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RAMCON
ENVIRONMENTAL CORPORATION

ENCLOSURE

RAMCON BUILDING □ 223 SCOTT ST. □ MEMPHIS, TN. 38112 □ 901/458-7000

MAY 19 1987

RAMCON

ENVIRONMENTAL CORPORATION

RAMCON BUILDING 223 SCOTT STREET MEMPHIS, TENNESSEE 38112 TELEPHONE 901 / 458-7000 800 / 458-4567

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
APAC - VIRGINIA, INC.
Virginia Beach, Virginia
April 30, 1987

Bobby C Lambeth
Bob Lambeth
APAC - Virginia

G. Sumner Buck, III
President

Ken Allmendinger
Team Leader

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TABLE I

SUMMARY OF TEST RESULTS
April 30, 1987

Test Run	Time	Grain Loading	Isokinetic Variation	Actual Emissions
1	10:07 to 11:34	0.0214 gr/SCF	99%	3.2 lbs/hr
2	11:59 to 13:28	0.0144 gr/SCF	101%	2.3 lbs/hr
3	13:47 to 15:38	0.0132 gr/SCF	102%	2.1 lbs/hr
	Average:	0.0163 gr/SCF		2.5 lbs/hr

On the basis of these test results, the average grain loading of the three test runs was below the .04 gr/SCF emissions limitation set by US EPA and the State of Virginia. Therefore, the plant is operating in compliance with State and Federal Standards.

III. TEST PROCEDURES

A. Method Used: The source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

B. Problems Encountered: No problems were encountered that affected testing.

IV. THE SOURCE

1. **Aggregate bins:** Virgin aggregate is fed individually into each of four bins by type. It is metered onto a conveyor belt running under the bins to a shaker screen. The proporation of each aggregate type is determined by the job mix formula and pre-set to be metered out to meet these specifications.

2. **Preliminary oversize screen:** The aggregate is fed through a shaker screen where oversize rocks and foreign material is screened out of the mix.

3. **Weigh conveyor belt:** The aggregate is conveyed to the rotary drum dryer on a conveyor belt which weighs the material. The production rate is determined by this weight reading.

4. **Rotary drum dryer/mixer:** The aggregate is fed into the rotary drum dryer where it is tumbled by flighting into a veil in front of a flame which drives off the moisture. Further mixing is also accomplished in this drum. Hot liquid asphalt is injected approximately one-third of the way down the inclined drum where it is mixed with the aggregate.

5. **Burner:** The fuel fired burner is used to provide the flame which drys the aggregate.

6. **Knock off baffleing:** A baffeling plate is inserted in the "dirty" side plenum as a knock out for heavy particles in the air stream. These particles fall to the bottom of the baghouse.

7. **Baghouse:** The hot gases are pulled through the bags into the clean air plenum. The solid particulate matter is trapped on the dust coat buildup on the bags. A bag cleaning cycle consisting of jet burst of air from the inside (or clean air side) of the bags sends a large bubble of air down the inside of the bags shaking loose buildup on the bag surface. This particulate matter is collected at the bottom of the baghouse and reinjected into the drum mixer where it is used as part of the finished project.

8. **Liquid asphalt storage:** The liquid asphalt is stored in this heated tank until it is needed in the mixer. The amount of asphalt content and its temperature are pre-set for each different type job.

9. Conveyor to surge/storage bin: The finished product of aggregate mixed with liquid asphalt is conveyed to a surge bin.

10. Surge/Storage bin: The asphaltic cement is dumped into this surge bin and metered out to dump trucks which pull underneath a slide gate at the bottom of the bin.

11. Control/operators house: The entire plant operation is controlled from this operator's house.

12. Truck loading scale: As the trucks receive the asphalt from the storage/surge bin they are weighed on the loading scale which tells the plant operator the amount of asphalt that is being trucked on each individual load.

13. Fuel Storage

DATA SUMMARY

Plant

1. Manufacturer of plant Astec Industries.
2. Designed maximum operating capacity 250 TPH @ 5 % moisture.
3. Actual operation rate 200 TPH @ 4 % moisture.
4. Startup date 4-7-87.
5. Type of fuel used in dryer # 2.
6. Quanity of fuel consumption Appox 2 gal / Tonn.

Aggregate

7. Name/type of mix P-401.
8. Percent asphalt in mix 5.2 %.
9. Temperature of asphalt 340°.
10. Sieve/Screening analysis: % Passing;

1"		3/8"	85.8	#30	27.4
3/4"	100	#4	69.7	#50	16.9
1/2"	94.0	#8	54.5	#200	6.0

Baghouse

11. Manufacturer Astec Industries.
12. No. of bags 725. Type of bags Dupont Nomex.
13. Air to cloth ratio 6:1. Designed ACFM 42,000 CFM
14. Square feet of bags 7000.
15. Type of cleaning; pulse jet ____, reverse air ✓, plenum pulse ____, other ____.
16. Cleaning cycle time 4 sec.
17. Interval between cleaning cycle 4 sec.
18. Pressure drop across baghouse 8 - 9 psi.
19. Pulse pressure on cleaning cycle .3 psi.

COMPANY NAME APAC-VA Inc DATE 4-30-87

PLANT DATA

COMPANY NAME _____

COMPANY REP. _____ DATE _____ Phone # _____

DATA SOURCE _____

PLANT LOCATION _____

PLANT MANUFACTURER _____ PLANT MODEL NO. _____ PLANT TYPE _____

MIX SPECIFICATION NO. _____ OIL SPECIFICATION NO. _____

TIME: START _____ STOP _____ A.T. _____ °F R.H. _____ %

TIME 24 HOUR	FUEL OIL ☑ NATURAL GAS ☐ PROPANE ☐	BURNER SETTING	AGGREGATE TPH	RECYCLE TPH	ASPHALT TPH	MIX TEMPERATURE °F	VENTURI ☐ Baghouse ☑ DIFFERENTIAL
14:15		34%	144.4	43.0	9.9	300°	8-9
14:30		33%	146.6	44.9	10.2	293°	8-9
14:45		35%	146.1	46.0	10.1	298°	8-9
15:00		37%	145.6	43.9	10.0	299°	8-9
15:15	Down						
15:30							
15:45		35%	143.1	40.9	9.7	301°	8-9

REMARKS:

V. EQUIPMENT USED

Equipment used on conducting the particulate emissions test was:

A. The Lear Siegler PM-100 stack sampler with appropriate auxillary equipment and glassware. The train was set up according to the schematic on the nex page.

B. An Airguide Instruments Model 211-B (uncorrected) aneroid barometer was used to check the barometric pressure.

C. Weston dial thermometers are used to check meter temperatures. An Analogic Model 2572 Digital Thermocouple is used for stack temperatures.

D. A Hays 621 Analyzer was used to measure the oxygen, carbon dioxide and carbon monoxide content of the stack gases. For non-combustion sources, A Bacharach Instrument Company Fyrite is used for the gas analysis.

E. Filters are mady by Schleicher and Schuell and are type 1-HV with a porosity of .03 microns.

F. The acetone is reagent grade or ACS grade with a residue of $\leq$ .001.

LABORATORY PROCEDURES FOR PARTICULATE SAMPLING

I. Field Preparation

A. FILTERS: Fiberglass 4" sampling filters are prepared as follows:

Filters are removed from their box and numbered on the back side with a felt pen. The numbering system is continuous from job to job. The filters are placed in a dessicator to dry for at least 24 hours. Clean plastic petri dishes, also numbered, top and bottom, are placed in the dessicator with the filters. After dessication, the filters are removed one at a time and weighed on the Sartorius analytical balance, then placed in the correspondingly numbered petri dish. Weights are then recorded in the lab record book. Three filters are used for each complete particulate source emissions test and there should be several extra filters included as spares.

B. SILICA GEL: Silica Gel used for the test is prepared as follows:

Approximately 200 g of silica gel is placed in a wide mouth "Mason" type jar and dried in an oven (175°C for two hours). The open jars are removed and placed in a dessicator until cool (2 hours) and then tightly sealed. The jars are then numbered and weighed on the triple beam balance to the closest tenth of a gram, and this weight is recorded for each sealed jar. The number of silica gel jars used is the same as the number of filters. Silica gel should be indicating type, 6-16 mesh.

II. Post-Testing Lab Analysis

A. FILTERS: The filters are returned to the lab in their sealed glass filter holder which was used in field sampling. In the lab these holders are opened. The filter is placed in its petri dish with the lid off and returned to the dessicator for at least 24 hours. The top half of the filter holder is washed into the corresponding probe wash bottle and the bottom half of the filter holder is washed into the corresponding impinger catch bottle. (See II, C and D). After dessication, the filters are reweighed. The final weight is recorded in the lab record book. The filter pick up weight is calculated and recorded also. This procedure is repeated for all filters used in the field.

Alternately, the test team may opt to oven dry the filters at 220°F for two to three hours, weigh the sample, and use this weight as a final weight.

B. SILICA GEL: The sealed silica gel jars should be reweighed on the triple-beam balance and their weights recorded as shown on previous page.

C. PROBE RINSINGS: In all tests, a probe wash-out analysis will be necessary. These samples are returned in sealed Mason jars and consist of A.R. Acetone with an unknown solid content. Clean 250 ml beakers are used to make this analysis. These should be immaculately washed and rinsed with deionized water, then oven dried at 105°C for about one hour. The beakers should be moved to the dessicator to cool for ninety (90) minutes, then labeled with a pencil and weighed on the Sartorius analytical balance. Any variance from this procedure should be duplicated exactly when reweighing, as this procedure has been found to be quite sensitive. After preparing the necessary number of beakers (one for each probe wash and one blank) the Mason jars should be opened, poured into the beaker, and any material remaining on the jar walls rinsed with an acetone wash bottle into the beaker. The amount of liquid in the beaker should be noted on the analysis form. The acetone rinsings are evaporated on a warming plate. The liquid is kept swirled with an air sweep to prevent "bumping". When the acetone is evaporated the beakers are weighed as in Section II A.

D. IMPINGER CATCH: In some testing cases, the liquid collected in the impingers must be analyzed for solids content. This involves a similar procedure to the probe wash solids determination, except that the liquid is deionized water.

E. ACETONE: Conduct a blank analysis of acetone in the 1 gallon glass container. This acetone will be used in the field for rinsing the probe, nozzle, and top half of the filter holder. Performing such a blank analysis prior to testing will insure that the quality of the acetone to be used will not exceed the .001% residual purity standard.

SPECIAL NOTE

When sampling sources high in moisture content, (such as asphalt plants) the filter paper sometimes sticks to the filter holder. When removing the filter it may tear. In order to maintain control of any small pieces of filter paper which may be easily lost, they are washed with acetone into the probe washing. This makes the filter weight light (sometimes negative) and the probe wash correspondingly heavier. The net weight is the same and no particulate is lost. This laboratory procedure is taught by EPA in the Quality Assurance for Source Emissions Workshop at Research Triangle Park and is approved by EPA.

VII. CALCULATIONS

Dry Gas Volume :

$$V_{m(std)} = V_m \left[\frac{T_{(std)}}{T_m} \right] \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{(std)}} \right] = 17.64 \frac{^\circ R}{in.Hg.} \; Y \; V_m \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right]$$

Where:

$V_{m(std)}$ = Dry Gas Volume through meter at standard conditions, cu.ft.

V_m = Dry Gas Volume measured by meter, cu.ft.

P_{bar} = Barometric pressure at oriface meter, in. Hg.

P_{std} = Standard absolute pressure,(29.92 in. Hg.)

T_m = Absolute temperature at meter $^\circ R$

T_{std} = Standard absolute temperature ($528^\circ R$)

ΔH = Average pressure drop across oriface meter, in.H_2O

Y = Dry gas meter calibration factor

13.6 = Inches water per inches Hg.

Run # 1 $V_{m(std)} = 17.64 \quad (1.02)(53.16) \left[\frac{(30.08) + \frac{1.19}{13.6}}{567} \right] = 50.82$ dsc

Run # 2 $V_{m(std)} = 17.64 \quad (1.02)(57.91) \left[\frac{(30.08) + \frac{1.35}{13.6}}{570} \right] = 55.09$ dsc

Run # 3 $V_{m(std)} = 17.64 \quad (1.02)(56.35) \left[\frac{(30.08) + \frac{1.29}{13.6}}{566} \right] = 53.98$ dsc

Dry molecular weight:

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

Where:

M_d	= Dry molecular weight, lb./lb.-mole.
$\%CO_2$	= Percent carbon dioxide by volume (dry basis).
$\%O_2$	= Percent oxygen by volume (dry basis).
$\%N_2$	= Percent nitrogen by volume (dry basis).
%CO	= Percent carbon monoxide by volume (dry basis).
0.264	= Ratio of O_2 to N_2 in air, v/v.
0.28	= Molecular weight of N_2 or CO, divided by 100.
0.32	= Molecular weight of O_2 divided by 100.
0.44	= Molecular weight of CO_2 divided by 100.

Run # 1: $M_d = 0.44(4.0\%) + 0.32(13.3\%) + 0.28(.0\% + 82.7\%) = 29.2$ lb./lb.-mole

Run # 2: $M_d = 0.44(4.0\%) + 0.32(12.0\%) + 0.28(.0\% + 84.0\%) = 29.1$ lb./lb.-mole

Run # 3: $M_d = 0.44(4.5\%) + 0.32(12.5\%) + 0.28(.0\% + 83.0\%) = 29.2$ lb./lb.-mole

Moisture content of stack gases: $$B_{ws} = \frac{V_{wc_{std}} + V_{wsg_{std}}}{V_{wc_{std}} + V_{wsg_{std}} + V_{m_{std}}} \times 100$$

Where:

B_{ws} = Proportion of water vapor, by volume, in the gas stream.

V_m = Dry gas volume measured by dry gas meter,(dcf).

$V_{wc_{std}}$ = Volume of water vapor condensed corrected to standard conditions (scf).

$V_{wsg_{std}}$ = Volume of water vapor collected in silica gel corrected to standard conditions (scf).

Run # 1: $$B_{ws} = \frac{16.9 + .7}{16.9 + .7 + 50.82} \times 100 = 25.7\ \%$$

Run # 2: $$B_{ws} = \frac{17.7 + .8}{17.7 + .8 + 55.09} \times 100 = 25.1\ \%$$

Run # 3: $$B_{ws} = \frac{17.9 + .7}{17.9 + .7 + 53.98} \times 100 = 25.6\ \%$$

Molecular weight of stack gases: $M_s = M_d\ (1-B_{ws}) + 18\ (B_{ws})$.

Where:

M_s = Molecular weight of stack gas, wet basis, (lb./lb.-mole).

M_d = Molecular weight of stack gas, dry basis, (lb./lb.-mole).

Run # 1: $M_s = 29.2\ (1-\ .257\ ) + 18\ (\ .257\ ) = 26.3$ (lb./lb.-mole).

Run # 2: $M_s = 29.1\ (1-\ .251\ ) + 18\ (\ .251\ ) = 26.3$ (lb./lb.-mole).

Run # 3: $M_s = 29.2\ (1-\ .256\ ) + 18\ (\ .256\ ) = 26.3$ (lb./lb.-mole).

Stack gas flow rate:

$$Q_{sd} = 3600 \left[1-B_{wc}\right] V_s A \left[\frac{T_{std}}{T_{stk}}\right] \left[\frac{P_s}{P_{std}}\right]$$

Where:

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, (dscf/hr).

A = Cross sectional area of stack ($ft.^2$).

3600 = Conversion factor, sec./hr.

t_s = Stack temperature ($^\circ f$).

T_s = Absolute stack temperature, ($^\circ R$).

T_{std} = Standard absolute temperature, ($528^\circ R$).

P_{bar} = Barometric pressure at measurement site, (in.Hg.).

P_g = Stack static pressure, (in.Hg.).

P_s = Absolute stack gas pressure, (in.Hg.); = $P_{bar} + P_g$

P_{std} = Standard absolute pressure, (29.92 in.Hg.)

Run # 1:

$$Q_{sd} = 3600\ (1-.257)\ (\ 70.93)\ (\ \ 7.7) \left[\frac{528}{735}\right] \left[\frac{30.08}{29.92}\right] = 1055054 \text{ dscf/}$$

Run # 2:

$$Q_{sd} = 3600\ (1-.251)\ (\ 76.06)\ (\ \ 7.7) \left[\frac{528}{746}\right] \left[\frac{30.08}{29.92}\right] = 1123680 \text{ dscf/}$$

Run # 3:

$$Q_{sd} = 3600\ (1-.256)\ (\ 73.87)\ (\ \ 7.7) \left[\frac{528}{742}\right] \left[\frac{30.08}{29.92}\right] = 1089885 \text{ dscf/}$$

Isokinetic variation : $I = 100\ T_s \left| \dfrac{0.002669\ V_{ic} + (V_m/T_m)(P_{bar} + \Delta H/13.6)}{60\ \ \theta\ \ V_s\ \ P_s\ \ A_n} \right|$

Where:

I	=	Percent isokinetic sampling.
100	=	Conversion to percent.
T_s	=	Absolute average stack gas temperature, °R.
0.002669	=	Conversion factor, Hg - ft^3/ml - °R.
V_{ic}	=	Total volume of liquid collected in impingers and silica gel,
T_m	=	Absolute average dry gas meter temperature, °R.
P_{bar}	=	Barometric pressure at sampling site, (in.Hg).
ΔH	=	Average pressure differential across the oriface meter, (in.H_2
13.6	=	Specific gravity of mercury.
60	=	Conversion seconds to minutes
θ	=	Total sampling time, minutes.
V_s	=	Stack gas velocity, ft./sec.
P_s	=	Absolute stack gas pressure, in.Hg.
A_n	=	Cross sectional area of nozzle, ft^2.

Run # 1:

$$I = 100 \times 735 \left| \frac{(0.002669)(374.0) + \frac{53.2}{567}\left| 30.08 + \frac{1.19}{13.6} \right|}{60\ (\ 84\ )\ (\ 70.93\ )\ (30.08\ )\ (\ .000264\ )} \right| = 99\ \%$$

Run # 2:

$$I = 100 \times 746 \left| \frac{(0.002669)(394.0) + \frac{57.9}{570}\left| 30.08 + \frac{1.35}{13.6} \right|}{60\ (\ 84\ )\ (\ 76.06\ )\ (30.08\ )\ (\ .000264\ )} \right| = 101\ \%$$

Run # 3:

$$I = 100 \times 742 \left| \frac{(0.002669)(395.0) + \frac{56.3}{566}\left| 30.08 + \frac{1.29}{13.6} \right|}{60\ (\ 84\ )\ (\ 73.87\ )\ (30.08\ )\ (\ .000264\ )} \right| = 102\ \%$$

RAMCON ENVIRONMENTAL CORPORATION

Plant APAC

Location Virginia Beach Va.

Operator K Allmendinger

Date 4-30-87

Run No. 1

Sample Box No. 1

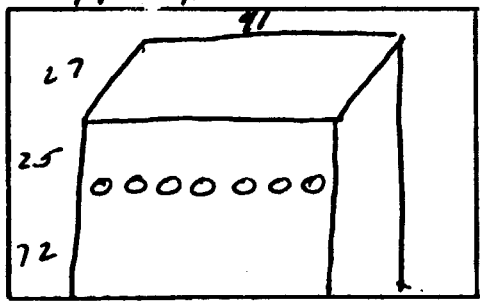
Meter Box No. 646882

Meter H @ 1.69

Y Factor 1.0486

Pitot Tube Coefficient Cp .79

PP = 1.00



Ambient Temperature 75

Barometric Pressure 30.08

Assumed Moisture, % 29

Probe Length, m(ft) 3

Nozzle Identification No. .000240

Avg. Calibrated Nozzle Dia., (in.) .220/.220/.220

Probe Heater Setting 4.5

Leak Rate, m^3/min. (cfm) .001

Probe Liner Material 316 stainless

Static Pressure, mm Hg(in.Hg) .01

Filter No. SG-1937

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	560	315
INITIAL	200	301
DIFFERENCE	360	14

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
4) 1	10:07:40 / 10:09	2	260	1.6	1.6	214.079 / 217.44	90	85	240	50
2	10:11	2	260	1.6	1.6	218.85	95	85	245	50
3	10:13	3	270	1.6	1.6	220.13	100	85	250	45
4	10:15	3	270	1.6	1.6	221.55	105	85	250	45
5	10:17	3	270	1.5	1.5	222.95	105	85	250	45
6	10:19:40	3	270	1.5	1.5	224.377	110	85	255	40
8) 1	10:20 / 10:22	3	270	1.3	1.3	225.72	110	85	255	40
2	10:24	2	265	1.1	1.1	226.95	110	85	255	40
3	10:26	2	270	1.3	1.3	228.27	110	85	250	40
4	10:28	2	280	1.3	1.3	229.60	115	90	250	40
5	10:30	2	280	1.4	1.4	230.98	115	90	250	40
6	10:32	2	275	1.4	1.4	232.31	120	90	240	40
c) 1	10:32:20 / 10:34	2	270	1.3	1.3	233.65	120	90	240	40

CO_2 : 4.0 4.0

RAMCON emissions test log sheet, cont. DATE 5-1-87 LOCATION Virginia B. TEST NO. 1

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft^3)	GAS SAMPLE TEMP.(°F)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							in	out		
4	11:17	2	285	1.0	1.0	258.32	130	100	245	40
5	11:19	2	285	1.2	1.2	260.60	130	100	245	40
6	11:21:30	2	285	1.2	1.2	261.882	130	100	245	40
1	11:22 / 11:24	2	270	1.2	1.2	263.18	125	100	245	40
2	11:26	2	280	1.4	1.4	264.55	130	100	240	40
3	11:28	2	280	1.3	1.3	265.88	130	100	240	40
4	11:30	2	280	.90	.90	266.93	130	100	240	40
5	11:32	2	285	.88	.88	268.14	130	100	240	40
6	11:34	2	285	.85	.85	269.231	130	100	240	40

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 5-1-87 LOCATION APAC Va. Beach, VA TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft^3)	GAS SAMPLE TEMP. (°F)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							in	out		
2	12:26	4	290	1.4	1.4	289.99	122	96	260	90
3	12:28	4	290	1.4	1.4	291.37	124	96	260	90
4	12:30	4	290	1.3	1.3	292.73	126	96	260	90
5	12:32	4	290	1.3	1.3	294.06	126	96	250	90
6	12:34	4	290	1.2	1.2	295.357	126	96	250	90
D) 1	12:35	4	285	1.1	1.1	296.63	120	96	255	95
2	12:37	4	285	1.2	1.2	297.93	122	96	255	95
3	12:38	4	285	1.2	1.2	299.21	124	96	255	95
4	12:40	4	290	1.4	1.4	300.59	126	96	260	95
5	12:42	4	290	1.4	1.4	301.97	126	96	260	95
6	12:44	4	290	1.3	1.3	303.315	126	96	260	95
E) 1	12:52	4	290	1.2	1.2	304.62	122	96	250	95
2	12:54	4	285	1.3	1.3	305.95	124	96	250	95
3	12:56	4	285	1.4	1.4	307.34	126	96	250	95
4	12:58	4	285	1.4	1.4	308.73	126	96	255	95
5	1:00	4	285	1.5	1.5	310.15	126	96	255	95
6	1:02	4	285	1.3	1.3	311.52	126	96	255	50
F) 1	~~1:03~~ 1:05	4	280	1.1	1.1	312.79	122	96	245	50
2	1:07	4	280	1.3	1.3	314.01	124	96	245	50
3	1:09	4	280	1.3	1.3	315.17	124	96	245	50

RAMCON ENVIRONMENTAL CORPORATION

Plant APAC

Location VA. Beach, VA.

Operator Bill Turner

Date 8/30/87

Run No. 3

Sample Box No. 3

Meter Box No. 6-46882

Meter H @ 1.69

Y Factor 1.0186

Pitot Tube Coefficient Cp .79

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature	80		
Barometric Pressure	30.08 FINAL	580	31.4
Assumed Moisture, %	25 INITIAL	200	27.9
Probe Length, m(ft)	3' DIFFERENCE	380	13
Nozzle Identification No.	.0002690		
Avg. Calibrated Nozzle Dia., (in.)	.220/.220/.220		
Probe Heater Setting	4.5		
Leak Rate, m^3/min. (cfm)			
Probe Liner Material	316 Stainless Steel		
Static Pressure, mm Hg (in. Hg)	.01		
Filter No.	SG-1951		

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H_2O	PRESSURE DIFF. ORF. MTR in H_2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
B) 1	1:47/1:49	4	290	1.5	1.5	321.315/329.16	98	98	240	40
2	1:51	4	290	1.5	1.5	330.38	110	98	240	45
3	1:53	4	290	1.4	1.4	331.73	116	96	245	45
4	1:55	3	290	1.3	1.3	333.14	118	96	245	95
5	1:57	3	290	1.3	1.3	334.56	120	94	250	45
6	1:59	3	290	1.2	1.2	335.99	120	94	250	45
C) 1	2:00/2:02	3	290	1.2	1.2	337.38	116	94	255	45
2	2:04	3	280	1.4	1.4	339.64	120	94	255	45
3	2:06	3	285	1.5	1.5	340.01	122	94	255	95
4	2:08	3	285	1.5	1.5	341.41	122	94	255	45
5	2:10	3	285	1.3	1.3	342.78	122	94	260	45
6	2:12	4	285	1.3	1.3	344.15	122	94	260	45
C) 1	2:14/2:16	4	285	1.1	1.1	345.47	118	94	265	45

CO_2 - 9.5%

O_2 - 12.5%

RAMCON emissions test log sheet, cont. DATE 5-1-87 LOCATION APC York Beach Va TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft^3) 373:46 ↓	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
4	2:59	4	285	1.4	1.4	~~372:08~~	120	92	250	45
5	3:01	4	280	1.3	1.3	379:79	120	92	250	45
6	3:03	4	280	1.3	1.3	376:12	120	92	255	45
1	~~3:04~~ 3:06	4	285	1.2	1.2	377:42	118	92	255	45
2	3:08	4	290	1.2	1.2	378:74	118	92	255	45
3	3:10	4	290	1.3	1.3	380:08	120	92	255	45
4	~~3:35~~ 3:12	4	~~290~~ 290	1.3	1.3	381:96	98	98	255	45
5	~~3:37~~ 3:14	4	~~290~~ 290	1.3	1.3	382:82	108	98	255	48
6	~~3:38~~ 3:16	4	245	1.1	1.1	384:163	112	96	260	45

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 5-4-87 Meter box number C46882

Barometric pressure, P_b = 30.07 in. Hg Calibrated by [illegible]

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Avg[a] (t_d), °F	Time (Θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	5	415.32 / 420.151	73	108 / 110	84 / 84	96.5	12:21	1.0202	1.64
1.0	5	421.84 / 426.98	73	110 / 110	85 / 86	97.75	8:49	1.0155	1.67
1.5	10	429.39 / 438.685	73	114 / 114	86 / 86	100	14:24	1.0168	1.66
2.0	10								
3.0	10								
4.0	10								
							Avg	1.0175	1.66

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \Theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110		
2.0	0.147		
3.0	0.221		
4.0	0.294		

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

KEN

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PITOT TUBE CALIBRATION DATA

Calibration pitot tube: type S size (OD) 3/8 ID number 43

Type S pitot tube ID number 43 $C_{p(std)}$ = 1

Calibration: date 1-8-87 performed by KB Allen

A-Side Calibration

Δp_{std}, cm (in.) H_2O	Δp_s, cm (in.) H_2O	$C_{p(S)}$ [a]	DEV. [b]
.92	1.6	.78	.01
.74	1.15	.80	.01
.82	1.3	.79	.00
Average		.79	

B-Side Calibration

Δp_{std}, cm (in.) H_2O	Δp_s, cm (in.) H_2O	$C_{p(S)}$ [a]	DEV. [b]
.92	1.5	.78	.01
.74	1.15	.80	.01
.82	1.30	.79	.00
Average		.79	

[a] $C_{p(S)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$ = _____

[b] $DEV = C_{p(S)} - \bar{C}_p$, (must be ≤ 0.01)

$\bar{C}_p(A) - \bar{C}_p(B)$ = _____ (must be ≤ 0.01).

RAMCON

Lear Siegler Stack Sampler

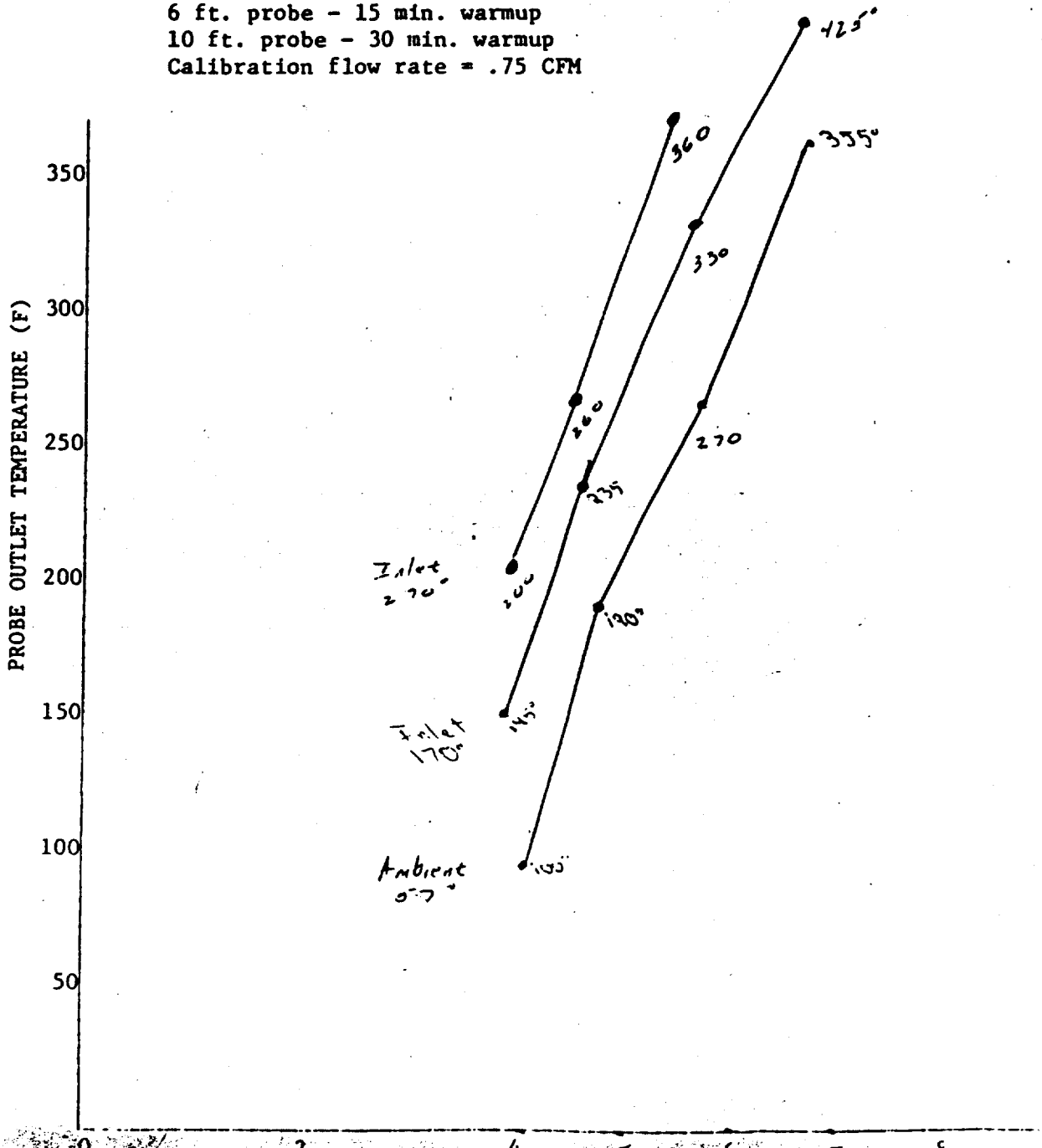
Heating Probe Calibration

Probe No. 43 Probe Length 3'

Date of Calibration 12-18-86 Signature K. B. Allen Jr

Name of Company to be tested _____

Note: 3 ft. probe - 5 min. warmup
6 ft. probe - 15 min. warmup
10 ft. probe - 30 min. warmup
Calibration flow rate = .75 CFM



STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-19-86 Thermocouple number Hot box

Ambient temperature 23 °C Barometric pressure 30.12 in. Hg

Calibrator LA Reference: mercury-in-glass ✓

other _____

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	boiling water	100 °C	100 °C	0%
B	Ambient	23 °C	22.8 °C	< 1%
	4-30-86	75 °F	75 °F	0%

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%$.

RAMCON Environmental Stack Test Team

Sumner Buck - President

Sumner Buck is the President of RAMCON Environmental. He is a graduate of the EPA 450 "Source Sampling for Particulate Pollutants" course and the 474 "Continuous Emissions Monitoring" course all given at RTP. Mr. Buck is a qualified V.E. reader with current certification. Mr. Buck has personally sampled over 300 stacks including over 200 asphalt plants. He is 43 years old and a graduate of the University of Mississippi with graduate studies at Memphis State University and State Technical Institute of Memphis.

Ken Allmendinger - Team Leader

Ken Allmendinger has been employed with RAMCON for three years. He has sampled over 100 asphalt plants with extensive training in Methods 1 through 5. He is qualified as a team leader and has current certification as a V.E. reader.

STACK TEST MONITORING

(42)

SOURCE NAME: APAC Virginia
LOCATION: Box 3091 Richmond Va 23235
DATE: 4-30-87
OBSERVER'S NAME: JOHN E. STEWART

PURPOSE OF TEST: NSPS Particulate
TESTING DONE BY: Ramcon Environmental
LAB ANALYSIS DONE BY: " "

COMPANY CONTACT: Bob Lambeth TELEPHONE: 804-774-113
CONTROL EQUIPMENT OPERATING: fabric filter (bag house)
OPACITY READING MADE: YES ✓ NO

UNIT/PROCESS NAME: hot mix asphalt facility
RATED CAPACITY: 250 tph
TYPE FUEL USED: #2 oil

APPROX. PROCESS RATE: 200 tph
METHOD OF DETERMINING PROCESS RATE: computer
STACK HEIGHT: 97
INDIVIDUAL STACK ✓ COMMON STACK
DIAMETER: (IF ROUND) (IF RECTANGULAR) WIDTH 27 LENGTH 81

I. SAMPLING POINT LOCATION

A. DISTANCE DOWNSTREAM FROM ANY FLOW DISTURBANCE:
NATURE OF DISTURBANCE 2.2 d
(BEND, CONTRACTION, EXPANSION, FAN, BAFFLES, ETC.)

B. DISTANCE UPSTREAM FRON ANY FLOW DISTURBANCE:
NATURE OF DISTURBANCE .8 d
(BEND, STACK EXIT CONTACTION, FAN, BAFFLES, EXPANSION, ETC.)

C. NUMBER OF PORTS IN STACK: 7

D. NUMBER OF POINTS SAMPLES PER PORT: 6

II. STACK GAS

A. STACK TEMPERATURE: 275°F

B. ORSAT ANALYSIS:
GRAB ✓ CONTINUOUS NUMBER OF INTEGRATED SAMPLES

C. PRELIMINARY Δ P: MIN. .97 MAX. 1.3

II. PARTICULATE TEST

A. SAMPLING TRAIN:
1. MANUFACTURER Ramcon Environmental MODEL 1
2. TEST METHOD: EPA METHOD 5 ✓ ASME PTC 21/27
OTHER (DESCRIBE)
3. TYPE FILTERS SLS type 3C
4. PROBE: LENGTH 3' MATERIAL 316 SS
5. PROBE HEATER SETTING 4.5
6. HEATER BOX SETTING 250°F
7. METER CALIBRATION FACTOR 1.01
8. METER Δ H @ FACTOR 1.69
9. DATE OF LAST CALIBRATION CHECK 4-26-87
a. ORIFICE METER ✓ b. DRY GAS METER ✓
c. TEMPERATURE ✓ d. PITOT TUBE ✓
e. NOZZLE DIAMETER ✓ f. OTHER