance plan, subject to MPCA approval, which indicates specific measures to be taken which are expected to all the unit(s) to operate in compliance with the applicable emission limitations. the plan must also include specific measures the facility will take to minimize emissions until compliance is demonstrated. However, if the unit(s) continue to operate, they will be considered to be operating in violation of the applicable limits from the date of the performance test until a retest has been conducted that demonstrates compliance.

Please note that results of a performance test are not final until MPCA staff provides a written compliance determination.