environmental testing inc.

SOURCE SAMPLING REPORT

FOR

SMITH & SONS PAVING COMPANY

Pineola, North Carolina

Performed by:
ENVIRONMENTAL TESTING, INC.
Charlotte, North Carolina

Larson Harsey 6-10-88
F. Larson Harsey
June 1988

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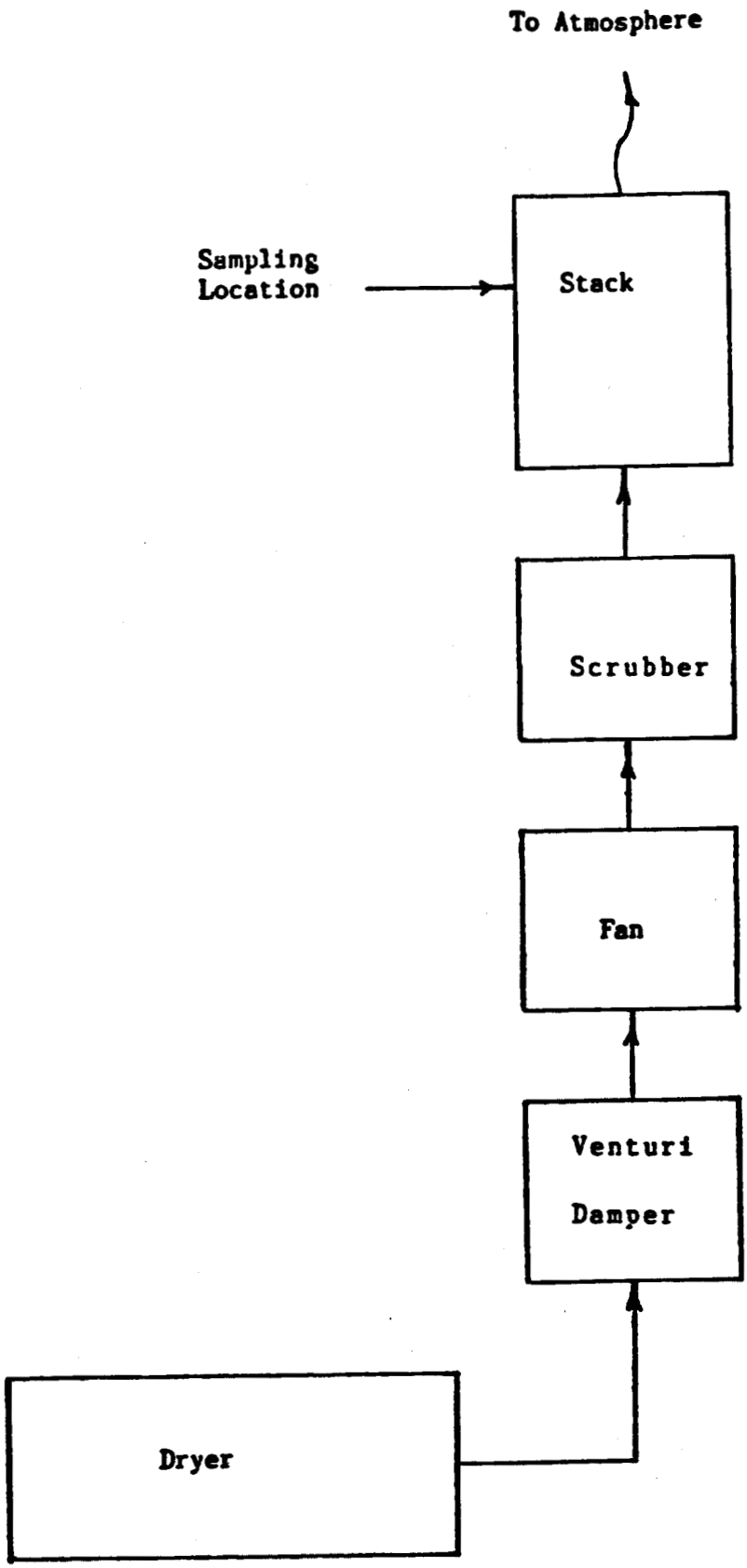
INTRODUCTION

Source sampling was performed for Smith & Sons Paving Company, Pineola, North Carolina, asphalt plant to determine particulate and visual emissions from the aggregate drying operation. Three sampling runs were made on June 8, 1988 at the sampling location shown on Figure 1.

The measurements of stack gas flow rate and pollutant concentrations and visual emissions were made according to U.S. Environmental Protection Agency and the North Carolina Department of Natural Resources and Community Development recommendations (DNRCD). Mr.Steve Maynard was present as an observer.

The following sections of the report treat the summary of results, the process and its operation, the location of the sampling points and the sampling and analytical procedures used.



FLOW DIAGRAM

Figure 1

SUMMARY OF RESULTS

Table 1 presents the summary of results from the particulate sampling. The mean particulate concentration was 0.0145 grains per dry standard cubic foot. The mean particulate emission rate was 1.816 pounds per hour. The process weight averaged 75.67 tons per hour for the three runs.

Based on the results of the particulate sampling, Simth & Sons Paving Company Pineola, North Carolina asphalt plant was in compliance with the permit limitation of 0.04 grains per dry standard cubic foot.

Opacity was determined as the average of 24 consecutive observations recorded at 15 second intervals. Thirty sets of 24 consecutive readings (6 minutes each) were averaged and presented on the summary sheet found in Appendix B for the 180 minute test.

Based on the results of the visual emission readings Smith & Sons Paving Company was in compliance with the permit limitation of 20 percent opacity.

TABLE 1

SUMMARY OF RESULTS, PARTICULATE SAMPLING

Run Number	1	2	3
Date	06/08/88	06/08/88	06/08/88
% Isokinetic	97.79	104.27	106.25
Volume of Gas Sampled, SCF * Dry	42.721	44.240	45.408
Stack Gas Flow Rate, SCFM * Dry	14842.5	14414.7	14519.3
Stack Gas Flow Rate, ACFM	21402.6	21029.4	21110.1
Particulate:			
Catch, mgrams	54.34	41.38	27.87
Concentration, grains/ SCF * Dry	0.0196	0.0144	0.0095
Emission Rate, lbs/hr	2.492	1.779	1.176

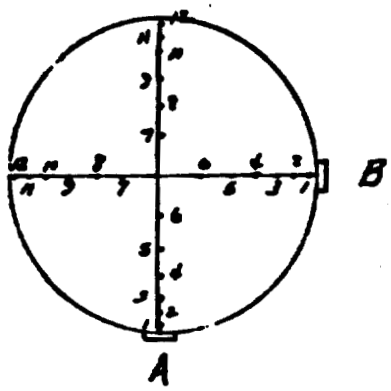
*68'F, 29.92 in. Hg
**Nozzle, probe, filter

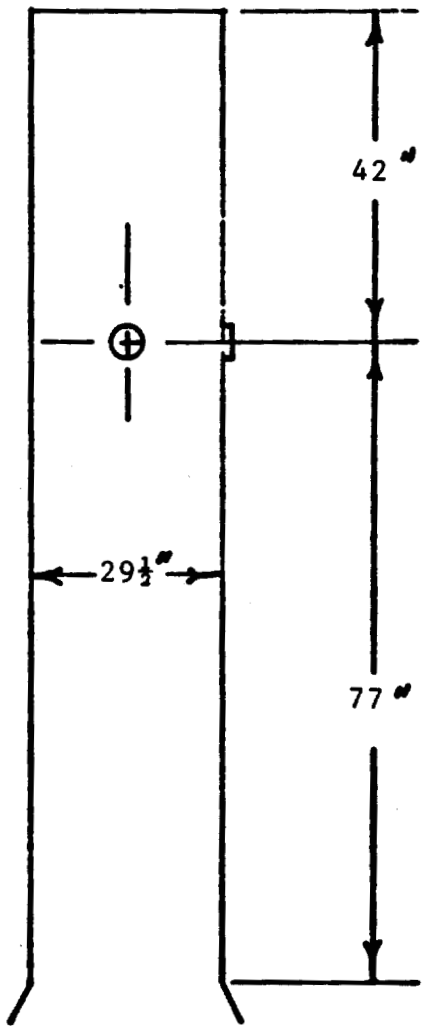
PROCESS DESCRIPTION AND OPERATION

The Smith & Sons Paving Company, Pineola, North Carolina, plant produced hot mix asphalt which was made from asphalt cement, sand, and granite aggregates. The materials were dried in a rotary dryer which was fired with a single burner. The fuel was No. 2 fuel oil. The aggregates were mixed in the first part of the rotary dryer and coated with asphalt in the second part of the dryer. Hot mixed asphalt was then conveyed to a storage silo. Air from the dryer went to a venturi damper, a fan, scrubber, and stack to the atmosphere. The plant was made by TODD of Cleveland, Tennessee.

LOCATION OF SAMPLING POINTS

The dimensions of the stack and the location of the sampling points are shown in Figure 2. The stack cross section was divided into 24 equal areas. The ports were labeled A and B. Each point was sampled for a period of 2 1/2 minutes per point which yielded a total test time of 60 minutes per run. The number of sampling points was determined by the distance from the last disturbance in the gas flow as outlined in Method 1, Federal Register, Volume 48, No. 191, 30 September 1983.





LOCATION OF SAMPLING POINTS

Figure 2

SAMPLING AND ANALYTICAL PROCEDURES

All sampling and analytical procedures used were those recommended by the U.S. Environmental Protection Agency and the N.C. DNRCD. Complete details are found in Appendix E which is a copy of the Federal Register, Volume 42, Number 160, dated 18 August 1977, and Federal Register, Volume 48, No. 191, 30 September 1983, and Federal Register, Volume 39, No. 219, 12 November 1974.

Sample point locations and velocity measurements were made by Methods 1 and 2. Gas composition was determined by Method 3 on continuous bag samples. Method 5 was used for the particulate determination. Method 9 was used for determining visual emissions.

APPENDICES

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Summary of Method 5 Particulate Results

Smith & Sons Paving Co. Pineola NC

Run Number		1	2	3
Date		6/ 8/88	6/ 8/88	6/ 8/88
DN	Sample nozzle dia., in.	0.207	0.207	0.207
TT	Net time of test	60	60	60
PB	Barometric pressure, in. Hg.	26.01	26.01	26.01
PM	Average orifice pressure drop, in. H2O	2.229	2.429	2.472
VM	Volume of dry gas sampled, cu. ft. at meter conditions	52.49	55.43	56.21
TM	Average gas meter temp. in degrees F.	107.29	118.81	111.94
VMSTD	Volume of dry gas sampled at standard conditions*, SCF	42.721	44.240	45.408
VW	Total water collected in impingers + silica gel, ML.	126.8	136.9	141.1
VMV	Volume of water vapor at standard conditions*, SCF	5.971	6.447	6.644
PMV	Percent moisture by volume	12.263	12.719	12.765
MD	Mole fraction dry gas	0.8774	0.8728	0.8724
PCO2	Percent CO2 by volume, dry	2.97	2.80	2.80
PO2	Percent O2 by volume, dry	17.13	17.30	17.30
PCO	Percent CO by volume, dry	0.00	0.00	0.00
PN2	Percent N2 by volume, dry	79.90	79.90	79.90
MWD	Molecular weight-dry stack gas	29.160	29.140	29.140
MW	Molecular weight-stack gas	27.792	27.723	27.718
CP	Pitot tube coefficient	0.84	0.84	0.84
DPS	Average velocity head of stack gas, inches water	1.1631	1.1377	1.1442
TS	Average stack temperature, F	119.92	123.67	121.38

PSI	Static pressure of stack gas, inches Hg.	-0.025	-0.025	-0.025
PS	Stack pressure, absolute	25.985	25.985	25.985
VS	Average stack velocity, FPM	4490.8	4412.5	4429.5
AS	Stack area, inches sqrd.	683.5	683.5	683.5
QS	Stack flow rate, dry, standard conditions, DSCFM	14842.5	14414.7	14519.3
QSW	Stack flow rate, wet, standard conditions, WSCFM	16917.0	16515.2	16643.9
QA	Actual stack flow rate, ACFM	21402.6	21029.4	21110.1
PERI	Percent isokinetic	97.79	104.27	106.25
FMF	Particulate, Mg., front	54.34	41.38	27.87
CAN	Particulate, GR/DSCF front	0.0196	0.0144	0.0095
CAM	Particulate, GR/WSCF front	0.0223	0.0165	0.0108
CAT	Particulate, GR/ACF front	0.0136	0.0099	0.0065
CAW	Particulate, LB/HR front	2.492	1.779	1.176
FNP	Net sampling points	24	24	24
RW	Process weight, tons/hr	80.0	75.0	72.0

*68 Degrees F. 29.92 Inches Hg.

Method 5 Particulate Calculations Test Number 1

Smith & Sons Paving Co. Pineola NC

Volume of Dry Gas Sampled at Standard Conditions

$$VMSTD = \frac{17.64 * VM * (PB + PM / 13.6)}{TM + 460} = 42.721$$

Volume of Water Vapor at Standard Conditions

$$VMV = 0.04709 * VW = 5.971$$

Percent Moisture in Stack Gas

$$PMV = \frac{100 * VMV}{VMSTD + VMV} = 12.263$$

Mole Fraction of Dry Gas

$$MD = \frac{100 - PMV}{100} = 0.8774$$

Average Molecular Weight of Dry Stack Gas

$$MWD = 0.44 * PCO2 + 0.32 * PO2 + 0.28 * (PN2+PCO) = 29.160$$

Molecular Weight of Stack Gas

$$MW = MWD * MD + 18 * (1-MD) = 27.792$$

Stack Gas Velocity at Stack Conditions

$$VS = 5129.4 * CP * DPS * SQRT(TS + 460) / (PS * MW) = 4490.8$$

Stack Gas Volumetric Flow at Standard Conditions, Dry

$$QS = \frac{0.123 * VS * AS * PS * MD}{TS + 460} = 14842.5$$

Stack Gas Volumetric Flow at Stack Conditions

$$QA = \frac{QS * (TS + 460)}{17.64 * PS * MD} = 21402.6$$

Percent Isokinetic

$$PERI = \frac{1039 * (TS + 460) * VMSTD}{VS * TT * PS * MD * DN * DN} = 97.79$$

Particulate Loading -- Probe, Cyclone, Filter
(At Standard Conditions)
CAN = 0.0154 * FMF / VMSTD = 0.0196

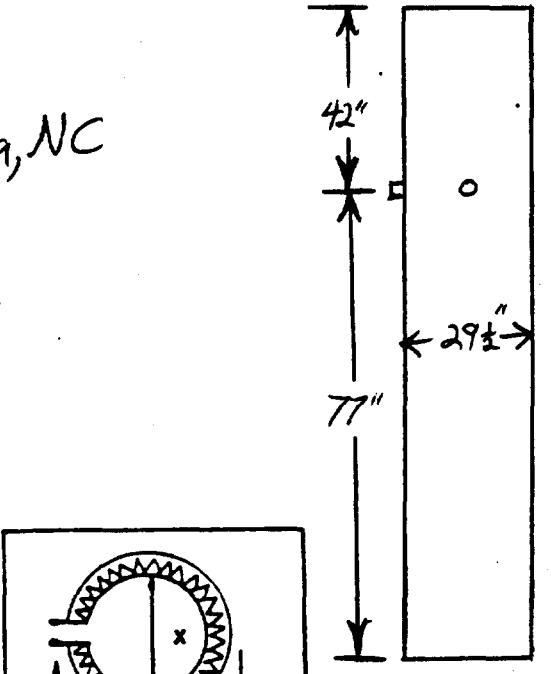
Particulate Loading -- Probe, Cyclone, Filter
(At Stack Conditions)

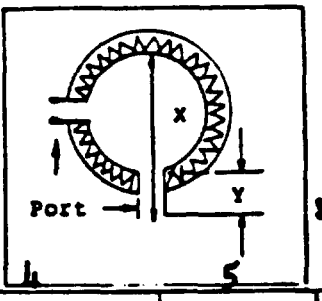
$$CAT = \frac{17.64 * CAN * PS * MD}{TS + 460} = 0.0136$$

Particulate Lb/Hr -- Probe, Cyclone, Filter
(At Standard Conditions)
CAW = 0.00857 * CAN * QS = 2.492

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant Smith + Sons Paving Co. - Pineda, NC
Date 05-24-88 — Test 6-8-88
Sampling location Stack
Inside of far wall to outside of nipple (I) 32.5"
Inside of near wall to outside of nipple (nipple length) (I) 3.0"
Stack I.D. (X-I) 29.5"
Nearest upstream disturbance 1.4 dd
Nearest downstream disturbance 2.6 dd
Calculated by FLH





SCHEMATIC OF SAMPLING LOCATION

1 TRAVERSE POINT NUMBER	2 FRACTION OF STACK I D	3 STACK I D	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	NIPPLE LENGTH	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.021	29.5"	0.62	3.0"	3.62
2	0.067		1.98		4.98
3	0.118		3.48		6.48
4	0.177		5.22		8.22
5	0.250		7.38		10.38
6	0.356		10.50		13.50
7	0.644		19.00		22.00
8	0.750		22.12		25.12
9	0.823		24.28		27.28
10	0.882		26.02		29.02
11	0.933		27.52		30.52
12	0.979	↓	28.88	↓	31.88

METHOD 2 GAS VELOCITY AND CYCLONIC FLOW DETERMINATION

Plant and City Smith-Sons Paving Co. - Pineola, NC Run Date 6-8-88

Sampling Location Asphalt Plant Clock Time 0715

Run Number 1 Operator FLH-RHL Amb. Temp., °F 53

Bar. Press., in. Hg 26.01 Static Press., in. H_2O -0.34

Stack Press., in. Hg 25.985 Static Press., in. Hg -0.025

Stack Dimension, in. - Diam. or side 1 29½ side 2 —

Pitot Tube (C_p) 0.84 Pitot Tube Leak Check <0.1 @ 4.2 in. H_2O

* Replaced Fan Motor

Field data

Traverse point number	Position, in.	Velocity head (Δp_s), in. H_2O A	Velocity head (Δp_s), in. H_2O B	Stack temp., °F A	Stack temp., °F B	Cyclonic flow determination: Δp_s at 0° reference A	Δp_s at 0° reference B	Angle (α) which yields a null Δp A	Angle (α) which yields a null Δp B
1	3.62	0.57	0.53	119	119	0.11	0.12	7	7
2	4.48	0.63	0.58			0.13	0.14	8	5
3	6.48	0.70	0.67			0.10	0.13	5	3
4	8.22	0.68	0.63			0.11	0.07	6	4
5	10.38	0.69	0.64			0.05	0.03	4	2
6	13.52	0.71	0.72			0.03	0.03	3	2
7	22.00	0.70	0.93			0.04	0.03	1	01
8	25.12	0.74	0.87			0.02	0.05	3	1
9	27.28	0.67	0.81			0.04	0.04	3	2
10	29.02	0.61	0.79			0.03	0.03	1	1
11	30.52	0.48	0.71			0.01	0.01	2	2
12	31.88	0.45	0.54			0.02	0.01	1	1
			ΔP 0.66						
1		1.80	1.85	120	121				
2		1.93	1.80						
3		1.85	1.65						
4		1.70	1.60						
5		1.45	1.40						
6		1.10	1.30	121					
7		1.05	1.05						
8		1.15	1.00						
9		0.99	1.10						
10		0.44	1.35						
11		1.05	1.30						
12		1.15	1.20						
		ΔP 1.26	1.36						

* New Fan

Average angle (α)[a] 3.1

[a] Average of (α) must be < 10 degrees to be acceptable.

NOMAGRAPH DATA

#1348 → 1.86

$\Delta H_@$ ~~1.82~~ 1.86 T_m ~~95~~ 105 %M ~16% P_s/P_m 1.0 C .89 D_b 121

$\overline{\Delta p}$ ~~0.66~~ 1.36 T_s 120 DN_c .198 DN_a 0.207 Ref. Δp 1.12 W_b 121

METHOD 5 PARTICULATE FIELD DATA

Plant Smith+Sons Paving - Pineda, N.C.
Run No. 1
Location Asphalt Plant
Date 6-8-88
Operator FLH-RHL
Sample Box No. 1
Meter Box No. ~~1267~~ 1348
Filter No. 41
Probe No. 4' #4
Pitot Tube Cp 0.84

Very Important — Fill in All Blanks
Leak Checks: Beg. @ 15" 0.006
End @ 7" 0.005
Pitot Tube: + @ 4.3 "H_2O
− @ 4.3 "H_2O
Static Pressure: −0.34 "H_2O
Start: 1135
Finish: 1238
Observer Steve Maynard Agency NCDNRCD

Bar. Press. "Hg 26.01
Meter Box ΔH@ 1.86 Y = 1.00
Assumed Tm, °F 105
Dry Bulb, °F 121
Wet Bulb, °F 121
Db - Wb, °F 0
Assumed Moisture % ≈16 %
Ps/Pm 1.0
C Factor 0.89

Ambient Temp., °F 80
Heater Box Setting, °F 250
Probe Tip Dia., in. 0.207
Probe Length 4' glass lined
Probe Heater Setting 85%
Average Δp 1.36 Δp 1.12
Average ΔH 2.20 ΔH Ref
Process Weight 80 tons/hr
Steam Load —
Steam Pressure —

Point	Clock Time	Dry Gas Meter, Cu. Ft.	Pitot Manometer (Δp) in H_2O	Orifice Manometer (ΔH) in H_2O Desired	Orifice Manometer (ΔH) in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum in Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Temp °F	% CO_2	% O_2
1	0	257.00	1.80	2.95	2.95	80	86	4.5	240	48	118		
2	2½	259.50	1.85	3.00	3.00	93	86	5.0	245	49	118		
3	5	262.00	1.65	2.70	2.70	98	87	4.2	250	50	118		
4	7½	264.38	1.55	2.50	2.50	102	89	3.8	250	51	117		
5	10	266.69	1.40	2.30	2.30	106	90	3.5	255	51	117		
6	12½	268.96	1.15	1.89	1.89	110	91	3.1	250	51	119		
7	15	271.02	1.05	1.70	1.70	112	92	2.8	245	52	119		
8	17½	272.96	0.96	1.56	1.56	115	92	2.5	245	53	119		
9	20	274.81	0.93	1.50	1.50	117	93	2.4	245	53	119		
10	22½	276.66	0.98	1.60	1.60	119	93	2.7	250	53	119		
11	25	278.51	1.20	1.95	1.95	120	94	3.2	250	54	119		
12	27½	280.54	1.35	2.20	2.20	120	96	3.8	240	54	120		
1	30/0	282.71	1.85	3.00	3.00	120	97	5.9	245	58	120		
2	2½	285.23	1.80	2.95	2.95	121	98	5.8	245	54	120		
3	5	287.73	1.75	2.85	2.85	122	98	5.5	250	53	120		
4	7½	290.18	1.60	2.60	2.60	125	100	5.5	250	53	120		
5	10	292.64	1.55	2.50	2.50	126	101	5.2	255	53	120		
6	12½	294.95	1.35	2.20	2.20	127	102	3.9	255	54	120		
7	15	297.14	1.05	1.70	1.70	128	103	3.1	255	53	122		
8	17½	299.10	1.00	1.65	1.65	128	104	3.1	250	53	122		
9	20	301.01	1.10	1.80	1.80	130	106	3.4	245	53	123		
10	22½	303.01	1.25	2.00	2.00	131	108	4.0	245	53	123		
11	25	305.09	1.30	2.10	2.10	132	109	5.1	255	55	123		
12	27½	307.26	1.40	2.30	2.30	133	110	5.4	260	56	123		
	30	309.49											

METHOD 5 PARTICULATE FIELD DATA

Plant Smith+Sons Paving - Pineola, N.C.
Run No. 2
Location Asphalt Plant
Date 6-8-88
Operator FLH, RHL
Sample Box No. 2
Meter Box No. ~~1264~~ 1348
Filter No. 42
Probe No. 4' #2
Pitot Tube Cp 0.84

Very Important — Fill In All Blanks
Leak Checks: Beg. @ 15" 0.003
End @ 9.5" 0.0015
Pitot Tube: ~~3.8~~ + @ 3.8 "H2O
= @ 3.8 "H2O
Static Pressure: = 0.34 "H2O
Start: 1310
Finish: 1413
Observer Steve Maynard Agency NCDNRCD

Bar. Press. "Hg 26.01
Meter Box ΔH@ 1.86 Y = 1.00
Assumed Tm, °F ~~105~~ 120 FLH
Dry Bulb, °F 121
Wet Bulb, °F 121
Db - Wb, °F 0
Assumed Moisture % ~~1.0~~ 10%
Ps/Pm 1.0
C Factor ~~0.84~~ 1.0

Ambient Temp., °F 83
Heater Box Setting, °F 250
Probe Tip Dia., in. 0.207
Probe Length 4' glass lined
Probe Heater Setting 85%
Average Δp 1.36 Δp Ref 1.0
Average ΔH 2.50 ΔH Ref
Process Weight 75 tons/hr
Steam Load —
Steam Pressure —

Point	Clock Time	Dry Gas Meter, Cu. Ft.	Pitot Manometer (Δp) in H_2O	Orifice Manometer (ΔH) in H_2O Desired	Orifice Manometer (ΔH) in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum in Hg Gauge	Box Temp. °F	Impinger Temp. °F	Stack Temp. °F	% CO_2	% O_2
1	0	309.70	1.85	3.40	3.40	104	102	6.7	225	64	121		
2	2½	312.36	1.75	3.25	3.25	108	104	6.3	230	61	121		
3	5	314.99	1.70	3.15	3.15	112	105	6.1	~~235~~	58	121		
4	7½	317.60	1.55	2.85	2.85	117	106	5.9	235	57	123		
5	10	320.12	1.50	2.78	2.78	121	106	5.6	235	57	122		
6	12½	322.58	1.25	2.30	2.30	126	106	4.3	235	56	122		
7	15	324.89	1.05	1.92	1.92	128	106	3.3	240	56	122		
8	17½	326.99	0.98	1.81	1.81	129	106	3.1	240	56	123		
9	20	329.05	0.88	1.62	1.62	129	106	2.9	245	57	124		
10	22½	331.98	0.95	1.75	1.75	130	107	3.0	245	57	124		
11	25	333.06	0.92	1.70	1.70	130	108	3.0	245	56	124		
12	27½	334.94	1.05	1.92	1.92	130	108	3.4	245	56	124		
1	30/0	337.05	1.95	3.60	3.60	128	108	(7.3)	245	64	124		
2	2½	339.75	1.85	3.40	3.40	131	108	7.1	240	59	125		
3	5	342.50	1.65	3.00	3.00	134	109	7.0	240	58	125		
4	7½	345.07	1.70	3.15	3.15	135	109	7.2	245	58	125		
5	10	347.69	1.50	2.78	2.78	138	109	6.8	~~245~~	57	125		
6	12½	350.20	1.40	2.60	2.60	140	112	6.4	250	58	125		
7	15	352.63	1.15	2.10	2.10	140	112	4.8	250	58	125		
8	17½	354.81	1.05	1.92	1.92	139	112	4.6	255	58	125		
9	20	356.95	1.00	1.85	1.85	139	112	4.3	255	58	125		
10	22½	359.05	0.98	1.81	1.81	139	112	4.1	250	59	125		
11	25	361.09	0.96	1.78	1.78	139	112	4.0	250	59	125		
12	27½	363.12	1.00	1.85	1.85	139	113	4.4	250	60	123		
	30	365.13											

METHOD 5 PARTICULATE FIELD DATA

Plant Smith + Sons Paving - Pineda, N.C.
Run No. 3
Location Asphalt Plant
Date 6-8-88
Operator FLH-RHL
Sample Box No. 3
Meter Box No. ~~1264~~ 1348
Filter No. 43
Probe No. 4' #3
Pitot Tube Cp 0.84

Very Important — Fill In All Blanks
Leak Checks: Beg. @ 15" 0.003
End @ 9" 0.001
Pitot Tube: + @ 4.5 "H2O
− @ 4.5 "H2O
Static Pressure: −0.34 "H2O
Start: 1505
Finish: 1608
Observer Steve Maynard Agency MCDNRCD

Bar. Press. "Hg 26.01
Meter Box ΔH@ 1.88 Y = 1.00
Assumed Tm, °F 120
Dry Bulb, °F 121
Wet Bulb, °F 121
Db - Wb, °F 0
Assumed Moisture % 10%
Ps/Pm 1.0
C Factor 1.0

Ambient Temp., °F 81
Heater Box Setting, °F 250
Probe Tip Dia., in. 0.207
Probe Length 4' glass lined
Probe Heater Setting 85%
Average Δp 1.36 Δp 1.0
Average ΔH 2.50 ΔH Ref
Process Weight 72 Tons/hr
Steam Load —
Steam Pressure —

Point	Clock Time	Dry Gas Meter, Cu. Ft.	Pitot Manometer (Δp) in H_2O	Orifice Manometer (ΔH) in H_2O Desired	Orifice Manometer (ΔH) in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum in Hg Gauge	Box Temp. °F	Impinger Temp. °F	Stack Temp °F	% CO_2	% O_2
1	0	365.40	1.85	3.40	3.40	99	100	6.8	225	63	122		
2	2½	368.12	1.80	3.40	3.40	108	101	6.9	230	60	121		
3	5	370.85	1.80	3.40	3.40	111	101	6.9	230	59	120		
4	7½	373.52	1.70	3.15	3.15	117	101	6.9	235	59	121		
5	10	376.17	1.55	2.85	2.85	120	101	5.8	240	58	122		
6	12½	378.78	1.35	2.55	2.55	122	102	5.2	245	59	121		
7	15	381.10	1.10	2.05	2.05	123	102	3.7	250	60	121		
8	17½	383.34	1.10	2.05	2.05	123	102	3.7	245	60	121		
9	20	385.50	1.00	1.90	1.90	123	102	3.5	245	61	121		
10	22½	387.63	0.91	1.70	1.70	120	102	3.1	250	61	14		
11	25	389.65	0.83	1.56	1.56	120	103	3.0	255	59	122		
12	27½	391.59	0.79	1.48	1.48	120	103	2.9	250	59	122		
1	30/0	393.58	1.85	2.85	2.35	116	103	4.7	265	57	122		
2	2½	395.74	1.80	3.40	3.40	118	103	4.8	255	57	122		
3	5	398.30	1.70	3.15	3.15	123	104	7.2	250	55	122		
4	7½	400.90	1.75	3.30	3.30	123	104	(7.7)	240	55	122		
5	10	403.59	1.50	2.78	2.78	123	104	6.4	245	55	121		
6	12½	406.12	1.35	2.35	2.35	126	105	5.0	255	56	121		
7	15	408.45	1.10	2.05	2.05	127	105	4.3	255	56	121		
8	17½	410.65	1.10	2.05	2.05	127	105	4.3	240	56	121		
9	20	413.21	1.20	2.25	2.25	127	105	4.3	260	57	121		
10	22½	415.62	1.10	2.05	2.05	127	106	4.8	260	58	121		
11	25	417.28	1.10	2.05	2.05	127	106	4.8	255	58	122		
12	27½	419.42	1.10	2.05	2.05	127	106	4.8	255	58	122		
	30	421.61											

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METHOD 3 - ORSAT AND DRY MOLECULAR WEIGHT DETERMINATION

Plant Smith+Sons Paving - Pineda, N.C. Sample Location Asphalt Plant
Sample Type - Continuous ✓ Pump Leakfree @ 10" ? ✓
Oxygen Check 20.9% ± 0.1% 20.9 Fuel Type No. 2 oil
Orsat Leak Check @ 4 min.: Pipet Levels - Leakfree ? ✓
Buret 13.8 - 13.8 = <0.2 ml ? ✓

Run No. 1 Sample Date 6-8-88 Ambient Temp. °F 80
Sampling Time (24 - hr clock) 1135-1238 Analysis By FZH

Gas \ Run	1 Actual	1 Net	2 Actual	2 Net	3 Actual	3 Net	Avg. %	Mult.	Molecular Wt. Dry lb/lb mole
CO_2	2.9	2.9	3.0	3.0	3.0	3.0	2.97	.44	1.307
O_2	20.1	17.2	20.1	17.1	20.1	17.1	17.13	.32	5.482
CO	20.1	0.0	20.1	0.0	20.1	0.0	0.0	.28	0.0
N2	100	79.9	100	79.9	100	79.9	79.90	.28	22.372
								Total	29.161

$F_o = \frac{20.9 - \%O_2}{\%CO_2} = 1.269$

Run No. 2 Sample Date 6-8-88 Ambient Temp. °F 83
Sampling Time (24 - hr clock) 1310-1413 Analysis By FZH

Gas \ Run	1 Actual	1 Net	2 Actual	2 Net	3 Actual	3 Net	Avg. %	Mult.	Molecular Wt. Dry lb/lb mole
CO_2	2.8	2.8	2.8	2.8	2.8	2.8	2.80	.44	1.232
O_2	20.1	17.3	20.1	17.3	20.1	17.3	17.30	.32	5.536
CO	20.1	0.0	20.1	0.0	20.1	0.0	0.0	.28	0.0
N2	100	79.9	100	79.9	100	79.9	79.90	.28	22.372
								Total	29.140

$F_o = \frac{20.9 - \%O_2}{\%CO_2} = 1.286$

Run No. 3 Sample Date 6-8-88 Ambient Temp. °F 81
Sampling Time (24 - hr clock) 1505-1608 Analysis By FZH

Gas \ Run	1 Actual	1 Net	2 Actual	2 Net	3 Actual	3 Net	Avg. %	Mult.	Molecular Wt. Dry lb/lb mole
CO_2	2.8	2.8	2.8	2.8	2.8	2.8	2.80	.44	1.232
O_2	20.1	17.3	20.1	17.3	20.1	17.3	17.30	.32	5.536
CO	20.1	0.0	20.1	0.0	20.1	0.0	0.0	.28	0.0
N2	100	79.9	100	79.9	100	79.9	79.90	.28	22.372
								Total	29.140

Fuel type	F_o range
Coal:	
Anthracite and lignite	1.016-1.120
Bituminous	1.083-1.230
Wood	1.000-1.120
Wood bark	1.003-1.130

$F_o = \frac{20.9 - \%O_2}{\%CO_2} = 1.286$

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METHOD 5 SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Smith+Sons Paving - Pineda, N.C. Recovered By FLH - RHL
Sample Location Asphalt Plant Recovery Date 06-09-88

	1	2	3
Run Number			
Sample Date	06-08-88	06-08-88	06-08-88
Sample Box Number	1	1	1
Probe Number	4' #1	4' #2	4' #3
Filter Number	41	42	43

MOISTURE RECOVERY

Impingers Cont. Number	1-1	1-2	1-3
Description of Water	Turbid	Turbid	Turbid
Liquid Level Marked	✓	✓	✓
Final Volume (wt.), ml	312	318	323
Initial Volume (wt.), ml	200	200	200
Net Volume (wt.), ml (g)	112	118	123
Silica Gel Cont. Number	1-1	1-2	1-3
Silica Gel % Spent	20%	20%	25%
Final Weight, g	214.8	218.9	218.1
Initial Weight, g	200.0	200.0	200.0
Net Weight, g	14.8	18.9	18.1
Total Moisture, g	126.8	136.9	141.1

PARTICULATE RECOVERY

Filter Cont. Number	1-1-#41	1-2-#42	1-3-#43
Particulate Description	Black	Black	Black
Filter Cont. Sealed	✓	✓	✓
Final Weight, mg	511.23	496.30	495.39
Final Weight Audit, mg	511.31	496.34	495.42
Initial Weight, mg	482.62	476.06	481.44
Initial Weight Audit, mg	482.63	476.02	481.43
Filter Catch, mg	28.64	20.28	13.97
Probe Rinse Cont. Number	1-1	1-2	1-3
Liquid Level Marked	✓	✓	✓
Final Weight, mg	105343.3	105779.4	103831.6
Final Weight Audit, mg	105343.1	105779.6	103831.6
Initial Weight, mg	105317.3	105758.0	103817.4
Initial Weight Audit, mg	105317.1	105758.1	103817.3
Less Acetone Blank, mg	- 0.3	- 0.3	- 0.3
Acetone Rinse Catch, mg	25.7	21.1	13.9
Total Particulate, mg	54.34	41.38	27.87

Acetone Blank Number	Blank A
Final Weight, mg	106458.7
Final Weight Audit, mg	106458.6
Initial Weight, mg	106458.4
Initial Weight Audit, mg	106458.3
Acetone Residue, mg	0.3
Acetone Volume, ml	125 ml
Concentration, mg/mg	3.05×10^{-6}

LABORATORY CUSTODY

Received By: FLH
Date Received: 06-08-88
Stored & Locked: ✓
Remarks: —

Visible Emission Summary Data Sheet

Company Smith & Sons Paving Co. Date 6-8-88 Location Pineola, N.C.

Start time 1135 Emission point Asphalt Plant Stack

Start no	Total opacity	Average opacity	Start no.	Total opacity	Average opacity	Start no.	Total opacity	Average opacity	Start no.	Total opacity	Average opacity	Start no.	Total opacity	Average opacity	Start no.	Total opacity	Average opacity
1	105	4.4	37			73			109			145			181		
2	125	5.2	38			74			110			146			182		
3	115	4.8	39			75			111			147			183		
4	110	4.6	40			76			112			148			184		
5	105	4.4	41			77			113			149			185		
6	105	4.4	42			78			114			150			186		
7	120	5.0	43			79			115			151			187		
8	105	4.4	44			80			116			152			188		
9	120	5.0	45			81			117			153			189		
10	110	4.6	46			82			118			154			190		
11	120	5.0	47			83			119			155			191		
12	125	5.2	48			84			120			156			192		
13	125	5.2	49			85			121			157			193		
14	120	5.0	50			86			122			158			194		
15	140	5.8	51			87			123			159			195		
16	165	6.9	52			88			124			160			196		
17	185	7.7	53			89			125			161			197		
18	155	6.4	54			90			126			162			198		
19	170	7.1	55			91			127			163			199		
20	150	6.2	56			92			128			164			200		
21	110	4.6	57			93			129			165			201		
22	120	5.0	58			94			130			166			202		
23	110	4.6	59			95			131			167			203		
24	120	5.0	60			96			132			168			204		
25	120	5.0	61			97			133			169			205		
26	120	5.0	62			98			134			170			206		
27	100	4.2	63			99			135			171			207		
28	110	4.6	64			100			136			172			208		
29	125	5.2	65			101			137			173			209		
30	110	4.6	66			102			138			174			210		
31			67			103			139			175			211		
32			68			104			140			176			212		
33			69			105			141			177			213		
34			70			106			142			178			214		
35			71			107			143			179			215		
36			72			108			144			180			216		

Maximum average 7.7 % Start number of six minute average 1

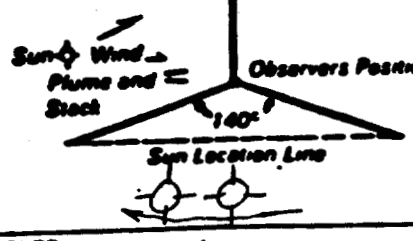
Number of nonoverlapping averages in excess of standard 0 Listing start number of these averages –

Calculated by Jeff Francis Date 6-9-88 Reviewed by _____ Date _____

Visible Emission Observation Form

SOURCE NAME: Smith & Sons Paving Co.
ADDRESS:
CITY: Pineola | STATE: N.C. | ZIP:
PHONE: | SOURCE ID NUMBER:
PROCESS EQUIPMENT: Asphalt Plant | OPERATING MODE:
CONTROL EQUIPMENT: Venturi Scrubber & Cyclone | OPERATING MODE:
DESCRIBE EMISSION POINT: START 30" dia. stack STOP
HEIGHT ABOVE GROUND LEVEL: START 20' STOP | HEIGHT RELATIVE TO OBSERVER: START -25' STOP
DISTANCE FROM OBSERVER: START 400' STOP | DIRECTION FROM OBSERVER: START NW STOP —
DESCRIBE EMISSIONS: START Steam w/ Particulate Gray-White STOP —
EMISSION COLOR: START Gray STOP | PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☐ YES ☒ | IF WATER DROPLET PLUME: ATTACHED ☒ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START Steam dissipation STOP —
DESCRIBE BACKGROUND: START Trees STOP —
BACKGROUND COLOR: START Green STOP | SKY CONDITIONS: START Clear STOP
WIND SPEED: START 0-3 STOP — | WIND DIRECTION: START S STOP —
AMBIENT TEMP: START 75 STOP 80 | Db 76.5 Wb 63 | RH, percent 48

Source Layout Sketch — Draw North Arrow



COMMENTS: Run 1

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

OBSERVATION DATE: 6-8-88 | START TIME: 1135 | STOP TIME: 1235

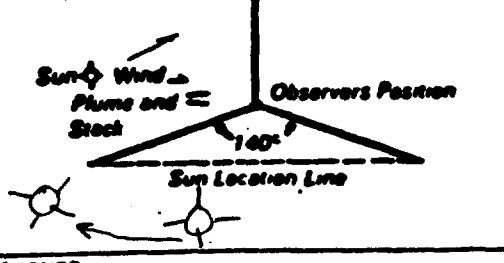
SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	0	5	5	5	31	0	5	5	5
2	5	0	0	5	32	5	5	0	5
3	5	5	5	5	33	5	5	5	5
4	5	5	5	5	34	5	5	5	5
5	5	5	5	5	35	0	5	5	5
6	5	5	5	5	36	5	5	5	5
7	5	5	5	5	37	5	5	5	5
8	5	5	5	5	38	5	5	0	5
9	5	5	10	5	39	5	5	5	5
10	5	5	5	5	40	5	5	5	5
11	5	5	5	5	41	5	10	5	5
12	5	5	5	5	42	5	5	5	5
13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

AVERAGE OPACITY FOR HIGHEST PERIOD: 5.2
NUMBER OF READINGS ABOVE 20 % WERE: 0
RANGE OF OPACITY READINGS: 0 MINIMUM 10 MAXIMUM
OBSERVER'S NAME (PRINT): Jeff Francis
OBSERVER'S SIGNATURE: Jeff Francis | DATE: 6-8-88
ORGANIZATION: Environmental Testing Inc.
CERTIFIED BY: EtA | DATE: 3-23-88
VERIFIED BY: | DATE:

Visible Emission Observation Form

SOURCE NAME	Smith + Sons Paving Co.
ADDRESS	
CITY	Pineola
STATE	N.C
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Asphalt Plant
OPERATING MODE	
CONTROL EQUIPMENT	Venturi Scrubber + Cyclone
OPERATING MODE	
DESCRIBE EMISSION POINT START	30' dia stack STOP
HEIGHT ABOVE GROUND LEVEL START	20' STOP
HEIGHT RELATIVE TO OBSERVER START	-25' STOP
DISTANCE FROM OBSERVER START	400' STOP
DIRECTION FROM OBSERVER START	NW STOP
DESCRIBE EMISSIONS START	Steam w/ Particulate STOP
EMISSION COLOR START	Gray STOP
PLUME TYPE	CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☐ YES ☒
IF WATER DROPLET PLUME	ATTACHED ☒ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	Steam Dissipation STOP
DESCRIBE BACKGROUND START	Trees STOP
BACKGROUND COLOR START	Green STOP
SKY CONDITIONS START	25% Cloudy STOP
WIND SPEED START	0-3 STOP
WIND DIRECTION START	S STOP S
AMBIENT TEMP START	79 STOP 81
Db / Wb	76.5 / 63
RH percent	48

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	6-8-88				START TIME	1311			STOP TIME	1411
SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45	
1	5	5	5	5	31	10	5	10	10	
2	5	5	5	5	32	10	10	5	5	
3	5	5	5	5	33	5	5	5	10	
4	5	5	5	5	34	5	5	5	5	
5	5	5	5	5	35	10	10	5	10	
6	5	5	5	5	36	5	5	5	5	
7	5	5	5	5	37	5	10	10	5	
8	5	5	5	5	38	5	10	10	5	
9	5	5	5	10	39	5	10	5	10	
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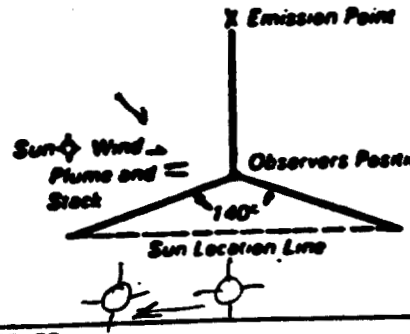
11	5	5	5	5	41	15	10	10	5	
12	5	5	5	5	42	5	5	5	10	
13	5	5	5	5	43	10	10	15	5	
14	5	5	5	5	44	5	5	10	5	
15	5	5	5	5	45	5	5	5	5	
16	5	5	5	10	46	5	5	5	5	
17	5	5	5	5	47	5	5	10	5	
18	5	5	5	5	48	5	5	5	10	
19	5	5	5	5	49	5	5	5	5	
20	5	5	5	5	50	5	15	5	10	
21	5	5	5	5	51	5	10	10	10	
22	5	5	5	5	52	5	5	5	10	
23	5	5	5	5	53	10	5	10	5	
24	5	5	5	5	54	10	5	5	5	
25	5	5	5	5	55	5	5	5	5	
26	10	5	5	5	56	5	5	10	5	
27	5	5	5	5	57	5	5	5	10	
28	5	5	5	5	58	10	5	10	10	
29	5	10	10	5	59	5	5	5	5	
30	10	5	5	5	60	5	5	10	5	

AVERAGE OPACITY FOR HIGHEST PERIOD	7.7
NUMBER OF READINGS ABOVE 20% WERE	0
RANGE OF OPACITY READINGS	5 MINIMUM — 15 MAXIMUM
OBSERVER'S NAME (PRINT)	Jeff Francis
OBSERVER'S SIGNATURE	Jeff Francis
DATE	6-8-88
ORGANIZATION	Environmental Testing Inc
CERTIFIED BY	ETA
DATE	3-23-88
VERIFIED BY	
DATE	
COMMENTS	Run 2
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	
TITLE	
DATE	

Visible Emission Observation Form

SOURCE NAME: Smith+Sons Paving Co.
ADDRESS:
CITY: Pineola | STATE: NC | ZIP:
PHONE: | SOURCE ID NUMBER:
PROCESS EQUIPMENT: Asphalt Plant | OPERATING MODE:
CONTROL EQUIPMENT: Venturi Scrubber + Cyclone | OPERATING MODE:
DESCRIBE EMISSION POINT: START 30' dia stack STOP
HEIGHT ABOVE GROUND LEVEL: START 20' STOP | HEIGHT RELATIVE TO OBSERVER: START 0 STOP
DISTANCE FROM OBSERVER: START 90' STOP | DIRECTION FROM OBSERVER: START NE STOP
DESCRIBE EMISSIONS: START Steam w/ Particulate STOP
EMISSION COLOR: START Gray STOP | 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 Steam dissipation STOP
DESCRIBE BACKGROUND: START Tree - Sky STOP
BACKGROUND COLOR: START Green/Blue STOP | SKY CONDITIONS: START Partly Cloudy STOP
WIND SPEED: START 0-3 STOP | WIND DIRECTION: START SW STOP
AMBIENT TEMP: START 87 STOP 86 | Db 81 | Wb 67 | RH, percent 49

Source Layout Sketch — Draw North Arrow



COMMENTS: Run 3

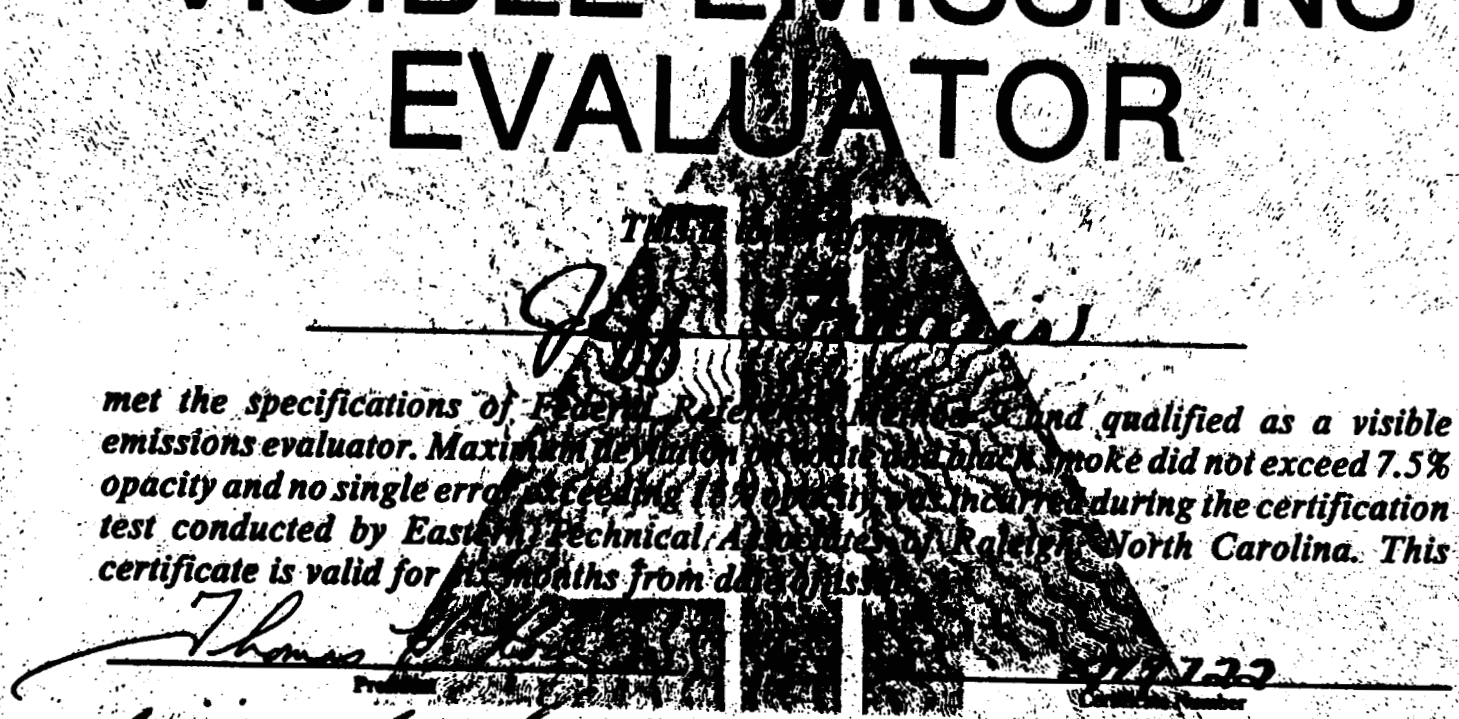
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE | TITLE | DATE

OBSERVATION DATE: 6-8-88 | START TIME: 1505 | STOP TIME: 1605

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

AVERAGE OPACITY FOR HIGHEST PERIOD: 5.2
NUMBER OF READINGS ABOVE 20 % WERE: 0
RANGE OF OPACITY READINGS: 0 MINIMUM | 10 MAXIMUM
OBSERVER'S NAME (PRINT): Jeff Francis
OBSERVER'S SIGNATURE: Jeff Francis | DATE: 6-8-88
ORGANIZATION: Environmental Testing Inc.
CERTIFIED BY: ETA | DATE: 5-23-88
VERIFIED BY: | DATE:

VISIBLE EMISSIONS EVALUATOR



This is to certify that

[redacted]

met the specifications of Federal Register [illegible] and qualified as a visible emissions evaluator. Maximum deviation on [illegible] 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 [illegible]
President

[illegible]
Certificate Number

Willie S. Lee
Vice President

Asheville
Location

David Savage
Program Manager

March 23, 1988
Date of Issue

APPENDIX C

PROCESS DATA

Run #1	80.00 Tons
Run #2	75.00 Tons
Run #3	72.00 Tons

APPENDIX D

TEST PARTICIPANTS

F. Larson Harsey	Biologist Environmental Testing, Inc.
Jeff A. Francis	Biologist Environmental Testing, Inc.
Rodney H. Lang	Biologist Environmental Testing, Inc.

CALIBRATION INFORMATION

NOZZLES

Each new set of nozzles purchased by ETI are first machined and calibrated before being put into field use. Thereafter, whenever it becomes apparent that a nozzle has been damaged, it is again machined and recalibrated. A set of three is matched to within 0.002 inches (Difference between high and low readings). Nozzles are checked prior to each source test.

PITOT TUBES

All pitot tubes used by ETI whether separate or attached to a sampling probe were made by ETI personnel. Prior to being put into field use, they are calibrated. In general, if a type "S" pitot tube is constructed properly, and not positioned too closely to the probe nozzle or any other obstruction, it will have a Cp of 0.83 - 0.87. As long as the pitot tube is not damaged its calibration should not change. All ETI pitot tubes are made to have a Cp of 0.84. If a pitot tube does not initially have a Cp of 0.84, it is altered until a reading of 0.84 is obtained. Pitot tubes are checked before each source test and receive a complete calibration once a year.

DRY GAS METER AND ORIFICE METER

Complete meter box calibrations are performed annually. One point calibrations at the average orifice meter and maximum vacuum readings encountered during the compliance test are performed after each source test. If the dry gas meter calibration factor differs from 1.00 by more than ±0.02 then the dry gas meter is repaired and given an annual calibration.

THERMOMETERS, PYRITES, ORSAT AND ORSAT BAGS

Each new thermometer, pyrometer and thermocouple purchased or manufactured by ETI is checked and calibrated before being put into field use. After each source test each temperature sensing device used on the test receives a one point calibration check according to U.S. EPA guidelines.

Pyrites, orsat and orsat bags are checked before and after each source test. If they do not function according to U.S. EPA protocol that piece of equipment is either repaired or replaced.

LABORATORY EQUIPMENT

ETI has a written quality assurance document that covers calibration and maintenance of laboratory equipment. This includes calibration of the analytical balance against Class S weights, and service contracts to maintain traceability to N.B.S. Calibration of thermometers, barometers, stopwatches and wet test meters are traceable to N.B.S. A copy of our quality assurance document may be obtained by written request.

METHOD 5 PRETEST - POSTEST CALIBRATION CHECKS

Plant Smith + Sons Paving - Pineola, N.C. Calibrated by FLH
Meter box number 1264/1348 Date 6-10-88

Dry Gas Meter
Pretest meter calibration factor, Y = 1.00 (within ± 2%)
Postest meter calibration factor, Y = 1.01 (within ± 5% of pretest)
Recalibration required? Circle one: yes or (no) If yes new Y = _____
Lower cal. factor, Y = _____ for calculations (pretest or postest)

Dry Gas Meter Thermometers
Was a pretest temperature correction used? Circle one: yes or (no) If yes temperature correction _____ (within ± 5.4°F over range)
Postest comparison with mercury-in-glass thermometer? (within ±10.8°F at ambient temperature) Recalibration required? Circle one: yes or (no)
Recalibration temperature correction? _____ (within ±5.4°F over range
If yes, no correction necessary for calculations if meter thermometer temperature is higher; if calibration temperature is higher, add correction to average meter temperature for calculations

Stack Temperature Sensor
Was a pretest temperature correction used? Circle one: yes or (no) If yes temperature correction _____ °F (within ±1.5% in °R over range)
Average stack temperature of compliance test, 582 °R
Temperature of ref. thermometer for recalibration #1 581 #2 _____ °R
(within ± 10% of the average stack temperature)
Temperature of stack thermometer for recalibration #1 580 #2 581 °R
Diff. between ref. and stack thermometer temps. #1 1 #2 0 °R
Do the ref. and stack values agree within ±1.5%? Circle one: (yes) or no
If yes, no correction is necessary for calculations
If no, calculations must be done twice--once with the recorded values and once with the average stack temperature corrected to correspond to the reference temperature differential; both final result values must be reported since there is no way to determine which is correct

Barometer
Was the pretest field barometer reading correct? Circle one: (yes) or no
Postest comparison? 0.014 in. Hg (±0.1 in. Hg) Recalibration required? Circle one: yes or no If yes, no correction necessary for calculations when the field barometer has a lower reading; if the mercury-in-glass reading is lower, subtract the difference from the field data readings for the calculations.

	Pretest	Postest
Hg in glass	29.064	29.214
Field	29.06	29.20
Difference	0.004	0.014

Nozzle
Was the nozzle calibrated to the nearest .001 in.? Circle one: (yes) or no
Nozzle #1: 0.207 0.207 0.206 0.207 0.207 : Average 0.207
Nozzle #2: — — — — — : Average —
Nozzle #3: — — — — — : Average —

Impinger Thermometer
Was a pretest temperature correction used? Circle one: yes or (no) If yes temperature correction _____ (within ±5.4°F over range)

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PRETEST - POSTEST THERMOMETER CALIBRATION

Client Smith+Sons Paving - Pineola, N.C. Date 6-6-88

Location Asphalt Plant Ref. Thermometer #22

Thermometer	Pretest		Postest 6-10-88	
	Temp., °F	Ref. Temp., °F	Temp., °F	Ref. Temp., °F
DGM #1264 M/B	72/71	72	— N/A	— NA
DGM #1348 M/B	72/72	72	70/69	70
DGM #				
DGM #				
Impinger #1				
Impinger #2				
Impinger #3				
Impinger #4	72	72	69	70
Impinger #5	72	72	69	70
WB #	72	72	70	70
DB #	72	72	69	70
Box #1	72	72	69	70
Box #2	71	72	70	70
Box #3	72	72	69	70
Box #4				
Box #5				
Box #6				
WB Omega 873	71	72	69	70
DB Omega 873	71	72	69	70
WB Omega #	71	72	70	70
DB Omega #	72	72	71	70
Probe 4' #1	75	76	120	121
Probe 4' #2	76	76	121	121
Probe ' #1				
Probe ' #2				

POSTEST DRY GAS METER CALIBRATION DATA FORM (English Units)

Test Number 1 Date 6-10-88 Meter Box No. 1348 Plant Smith+Sons Paving Co. - Pineda, NC

Barometric Pressure, P_b = 29.214 in. Hg Dry Gas Meter No. 1348 Pretest Y 1.00

Orifice manometer setting, inches H_2O ΔH	Gas Volume: Wet test meter, ft³ V_w	Gas Volume: Dry gas meter, ft³ V_d	Temperature: Wet test meter, °F t_w	Temperature: Dry Gas Meter: Inlet °F t_{d_i}	Temperature: Dry Gas Meter: Outlet °F t_{d_o}	Temperature: Dry Gas Meter: Average °F t_d	Time min. θ	Vacuum setting in. Hg	Y_i	$\frac{Y_i V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$
2.38	10	10.67	69.5	127	101	114	12.29	7.7	1.009	(29.214)/(29.389)
2.38	10	10.69	69.5	128	102	115	12.28	7.7	1.009	(29.214)/(29.389)
2.38	10	10.69	69.5	128	102	115	12.30	7.7	1.009	(29.214)/(29.389)
										1.01

V_w = Gas volume passing through the wet test meter, ft.³

V_d = Gas volume passing throught the dry gas meter, ft.³

t_w = Temperature of the gas in the wet test meter, °F

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F

ΔH = Pressure differential across orifice, in. H_2O

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y

P_b = Barometric pressure, in. Hg

θ = Time of calibration run, min.

RAC STAKSAMPLR CALIBRATION SHEET

Meter Box Serial Number: 1348 Barometric Pressure (P_b): 29.763

Leak Check @ 6.8 in. H_2O: OK	Date: 01-29-88	Calibrated by: PRJ
Pump: OK	Pump Oil: OK	Clean Quick Connects: OK
Manometers: OK	Dry Test Meter: OK	Thermometers: OK
Lights: OK	Electrical Check: OK	Variac: OK
Vacuum Gauge: OK	Leak Check @ 27" Hg.: <0.001 CFM	

Man. Orifice	CF_w	CF_d	T_w	IT_d	OT_d	T_d ave.	Time t
0.5	5	5.33	68.3	108.0	96.0	102.00	12.70
1.0	5	5.34	68.4	115.0	97.5	106.25	9.32
1.5	10	10.73	68.5	119.5	99.5	109.50	15.46
2.0	10	10.76	68.5	124.0	101.5	112.75	13.45
3.0	10	10.75	68.5	126.0	103.0	114.50	11.14
4.0	10	10.71	68.5	126.0	103.0	114.50	9.68

Calculate Y and $\Delta H_@$ as follows:

$$Y = \frac{CF_w P_b (T_d \text{ ave.} + 460)}{CF_d (P_b + \Delta H/13.6)(T_w + 460)} = 1.00 \qquad \Delta H_@ = \frac{0.0317 \ \Delta H}{P_b (T_d + 460)} \left(\frac{(T_w + 460)\, t}{CF_w}\right)^2 = 1.86$$

Tolerances: $Y = 0.90 - \underline{1.00} - 1.10$ Y +/- 0.02Y $\qquad \Delta H_@ = 1.6 - \underline{1.84} - 2.1$ $\Delta H_@$ +/- 0.15 in.

CALIBRATION CALCULATIONS PUMP AND ORIFICE METER

Manometer Delta H 0.5 in. H_2O

$$Y = \frac{5 \times 29.763 (102.00 + 460)}{5.33 (29.763 + 0.0368)(68.3 + 460)} = 0.997 \qquad \Delta H_@ = \frac{0.01585}{29.763 (102.00 + 460)} \left(\frac{(68.3 + 460)\, 12.70}{5}\right)^2 = 1.706$$

Manometer Delta H 1.0 in. H_2O

$$Y = \frac{5 \times 29.763 (106.25 + 460)}{5.34 (29.763 + 0.0737)(68.4 + 460)} = 1.001 \qquad \Delta H_@ = \frac{0.03170}{29.763 (106.25 + 460)} \left(\frac{(68.4 + 460)\, 9.32}{5}\right)^2 = 1.825$$

Manometer Delta H 1.5 in. H_2O

$$Y = \frac{10 \times 29.763 (109.50 + 460)}{10.73 (29.763 + 0.1103)(68.5 + 460)} = 1.001 \qquad \Delta H_@ = \frac{0.04755}{29.763 (109.50 + 460)} \left(\frac{(68.5 + 460)\, 15.46}{10}\right)^2 = 1.873$$

Manometer Delta H 2.0 in. H_2O

$$Y = \frac{10 \times 29.763 (112.75 + 460)}{10.76 (29.763 + 0.1471)(68.5 + 460)} = 1.002 \qquad \Delta H_@ = \frac{0.06340}{29.763 (112.75 + 460)} \left(\frac{(68.5 + 460)\, 13.45}{10}\right)^2 = 1.879$$

Manometer Delta H 3.0 in. H_2O

$$Y = \frac{10 \times 29.763 (114.50 + 460)}{10.75 (29.763 + 0.2206)(68.5 + 460)} = 1.004 \qquad \Delta H_@ = \frac{0.09510}{29.763 (114.50 + 460)} \left(\frac{(68.5 + 460)\, 11.14}{10}\right)^2 = 1.928$$

Manometer Delta H 4.0 in. H_2O

$$Y = \frac{10 \times 29.763 (114.50 + 460)}{10.71 (29.763 + 0.2941)(68.5 + 460)} = 1.005 \qquad \Delta H_@ = \frac{0.12680}{29.763 (114.50 + 460)} \left(\frac{(68.5 + 460)\, 9.68}{10}\right)^2 = 1.941$$

NOZZLE CALIBRATION

Date: 03-21-88
By: RBMc

Set Number 1 Brown Box

Nozzle I.D.	D_1, in.	D_2, in.	D_3, in.	D_4, in.	D_5, in.	D, in.	$D_{ave.}$
.187-1	0.187	0.188	0.188	0.186	0.187	0.002	0.187
.187-2	0.189	0.189	0.189	0.190	0.189	0.001	0.189
.187-3	0.186	0.186	0.185	0.186	0.186	0.001	0.186
.203-1	0.207	0.208	0.207	0.207	0.207	0.001	0.207
.250-1	0.252	0.252	0.252	0.252	0.252	0.000	0.252
.250-2	0.254	0.253	0.253	0.254	0.253	0.001	0.253
.250-3	0.251	0.250	0.249	0.249	0.250	0.002	0.250
.300-1	0.304	0.304	0.305	0.305	0.304	0.001	0.304
.300-2	0.302	0.303	0.304	0.303	0.303	0.002	0.303
.300-3	0.300	0.301	0.300	0.300	0.300	0.001	0.300
.335-1	0.336	0.336	0.336	0.336	0.336	0.000	0.336
.375-1	0.375	0.375	0.376	0.376	0.375	0.001	0.375
.375-2	0.375	0.374	0.375	0.375	0.374	0.001	0.375
.375-3	0.374	0.375	0.375	0.376	0.375	0.002	0.375
.400-1	0.404	0.405	0.404	0.405	0.405	0.001	0.405
.500-1	0.505	0.504	0.504	0.504	0.504	0.001	0.504
.500-2	0.504	0.502	0.503	0.503	0.503	0.002	0.503
.500-3	0.502	0.503	0.503	0.502	0.502	0.001	0.502
.625-1	0.619	0.618	0.619	0.619	0.619	0.001	0.619
.775-1	0.770	0.778	0.780	0.780	0.780	0.002	0.779
1.00-1	1.000	1.000	0.999	1.000	1.000	0.001	1.000

Set Number 2 Blue Box

Nozzle I.D.	D_1, in.	D_2, in.	D_3, in.	D_4, in.	D_5, in.	D, in.	$D_{ave.}$
.187-1	0.185	0.185	0.186	0.185	0.184	0.002	0.185
.187-2	0.184	0.185	0.185	0.185	0.185	0.001	0.185
.187-3	0.186	0.186	0.186	0.186	0.186	0.000	0.186
.203-1	0.207	0.207	0.206	0.207	0.207	0.001	0.207
.250-1	0.250	0.250	0.250	0.249	0.249	0.001	0.250
.250-2	0.251	0.252	0.252	0.251	0.252	0.001	0.252
.250-3	0.249	0.250	0.249	0.250	0.250	0.001	0.250
.300-1	0.301	0.302	0.302	0.302	0.301	0.001	0.302
.300-2	0.301	0.303	0.303	0.302	0.302	0.002	0.302
.300-3	0.301	0.300	0.302	0.302	0.302	0.002	0.302
.335-1	0.340	0.339	0.339	0.339	0.338	0.002	0.339
.375-1	0.378	0.378	0.378	0.378	0.378	0.000	0.378
.375-2	0.376	0.377	0.376	0.376	0.377	0.001	0.376
.375-3	0.376	0.376	0.376	0.375	0.376	0.001	0.376
.500-1	0.496	0.495	0.497	0.496	0.496	0.002	0.496
.500-2	0.497	0.499	0.499	0.499	0.499	0.002	0.499
.500-3	0.497	0.498	0.498	0.497	0.498	0.001	0.498

Where:
$D_{1,2,3,4,5}$ = nozzle diameter measured on a different diameter, in.
Tolerance = measure within 0.001 in.
D = maximum difference in any two measurements, in.
Tolerance = 0.004 in.
$D_{ave.}$ = average of D_1, D_2, D_3, D_4, and D_5.

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TYPE S PITOT TUBE INSPECTION DATA FORM

Date: 03-15-88
Calibrator: RBMc

Specifications:
1.) Pitot tube assembly must be level.
2.) If pitot tube is damaged explain under comments section.
3.) $z = A \sin \tau$ (<0.125) and $w = A \sin \theta$ (<0.03125)
4.) α <10° and β <5°

I.D.	α_1°	α_2°	β_1°	β_2°	τ°	θ°	A, in.	z, in.	w, in.	P_A, in.	P_B, in.	D_t, in.
36''- 1	2.0	1.0	1.0	1.0	2.0	0.5	0.778	0.027	0.00679	0.389	0.389	0.376
36''- 2	2.0	0.5	1.0	2.0	0.0	0.5	1.151	0.000	0.01004	0.575	0.576	0.377
40''- 1	1.0	1.0	1.0	1.0	0.0	0.5	1.100	0.000	0.00960	0.550	0.550	0.388
54''- 1	3.0	3.0	1.0	1.0	1.0	1.5	1.006	0.018	0.02633	0.503	0.503	0.380
66''- 1	1.0	0.0	4.0	0.0	0.0	1.5	1.040	0.000	0.02722	0.520	0.520	0.386
96''- 1	2.0	0.5	3.0	2.0	2.0	0.5	0.910	0.032	0.00794	0.455	0.455	0.376
4' - 1	1.0	3.0	1.0	4.0	0.0	0.5	0.966	0.000	0.00843	0.483	0.483	0.378
4' - 2	2.0	1.0	1.0	1.0	0.0	1.0	0.891	0.000	0.01555	0.445	0.446	0.371
4' - 3	4.0	2.0	2.0	3.0	0.0	1.0	0.878	0.000	0.01532	0.439	0.439	0.375
4' - 4	1.0	4.0	4.0	1.0	0.5	0.0	0.839	0.007	0.00000	0.419	0.420	0.375
4' - 5	0.0	2.0	2.0	1.0	0.5	0.0	0.866	0.007	0.00000	0.433	0.433	0.372
4' - 6	2.0	1.0	1.0	0.0	1.0	0.5	0.955	0.017	0.00833	0.477	0.478	0.376
5' - 1	2.0	1.0	0.0	1.0	1.0	1.0	1.001	0.017	0.01747	0.500	0.501	0.375
5' - 2	1.0	3.0	0.0	0.0	0.0	1.5	1.045	0.000	0.02735	0.522	0.523	0.377
5' - 3	1.0	1.0	1.0	1.0	2.0	0.5	1.048	0.037	0.00915	0.524	0.524	0.376
5' - 4	0.5	2.0	1.0	0.0	2.0	1.0	1.038	0.036	0.01812	0.519	0.519	0.380
6' - 1	0.0	0.0	1.0	0.5	0.0	1.0	0.995	0.000	0.01737	0.498	0.497	0.380
6' - 2	1.0	1.0	0.0	0.0	2.0	1.5	1.004	0.035	0.02628	0.502	0.502	0.378
6' - 3	1.0	1.0	0.5	1.0	1.0	0.5	1.009	0.018	0.00881	0.504	0.505	0.377
6' - 4	1.0	0.5	1.0	0.0	2.0	1.0	1.000	0.035	0.01745	0.500	0.500	0.375
8' - 1	1.0	1.5	3.0	2.0	3.0	1.0	0.845	0.044	0.01475	0.423	0.422	0.378
8' - 2	0.0	1.0	2.0	2.0	0.0	1.5	0.905	0.000	0.02369	0.452	0.453	0.380
8' - 3	4.0	6.0	3.0	0.0	0.0	1.5	0.932	0.000	0.02440	0.466	0.466	0.376
8' - 4	1.5	2.0	1.5	1.0	0.0	0.5	1.017	0.000	0.00887	0.509	0.508	0.379
8' - 5	2.0	1.0	0.0	0.0	1.0	1.0	0.985	0.017	0.01719	0.492	0.493	0.379
8' - 6	0.0	0.0	0.5	3.0	1.0	0.5	0.925	0.016	0.00807	0.462	0.463	0.378
8'9''	1.0	2.0	0.5	0.5	0.0	2.0	0.895	0.000	0.03124	0.447	0.448	0.380
9'7''-1	2.0	2.0	0.0	2.0	0.0	1.0	0.918	0.000	0.01602	0.459	0.459	0.382
9'7''-2	1.0	3.0	1.0	2.5	1.5	1.0	0.960	0.025	0.01675	0.480	0.480	0.375
12'6''	1.5	1.5	2.5	2.5	0.0	0.5	0.809	0.000	0.00705	0.404	0.404	0.377

Comments: Only minor filing and cleaning required.

Pitot tubes requiring further calibration: None.

the OMEGA Group

DATE: 12-10-85

CERTIFICATE OF CALIBRATION

CUSTOMER: ENVIRONMENTAL TESTING INC
1700 UNIV COMMERICAL PL
CHARLOTTE NC 28213

Customer Purchase Order: 2861RO
OMEGA Work Order No: SO 511268760
MODEL: HH-2
SERIAL NO: 14403

OMEGA ENGINEERING certifies that the above instrumentation has been calibrated and tested to meet or exceed the published specifications. This calibration and testing was performed using instrumentation and standards that are traceable to the U.S. National Bureau of Standards.

Reference: NATIONAL BUREAU OF STANDARDS TEST NO(s): 36320

Tony D'Inverno
Supervisor, Instrumentation

CAL-3

OMEGA ENGINEERING, INC.
OMEGA PRESS
OMEGA INTERNATIONAL CORP.
BIOMEGA
One Omega Drive, Box 4047, Stamford, CT 06907-0047 (203) 359-1660 Telex 996404 Cable OMEGA FAX (203) 359-7700

Whatman Inc.

Whatman Inc. • 9 Bridewell Place, Clifton, New Jersey 07014 • Telephone: (201) 777-4825
Telex: 133426 • Cable: REEVEPAP

February 1, 1979

Mr. Paul R. Jenkins, Jr.
Vice-President
Environmental Testing Inc.
1700 University Commercial Place
Charlotte, North Carolina 28213

Dear Mr. Jenkins:

Further to our telephone conversation on January 15, 1979 Reeve Angel Grade 900AF is tested with a Q128 DOP Penetrometer manufactured by the Air Technology Association to measure DOP. This is a more sophisticated unit than that listed in the Federal Register, Part II, Thursday, August 18, 1977, Environmental Protection Agency, Standards of Performance for New Stationary Sources.

Grade 900AF will meet the EPA DOP requirements of 0.05 ≤ percent penetration on a 0.3 micron dioctyl phthalate smoke particles as listed on page 41778 of the Federal Register, Vol. 42, No. 160, Thursday, August 18, 1977 under 3. Reagent, 3.1.1 Filters.

I hope this will satisfy your inquiry. If we can be of any further service, please contact us at your convenience.

Very truly yours,

John Zacharias
Vice President
Business Manager, Paper Division, N. A.

JZ/mpm

SAMPLE BOX
TEMPERATURE SENSOR CALIBRATION DATA FORM
TOLERANCE: +/- 5.4 F

DATE: 07/16/87
AMBIENT TEMPERATURE, F : 72
CALIBRATOR: FLH/JPM

BAROMETRIC PRESSURE: 29.24
REFERENCE THERMOMETER # 22

REFERENCE POINT #		SOURCE	REFERENCE THERMOMETER TEMPERATURE,F	THERMOCOUPLE POTENTIOMETER TEMPERATURE,F	TEMPERATURE DIFFERENCE, %
SAMPLE BOX					
#1	A.	water bath	72	73	-.19
	B.	oil bath	130	130	0.00
	C.	oil bath	194	192	0.31
	D.	oil bath	222	222	0.00
	E.	oil bath	282	282	0.00
#2	A.	water bath	72	73	-.19
	B.	oil bath	130	130	0.00
	C.	oil bath	194	192	0.31
	D.	oil bath	222	222	0.00
	E.	oil bath	282	282	0.00
#3	A.	water bath	72	74	-.38
	B.	oil bath	130	131	-.17
	C.	oil bath	194	195	-.15
	D.	oil bath	222	224	-.29
	E.	oil bath	282	282	0.00
#4	A.	water bath	72	72	0.00
	B.	oil bath	130	130	0.00
	C.	oil bath	190	190	0.00
	D.	oil bath	226	226	0.00
	E.	oil bath	286	286	0.00
#5	A.	water bath	72	72	0.00
	B.	oil bath	130	130	0.00
	C.	oil bath	190	190	0.00
	D.	oil bath	226	226	0.00
	E.	oil bath	286	288	-.27
#6	A.	water bath	72	72	0.00
	B.	oil bath	130	130	0.00
	C.	oil bath	196	194	0.30
	D.	oil bath	230	230	0.00
	E.	oil bath	286	286	0.00
#7	A.	water bath	72	71	0.19
	B.	oil bath	130	130	0.00
	C.	oil bath	196	194	0.30
	D.	oil bath	230	230	0.00
	E.	oil bath	288	287	0.13
#8	A.	water bath	72	70	0.38
	B.	oil bath	130	130	0.00
	C.	oil bath	190	190	0.00
	D.	oil bath	230	230	0.00
	E.	oil bath	288	287	0.13

$$\text{TEMPERATURE DIFFERENCE} = \frac{(\text{REF TEMP, F} + 460) - (\text{TEST TEMP, F} + 460)}{\text{REF TEMP, F} + 460} \times 100 <= 1.5\%$$

WET-BULB DRY-BULB; BIMETALLIC
TEMPERATURE SENSOR CALIBRATION DATA FORM
TOLERANCE: +/- 5.4 F

DATE: 07/16/87
AMBIENT TEMPERATURE, F : 72
CALIBRATOR: FLH/JPM

BAROMETRIC PRESSURE: 29.24
REFERENCE THERMOMETER # 22

REFERENCE POINT #		SOURCE	REFERENCE THERMOMETER TEMPERATURE, F	THERMOCOUPLE POTENTIOMETER TEMPERATURE, F	TEMPERATURE DIFFERENCE, %
Bimetallic					
Db1	A.	water bath	73	74	-.19
	B.	oil bath	130	134	-.68
	C.	oil bath	192	196	-.61
	D.	oil bath	218	221	-.44
	E.	oil bath	286	287	-.13
Wb1	A.	water bath	73	74	-.19
	B.	oil bath	130	132	-.34
	C.	oil bath	226	228	-.29
	D.	oil bath	194	194	0.00
	E.	oil bath	286	286	0.00
Db2	A.	water bath	73	73	0.00
	B.	oil bath	130	132	-.34
	C.	oil bath	193	193	0.00
	D.	oil bath	226	229	-.44
	E.	oil bath	286	286	0.00
Wb2	A.	water bath	73	72	0.19
	B.	oil bath	130	133	-.51
	C.	oil bath	193	190	0.46
	D.	oil bath	218	218	0.00
	E.	oil bath	288	287	0.13
NOx Flask					
	A.	ice bath	34	34	0.00
	B.	ice bath	50	50	0.00
	C.	water bath	73	73	0.00
	D.	water bath	89	89	0.00
	E.	oil bath	115	114	0.17
Hot Box	A.	water bath	73	73	0.00
	B.	oil bath	130	135	-.85
	C.	oil bath	194	191	0.46
	D.	oil bath	210	210	0.00
	E.	oil bath	270	267	0.41

$$\text{TEMPERATURE DIFFERENCE} = \frac{\text{(REF TEMP, F + 460)} - \text{(TEST TEMP, F + 460)}}{\text{(REF TEMP, F + 460)}} \times 100 <= 1.5\%$$

METER BOX
TEMPERATURE SENSOR CALIBRATION DATA FORM
TOLERANCE: +/- 5.4 F

DATE: 07/16/87
AMBIENT TEMPERATURE, F : 72
CALIBRATOR: FLH/JPM

BAROMETRIC PRESSURE: 29.24
REFERENCE THERMOMETER # 22

REFERENCE POINT #		SOURCE	REFERENCE THERMOMETER TEMPERATURE,F	THERMOCOUPLE POTENTIOMETER TEMPERATURE,F	TEMPERATURE DIFFERENCE, %
METER BOX					
1264A	A.	ice bath	36	36	0.00
	B.	water bath	72	73	-.19
	C.	oil bath	128	126	0.34
	D.	oil bath	140	140	0.00
1264B	A.	ice bath	36	36	0.00
	B.	water bath	72	73	-.19
	C.	oil bath	128	126	0.34
	D.	oil bath	140	140	0.00
1348A	A.	ice bath	35	34	0.20
	B.	water bath	72	72	0.00
	C.	oil bath	126	126	0.00
	D.	oil bath	140	140	0.00
1348B	A.	ice bath	35	35	0.00
	B.	water bath	72	73	-.19
	C.	oil bath	126	126	0.00
	D.	oil bath	140	140	0.00
1481A	A.	ice bath	35	35	0.00
	B.	water bath	72	73	-.19
	C.	oil bath	128	126	0.34
	D.	oil bath	140	140	0.00
1481B	A.	ice bath	35	36	-.20
	B.	water bath	72	73	-.19
	C.	oil bath	128	128	0.00
	D.	oil bath	140	139	0.17
1965A	A.	ice bath	34	34	0.00
	B.	water bath	72	72	0.00
	C.	oil bath	126	125	0.17
	D.	oil bath	140	140	0.00
1965B	A.	ice bath	34	33	0.20
	B.	water bath	72	72	0.00
	C.	oil bath	126	126	0.00
	D.	oil bath	140	140	0.00

$$\text{TEMPERATURE DIFFERENCE} = \frac{(\text{REF TEMP, F} + 460) - (\text{TEST TEMP, F} + 460)}{\text{REF TEMP, F} + 460} \times 100 <= 1.5\%$$

WET-BULB DRY-BULB; OMEGA TEMP
TEMPERATURE SENSOR CALIBRATION DATA FORM
TOLERANCE: +/- 5.4 F

DATE: 07/16/87
AMBIENT TEMPERATURE, F : 72
CALIBRATOR: FLH/JPM

BAROMETRIC PRESSURE: 29.24
REFERENCE THERMOMETER # 22/#23

REFERENCE POINT #		SOURCE	REFERENCE THERMOMETER TEMPERATURE,F	THERMOCOUPLE POTENTIOMETER TEMPERATURE,F	TEMPERATURE DIFFERENCE, %
Omega Temp HH-2 #1					
Db1	A.	water bath	72	72	0.00
	B.	oil bath	160	160	0.00
	C.	oil bath	185	185	0.00
	D.	oil bath	225	224	0.15
	E.	oil bath	280	280	0.00
Wb1	A.	water bath	72	72	0.00
	B.	oil bath	160	160	0.00
	C.	oil bath	186	186	0.00
	D.	oil bath	226	225	0.15
	E.	oil bath	280	280	0.00
Omega Temp HH-2 #2					
Db2	A.	water bath	72	72	0.00
	B.	oil bath	160	159	0.16
	C.	oil bath	188	187	0.15
	D.	oil bath	221	220	0.15
	E.	oil bath	283	282	0.13
Wb2	A.	water bath	72	73	-.19
	B.	oil bath	160	159	0.16
	C.	oil bath	188	188	0.00
	D.	oil bath	220	219	0.15
	E.	oil bath	283	282	0.13

$$\text{TEMPERATURE DIFFERENCE} = \frac{(\text{REF TEMP, F} + 460) - (\text{TEST TEMP, F} + 460)}{\text{REF TEMP, F} + 460} \times 100 <= 1.5\%$$

WEY-BULB DRY-BULB OMEGA TEMP
TEMPERATURE SENSOR CALIBRATION DATA FORM
TOLERANCE: +/- 5.4 F

DATE: 07/16/87
AMBIENT TEMPERATURE, F : 72
CALIBRATOR: FLH/JPM

BAROMETRIC PRESSURE: 29.24
REFERENCE THERMOMETER # 22/# 23

REFERENCE POINT #		SOURCE	REFERENCE THERMOMETER TEMPERATURE,F	THERMOCOUPLE POTENTIOMETER TEMPERATURE,F	TEMPERATURE DIFFERENCE, %
Omega Temp 873-F					
Db1	A.	water bath	72	73	-.19
	B.	oil bath	163	162	0.16
	C.	oil bath	186	185	0.15
	D.	oil bath	230	229	0.14
	E.	oil bath	280	279	0.14
Wb1	A.	water bath	72	73	-.19
	B.	oil bath	163	162	0.16
	C.	oil bath	188	187	0.15
	D.	oil bath	232	231	0.14
	E.	oil bath	280	279	0.14
873-F High Temp					
	A.	oil bath	280	279	0.14
	B.	M. Furnace	415	416	-.11
	C.	M. Furnace	595	596	-.09
	D.	M. Furnace	835	837	-.15
	E.	M. Furnace	1075	1077	-.13

$$\text{TEMPERATURE DIFFERENCE} = \frac{(\text{REF TEMP, F} + 460) - (\text{TEST TEMP, F} + 460)}{} \times 100 <= 1.5\%$$

STACK
TEMPERATURE SENSOR CALIBRATION DATA FORM
TOLERANCE: +/- 5.4 F

DATE: 07/24/87
AMBIENT TEMPERATURE, F : 74
CALIBRATOR: FLH

BAROMETRIC PRESSURE: 29.28
REFERENCE THERMOMETER # 22/#5

REFERENCE POINT #		SOURCE	REFERENCE THERMOMETER TEMPERATURE, F	THERMOCOUPLE POTENTIOMETER TEMPERATURE, F	TEMPERATURE DIFFERENCE, %
4'-1	A.	oil bath	92	92	0.00
	B.	oil bath	242	242	0.00
	C.	oil bath	368	367	0.12
4'-2	A.	oil bath	92	92	0.00
	B.	oil bath	242	241	0.14
	C.	oil bath	368	368	0.00
5'-1	A.	oil bath	92	91	0.18
	B.	oil bath	242	244	-.28
	C.	oil bath	376	380	-.24
5'-2	A.	oil bath	92	91	0.18
	B.	oil bath	242	244	-.28
	C.	oil bath	378	380	-.24
6'-1	A.	oil bath	90	89	0.18
	B.	oil bath	242	243	-.14
	C.	oil bath	378	377	0.12
6'-2	A.	oil bath	90	91	-.18
	B.	oil bath	242	244	-.28
	C.	oil bath	378	377	0.12
8'-1	A.	oil bath	98	96	0.36
	B.	oil bath	242	243	-.14
	C.	oil bath	378	379	-.12
8'-2	A.	oil bath	98	99	-.18
	B.	oil bath	242	244	-.28
	C.	oil bath	378	378	0.00
8'-3	A.	oil bath	98	96	0.36
	B.	oil bath	242	244	-.28
	C.	oil bath	378	379	-.12
8'-9"	A.	oil bath	98	96	0.36
	B.	oil bath	242	243	-.14
	C.	oil bath	380	381	-.12
9'-7"	A.	oil bath	104	102	0.35
	B.	oil bath	242	244	-.28
	C.	oil bath	380	381	-.12

$$\text{TEMPERATURE DIFFERENCE} = \frac{(\text{REF TEMP, F} + 460) - (\text{TEST TEMP, F} + 460)}{\text{REF TEMP, F} + 460} \times 100 <= 1.5\%$$

IMPINGER
TEMPERATURE SENSOR CALIBRATION DATA FORM
TOLERANCE: +/- 2.0 F

DATE: 07/16/87
AMBIENT TEMPERATURE, F : 72
CALIBRATOR: FLH/JPM

BAROMETRIC PRESSURE: 29.24
REFERENCE THERMOMETER # 22

REFERENCE POINT #		SOURCE	REFERENCE THERMOMETER TEMPERATURE,F	THERMOCOUPLE POTENTIOMETER TEMPERATURE,F	TEMPERATURE DIFFERENCE, %
#1	A.	ice bath	34	34	0.00
	B.	water bath	73	73	0.00
	C.	oil bath	112	111	0.17
#2	A.	ice bath	34	33	0.20
	B.	water bath	74	73	0.19
	C.	oil bath	112	110	0.35
#3	A.	ice bath	34	33	0.20
	B.	water bath	73	72	0.19
	C.	oil bath	110	108	0.35
#4	A.	ice bath	34	34	0.00
	B.	water bath	74	73	0.19
	C.	oil bath	112	113	-.17
#5	A.	ice bath	34	35	-.20
	B.	water bath	73	73	0.00
	C.	oil bath	110	109	0.18

$$\text{TEMPERATURE DIFFERENCE} = \frac{(\text{REF TEMP, F} + 460) - (\text{TEST TEMP, F} + 460)}{\text{REF TEMP, F} + 460} \times 100 <= 1.5\%$$

WALTER H. KESSLER COMPANY, INC.

THERMOMETERS KESSLER HYDROMETERS

ONE-SIXTY NICKS STREET • WESTBURY, LONG ISLAND, NEW YORK • 516 EDGEWOOD 4-4064

1 C

MANUFACTURERS CERTIFICATE OF CALIBRATION

This is to certify that the instrument listed below has been tested in our temperature calibration laboratory in accordance with the latest procedures in the finest constant temperature equipment available, against National Bureau of Standards certified master standards.

Certified for: Fisher Scientific Company

Description: Thermometer #15-041D -1/201°C in 0.2° Div Total Immersion

Instrument Serial No. 811 007 Date Certified: January 30, 1981

Reading of This Instrument	Reading of N.B.S. Standard (True Temperature)
+0.02C	0.00C
20.00C	20.00C
40.00C	40.00C
59.96C	60.00C
79.98C	80.00C
100.02C	100.00C
119.92C	120.00C
139.98C	140.00C
160.00C	160.00C
180.00C	180.00C
199.86C	200.00C

The tabulated readings apply provided the ice-point reading taken after exposure for not less than 3 days to a temperature of about 25° C (77° F) is +0.02C . If the ice-point reading is found to be higher (or lower) than stated, all other readings will be higher (or lower) by the same amount.

Serial & Test numbers of National Bureau of Standards certified instruments referenced in certification of the thermometer listed above:

NBS Standard M44165,78A-227,M44451,78A-220,78A-601/602

NBS Test No 176240,219883,176240,219883,219606

WALTER H. KESSLER COMPANY, INC.

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WEIGHT TRACEABILITY CERTIFICATE

TO: Environmental Testing, Inc.
1700 Univ. Commercial Dr.
Charlotte, NC 28213

The balances listed below have been serviced by our representative on December 21, 1987

This is to certify that the test weights used are traceable to the National Bureau of Standards.

	Analytical	Precision
Mettler identification number of test weights used:	13	
Mettler calibration date of test weights used:	8-1-87	
National Bureau of Standards test number:	737/0670-49	

Model and serial number of balances serviced:

AE163- C57742	
H54AR- 677277	

Kevin Z. Byrd
Mettler Service Representative

1-17-88
Date of Issue

Mettler

Mettler Instrument Corporation
Box 71, Hightstown, NJ 08520
(609) 448-3000

F-134 (1/88)

GCA CORPORATION
Precision Scientific Group

3737 West Cortland Street
Chicago, Illinois 60647
Telephone: 312-227-2660
Telex: 254028

February 2, 1984

Environmental Testing
1700 University Commercial Place
Charlotte, N.C. 28213

Attn: Mr. Paul Jenkins

Subj: Certification Wet Test Meter

Dear Mr. Jenskins:

In lieu of any printed certification from our company, we offer as follows our statement on the referenced subject.

> "The Wet Test Meter catalog number 63123, has been tested at our plant facilities using a Meter Prover Bottle NBS registration No. 4897. The Meter was found to perform to our advertised specifications of plus or minus 1/2% error in flow rate and conforms to specifications of ASTM D-1071."

Respectfully,

Bob Husberg

Bob Husberg
Supervisor, Customer Service

BH/mg