AP42 Section: 11.1

Reference Number: 61

Title: Results Of The August 3, 1993 State Particulate Emission Compliance Test Of The Stationary Asphalt Plant In Oronoco, Minnesota,

Interpoll Laboratories, Inc., Circle Pines, MN,

August 31, 1993.

AP-42 Section 11.1
Reference
Report Sect. 4
Reference 61

12044

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RESULTS OF THE AUGUST 3, 1993 STATE PARTICULATE EMISSION COMPLIANCE TEST OF THE STATIONARY ASPHALT PLANT IN ORONOCO, MINNESOTA

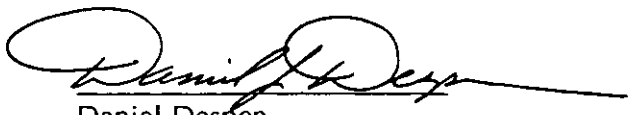
Submitted to:

SHAMROCK ENTERPRISES
6415 Bandle Road
Rochester, Minnesota 55901

Attention:

Carroll Kelley

Approved by:



Daniel Despen
Manager
Field Testing Support Group

Report Number 3-9555
August 31, 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 August 3, 1993 Interpoll Laboratories Personnel conducted a State Particulate and Visible Emission Compliance Test on the Shamrock Enterprises Stationary Asphalt Plant located in Oronoco, Minnesota. Ed Trowbridge and Gary Hove performed the on-site portion of the test. Coordination between testing activities and plant operation was provided by LaVane Fleishchfresser of Shamrock Enterprises. A member of the Minnesota Pollution Control Agency did not witness the test.

The asphalt plant tested is a Madsen Model No. 408 Batch Plant. The rated capacity of the plant is 200 TON/HR at an aggregate moisture content of 5%. The normal production rate of the plant is 180 - 200 TON/HR at an aggregate moisture content of 5.54%. The plant was fired with natural gas during the test. Particulate emissions from the asphalt plant are controlled by a Badger wet scrubber. During the test, the flow rate to the scrubber was 180 GPM and 100% of the scrubber water was recycled.

Particulate evaluations were performed in accordance with EPA Methods 1 - 5, and 9, CFR Title 40, Part 60, Appendix A (revised July 1, 1991). 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 2 test ports oriented at 90 degrees on the stack. The test ports are located > 2 diameters downstream and >0.5 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.

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 1. The particulate concentration averaged 0.403 GR/DSCF (Dry + Organic Wet Catch) and 0.399 GR/DSCF (Dry Catch Only). The corresponding particulate emission rates averaged 76.4 and 75.6 LB/HR. Opacity averaged 0.

No difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of this fact and a complete review of the entire 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 August 3, 1993 Particulate Emission Compliance Test on the Stationary Asphalt Plant Located in Oronoco, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	08-03-93	08-03-93	08-03-93
Time runs were done (HRS)	950/1059	1122/1230	1248/1351
Process rate (TON/HR)			
recycle	81.0	81.0	85.0
aggregate	152.0	150.0	159.0
asphalt	9.0	8.5	9.1
total	242.0	239.5	253.2
Volumetric flow			
actual (ACFM)	35637	43689	42335
standard (DSCFM)	20324	23400	22618
Gas temperature (DEG-F)	157	162	164
Moisture content (%V/V)	31.08	34.79	34.76
Gas composition (%V/V,dry)			
carbon dioxide	5.30	5.10	4.70
oxygen	11.90	12.30	12.90
nitrogen	82.80	82.60	82.40
Isokinetic variation (%)	107.5	99.7	101.1
Part. emission rate (LB/HR)	70.01	74.56	84.48
Particulate concentration			
actual (GR/ACF)	0.229	0.199	0.233
standard (GR/DSCF)	0.402	0.372	0.436

Note: Dry + Organic Wet Catch

Table 2. Summary of the Results of the August 3, 1993 Particulate Emission Compliance Test on the Stationary Asphalt Plant Located in Oronoco, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	08-03-93	08-03-93	08-03-93
Time runs were done (HRS)	950/1059	1122/1230	1248/1351
Process rate (TON/HR)			
recycle	81.0	81.0	85.0
aggregate	152.0	150.0	159.0
asphalt	9.0	8.5	9.1
total	242.0	239.5	253.2
Volumetric flow			
actual (ACFM)	35637	43689	42335
standard (DSCFM)	20324	23400	22618
Gas temperature (DEG-F)	157	162	164
Moisture content (%V/V)	31.08	34.79	34.76
Gas composition (%V/V,dry)			
carbon dioxide	5.30	5.10	4.70
oxygen	11.90	12.30	12.90
nitrogen	82.80	82.60	82.40
Isokinetic variation (%)	107.5	99.7	101.1
Part. emission rate (LB/HR)	69.51	73.27	83.93
Particulate concentration			
actual (GR/ACF)	0.227	0.196	0.231
standard (GR/DSCF)	0.399	0.365	0.433

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
Asphalt Plant Stack

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

	Run 1	Run 2	Run 3
Date of run	08-03-93	08-03-93	08-03-93
Dry basis (orsat)			
carbon dioxide.....	5.30	5.10	4.70
oxygen.....	11.90	12.30	12.90
nitrogen.....	82.80	82.60	82.40
Wet basis (orsat)			
carbon dioxide.....	3.65	3.33	3.07
oxygen.....	8.20	8.02	8.42
nitrogen.....	57.06	53.87	53.76
water vapor.....	31.08*	34.79*	34.76
Dry molecular weight.....	29.32	29.31	29.27
Wet molecular weight.....	25.80	25.37	25.35
Specific gravity.....	0.891	0.876	0.876
Water mass flow.....(LB/HR)	29035	35235	33804

* Free or condensed water in the gas stream.

FO	1.698	1.686	1.702

3.2 Results of Particulate Loading Determinations

Interpoll Labs Report No. 3-9555
Shamrock Enterprises
Oronoco, Minnesota

Test No. 1
Asphalt Plant Stack

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

	Run 1	Run 2	Run 3
Date of run	08-03-93	08-03-93	08-03-93
Time run start/end.....(HRS)	950/1059	1122/1230	1248/1351
Static pressure.....(IN.WC)	-0.05	-0.05	-0.05
Cross sectional area (SQ.FT)	27.79	27.79	27.79
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	350.0	394.0	375.0
desiccant.....(GRAMS)	10.0	11.0	19.0
total.....(GRAMS)	360.0	405.0	394.0
Total particulate material..			
.....collected(grams)	0.8680	0.8570	0.9847
Gas meter coefficient.....	0.9983	0.9983	0.9983
Barometric pressure..(IN.HG)	28.94	28.94	28.94
Avg. orif.pres.drop..(IN.WC)	1.28	1.41	1.37
Avg. gas meter temp..(DEF-F)	80.0 1600	83.5	84.9
Volume through gas meter....			
at meter conditions...(CF)	35.20	37.80	37.15
standard conditions.(DSCF)	33.33	35.57	34.87
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.360	.360	.360
Avg.stack gas temp ..(DEG-F)	157 1600	162	164
Volumetric flow rate.....			
actual.....(ACFM)	35637	43689	42335
dry standard.....(DSCFM)	20324	23400	22618
Isokinetic variation.....(%)	107.5 108.5	99.7	101.1
Particulate concentration...			
actual.....(GR/ACF)	0.22910	0.19903	0.23273
dry standard.....(GR/DSCF)	0.40185	0.37174	0.43577
Particle mass rate...(LB/HR)	70.007	74.559	84.484

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	240.00
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: Gary Hove
Cert. Date: 4-93
Date of Observation: 08-03-93
Time of Observation: 0950-1050

APPENDIX A

VOLUMETRIC FLOW RATE DETERMINATION

Test No. 1
Asphalt Plant Stack

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

Date of Determination.....	08-03-93
Time of Determination.....(HRS)	920
Barometric pressure.....(IN.HG)	28.94
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	71.375
Duct area.....(SQ.FT)	27.79
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.05
Avg. gas temp.....(DEG-F)	146
Moisture content.....(% V/V)	31.08
Avg. linear velocity.....(FT/SEC)	23.5
Gas density.....(LB/ACF)	.05647
Molecular weight.....(LB/LBMOLE)	29.32
Mass flow of gas.....(LB/HR)	132937
Volumetric flow rate.....	
actual.....(ACFM)	39239
dry standard.....(DSCFM)	22787

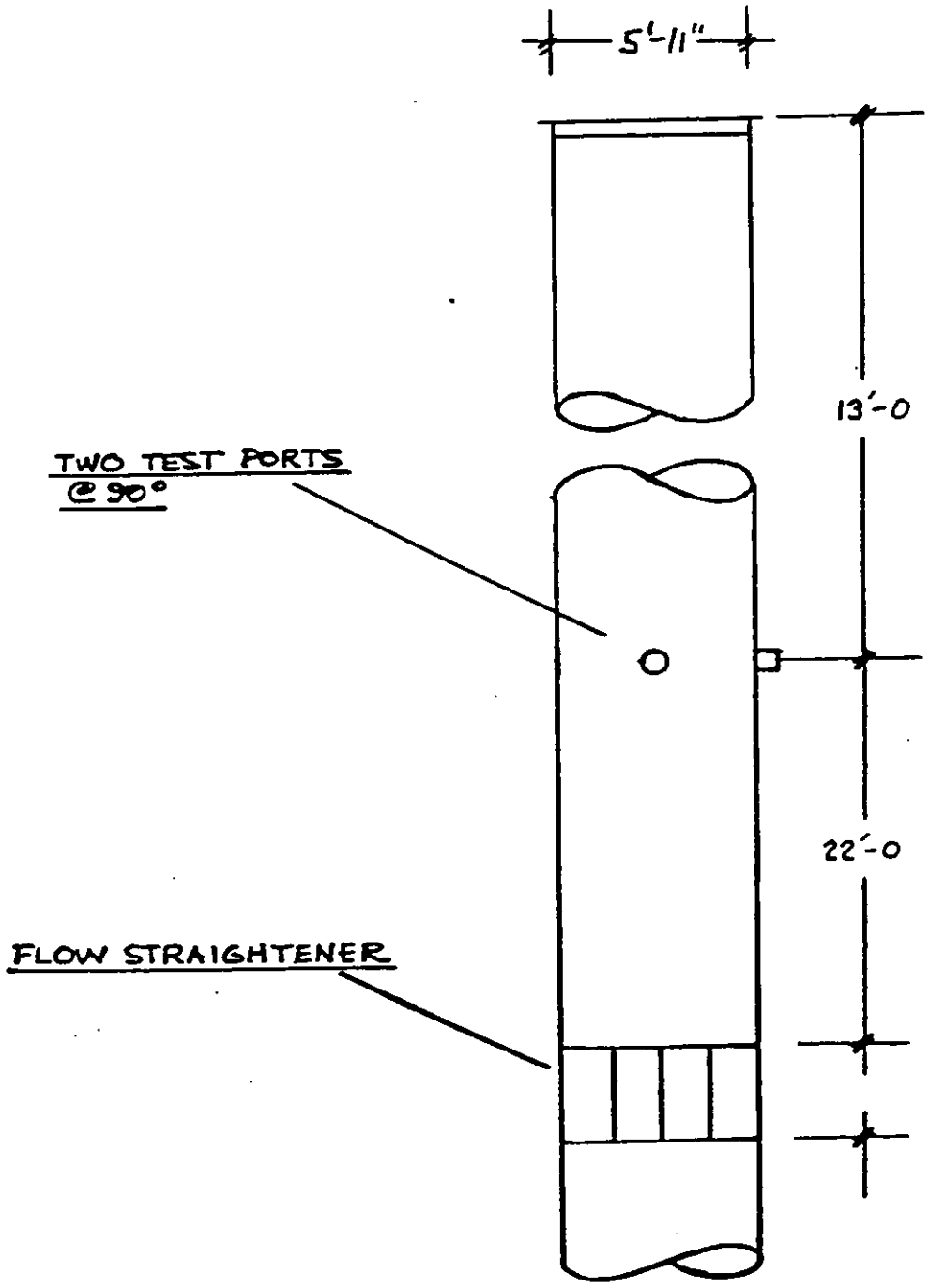
APPENDIX B

LOCATION OF TEST PORTS

SHAMROCK ENTERPRISES

STATIONARY BATCH PLANT

ORONOCO, MN



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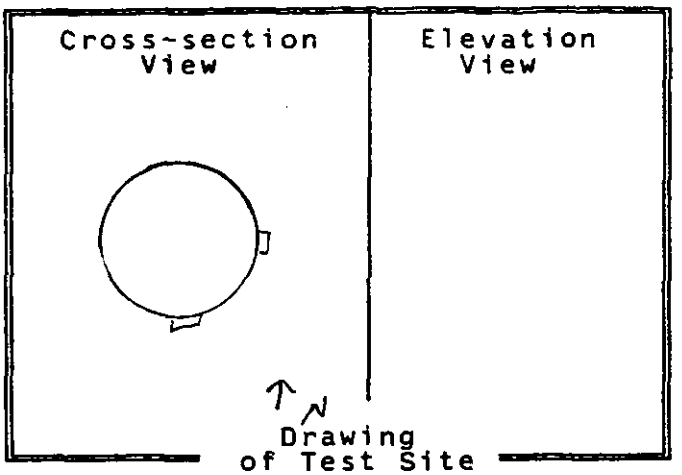
NOT TO SCALE

APPENDIX C

FIELD DATA SHEETS

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job SHAMROCK ENTERPRISES
Source ASPHALT PLANT - STACK
Test 1 Run 1 Date 9-3-93
Stack dimen. 71 3/8 IN.
Dry bulb 145 °F Wet bulb 143 °F
Manometer: ☐ Reg. ☒ Exp. ☐ Elec.
Barometric pressure 28.94 in Hg
Static pressure -.05 in WC
Operators E. TROWBRIDGE - G. HOVE
Pitot No 23V-6 C_p .840



Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: 4 5/8 in.		Time start: 1520 hrs	
A	1	.021	1.50	6.125	.10	
	2	.067	4.78	9.40	.09	
	3	.118	8.42	13.05	.08	
	4	.177	12.68	17.26	.10	
	5	.250	17.84	22.47	.15	148
	6	.356	25.41	30.04	.22	
	7	.644	45.96	50.59	.25	
	8	.750	53.53	58.16	.25	
	9	.823	58.74	63.37	.23	
	10	.582	62.95	67.58	.25	
	11	.933	66.59	71.22	.26	
	12	.979	69.87	74.50	.10	
B	1				.04	
	2				.04	
	3				.04	
	4				.06	
	5				.06	145
	6				.09	
	7				.20	
	8				.15	
	9				.18	
	10				.20	
	11				.20	
	12				.22	
Temp. meas. device & S/N: PDT-12					Time end: 0935 hrs	

manometer; S= expanded; E=electronic

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

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

Date 8-3-93 Test 1 Run 1
No. of traverse points 24
Filter type: 4" Glass Fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 8 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5562

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		100	350
Impinger No. 3		0	
Condenser			
Desiccant	1296	1286	10
Total			360

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 6 Bag No. 1

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

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

Time start: 0951 (HRS) Time end: 1058 (HRS)

Sampling rate: 400 cc/min Operator: ET

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

CF-023

S-0046RR

CF-

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: SHAMROCK ENTERPRISES — Operators: E. TROWBRIDGE — Pitot No.: 23V-6 — Cp: .840
Source: ASPHALT PLANT STACK — Meter Box No.: 1 — ΔH: 1.42 IN WC — Bar. Press.: 28.94 inHg H2O — Nozzle No.: 2-6 — Nozzle Dia: .376 IN.
Date: 8-3-93 — Test: 1 — Run: 1 — Counter coeff.: .9983

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)
	0950	374.80											
A - 12	2.5	376.42	.13	1.45	6.49	3.0	145	235	238	58	71	70	8.2
11	5	378.60	.24	2.61	8.64	6.0	143				77	72	8.1
10	7.5	380.60	.20	2.18	10.05	6.0	145	240	242	60	79	73	8.1
9	10	382.75	.23	2.49	2.81	7.1	152				81	74	8.5
8	12.5	384.90	.24	2.42	4.94	7.5	155	241	245	42	83	75	12.4
7	15	386.90	.20	2.03	6.89	7.0	155				84	76	11.4
6	17.5	387.95	.06	.61	7.97	3.0	155	240	247	47	83	76	8.7
5	20	389.40	.10	1.01	9.35	3.8	160				83	76	8.7
4	22.5	390.42	.05	.50	0.33	3.0	160	242	243	44	82	76	8.7
3	25	391.35	.04	.34	1.19	2.5	160				82	76	9.9
2	27.5	392.10	.04	.39	2.05	2.5	160	240	245	46	82	76	10.5
1	30	392.92	.04	.39	2.92	2.5	160				83	77	10.9
B - 12	32.5	394.90	.20	1.97	4.84	4.0	161	258	241	45	84	77	9.5
11	35	396.80	.22	2.17	6.86	6.1	160				86	78	9.9
10	37.5	398.74	.20	1.98	8.80	6.5	159	241	245	46	86	79	8.5
9	40	400.60	.18	1.78	0.64	6.5	160				84	79	10.1
8	42.5	402.22	.13	1.29	2.20	6.0	159	242	248	50	87	79	10.2
7	45	404.14	.20	1.98	4.14	6.9	159				87	79	9.0
6	47.5	405.40	.08	.79	5.37	4.0	159	240	242	50	87	79	8.3
5	50	406.51	.06	.59	6.43	3.4	161				86	79	8.4
4	52.5	407.50	.05	.49	7.41	3.0	160	241	245	47	86	79	8.4
3	55	408.35	.04	.39	8.27	3.0	161				85	79	8.3
2	57.5	409.18	.04	.39	9.14	3.0	160	240	242	47	85	79	8.5
1	60	410.00	.04	.39	0.01	3.0	160				85	79	8.3
	(1059)												
	θ = 60	Vm = 35.20		ΔH = 1.28							Avg. = 80.0		

C-3

S 00370

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Kawneer Source Exhaust Plant Stack Method 5 Filter holder: 4" Glass
Date 8-3-93 Test 1 Run 2
No. of traverse points 24 Filter type:

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 8 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5-5-64

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	594	100	394
Impinger No. 3		0	
Condenser			
Desiccant	1280	1269	11
Total			405

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 6 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1123 (HRS) Time end: 1229 (HRS)
Sampling rate: 400 cc/min Operator: ET
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

CF-...

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: SHAMROCK ENTERPRISES — Operator: ET-GH — Pitot No.: 23V-6 — Cp: .840
Source: ASPHALT PLANT STACK — Meter Box No.: 2 — ΔH@ 1.92 IN WC — Bar. Press.: 28.94 inHg H2O X
Date: 5-3-93 — Test: 1 — Run: 2 — Computer conft.: .9983 — Nozzle No.: 2-6 — Nozzle Dia: .360 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 (x v/v)
	1122	410.30											
B 12	2.5	412.14	.20	1.83	2.15	√.0	163	23√	237	41	78	77	9.0
11	5	414.13	.23	2.13	4.17	5.8	161				79	77	9.0
10	7.5	415.94	.19	1.73	5.97	√.2	161	241	245	46	81	78	9.5
9	10	418.20	.30	2.74	8.24	7.8	161				83	78	9.9
8	12.5	419.90	.15	1.38	9.86	√.0	161	245	251	50	83	78	10.9
7	15	421.75	.20	1.83	1.72	√.4	161				86	79	9.4
6	17.5	422.95	.07	.64	2.93	3.1	160	242	250	50	86	79	9.7
5	20	423.90	.06	.5√	3.86	3.0	159				86	79	10.1
4	22.5	424.80	.05	.46	4.79	3.0	159	240	252	53	86	80	9.5
3	25	425.70	.04	.37	5.64	2.8	159				86	80	9.5
2	27.5	426.45	.04	.37	6.48	2.8	159	243	250	50	86	80	9.3
1	30	427.35	.04	.37	7.32	2.8	159				86	80	9.4
A 12	32.5	428.85	.12	1.11	8.77	4.1	161	245	255	48	86	80	10.1
11	35	430.80	.24	2.21	0.81	6.5	161				87	81	9.9
10	37.5	432.70	.20	1.84	2.69	6.2	162	247	251	51	88	81	10.3
9	40	434.75	.24	2.21	4.74	6.8	162				89	82	10.9
8	42.5	436.90	.26	2.40	6.87	7.0	162	245	249	53	89	82	10.5
7	45	438.84	.22	2.03	8.84	6.9	164				90	82	9.9
6	47.5	440.90	.14	1.29	0.41	√.√	164	244	251	53	90	82	10.1
5	50	442.20	.18	1.66	2.19	√.8	164				91	83	10.3
4	52.5	444.05	.20	1.71	4.00	6.0	165	240	247	50	91	83	10.4
3	55	445.50	.12	1.03	5.41	4.2	164				91	83	10.3
2	57.5	446.80	.12	1.03	6.81	4.2	165	243	250	52	91	83	9.9
1	60	448.10	.10	.86	8.09	4.1	165				91	83	9.9
	(1230)												
	θ = 60	Vm = 37.80		^H = 1.41							Avg. = 83 5		

C-5

C 00270

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job Shamrock Date 8/3/93 Test 1 Run 3
Source Asphalt Plant Stack No. of traverse points 24
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 9 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 5565

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			
Impinger No. 2	575	200	375
Impinger No. 3			
Condenser			
Desiccant	1310	1291	19
Total			394

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 6 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1244 (HRS) Time end: 1350 (HRS)
Sampling rate: 400 cc/min Operator: E.T
S/N of O_2 Analyzer used to monitor train outlet: 1

CF-023

CF-

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job SHAMROCK ENTERPRISES — Operators ET-GH — Pitot No. 23V-6 — Cp .840
Source ASPHALT PLANT STACK — Meter Box No. 7 — ΔH 1.92 IN WC — Bar. Press. 28.94 inHg H2O X
Date 8-3-93 — Test 1 — Run 3 — Calibr coeff. .9955 — Nozzle No. 7-5 — Nozzle Dia .376 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)
	1248	448.40											
A 12	2.5	450.34	.23	1.96	0.37	5.9	165	234	240	46	81	80	10.9
11	5	452.30	.24	2.03	2.28	6.0	165				84	80	10.9
10	7.5	454.29	.26	2.21	4.32	6.8	165	239	242	48	85	80	10.3
9	10	456.55	.32	2.71	6.59	8.1	166				85	80	10.5
8	12.5	458.70	.28	2.37	8.71	8.0	166	240	245	51	85	80	10.7
7	15	460.62	.24	2.04	0.67	7.0	166				84	81	10.9
6	17.5	462.51	.21	1.78	2.57	4.5	166	242	244	53	87	81	10.2
5	20	464.31	.20	1.70	4.31	6.2	167				87	81	10.3
4	22.5	466.11	.20	1.70	6.10	4.2	167	240	246	53	88	82	10.5
3	25	467.52	.12	1.02	7.50	4.5	166				88	82	10.3
2	27.5	468.81	.11	.94	8.84	4.2	166	240	244	55	88	82	10.0
1	30	470.15	.10	.85	0.12	4.0	165				88	82	9.7
B 12	32.5	472.00	.22	1.88	2.01	4.1	165	242	246	52	88	82	10.5
11	35	474.03	.24	2.05	3.99	6.3	165				88	82	9.9
10	37.5	475.72	.20	1.71	5.79	6.2	164	240	245	55	90	83	10.1
9	40	477.50	.18	1.55	7.51	6.2	160				91	84	9.9
8	42.5	478.45	.12	1.04	8.93	5.0	159	240	247	56	91	84	10.1
7	45	480.25	.10	.87	0.22	4.1	159				91	84	10.4
6	47.5	481.40	.08	.69	1.37	3.9	161	245	245	56	90	84	10.5
5	50	482.40	.06	.52	2.37	3.0	160				90	84	10.4
4	52.5	483.20	.04	.34	3.18	3.0	162	244	245	56	84	83	10.5
3	55	484.05	.04	.34	4.00	3.0	160				84	83	10.5
2	57.5	484.82	.04	.34	4.81	5.0	159	240	242	58	89	83	10.5
1	60	485.55	.03	.26	5.52		158				89	83	11.0
	(1351)												
	θ = 60	Vm = 37.15		ΔH = 1.5							Avg. = 84.9		

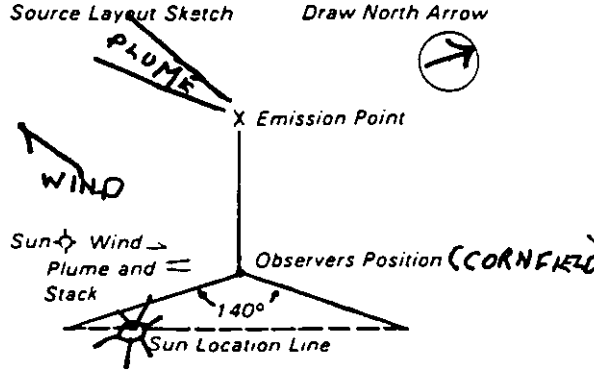
C-7

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

SOURCE NAME: SHAMROCK ENTERPRIZES	OBSERVATION DATE: 8-3-93	START TIME: 0950
ADDRESS:		STOP TIME: 1050
CITY: ORONOCO	STATE: MN	ZIP:
PHONE:	SOURCE ID NUMBER:	
PROCESS EQUIPMENT: ASPHALT PLANT	OPERATING MODE: FULL	
CONTROL EQUIPMENT: WET SCRUBBER	OPERATING MODE: FULL-180 TPH	
DESCRIBE EMISSION POINT: START STEEL STACK STOP STEEL STACK		
HEIGHT ABOVE GROUND LEVEL: START 55' STOP	HEIGHT RELATIVE TO OBSERVER: START 60 STOP	
DISTANCE FROM OBSERVER: START 225' STOP 225'	DIRECTION FROM OBSERVER: START WEST STOP WEST	
DESCRIBE EMISSIONS: START LOFTING PLUME STOP LOFTING PLUME		
EMISSION COLOR: START BROWN STOP BROWN	PLUME TYPE: CONTINUOUS X FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☐ YES X	IF WATER DROPLET PLUME: ATTACHED X DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START 75'E-SE OF STACK STOP 75'E-SE OF STACK		
DESCRIBE BACKGROUND: START SKY STOP SKY		
BACKGROUND COLOR: START WHITE/BLUE STOP BLUE	SKY CONDITIONS: START CLOUDY STOP CLOUDY	
WIND SPEED: 13-18 MPH START MOD STOP MODERATE	WIND DIRECTION: START EAST STOP	
AMBIENT TEMP: START 64 STOP 64	WET BULB TEMP:	RH, percent: 59%

Source Layout Sketch — Draw North Arrow



SEC / MIN	0	15	30	45	SEC / MIN	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	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

AVERAGE OPACITY FOR HIGHEST PERIOD: 0%	NUMBER OF READINGS ABOVE: 0 % WERE 0
RANGE OF OPACITY READINGS: MINIMUM 0	MAXIMUM 0
OBSERVER'S NAME (PRINT): GARY HOVE	
OBSERVER'S SIGNATURE: Gary Hove	DATE: 8-3-93
ORGANIZATION: INTERPOLL	
CERTIFIED BY: WIS. DNR	DATE: 4-93
VERIFIED BY:	DATE:

COMMENTS:

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

S-0079R

WISCONSIN
DEPT. OF NATURAL RESOURCES
George E. Meyer
Secretary

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

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

April 19, 1993

File Code: 4500

Mr. Gary Hove
Interpoll Labs.
4500 N.E. Ball Rd.
Circle Pines, MN 55014

Dear Mr. Hove:

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

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

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

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

This certification is valid until October 6, 1993.

Sincerely,

Andy Seeber, Environmental Specialist
Compliance Section
Bureau of Air Management

Enclosure

RECEIVED
APR 23 1993
INTERPOLL LABORATORIES

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL DATA

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job Shamrock
Team Leader ET
Date Submitted 8-3-93
Test No. 1
Date of Analysis 8-4-93

Source Asphalt Plant
Test Site Stack
Date of Test 8-3-93
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	9555-07	1	0.00	5.30	17.20	5.30	11.90	1.70
		2	0.00	5.30	17.20	5.30	11.90	1.70
	☑ B ☐ F	Avg				5.30	11.90	
1/2	-11	1	0.00	5.10	17.40	5.10	12.30	1.69
		2	0.00	5.10	17.40	5.10	12.30	1.69
	☑ B ☐ F	Avg				5.10	12.30	
1/3	-15	1	0.00	4.70	17.60	4.70	12.90	1.70
		2	0.00	4.70	17.60	4.70	12.90	1.70
	☑ B ☐ F	Avg				4.70	12.90	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

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

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

EPA Method 3 Guidelines

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

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

LSC.04.RP

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job Shamrock
Team Leader ET
Date Submitted 8-3-93
Test No. 1
Date of Analysis 8-11-93

Source Asphalt plant
Test Site Stack
Date of Test 8-3-93
No. of Runs Completed 3
Technician C. Helgeson

0	Test 1 Run 0 Field Blank Log Number 9555-03 Comments	Dish No. 18 Dish Tare Wt. 49.9871 g Dish+Sample Wt. 49.9874 g Sample Wt. 0.0003 g
1	Test 1 Run 1 Log Number -06 Comments	Dish No. 19 Dish Tare Wt. 48.9571 g Dish+Sample Wt. 48.9636 g Sample Wt. 0.0065 g
2	Test 1 Run 2 Log Number -10 Comments	Dish No. 21 Dish Tare Wt. 47.5281 g Dish+Sample Wt. 47.5432 g Sample Wt. 0.0151 g
3	Test 1 Run 3 Log Number -14 Comments	Dish No. 25 Dish Tare Wt. 44.3454 g Dish+Sample Wt. 44.3521 g Sample Wt. 0.0067 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. 0.0003g

Results:

Field Blk.	Run 1 ✓ Bank	Run 2	Run 3	Run 4	Run 5
	0.0062	0.0148	0.0064	D-2	

LSC-03.GR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job Shamrock
Team Leader ST
Date Submitted 8-3-93
Test No. 1
Date of Analysis 8-4-93
Transport Leakage ☒ None ☐ _____ ml

Source Asphalt Plant
Test Site Stack
Date of Test 8-3-93
No. of Runs Completed 3
Technician C. Nelson
Solvent Acetone

0	Test 1 Run 0 Field Blank Log Number 9555-01 Vol. of Solvent 150 ml *Solvent Residue 4.0 ug/ml	Dish No. 517 Dish Tare Wt. 48.5948 g Dish+Sample Wt. 48.5954 g Sample Wt. 0.0006 g
1	Test 1 Run 1 Vol. of Solvent 175 ml Log Number -04 Comments	Dish No. 608 Dish Tare Wt. 48.2805 g Dish+Sample Wt. 49.0057 g Sample Wt. 0.7252 g
2	Test 1 Run 2 Vol. of Solvent 210 ml Log Number -08 Comments	Dish No. 614 Dish Tare Wt. 44.4097 g Dish+Sample Wt. 45.1123 g Sample Wt. 0.7026 g
3	Test 1 Run 3 Vol. of Solvent 210 ml Log Number -12 Comments	Dish No. 619 Dish Tare Wt. 47.5515 g Dish+Sample Wt. 48.4087 g Sample Wt. 0.8572 g
4	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

*Solvent Residue ___ ug/ml = [(Sample Wt. 0.0006 g)(10⁶)]/Vol. of Sol. 150 ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.7245	0.7018	0.8564 D-3		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job Shamrock
Team Leader CT
Date Submitted 8-3-93
Test No. 1
Date of Analysis 8-4-93

Source Asphalt Plant
Test Site Stack
Date of Test 8-3-93
No. of Runs Completed 3
Technician C. Helgeson

	Test 1 Run 0 Field Blank Log Number 9555-02 Comments	Filter No. 5567 Filter Type 4"GF Filter Tare Wt. .4378 g Filter+Sample Wt. .4380 g Sample Wt. .0002 g
0		
1	Test 1 Run 1 Log Number -05 Comments	Filter No. 5562 Filter Type 4"GF Filter Tare Wt. .9274 g Filter+Sample Wt. 1.0647 g Sample Wt. 0.1373 g
2	Test 1 Run 2 Log Number -09 Comments	Filter No. 5564 Filter Type 4"GF Filter Tare Wt. .4308 g Filter+Sample Wt. 1.0712 g Sample Wt. 0.1404 g
3	Test 1 Run 3 Log Number -13 Comments	Filter No. 5565 Filter Type 4"GF Filter Tare Wt. .4375 g Filter+Sample Wt. 1.0594 g Sample Wt. 0.1219 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
	0.1373	0.1404	0.1219		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.8680	0.8570	0.4847		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job Shamrock
Field Engineer [illegible]
Date Submitted 8-3-93
Test No. 1

Source Asphalt Plant
Test Site Stack
Date of Test 8-3-93
No. of Runs Completed 3

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

Type of Source: Asphalt

Fuel Type:

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

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

APPENDIX E

ASPHALT PLANT INFORMATION SHEET

Interpoll Laboratories
(612)786-6020

Asphalt Plant Information Sheet

Manufacturer and Model No. of the Plant: Madson 408 Batch Plant

Owner and Operator of the Plant: Shamrock Enterprises Rochester, Mn. 55901
6415 Bandel Rd. N.W. "Kenny Mesenbring"

Location of Plant at time of Test (State, County and Address): 3161 85th St. N.W.
Rochester, Mn 55901

Estimated Total Time of the Plant at this Site (from when to when): 1979 - 1993

Type of Pollution Control Equipment (wet scrubber, mechanical collector, etc.: Wet 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: 180 GPM

Manufacturer recommended pressure drop across venturi: _____ IN.WC.

Rated Capacity of Asphalt Plant: 200 TONS/HR
at an aggregate moisture content of: 5 ~~4.7~~ %

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: ~~4.7~~ 5.54 %

NOTE: Attach drawings of plant and pollution control equipment.

Name of Individual Supplying Information: LaVane Fleischfresser

Date: 8-3-93

S-0150R(2)

APPENDIX F

ASPHALT PLANT OPERATING DATA

RECORD OF ASPHALT PLANT OPERATING CONDITIONS DURING COMPLIANCE TEST

Plant Mfr & Model: Madsen 408 Type: 0 - Drum mix
(0 - Conventional)

Test Date: 8-3-93 Location: Oronoco Plant Time: start 9:45 end 10:45

Pollution Control Equipment: 0 - Baghouse 0 - Venturi scrubber
0 - Cyclone (0 - Wet scrubber)

Fuel: Natural Gas If wet scrubbing: 100 % scrubber water recycled

No. of Burners: 1 Burner(s) rating: 1.5 MMBtu/h = 100 % setting

Time	Burner Setting %	Aggregate tph	Recycle tph	Asphalt tph	Total tph	Mix Temp F	Dust Collector Pressure Drop in WC	Scrubber Water Flow gpm	
9:55	4	132	70	8.118	200	290	10	180	
10:05	5	164	88	9.58	252	290	9.5	180	
10:15	5	164	88	9.58	252	290	9.5	180	14-21
10:25	4	143	73	8.21	216	~~290~~	9.5	180	27
10:35	4	143	73	8.21	216	~~290~~	9.5	180	39
10:45	5.5	164	88	9.58	252	290	10	180	51
10:55	5.5	164	88	9.58	252	290	9	180	
									60

Moisture Content in the Aggregates

	Run No. 1	Run No. 2	Run No. 3
Virgin	4.5%		
Recycle	2.4		
Combined	6.9%		

Production Specific Fuel Usage

0 - measured
0 - calculated *

_____ cu ft/ton hot mix

_____ gal/ton hot mix

* attach schedule per Test Plan F.6

Signature: [signature] date: 8-3-93
cognisant official

Sand - 3.5%
Coarse - 3.8%
Fines -

Kathy E.

S-319RR

RECORD OF ASPHALT PLANT OPERATING CONDITIONS DURING COMPLIANCE TEST

Plant Mfr & Model: Madson 408 Type: 0 - Drum mix
(0 - Conventional)

Test Date: 8-3-93 Location: Orange Plant Time: start 11.20 end 12:20

Pollution Control Equipment: 0 - Baghouse 0 - Venturi scrubber
0 - Cyclone (0 - Wet scrubber)

Fuel: Natural Gas If wet scrubbing: 100 % scrubber water recycled

No. of Burners: 1 Burner(s) rating: 1.5 MMBtu/h = 100 % setting

Time	Burner Setting %	Aggregate tph	Recycle tph	Asphalt tph	Total tph	Mix Temp F	Dust Collector Pressure Drop in WC	Scrubber Water Flow gpm	
11:20	5	145	78	8.09	231	295	10	180	
11:30	4	145	78	8.09	231	295	9.0	180	99
11:40	4	145	78	8.09	231	295	10	180	108
11:50	4	145	78	8.09	231	300	10	180	
12:00	4	145	78	8.09	231	295	10	180	117
12:10	3.5	164	88	9.58	252	290	10	180	133
12:20	4	164	88	9.58	252	290	10	180	
									138

Moisture Content in the Aggregates

	Run No. 1	Run No. 2	Run No. 3
Virgin		4.1 %	
Recycle		3.1 %	
Combined		7.2 %	

Production Specific Fuel Usage

0 - measured
0 - calculated *

_____ cu ft/ton hot mix

_____ gal/ton hot mix

* attach schedule per Test Plan F.6

Signature: LaVaun Thuff date: 8-3-93
cognisant official

3.5

S-319RR

RECORD OF ASPHALT PLANT OPERATING CONDITIONS DURING COMPLIANCE TEST

Plant Mfr & Model: Madson 408 Type: O - Drum mix
(O - Conventional)

Test Date: 8-3-93 Location: Orocco Plant Time: start 12:45 end 1:45

Pollution Control Equipment: O - Baghouse O - Venturi scrubber
O - Cyclone (O - Wet scrubber)

Fuel: Natural Gas If wet scrubbing: 100 % scrubber water recycled

No. of Burners: 1 Burner(s) rating: 1.5 MMBtu/h = 100 % setting

Time	Burner Setting %	Aggregate tph	Recycle tph	Asphalt tph	Total tph	Mix Temp F	Dust Collector Pressure Drop in WC	Scrubber Water Flow gpm
1245	4	164	88	9.58	252		10.5	180
1255	4	164	88	9.58	252		10	180
105	3.5	164	88	9.58	252		10	180
115	4	145	78	8.09	231		9.5	180
125	4	164	88	9.58	252		10	180
135	3.5	145	78	8.09	231		10	180
145	3.5	164	88	9.58	252		10	180

Moisture Content in the Aggregates

	Run No. 1	Run No. 2	Run No. 3
Virgin			4.3 %
Recycle			5.5 %
Combined			9.8 %

Production Specific Fuel Usage

O - measured
O - calculated *

_____ cu ft/ton hot mix

_____ gal/ton hot mix

* attach schedule per Test Plan F.6

Signature: LaVane Shurtleff date: 8-3-93
cognisant official

S-319RR

APPENDIX G

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.

3a P1(1-5)

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 °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.

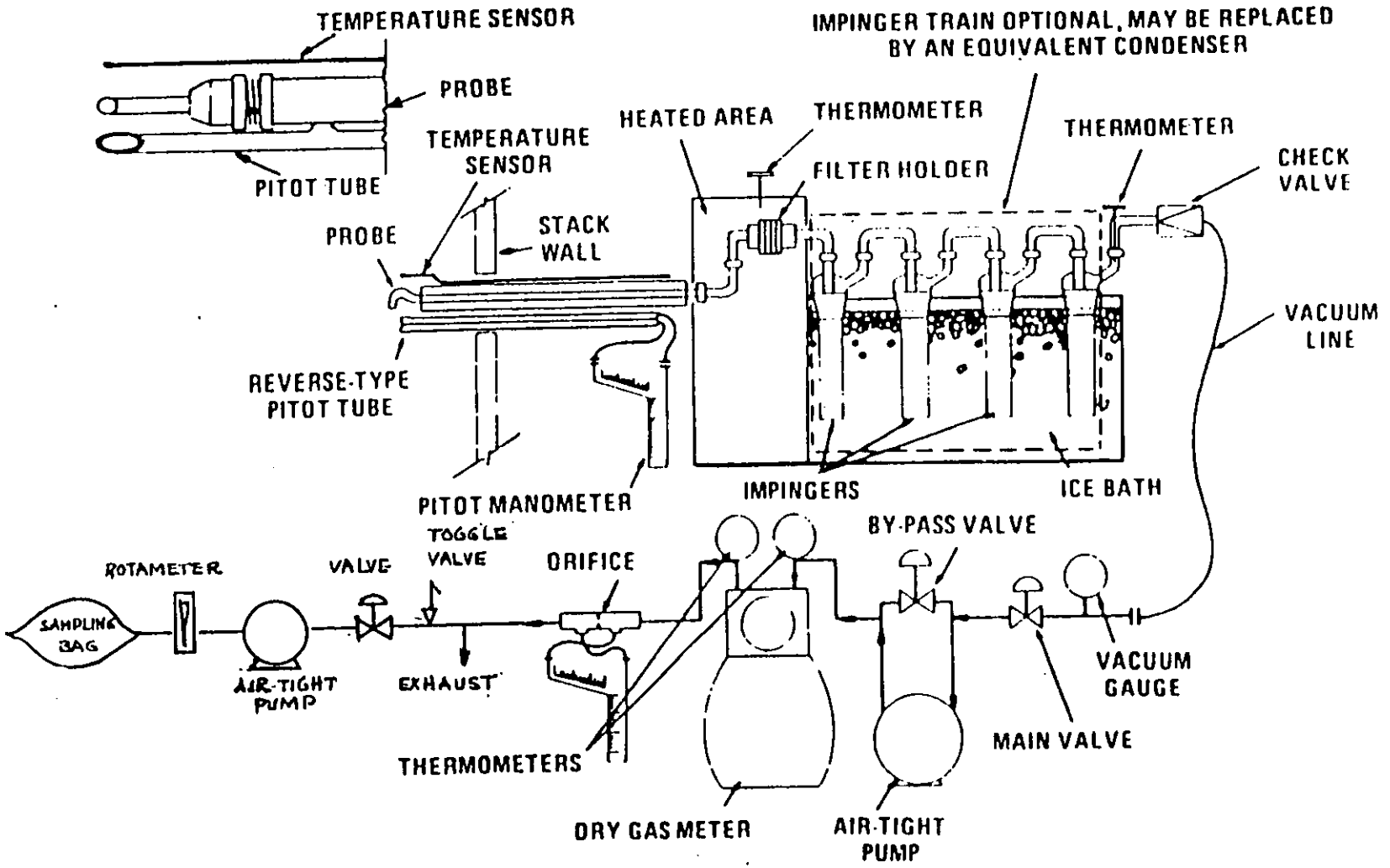
   Wisconsin - Use Method II-8672-WI.

   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 H

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, ^{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.

Y = 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 I

SAMPLING TRAIN CALIBRATION DATA

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

Job Shamrock Date 8-3-93

Operator E. Crawford Module No. 7

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 28.94 in. Hg. $_T$ = .9983 ^H@ 1.97 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(367.00)	[redacted]	
2.5	368.88	72	69
5.0	370.77	76	71
7.5	372.44	77	72
10	374.56	78	73
[redacted]	V_m= 7.56	Avg(t_m)= 73.5 °F	

Calculate Y_{cn} as follows:

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

$$Y_{cn} = \frac{1.786}{(\quad)(\quad)}\left[\frac{(75.5) + 460}{(28.94)}\right]^{0.5} \quad 4.2935$$

$$Y_{cn} = 1.0160$$

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: August 5, 1993

Meter Box No. : 7 (Rockwell Dry Test Meter Serial No. 965550)

Date of Last Calibration: June 23, 1993
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 23, 1993	3-9197	218.30	225.20	6.90	6.90
June 25, 1993	3-9202	254.25	523.82	269.57	276.47
June 29, 1993	3-9289	524.60	957.44	432.84	709.31
July 27, 1993	3-9554	957.60	1362.51	404.91	1114.22
August 3, 1993	3-9555	1367.00	1485.55	118.55	1232.77

* Total volume through meter since last calibration.

Date 6-23-93

Bar. Press. 28.95 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 7
Serial No. DTM 965550
Wet Test Meter No. AL-20
Technician E Trowbridge

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index Y (%)	* 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. ΔH@	C_f
							Wet Test	Dry Test					
nominal	actual				V_{di}	V_{df}	t_w (°F)	t_{di} (°F)	t_{do} (°F)				
0.5	.5	2	99.85	0.01	237.000	239.035	72	80	76	5/05	.9911	1.87	
1.2	1.2	3	99.91	0.025	233.000	236.050	72	82	76	5/05	.9925	1.98	
2.0	2.0	3	99.93	0.055	239.500	242.550	72	86	79	3/58	.9911	2.00	
3.3	3.3	5	100.00	0.09	243.000	248.060	72	91	81	5/09	1.0054	1.98	
4.7	4.7	5	100.02	0.12	249.000	254.070	72	95	83	4/22	1.0055	2.02	
8	8	4	5	6	7		8	8	10	11/13	.9983	1.97	

Positive leak check performed by ET

Meter was in tolerance ☒

Meter was not in tolerance ☐; readjusted linkage

Meter was not in tolerance ☐; changed dry test meters

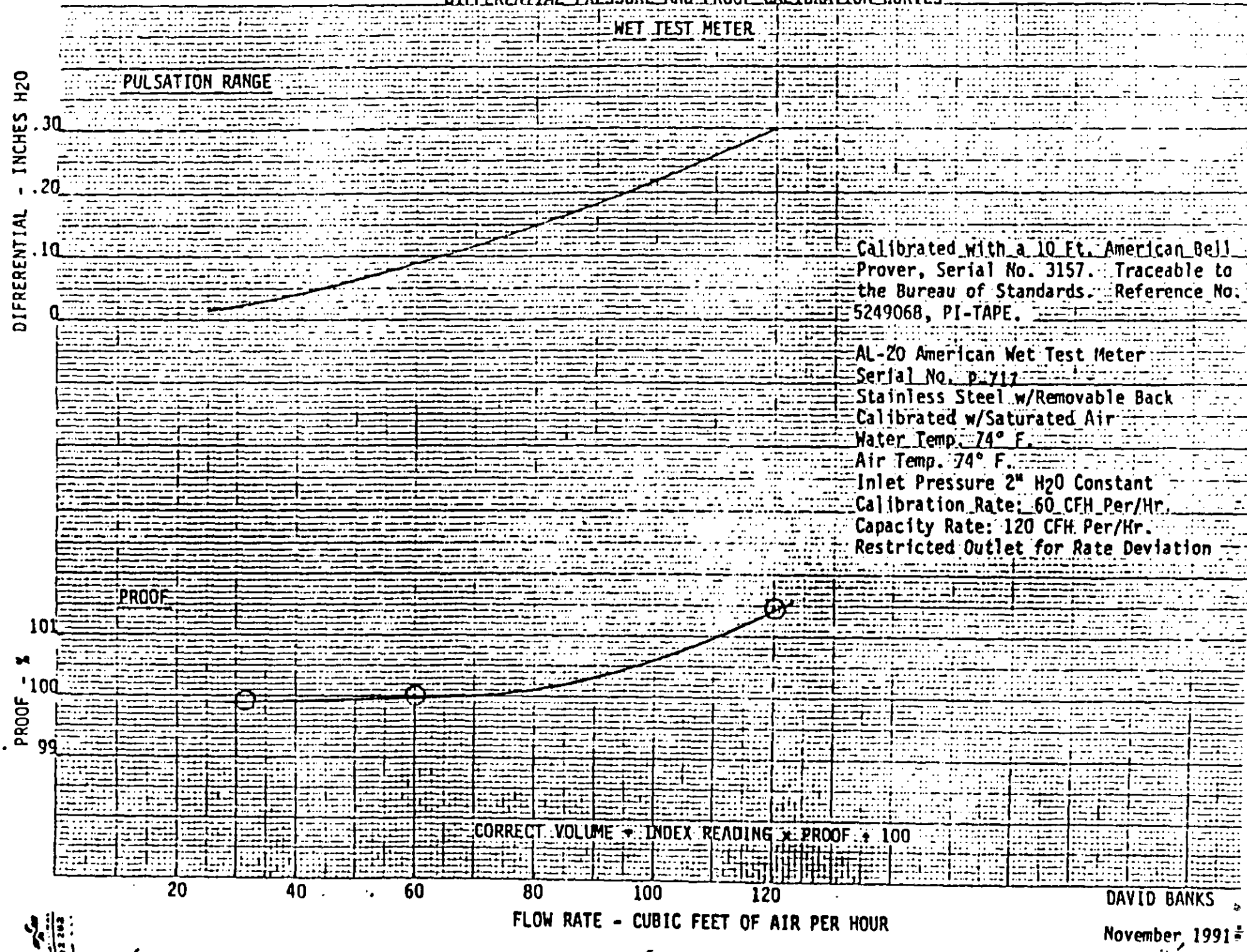
Approved by Daniel L Deyo Date 6/25/93

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

S0102RR 11/91

DIFFERENTIAL PRESSURE AND PROOF CALIBRATION CURVES

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: 8-3-93 Nozzle Number 7-6
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	.361
2	.359
3	.360
Average:	.360

Interpoll Laboratories, Inc.

Temperature Measurement Device Calibration Sheet

Unit under test:
Vendor Fluke
Model 51
Range 0 - 2 °F
Date of Calibration 7-6-93

PDT-12
Serial Number 5030376
Thermocouple Type K
Technician E. TROWBRIDGE

Method of Calibration:

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

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

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0	1.2	1.2	.24
100	100	100.2	.2	.03
200	200	202.2	2.2	.33
300	300	301.2	1.2	.15
400	400	399.6	.4	.04
500	500	500.0	0	0
600	600	601.8	1.8	.17
700	700	699.8	.2	.02
800	800	801.4	1.4	.11
900	900	899.8	.2	.01
1000	1000	1001.6	1.6	.11
1100	1100	1101	1	.06
1200	1200	1203.2	3.2	.19
1300	1300	1300	0	0
1400	1400	1403.4	3.4	.18
1500	1500	1500.8	.8	.04
1600	1600	1601.8	1.8	.08
1700	1700	1700.2	.2	.01
1800	1800	1802	2.0	.09
1900	1900	1898.2	1.8	.07
2000	2000	2001.4	1.4	.05
2100	2100	2098.4	1.6	.06
		Averages:	1.25	.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

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 23-6

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .461 IN.

Alignment:

4. α_1 <10° 1
5. α_2 <10° 1

6. B_1 <5° 1
7. B_2 < 5° 2

8. Z <.125" .02
9. W <.0625" .02

Distance from Pitot to Probe Components:

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

☒ Meets all EPA design criteria thus C_p = 0.84

☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
C_p = _____

Date of Inspection: 4-7-93

Inspected by: E. Turbeville

CFR Title 40 Part 60 Appendix A Method 2

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