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Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

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

RAMCON
ENVIRONMENTAL CORPORATION

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
ASPHALT PAVING OF SHELBY, INC.
KINGS MOUNTAIN, NORTH CAROLINA
June 13, 1988

Don Dedmon
Asphalt Paving of Shelby

G. Sumner Buck, III
President

Ken Allmendinger
Team Leader

RAMCON BUILDING, 223 SCOTT STREET, MEMPHIS, TENNESSEE 38112
TELEPHONE 800/458-4567 IN TENNESSEE 901/458-7000 FAX 901-458-3848

RAMCON
ENVIRONMENTAL CORPORATION

July 1, 1988

Mr. Don Dedmon
Asphalt Paving of Shelby, Inc.
P. O. Box 1526
Shelby, NC 28150

Re: Particulate Emissions Test - Kings Mountain, North Carolina

Dear Mr. Dedmon:

Enclosed you will find four copies of our report on the particulate emissions test we conducted on your plant. Based on our test results, your plant does pass both EPA New Source Performance Standards and those set by the State of North Carolina. The average grain loading of the three test runs was below the allowable emissions standard set by EPA and the State of North Carolina. Therefore, your plant is operating in compliance with State and Federal Standards.

You will want to sign the report covers and send two copies to:

Mr. Bernie O. Pittman
North Carolina Division of Environmental Management
919 North Main St.
Mooresville, NC 28115

You will need to keep one copy of the report at the plant.

We certainly have enjoyed working with you and we look forward to serving you again in the future.

Sincerely,

G. Sumner Buck, III
President

GSBIII:mew

Enclosures

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

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I. INTRODUCTION

On June 13, 1988, personnel from RAMCON Environmental Corporation (REC) conducted a source emissions test for particulate emissions compliance at Asphalt Paving of Shelby's Astec drum mix asphalt plant located in Kings Mountain, North Carolina. RAMCON personnel conducting the test were Ken Allmendinger, Team Leader, and Kevin Powell. Kim Rea was responsible for the particulate laboratory analysis including taring the beakers and filters and recording final data in the laboratory record books. Custody of the samples was limited to Mr. Allmendinger and Ms. Rea.

The purpose of the test was to determine if the rate of particulate from the plant's baghouse and the total contaminants by weight (grain loading) is below the allowable N.S.P.S. limits set by the State of North Carolina.

II. TEST RESULTS

Table I summarizes the test results. The grain loading limitation for EPA is specified in 39 FR 9314, March 8, 1974, 60.92 Standards for Particulate Matter (1), as amended. The allowable N.S.P.S. particulate emissions for EPA and the State of North Carolina is .04 gr/dscf.

Mr. Bernie Pittman of North Carolina's Division of Environmental Management observed the testing conducted by RAMCON.

Kevin Powell conducted the visible emissions test (Reference Method 9). The opacity on all three tests ranged from 0 to 5%; therefore, this plant meets N.S.P.S. requirements.

TABLE I

SUMMARY OF TEST RESULTS
June 13, 1988

Test Run	Time	Grain Loading	Isokinetic Variation	Actual Emissions
1	08:49 to 09:53	0.0330 gr/DSCF	104.0%	5.4 lbs/hr
2	10:34 to 11:39	0.0353 gr/DSCF	96.8%	6.0 lbs/hr
3	12:10 to 13:15	0.0314 gr/DSCF	98.2%	5.2 lbs/hr
	Average:	0.0332 gr/DSCF		5.5 lbs/hr

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

III. TEST PROCEDURES

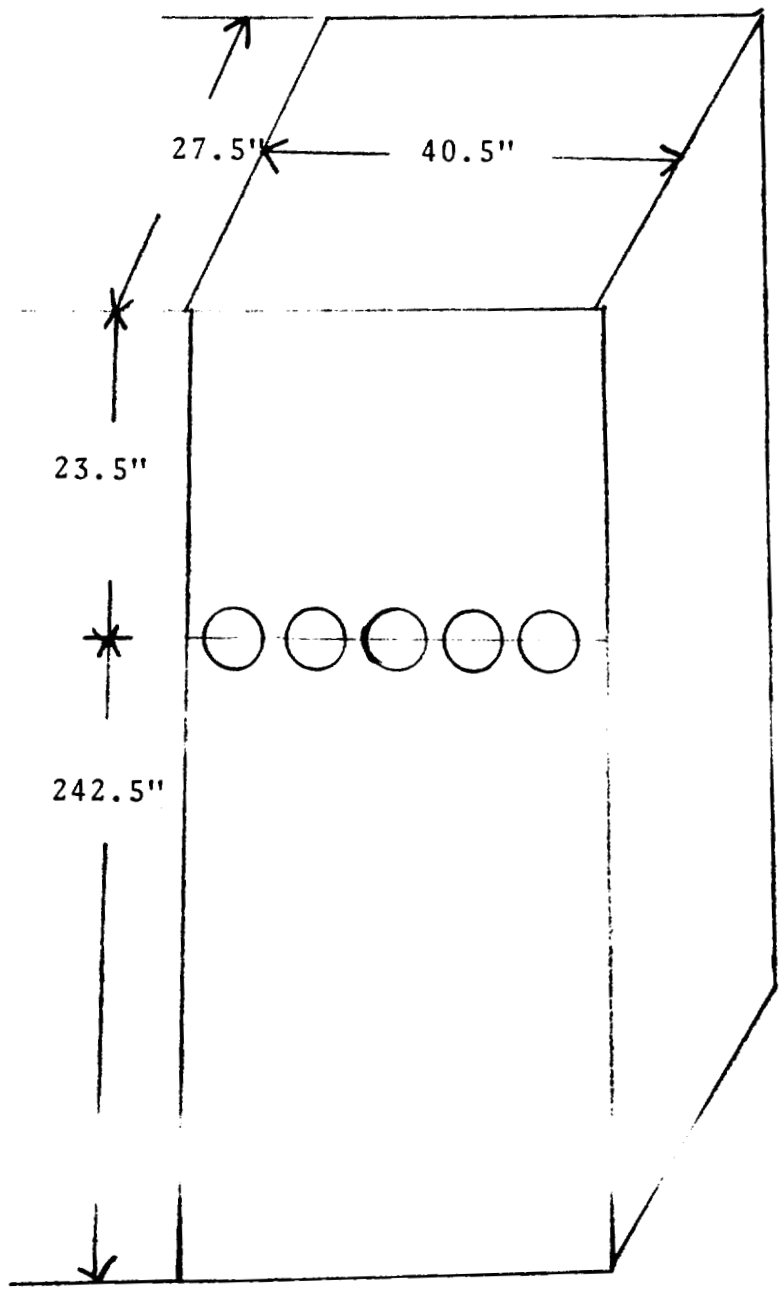
A. Method Used: The source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

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

C. Sampling Site: The emissions test was conducted after a baghouse on a rectangular stack measuring 27.5" x 40.5" with an equivalent diameter of 32.8". Five sampling ports were placed 23.5" down (.07 diameters upstream) from the top of the stack and 242.5" up (7.4 diameters downstream) from the last flow disturbance. Thirty points were sampled, six through each port for two minutes each for a total test time of sixty minutes per test run.

Points on a Diameter	Probe Mark
1	*7.8"
2	12.4"
3	17.0"
4	21.5"
5	26.1"
6	30.7"

*Measurements include a 5.5" standoff.



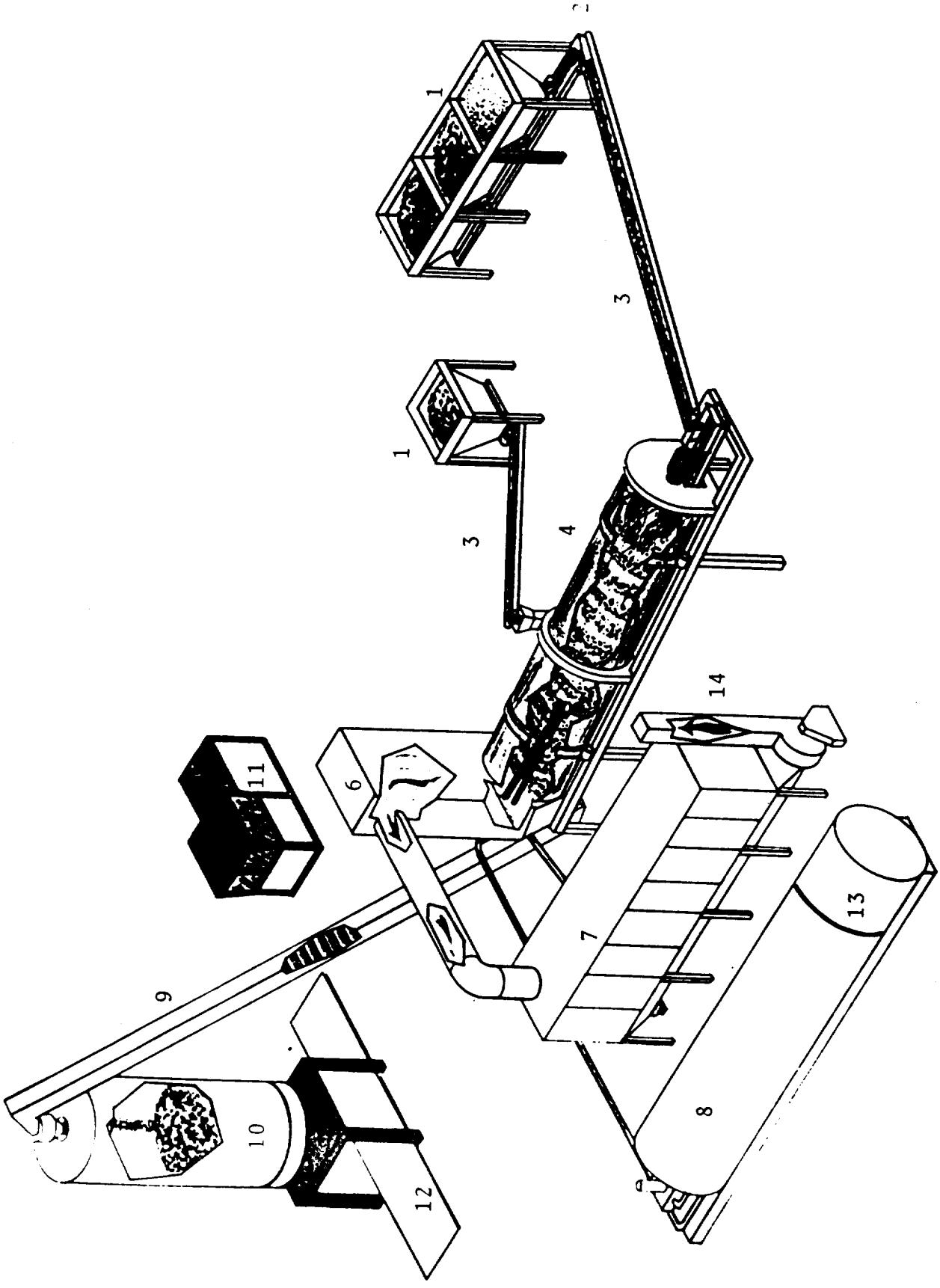
IV. THE SOURCE

IV. THE SOURCE

Asphalt Paving of Shelby, Inc. employs an Astec drum mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt oil to bind the mixture together. After the hot asphalt mix is manufactured at the plant, it is transported to the location where it is to be applied. The hot asphalt mix is spread evenly over the surface with a paver and then compacted with a heavy roller to produce the final product.

The following is a general description of the plant's manufacturing process: The cold feed materials (aggregate) are dumped into four separate bins which in turn feed a common continuous conveyor. The aggregate is dispensed from the bins in accordance with the desired formulation onto the cold feed system conveyor to an inclined weigh conveyor then to a rotating drum for continuous mixing and drying at approximately 300°F. The required amount of hot asphalt oil is then injected onto and mixed into the dried aggregate. The now newly formed hot asphalt mix is pulled to the top of a storage silo by conveyor. The hot asphalt mix is then discharged from the storage silo through a slide gate into waiting dump trucks, which transport the material to a final destination for spreading. The rated capacity of the plant will vary with each aggregate mix and moisture content with a 5% surface moisture removal.

The drum mixer uses a burner fired with natural gas to heat air to dry the aggregate, and the motion of the rotating drum to blend the aggregate and hot asphalt oil thoroughly. The air is drawn into the system via an exhaust fan. After passing through the burner and the mixing drum, the exhaust gasses pass through a baghouse. The baghouse is manufactured by Astec. The exhaust gasses are drawn through the baghouse and discharged to the atmosphere through a stack. The design pressure drop across the tube-sheet is 1 - 6 inches of water. The particulate matter, which is removed by the baghouse, is reinjected into the drum mixer.



ASTEC - DRUM MIX BAGHOUSE

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

14. Stack

DATA SUMMARY

Plant

1. Manufacturer of plant AsTec Industries, Inc.
2. Designed maximum operating capacity 250 TPH @ ___ % moisture.
3. Actual operation rate 200 TPH @ ___ % moisture.
4. Startup date MAR 9 - 88.
5. Type of fuel used in dryer Natural Gas.
6. Quanity of fuel consumption 67759 cu.Ft HR. MAX.
   40655 cu Ft HR. AVG.

Aggregate

7. Name/type of mix I 2.
8. Percent asphalt in mix 6.7% %.
9. Temperature of asphalt 290°.
10. Sieve/Screening analysis: % Passing;

1"	100	3/8"	95	# 40	26
3/4"	100	# 4	77	# 80	14
1/2"	98	# 8	66	#200	5.2

Baghouse

11. Manufacturer AsTec Industries, Inc. SBH-42
12. No. of bags 576. Type of bags 14.7 Nomex.
13. Air to cloth ratio 5.5 To 1. Designed ACFM 38500.
14. Square feet of bags 6970 sq. Ft.
15. Type of cleaning; pulse jet ___, reverse air ___, plenum pulse ___, other Air Pulse.
16. Cleaning cycle time ___.
17. Interval between cleaning cycle Individual Modules Cleaned Continuously
18. Pressure drop across baghouse 5 to 8 psi.
19. Pulse pressure on cleaning cycle 120 psi.

COMPANY NAME Asphalt Paving of Shelby Inc DATE 6-13-88

COMPANY REPRESENTATIVE [illegible]

PLANT DATA

COMPANY NAME ASPHALT PAVING OF SHELBY

COMPANY REP. David Bradford DATE 6-13-88 PHONE # 739-4568

DATA SOURCE Computer

PLANT LOCATION KINGS MTN. N.C.

PLANT MFG. ASTEC PLANT MODEL # 87-155 PLANT TYPE DRUMMI

MIX SPECIFICATION # I-2 OIL SPECIFICATION # _____

	Time 24 Hour	Fuel Oil ✓ Nat. Gas Propane Coal	Burner Setting	Aggregate TPH	Recycle TPH	Liquid Asphalt TPH	Mix Temp. °F	Venturi ✓ Baghouse Pressure Drop Inches Water
	8:25		44	197.42		10.93	305	2
	8:38		46	191.39		10.42	298	2
	8:54		46	195.50		10.72	295	2
1	9:09		48	194.57		10.75	297	2
	9:28		46	196.23		10.96	295	1¾
	9:42		47	195.38		11.00	3:03	2
	9:57		42	195.57		10.92	3:00	2
	10:14		43	194.60		10.43	2:95	2
	10:30		43	196.66		10.99	2:97	2
	10:47		51	199.45		11.04	2:88	2¼
2	11:00		49	198.43		11.10	2.96	2¼
	11:14		45	196.64		10.67	3:02	2
	11:28		41	196.59		11.23	303	2
	11:43		47	198.28		11.13	2.96	2
	11:58		43	202.99		11.32	2.98	2
	12:14		42	195.45		10.92	3.00	2
	12:28		42	196.44		10.91	3.00	2¼
3	12:46		46	198.73		11.19	2:94	2
	1:00		44	196.96		11.10	3.00	2
	1:15		43	208.10		11.92	3.00	2

V. EQUIPMENT USED

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.

VI. LABORATORY PROCEDURES & RESULTS

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 petri dishes. In the lab, the dishes are opened and placed into a dessicator for at least 24 hours. Then, the filters are weighed continuously every 6 hours until a constant weight is achieved. All data is recorded on the laboratory forms that will be bound in the test report.

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 silica gel used in the stack test is returned to the appropriate mason jar and sealed for transport to the laboratory where it is reweighed to a constant weight on a triple-beam balance to the nearest tenth of a gram.

C. PROBE RINSINGS: In all tests, where a probe washout analysis is necessary, this is accomplished in accordance with procedures specified in "EPA Reference Method 5". These samples are returned in sealed mason jars to the laboratory for analysis. The front half of the filter holder is washed in accordance with the same procedures and included with the probe wash. Reagent or ACS grade acetone is used as the solvent. The backhalf of the filter holder is washed with deionized water into the impinger catch for appropriate analysis.

D. IMPINGER CATCH: In some testing cases, the liquid collected in the impingers must be analyzed for solid 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 from the one 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.

WEIGHING PROCEDURE - SARTORIUS ANALYTICAL BALANCE

The Sartorius balance is accurate to 0.1 mg and has a maximum capacity of 200 grams. The balance precision (standard deviation) is 0.05 mg. Before weighing an item, the balance should first be zeroed. This step should be taken before every series of weighings. To do this, the balance should have all weight adjustments at "zero" position. The beam arrest lever (on the lower left hand side toward the rear of the balance) is then slowly pressed downward to full release position. The lighted vernier scale on the front of the cabinet should align the "zero" with the mark on the cabinet. If it is not so aligned, the adjustment knob on the right hand side (near the rear of the cabinet) should be turned carefully until the marks align. Now return the beam arrest to horizontal arrest position. The balance is now "zeroed".

To weigh an item, it is first placed on the pan. And the sliding doors are closed to avoid air current disturbance. The weight adjustment knob on the right hand side must be at "zero". The beam arrest is then slowly turned upward. The lighted scale at the front of the cabinet will now indicate the weight of the item in grams. If the scale goes past the divided area, the item then exceeds 100 g weight (about 3-1/2 ounces) and it is necessary to arrest the balance (beam arrest lever) and move the lever for 100 g weight away from you. It is located on the left hand side of the cabinet near the front, and is the knob closest to the side of the cabinet. The balance will not weigh items greater than 200 grams in mass, and trying to do this might harm the balance. Remember -- this is a delicate precision instrument.

After the beam is arrested, in either weight range, the procedure is the same. When the weight of the item in grams is found, "dial in" that amount with the two knobs on the left hand side (near the 100 g lever) color coded yellow and green. As you dial the weight, the digits will appear on the front of the cabinet. When the proper amount is dialed, carefully move the arrest lever down with a slow, steady turn of the wrist. The lighted dial will appear, and the right hand side knob (front of cabinet) is turned to align the mark with the lower of the two lighted scale divisions which the mark appears between. When these marks are aligned, the two lighted digits along with the two indicated on the right hand window on the cabinet front are the fractional weight in grams (the decimal would appear before the lighted digits) and the whole number of grams weight is the amount "dialed in" on the left.

In general, be sure that the beam is in "arrest" position before placing weight on or taking weight off of the pan. Don't "dial in" weight unless the beam is arrested. The balance is sensitive to even a hand on the table near the balance, so be careful and painstaking in every movement while weighing.

Form REC#8

(13)

SAMPLE ANALYTICAL DATA FORM

Plant Location Asphalt Paving of Shelby Relative humidity in lab 45 %

Sample Location Hot mix asphalt plant Density of Acetone (pa) .7853 mg/ml

Blank volume (V_a) 200 ml

Date/Time wt. blank 6-20-88 Gross wt. 101.0396 mg

Date/Time wt. blank 6-21-88 Gross wt. 101.0395 mg

Ave. Gross wt. 101.0396 mg

Tare wt. 101.0393 mg

Weight of blank (m_{ab}) .0003 mg

Acetone blank residue concentration (C_a) (C_a) = (M_{ab}) / (V_a) (p_a) = (.000001? mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} p_a$ = (.00000?)(200)(.7853) = (.0003)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	200	200	200
Date/Time of wt 6-20-88 Gross wt	g	158.9700	99.0146	94.5202
Date/Time of wt 6-21-88 Gross wt	g	158.9700	99.0143	94.5200
Average Gross wt	g	158.9700	99.0145	94.5201
Tare wt	g	158.9171	98.9472	94.4703
Less acetone blank wt (W_a)	g	.0003	.0003	.0003
Wt of particulate in acetone rinse (m_a)	g	.0526	.0670	.0495

Filter Numbers	#	SG-2666	SG-2605	SG-2686
Date/Time of wt 6-20-88 Gross wt	g	.5742	.5460	.5619
Date/Time of wt 6-21-88 Gross wt	g	.5740	.5457	.5614
Average Gross wt	g	.5741	.5459	.5617
Tare wt	g	.5359	.5188	.5277

Weight of particulate on filters(s) (m_f)	g	.0382	.0271	.0340
Weight of particulate in acetone rinse	g	.0526	.0670	.0495
Total weight of particulate (m_n)	g	.0908	.0941	.0835

Note: In no case should a blank residue greater than 0.01 mg/g (or 0.001% of the blank weight) be subtracted from the sample weight.

Remarks

Signature of analyst Kim Rea Signature of reviewer

VII. CALCULATIONS

ASPHALT PAVING OF SHELBY, INC.
KINGS MOUNTAIN, NORTH CAROLINA
6/13/88

SUMMARY OF TEST DATA

		RUN #1	RUN #2	RUN #3
SAMPLING TRAIN DATA				
	start	08:49	10:34	12:10
	finish	09:53	11:39	13:15
1. Sampling time, minutes	Θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.2250	.2250	.2250
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000276	.000276	.000276
4. Isokinetic variation	I	104.0	96.8	98.2
5. Sample gas volume - meter cond., cf.	V_m	44.125	43.959	44.745
6. Average meter temperature, ^oR	T_m	550	566	577
7. Avg. oriface pressure drop, in. H_2O	dH	1.66	1.56	1.61
8. Total particulate collected, mg.	M_n	90.80	94.10	83.50
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2	A	7.70	7.70	7.70
10. Absolute stack gas pressure, in. Hg.	P_s	29.76	29.76	29.76
11. Barometric pressure, in. Hg.	P_{bar}	29.76	29.76	29.76
12. Avg. absolute stack temperature, R^o	T_s	729	735	740
13. Average $-\sqrt{\text{vel. head}}$, (C_p= .80)	$-\sqrt{dP}$	1.22	1.25	1.27
14. Average stack gas velocity, ft./sec.	V_s	81.38	83.53	85.67
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	385.00	347.00	389.00
16. Moisture in stack gas, %	B_{ws}	29.91	28.55	30.98
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1139	1182	1163
18. Stack gas flow rate, cfm	acfm	37598	38591	39580
19. Particulate concentration, gr/dscf	C_s	0.0330	0.0353	0.0314
20. Particulate concentration, lb/hr	E	5.37	5.96	5.22
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	3.00	3.00	2.50
23. Percent O_2 by volume	O_2	14.50	13.50	14.00
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	82.50	83.50	83.50

Format: summryR3

NAME: ASPHALT PAVING OF SHELBY, INC. (15)
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA
TEST DATE: 6/13/88

Dry Gas Volume

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

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 ^oR.

T_{std} = Standard absolute temperature (528^oR).

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

Y = Dry gas meter calibration factor.

13.6 = Inches water per inches Hg.

RUN 1:

$$V_{m(std)} = (17.64)(1.003)(44.125)\left[\frac{(29.76) + \frac{1.66}{13.6}}{550}\right] = 42.416 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(1.003)(43.959)\left[\frac{(29.76) + \frac{1.56}{13.6}}{566}\right] = 41.052 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(1.003)(44.745)\left[\frac{(29.76) + \frac{1.61}{13.6}}{577}\right] = 40.994 \text{ dscf}$$

NAME: ASPHALT PAVING OF SHELBY, INC. (10)
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA
TEST DATE: 6/13/88 **Total Contaminants by Weight: GRAIN LOADING**

Particulate concentration C_s' gr./dscf.

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{M_n}{V_{m(std)}}\right]$$

Where:

C_s' = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions,gr./dscf.

M_n = Total amount of particulate matter collected, mg.

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

Run 1:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{90.80}{42.416}\right] = 0.0330 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{94.10}{41.052}\right] = 0.0353 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{83.50}{40.994}\right] = 0.0314 \text{ gr./dscf.}$$

NAME: ASPHALT PAVING OF SHELBY, INC.
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA
TEST DATE: 6/13/88

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:

$$M_d = 0.44(\ 3.00\%) + 0.32(14.50\%) + 0.28(\ .00\% + 82.50\%) = 29.06 \ \frac{lb}{lb\text{-mole}}$$

Run 2:

$$M_d = 0.44(\ 3.00\%) + 0.32(13.50\%) + 0.28(\ .00\% + 83.50\%) = 29.02 \ \frac{lb}{lb\text{-mole}}$$

Run 3:

$$M_d = 0.44(\ 2.50\%) + 0.32(14.00\%) + 0.28(\ .00\% + 83.50\%) = 28.96 \ \frac{lb}{lb\text{-mole}}$$

NAME: ASPHALT PAVING OF SHELBY, INC. (18)
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA
TEST DATE: 6/13/88

Water Vapor Condensed

$$V_{wc_{std}} = \left[V_f - V_i \right] \left[\frac{p_w R T_{(std)}}{M_w P_{(std)}} \right] = 0.04707 \left[V_f - V_i \right]$$

$$V_{wsg_{std}} = \left[W_f - W_i \right] \left[\frac{R T_{(std)}}{M_w P_{(std)}} \right] = 0.04715 \left[W_f - W_i \right]$$

Where:

0.04707 = Conversion factor, $ft.^3/ml.$

0.04715 = Conversion factor, $ft.^3/g.$

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

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

$V_f - V_i$ = Final volume of impinger contents less initial volume, ml.

$W_f - W_i$ = Final weight of silica gel less initial weight, g.

p_w = Density of water, 0.002201 lb/ml.

R = Ideal gas constant, 21.85 in.Hg. (cu.ft./lb.-mole)(^oR).

M_w = Molecular weight of water vapor, 18.0 lb/lb-mole.

T_{std} = Absolute temperature at standard conditions, 528^oR.

P_{std} = Absolute pressure at standard conditions, 29.92 inches Hg.

Run 1:

$V_{wc(std)}$ = (0.04707) (370.0) = 17.4 cu.ft
$V_{wsg(std)}$ = (0.04715) (15.0) = 0.7 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (335.0) = 15.8 cu.ft
$V_{wsg(std)}$ = (0.04715) (12.0) = 0.6 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (375.0) = 17.7 cu.ft
$V_{wsg(std)}$ = (0.04715) (14.0) = 0.7 cu.ft

NAME: ASPHALT PAVING OF SHELBY, INC. (19)
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA
TEST DATE: 6/13/88

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:

$$B_{ws} = \frac{17.4 + 0.7}{17.4 + 0.7 + 42.416} \times 100 = 29.91\ \%$$

Run 2:

$$B_{ws} = \frac{15.8 + 0.6}{15.8 + 0.6 + 41.052} \times 100 = 28.55\ \%$$

Run 3:

$$B_{ws} = \frac{17.7 + 0.7}{17.7 + 0.7 + 40.994} \times 100 = 30.98\ \%$$

NAME: ASPHALT PAVING OF SHELBY, INC.
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA
TEST DATE: 6/13/88

(20)

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:

$M_s = 29.06 (1 - 29.91) + 18 (29.91) = 25.75$ (lb./lb.-mole)

Run 2:

$M_s = 29.02 (1 - 28.55) + 18 (28.55) = 25.87$ (lb./lb.-mole)

Run 3:

$M_s = 28.96 (1 - 30.98) + 18 (30.98) = 25.56$ (lb./lb.-mole)

NAME: ASPHALT PAVING OF SHELBY, INC. (21)
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA
TEST DATE: 6/13/88

Stack Gas Velocity

$$V_s = K_p\, C_p \left[\sqrt{dP} \right]_{avg.} \sqrt{\frac{T_{s(avg.)}}{P_s\, M_s}}$$

Where:

V_s = Average velocity of gas stream in stack, ft./sec.

K_p = 85.49 ft/sec $\left[\text{(g/g-mole)-(mm Hg) / (^{o}K)(mm } H_2O\right]^{1/2}$

C_p = Pitot tube coefficient, (dimensionless).

dP = Velocity head of stack gas, in. H_2O.

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).

t_s = Stack temperature, (^{o}f).

T_s = Absolute stack temperature, (^{o}R). = 460 + t_s.

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

Run 1:

$$V = (85.49)\ (\ .80)\ (\ 1.22) \sqrt{\frac{729}{(29.76)(25.75)}} = 81.38 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (\ .80)\ (\ 1.25) \sqrt{\frac{735}{(29.76)(25.87)}} = 83.53 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ .80)\ (\ 1.27) \sqrt{\frac{740}{(29.76)(25.56)}} = 85.67 \text{ ft/sec.}$$

Format: vsR3

NAME: ASPHALT PAVING OF SHELBY, INC.
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA
TEST DATE: 6/13/88

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, (^oF).

T_s = Absolute stack temperature, (^oR).

T_{std} = Standard absolute temperature, (528^oR).

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:

$$Q_{sd}=3600(1-\ .2991\ )(\ 81.38)(\ 7.70)\left[\frac{528}{729}\right]\left[\frac{29.76}{29.92}\right] = 1139055.0\ \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1-\ .2855\ )(\ 83.53)(\ 7.70)\left[\frac{528}{735}\right]\left[\frac{29.76}{29.92}\right] = 1182104.5\ \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1-\ .3098\ )(\ 85.67)(\ 7.70)\left[\frac{528}{740}\right]\left[\frac{29.76}{29.92}\right] = 1163243.1\ \frac{dscf}{hr}$$

NAME: ASPHALT PAVING OF SHELBY, INC. (23)
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA
TEST DATE: 6/13/88 **Emissions Rate from Stack**

$$E = \frac{(C_s)\ (Q_{sd})}{7000\ gr./lb.} = lb. / hr.$$

Where:

E = Emissions rate, lb./hr.

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions (gr/dscf).

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

Run 1:

$$E = \frac{(0.0330)\ (1139055.0)}{7000} = 5.37\ lb. / hr.$$

Run 2:

$$E = \frac{(0.0353)\ (1182104.5)}{7000} = 5.96\ lb. / hr.$$

Run 3:

$$E = \frac{(0.0314)\ (1163243.1)}{7000} = 5.22\ lb. / hr.$$

NAME: ASPHALT PAVING OF SHELBY, INC.
LOCATION: KINGS MOUNTAIN, NORTH CAROLINA (24)
TEST DATE: 6/13/88

Isokinetic Variation

$$I = 100\ T_s \left[\frac{0.002669\ V_{ic} + (V_m / T_m)\ (P_{bar} + dH / 13.6)}{60 \quad \Theta \quad V_s \quad P_s \quad A_n} \right]$$

Where:

I	=	Percent isokinetic sampling.
100	=	Conversion to percent.
T_s	=	Absolute average stack gas temperature, ^{o}R.
0.002669	=	Conversion factor, Hg - ft^3/ml - ^{o}R.
V_{ic}	=	Ttl vol of liquid collected in impingers and silica gel, ml.
T_m	=	Absolute average dry gas meter temperature, ^{o}R.
P_{bar}	=	Barometric pressure at sampling site, (in. Hg).
dH	=	Av pressure differential across the oriface meter, ($in.H_2O$).
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:

$$I = (100)(729)\left[\frac{(0.002669)(385.00) + \frac{44.125}{550}\left[29.76 + \frac{1.66}{13.6}\right]}{60\ (\ 60.0\ )\ (\ 81.38\ )\ (\ 29.76\ )\ (\ .000276\ )} \right] = 104.0\%$$

Run 2:

$$I = (100)(735)\left[\frac{(0.002669)(347.00) + \frac{43.959}{566}\left[29.76 + \frac{1.56}{13.6}\right]}{60\ (\ 60.0\ )\ (\ 83.53\ )\ (\ 29.76\ )\ (\ .000276\ )} \right] = 96.8\%$$

Run 3:

$$I = (100)(740)\left[\frac{(0.002669)(389.00) + \frac{44.745}{577}\left[29.76 + \frac{1.61}{13.6}\right]}{60\ (\ 60.0\ )\ (\ 85.67\ )\ (\ 29.76\ )\ (\ .000276\ )} \right] = 98.2\%$$

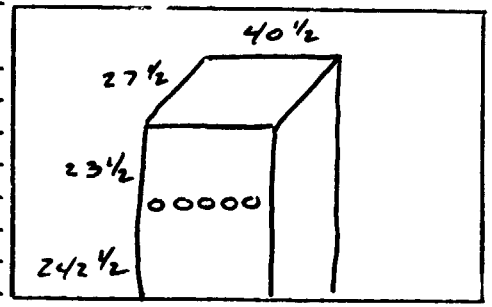
Format: iR3

VIII. FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant Asphalt Paving & Shelby

Location Shelby NC.
Operator K. Allmendinger
Date 6-13-88
Run No. 1
Sample Box No. 1
Meter Box No. 0124 1478/0
Meter H @ 1.63
C Factor 1.003
Pitot Tube Coefficient Cp .80



		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature	65		
Barometric Pressure	29.76 FINAL	570	530
Assumed Moisture, %	25 INITIAL	200	515
Probe Length, m(ft)	4 DIFFERENCE	370	15
Nozzle Identification No.	.00027761		
Avg. Calibrated Nozzle Dia., (in.)	.225/.225/.22		
Probe Heater Setting	4.5		
Leak Rate, m^3/min. (cfm)	.001 @ 4"		
Probe Liner Material	3/6 Stainless		
Static Pressure, mm Hg (in. Hg)	.05		
Filter No.	56-2666		

Schematic of Stack Cross Section

Pre test leak check .002 @ 12"

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		FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
							Inlet	Outlet		
A) 1	8:46:45 / 8:51	3	260	1.2	1.3	314.325 / 315.61	80	70	230	60
2	8:53	4	260	1.6	1.8	317.11	85	70	235	55
3	8:55	4	270	1.6	1.8	318.62	85	70	240	55
4	8:57	4	265	1.6	1.8	320.13	90	70	245	55
5	8:59	4	265	1.6	1.8	321.65	90	70	250	55
6	9:01:45	4	265	1.7	1.9	323.21	95	70	250	55
B) 1	9:02:45 / 9:04	4	270	1.6	1.8	324.77	90	70	250	55
2	9:06	4	270	1.6	1.8	326.30	95	70	255	55
3	9:08	4	270	1.6	1.8	327.83	100	70	255	50
4	9:10	4	275	1.6	1.8	329.37	100	75	255	50
5	9:12	4	280	1.6	1.8	330.92	100	75	255	50
6	9:14:45	4	265	1.5	1.7	332.41	105	75	260	50
C) 1	9:16:30 / 9:18	4	265	1.6	1.8	333.97	100	75	260	50

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-13-88 LOCATION Shelby 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		
2	9:20	4	270	1.6	1.8	335.50	105	75	260	50
3	9:22	4	270	1.5	1.7	337.04	105	80	260	50
4	9:24	4	270	1.5	1.7	338.54	110	80	255	50
5	9:26	3	270	1.1	1.2	339.79	110	80	255	50
~~D~~ 6	~~9:28:30~~	3	265	1.1	1.2	341.05	110	80	255	50
D) 1	9:29:10 9:31	4	265	1.5	1.7	342.55	105	80	250	50
2	9:33	4	265	1.5	1.7	344.03	110	80	250	50
3	9:35	4	275	1.4	1.5	345.47	110	80	250	50
4	9:37	4	270	1.4	1.5	346.89	110	80	250	50
E) 5	9:39	4	270	1.4	1.5	348.26	110	80	250	50
6	9:41:10	3	265	1.3	1.4	349.44	110	85	250	50
E) 1	9:41:50 9:43	4	260	1.4	1.5	351.06	110	85	250	50
2	9:45	4	270	1.7	1.9	352.66	110	85	250	50
3	9:47	4	270	1.7	1.9	354.16	115	85	250	50
4	9:49	4	270	1.5	1.7	355.66	115	85	250	50
5	9 min 51	4	275	1.5	1.7	357.15	115	85	250	50
6	9 min 53:50	3	275	1.1	1.2	358.45	115	85	250	50
			$\Sigma \sqrt{\Delta p}$ = 36.5137							

RAMCON ENVIRONMENTAL CORPORATION

Plant Asphalt Paving of Shelby

Location Shelby NC
Operator K. Hollanks
Date 6-13-88
Run No. 2
Sample Box No. 2
Meter Box No. 147818 C124
Meter H @ 1.63
C Factor 1.003
Pitot Tube Coefficient Cp .80

Ambient Temperature 80
Barometric Pressure 29.76
Assumed Moisture, % 25
Probe Length, m(ft) 4
Nozzle Identification No. .0002761
Avg. Calibrated Nozzle Dia., (in.) .225/.225/.22
Probe Heater Setting 4.5
Leak Rate, m^3/min. (cfm) +.002 @ 11"
Probe Liner Material 316 Stainless
Static Pressure, mm Hg (in. Hg) .05
Filter No. 86-2605

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	535	526
INITIAL	200	514
DIFFERENCE	335	12

Schematic of Stack Cross Section

Pre test leak check .002 @ 12"

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H_2O	PRESSURE DIFF. ORF. MTR in H_2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A) 1	10:34 / 10:36	6	275	1.6	1.6	358.574 / 359.95	95	90	260	60
2	10:38	6	275	1.7	1.7	361.44	105	90	260	55
3	10:40	6	275	1.7	1.7	362.88	110	90	260	55
4	10:42	6	275	1.6	1.6	364.40	110	90	260	55
5	10:44	6	270	1.5	1.5	365.81	110	90	260	50
6	10:46	5	270	1.1	1.1	367.09	115	90	260	50
B) 1	10:47.45 / 10:49	7	265	1.8	1.8	368.72	110	90	260	50
2	10:51	7	270	1.7	1.7	370.19	115	90	255	50
3	10:53	7	270	1.7	1.7	371.74	115	90	255	50
4	10:55	7	265	1.5	1.5	373.19	115	90	255	50
5	10:57	7	265	1.5	1.5	374.65	120	90	255	50
6	10:59:45	6	260	1.2	1.2	375.97	120	90	255	50
C 1	11:00:50 / 11:02	8	265	1.7	1.7	377.52	115	95	255	50

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-13-88 LOCATION Shelby 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 2	11:04	8	275	1.7	1.7	379.05	120	95	250	50
3	11:06	7	280	1.6	1.6	380.56	120	95	250	50
4	11:08	7	280	1.5	1.5	382.04	120	95	250	50
5	11:10	6	280	1.4	1.4	383.44	120	95	250	50
6	11:12:50	5	275	1.1	1.1	384.68	120	95	250	50
D) 1	11:14 11:16	7	280	1.7	1.7	386.24	115	95	250	50
2	11:18	7	280	1.7	1.7	387.82	120	95	250	50
3	11:20	7	280	1.7	1.7	389.28	120	95	250	50
4	11:22	7	280	1.5	1.5	390.72	120	95	250	50
5	11:24	7	275	1.5	1.5	392.27	125	95	250	50
6	11:26	5	275	1.2	1.2	393.54	125	95 N/A	250	50
E) 1	11:27 11:29	6	275	1.6	1.6	395.00	120	100	250	50
2	11:31	7	280	1.7	1.7	396.53	120	100	250	50
3	11:33	7	285	1.7	1.7	398.02	125	100	250	50
4	11:35	7	285	1.7	1.7	399.54	125	100	250	50
5	11:37	7	280	1.7	1.7	401.04	125	100	250	50
6	11:39	7	275	1.6	1.6	402.533	125	100	250	50
			$\sum \sqrt{\Delta p} = 37.4363$							

RAMCON ENVIRONMENTAL CORPORATION

Plant Asphalt Paving of Shelby

Location Shelby, No.
Operator D. Hemendinger
Date 6-13-88
Run No. 3
Sample Box No. 3
Meter Box No. 6124 147810
Meter H @ 1.63
C Factor 1.003
Pitot Tube Coefficient Cp .80

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature	82		
Barometric Pressure	29.76 FINAL	575	529
Assumed Moisture, %	25 INITIAL	200	517
Probe Length, m(ft)	4 DIFFERENCE	375	14
Nozzle Identification No.	0002761		
Avg. Calibrated Nozzle Dia., (in.)	.225/.225/.225		
Probe Heater Setting	4.5		
Leak Rate, m^3/min. (cfm)	.003@5"		
Probe Liner Material	316 stainless		
Static Pressure, mm Hg (in.Hg)	.05		
Filter No.	SG-2686		

Schematic of Stack Cross Section

Pre-test leak check .01@15"

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	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A) 1	12:10:30 / 12:12	3	280	1.5	1.5	402.78 / 404.13	110	105	230	65
2	12:14	5	280	1.8	1.8	405.69	120	100	235	60
3	12:16	5	280	1.8	1.8	407.24	120	100	240	60
4	12:18	5	280	1.8	1.8	408.82	125	100	245	55
5	12:20	5	280	1.8	1.8	410.38	125	100	245	55
6	12:22:30	4	280	1.7	1.7	411.92	130	100	245	55
B) 1	12:23:45 / 12:25	4	275	1.5	1.5	413.37	120	105	245	55
2	12:27	4	280	1.7	1.7	414.90	125	105	245	55
3	12:29	4	285	1.7	1.7	416.42	130	105	245	55
4	12:31	4	285	1.7	1.7	417.88	130	105	250	55
5	12:33	4	285	1.6	1.6	419.37	130	105	250	55
6	12:35:45	4	275	1.3	1.3	420.72	130	105	250	55
C) 1	12:36:40 / 12:38	5	275	1.8	1.8	422.28	130	105	250	55

(29)

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-13-88 LOCATION Shelby 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)	GAS SAMPLE TEMP. (°F)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							in	out		
2	12:10	5	280	1.5	1.5	423.85	130	105	250	55
3	12:12	5	285	1.6	1.6	425.35	130	105	250	55
4	12:14	4	280	1.5	1.5	426.84	130	105	250	50
5	12:16	4	280	1.4	1.4	428.25	130	105	255	50
6	12:18:40	3	275	1.1	1.1	429.50	130	105	255	50
D) 1	~~12:49:40~~ 12:51	5	275	1.8	1.8	431.06	125	105	255	50
2	12:53	5	275	1.8	1.8	432.65	130	105	255	50
3	12:55	5	280	1.7	1.7	434.22	130	105	255	50
4	12:57	4	280	1.5	1.5	435.69	130	105	255	50
5	12:59	4	280	1.5	1.5	437.15	130	105	255	50
6	1:01:40	4	280	1.4	1.4	438.54	130	105	255	50
E) 1	~~1:03:20~~ 1:05	5	275	1.5	1.5	440.04	125	105	255	50
2	1:07	5	280	1.8	1.8	441.55	130	105	255	50
3	1:09	5	285	1.8	1.8	443.13	130	105	250	55
4	1:11	5	285	1.7	1.7	444.65	135	105	250	55
5	1:13	5	285	1.5	1.5	446.15	135	105	250	55
6	1:15:20	4	285	1.3	1.3	447.525	135	105	250	55
			$\Sigma\sqrt{\Delta p}$ = 38.0381							

(SW)

IX. CALIBRATIONS

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 4-22-85 Meter box number 14780 C-124

Barometric pressure, P_b = 29.73 in. Hg Calibrated by KA

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	93.72 / 98.91	73.4	108 / 108	84 / 84	96	12:16	1.0030	1.643
1.0	5	87.34 / 92.57	73.4	110 / 111	84 / 84	97.25	8:46	1.0065	1.675
1.5	10	96.05 / 86.55	73.4	110 / 112	83 / 84	97.25	19:25	1.0069	1.698
2.0	10	64.27 / 75.57	73.4	110 / 112	80 / 83	96.25	13:43	1.0101	1.697
3.0	10								
4.0	10								
							Avg	1.0066	1.678

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.

Quality Assurance Handbook M4-2.3A (front side)

Form #REC-02

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 7-4-88 Meter box number 147810 C-12

Barometric pressure, P_b = 30.05 in. Hg Calibrated by KH

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	238.849 / 243.756	80.6	110 / 112	88 / 89	99.75	12:05	1.013	1.61
1.0	5	250.87 / 255.454	80.6	113 / 114	88 / 88	100.75	8:37	1.018	1.63
1.5	10	238.76 / 247.865	80.6	112 / 116	87 / 88	100.5	12:42	1.022	1.64
2.0	10	227.68 / 237.71	80.6	111 / 114	85 / 86	99	12:19	1.023	1.67
3.0	10								
4.0	10								
							Avg	1.019	1.638

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.

RAMCON ENVIRONMENTAL CORPORATION

Lear Siegler Stack Sampler

Nozzle Diameter Calibration

Date _____ Signature _____

Nozzle No.	Average Diameter	Nozzle No.	Average Diameter
1		7	
2		8	
3		9	
4		10	
5		11	
6		12	

Pitot Tube Calibration (S Type)

Pitot Tube Identification No. 42 Date 2-4-88

Calibrated by: Sam T. Turner

"A" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp (s) cm H_2O (in. H_2O)	$C_p(s)$	DEVIATION $C_{p(s)}-\bar{C}_p(A)$
1	0.98	1.55	.795	∠.01
2	0.85	1.35	.793	∠.01
3	0.64	1.00	.800	∠.01
		$\bar{C}_p$ (SIDE A)	.796	

"B" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp(s) cm H_2O in. H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(B)$
1	0.98	1.55	.795	∠.01
2	0.85	1.35	.793	∠.01
3	0.64	1.00	.800	∠.01
		$\bar{C}_p$ (SIDE B)	.796	

$$\text{AVERAGE DEVIATION} = \sigma(\text{A OR B}) = \frac{\sum_{1}^{3} |C_p(s)-\bar{C}_p(\text{A OR B})|}{3} \leftarrow \text{MUST BE} \leq 0.01$$

$$|\bar{C}_p(\text{SIDE A})-\bar{C}_p(\text{SIDE B})| \leftarrow \text{MUST BE} \leq 0.01$$

$$C_{p(s)} = C_{p(std)}\sqrt{\frac{\Delta p\ std}{\Delta p_s}}$$

RAMCON

Lear Siegler Stack Sampler

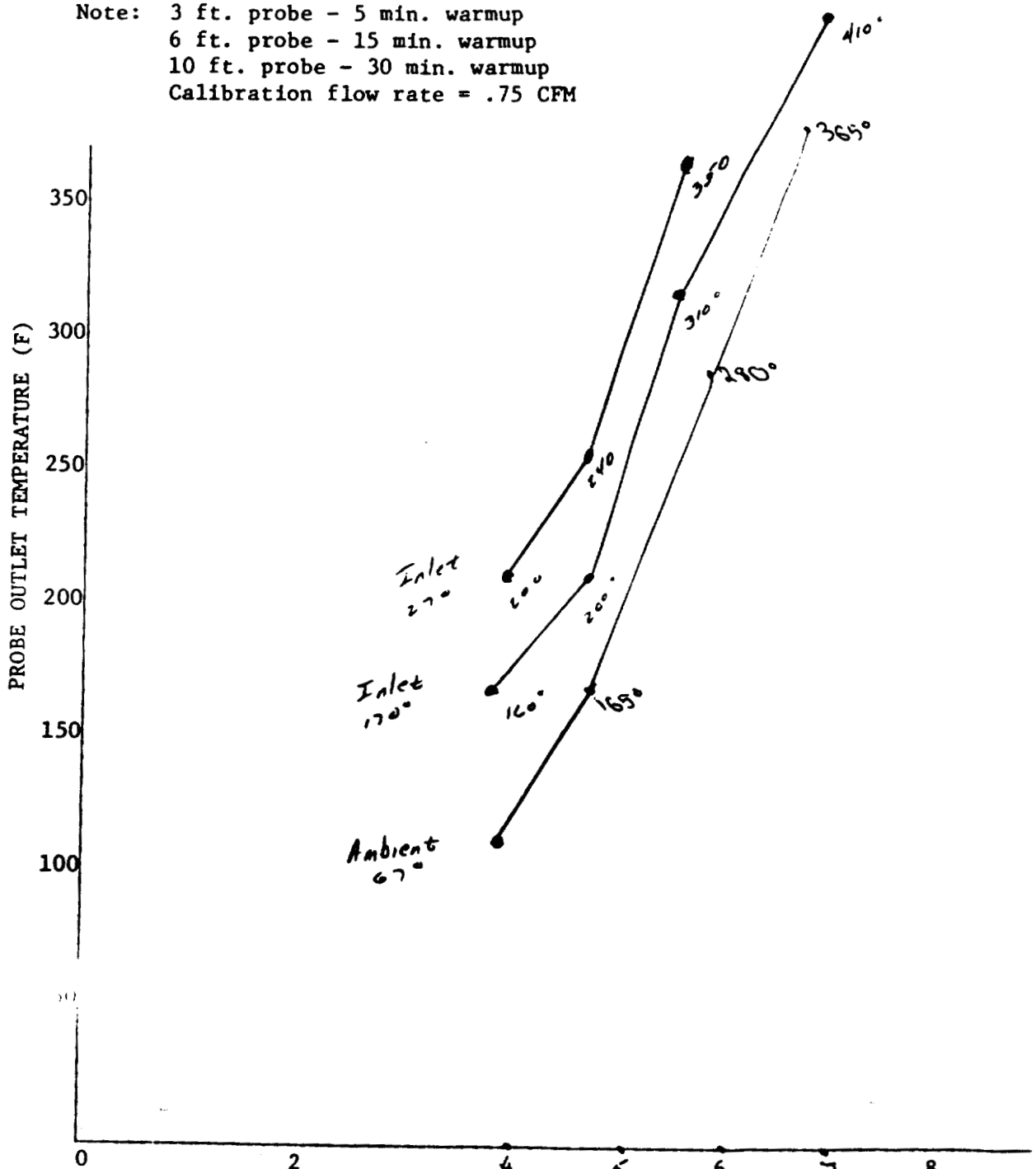
Heating Probe Calibration

Probe No. 42 Probe Length 4'

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



RAMCON ENVIRONMENTAL CORPORATION

Date 2-10-88 Thermocouple number 42

Ambient temperature 55°F ~~°C~~ Barometric pressure 29.87 in. Hg

Calibrator K. Allmending Reference: mercury-in-glass ✓

other _____

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °C	Thermocouple Potentiometer Temperature, °C	Temperature Difference,[c] %
A	ICE WATER	34°F	33°F	.03%
B	Boiling WATER	212°F	210°F	.009%
C	OIL	379°F	376°F	.008%
D	Ambient	55°F	54°F	.02%
	6-13-88	65 °F	65 °F	0 %

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON ENVIRONMENTAL CORPORATION

Date 2-10-88 Thermocouple number Hotbox

Ambient temperature 24°C °C Barometric pressure 29.95 in. Hg

Calibrator S. Turner Reference: mercury-in-glass ✓

other _____

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °C	Thermocouple Potentiometer Temperature, °C	Temperature Difference, %
A	Boiling Water	100°C	100°C	0%
B	AMBIENT	24°C	24°C	0%
C	AMBIENT 6-13-88	65°F	65°F	0%

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON ENVIRONMENTAL CORPORATION

Date 2-10-88 Thermocouple number Inlet/Outlet

Ambient temperature 24 °C Barometric pressure 29.95 in. Hg

Calibrator S. Turner Reference: mercury-in-glass ✓

other _____

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °C	Thermocouple Potentiometer Temperature, °C	Temperature Difference,[c] %
A	Inlet Ambient	24°C	24°C	0%
B	Outlet Ambient	24°C	24°C	0%
C	Ambient 6-13-88	65°F	65°F	0%

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

X. RAMCON PERSONNEL

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.

XI. VISIBLE EMISSIONS

SOURCE NAME: Asphalt & Paving of Shelby

ADDRESS: Hwy 74 E Longbranch Rd

P.O. 1526

CITY: Shelby | STATE: NC | ZIP: 28150

PHONE: (704) 739-4568 | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Drum Mix | OPERATING MODE:

CONTROL EQUIPMENT: Baghouse | OPERATING MODE:

DESCRIBE EMISSION POINT: rectangular stack

HEIGHT ABOVE GROUND LEVEL: 25 | HEIGHT RELATIVE TO OBSERVER: 5'

DISTANCE FROM OBSERVER: 450' | DIRECTION FROM OBSERVER: NE

DESCRIBE EMISSIONS: one puff of light smoke

EMISSION COLOR: light tan | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☑

WATER DROPLETS PRESENT: NO ☑ YES ☐ | IS WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED: Top of stack

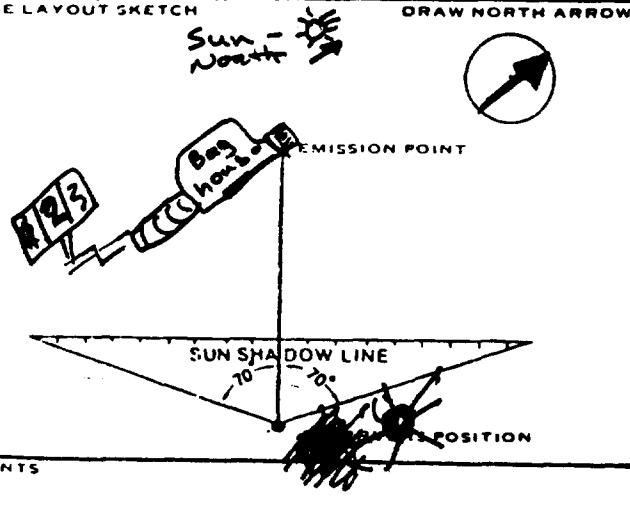
DESCRIBE BACKGROUND: green trees then Blue/white sky

BACKGROUND COLOR: green / blue sky | SKY CONDITIONS: clear

WIND SPEED: 0-5 mph | WIND DIRECTION: E+NE

AMBIENT TEMPERATURE: 72 | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



COMMENTS:

OBSERVATION DATE: June 13 1988 | START TIME: 10:38 | STOP TIME: 11:38

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	5	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:

NUMBER OF READINGS ABOVE: 0 % WERE 1

RANGE OF OPACITY READINGS: 0 MINIMUM 5 MAXIMUM

OBSERVER'S NAME (PRINT): Kevin A. Powell

OBSERVER'S SIGNATURE: Kevin A Powell | DATE: June 13, 1988

ORGANIZATION: RAMCON Environmental

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE:

TITLE: | DATE:

CERTIFIED BY: State of Tenn | DATE: June 8, 1988

VERIFIED BY: | DATE:

EPA FORM 9 DEC 84

SOURCE NAME: Asphalt and Paving of Shelby

OBSERVATION DATE: ~~6-9~~ 6-13-88 | START TIME: 12:09 | STOP TIME: 1:0[illegible]

ADDRESS: Hwy 74 & Longbeach Rd

P.O. 1526

CITY: Shelby | STATE: N C | ZIP: 28150

PHONE: (704) 739-4568 | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Drum Mix | OPERATING MODE:

CONTROL EQUIPMENT: Baghouse | OPERATING MODE:

DESCRIBE EMISSION POINT: rectangular stack from baghouse (tan)

HEIGHT ABOVE GROUND LEVEL: 25 | HEIGHT RELATIVE TO OBSERVER: 5'

DISTANCE FROM OBSERVER: 450' | DIRECTION FROM OBSERVER: NE

DESCRIBE EMISSIONS: two puffs of light smoke

EMISSION COLOR: light tan/white | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☑

WATER DROPLETS PRESENT: NO ☑ YES ☐ | IS WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED: top of stack

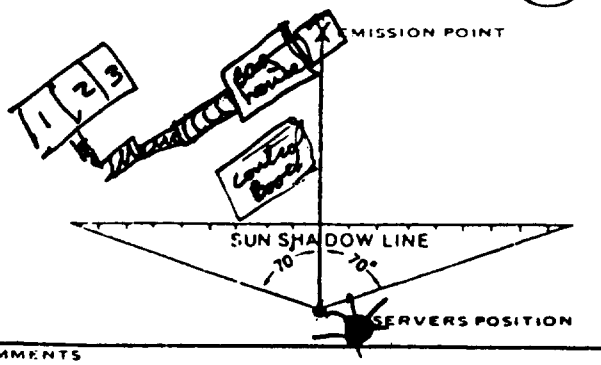
DESCRIBE BACKGROUND: trees (green tops) & blue/white haze sky

BACKGROUND COLOR: green / blue haze | SKY CONDITIONS: clear - haze

WIND SPEED: 0-5 mph | WIND DIRECTION: E - NE

AMBIENT TEMPERATURE: 76 | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



SEC M	0	15	30	45	SEC M	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	5	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	5	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 2

RANGE OF OPACITY READINGS: 0 MINIMUM 5 MAXIMUM

COMMENTS:

OBSERVER'S NAME (PRINT): Kevin A. Powell

OBSERVER'S SIGNATURE: Kevin A Powell | DATE: June 13 1988

ORGANIZATION: RAMCON Environmental Corp

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE:

TITLE: | DATE:

CERTIFIED BY: State of Tennessee | DATE: June 8, 1988

VERIFIED BY: | DATE:

EPA FORM 3.1

SOURCE NAME: Asphalt & Paving of Shelby

OBSERVATION DATE: June 13, 1988 | START TIME: 1:25 | STOP TIME: 2:25

ADDRESS: Hwy 74 E Longbranch Rd P.O 1526

CITY: Shelby | STATE: NC | ZIP: 28150

PHONE: (704) 734-4568 | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Drum mix | OPERATING MODE:

CONTROL EQUIPMENT: Baghouse | OPERATING MODE:

DESCRIBE EMISSION POINT: rectangular stack

HEIGHT ABOVE GROUND LEVEL: 25' | HEIGHT RELATIVE TO OBSERVER: 5'

DISTANCE FROM OBSERVER: 450' | DIRECTION FROM OBSERVER: NE

DESCRIBE EMISSIONS: occasional puffs of light brown

EMISSION COLOR: light tan to white | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☒

WATER DROPLETS PRESENT: NO ☒ YES ☐ | IS WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED: top of stack

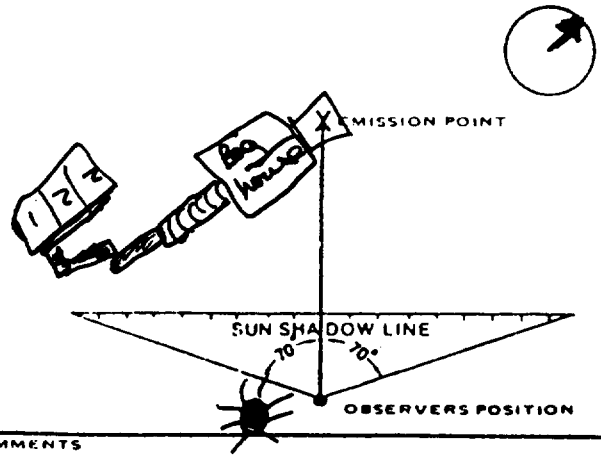
DESCRIBE BACKGROUND: green tree tops & cloudy sky

BACKGROUND COLOR: green / blue-white | SKY CONDITIONS: clear - hazy

WIND SPEED: 0-5 mph | WIND DIRECTION: NE

AMBIENT TEMPERATURE: 82° | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



SEC M	0	15	30	45	SEC M	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	5	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	5	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	5	0	58	0	5	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: .625

NUMBER OF READINGS ABOVE 0 % WERE 4

RANGE OF OPACITY READINGS: 0 MINIMUM — 5 MAXIMUM

COMMENTS:

OBSERVER'S NAME (PRINT): Kevin A. Powell

OBSERVER'S SIGNATURE: Kevin A Powell | DATE: June 13, 1988

ORGANIZATION: RAMCON Environmental Corp

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE:

TITLE: | DATE:

CERTIFIED BY: State of Tennessee | DATE: June 8, 1988

VERIFIED BY: | DATE:

DEC# 1.1

TENNESSEE DEPARTMENT OF HEALTH AND ENVIRONMENT
CUSTOMS HOUSE
701 BROADWAY
NASHVILLE, TENNESSEE 37219-5403

JUN 2 1 1988

Kevin A. Powell
Ramcon
223 Scott Street
Memphis, TN 38112

RE: Certificate Number 1106

Dear Mr. Powell:

Enclosed you will find your certification card for successfully completing the June 7-9, 1988 Visible Emissions Evaluation School held in Memphis, Tennessee. In order to be certified as a qualified Visible Emissions Evaluator for all the methods approved by the Tennessee Air Pollution Control Board, one must meet an intensive array of criteria.

The individual reading criteria is as follows:

1. EPA Method 9 (6 Minute Average) requires a deviation of less than 7.5 on white and black smoke, and that the reader miss no reading by more than 15% opacity.

2. Tennessee Visible Emissions Evaluation Method 1 (Roads and Parking Areas) requires a worst-two-minute deviation of 8.8 or less.

3. TVEE Method 2 (Aggregate or Time Count) has the same criteria requirements as EPA Method 9.

4. TVEE Method 3 (Zero Percent Opacity) requires that the value assigned to a zero reading during a certification run shall not exceed 10% opacity, nor shall the combination of other zero readings exceed 10% opacity (i.e. two readings of five percent opacity).

5. TVEE Method 4 (Fugitive Dust Emissions from Non-Stack Emission Points) has the same criteria requirements as EPA Method 9.

Based on these criteria you are certified by the State of Tennessee to read EPA Method 9, and TVEE Methods 1, 2, 3, and 4.

This certification is valid until December 08, 1988.

You must complete the requirements for recertification prior to this expiration date to retain your status as a qualified Visible Emissions Evaluator.

It was a pleasure having your participation in our Visible Emissions School. The Tennessee Division of Air Pollution Control would welcome any comments, or suggestions you may have concerning the operation of the school. Please forward any comments to the Division at (615)741-3931 or at the above address.

Sincerely yours,

Carl Koontz

Visible Emissions Evaluation School
Division of Air Pollution Control

Enclosure