RAMCON

ENVIRONMENTAL CORPORATION

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

RAMCON
ENVIRONMENTAL CORPORATION



SOURCE SAMPLING
for
PARTICULATE EMISSIONS
**PIEDMONT ASPHALT PAVING COMPANY**
GOLD HILL, NORTH CAROLINA
February 1 & 2, 1988

Pete Galloway
Piedmont Asphalt Paving

G. Sumner Buck, III
President

Ken Allmendinger
Team Leader

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TELEPHONE 800/458-4567 IN TENNESSEE 901/458-7000

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February 5, 1988

Mr. Pete Galloway
Piedmont Asphalt Paving Company
P.O. Box 931
Salisbury, NC 28144

Re: Particulate Emissions Test - Gold Hill North Carolina

Dear Mr. Galloway:

Enclosed you will find four copies of our report on the particulate emissions test we conducted at 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. Therefore, the plant is operating in compliance with Federal and State Standards.

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

Mr. Yin-Pong Chang, P.E.
North Carolina DNR
Div. of Environmental Mgmt.
919 N. Main Street
Mooresville, NC 28115

You will need to keep one copy of the report at the plant. We certainly have enjoyed working with you and look forward to serving you again in the future.

Sincerely,

G. Sumner Buck, III
President

GSBIII:kr

Enclosures

## TABLE OF CONTENTS

## I. INTRODUCTION

On February 1 & 2, 1988, personnel from RAMCON Environmental Corporation (REC) conducted a source emissions test for particulate emissions compliance at Piedmont Asphalt Paving's Astec drum mix asphalt plant located in Gold Hill, North Carolina. RAMCON personnel conducting the test were Ken Allmendinger, Team Leader and Shawn Greenwood. Kim Rea was responsible for the 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 emissions from the plant's baghouse and the total contaminants by weight (grain loading) is below the allowable N.S.P.S. limits set by EPA and the State of North Carolina.

## II. TEST RESULTS

Table I summarizes the test results. The grain loading limitation for EPA is .04 gr/DSCF and is specified in 39 FR 9314, March 8, 1974, 60.92 Standards for Particulate Matter (1), as amended. The allowable emissions for the State of North Carolina are the same as those set by EPA.

Mr. Yin-Pong Chang of North Carolina's Department of Natural Resources observed the testing conducted by RAMCON. Shawn Greenwood and Ken Allmendinger conducted the opacity test (Reference Method 9), which ranged from 0% to 20% on all three test runs and therefore, meets N.S.P.S. requirements.

# TABLE I

## SUMMARY OF TEST RESULTS
February 1 & 2, 1988

| Test Run | Time | Grain Loading | Isokinetic Variation | Actual Emissions |
|---|---|---|---|---|
| 1 | 14:32 to 15:43 | 0.0467 gr/DSCF | 104% | 3.9 lbs/hr |
| 2 | 08:30 to 09:35 | 0.0224 gr/DSCF | 103% | 1.8 lbs/hr |
| 3 | 10:26 to 11:34 | 0.0457 gr/DSCF | 102% | 3.5 lbs/hr |
| | Average: | 0.0383 gr/DSCF | | 3.1 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 EPA and the State of North Carolina. Therefore, the plant is operating in compliance with Federal and State Standards.

## III. TEST PROCEDURES

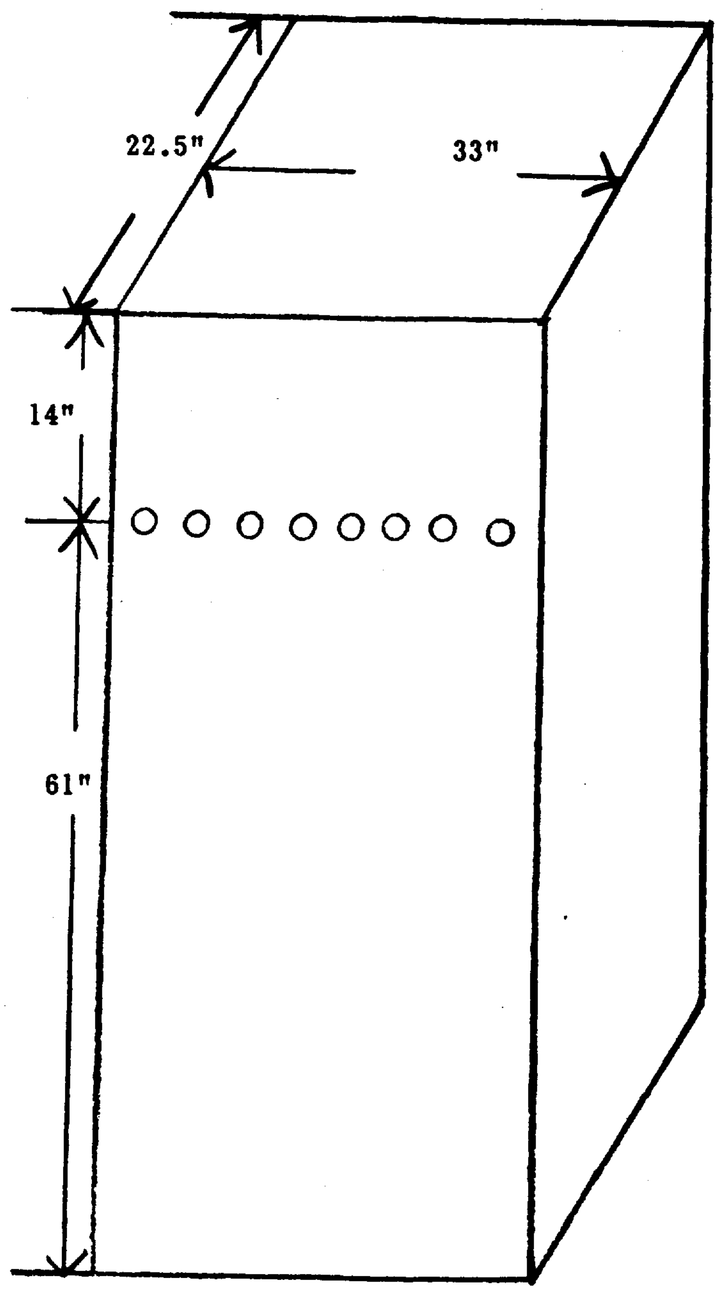
A. Method Used: The source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

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

C. Sampling Site: The emissions test was conducted after a baghouse on a rectangular stack measuring 33" x 22.5" with an equivalent diameter of 26.8". Eight sampling ports were placed 14" down (0.52 diameters upstream) from the top of the stack and 61" up (2.3 diameters downstream) from the last flow disturbance. Thirty two points were sampled, four through each port for two minutes each.

| Points on a Diameter | Probe Mark |
|---|---|
| 1 | *7.8" |
| 2 | 13.4" |
| 3 | 19.1" |
| 4 | 24.7" |

*Measurements include a 5.0" standoff.



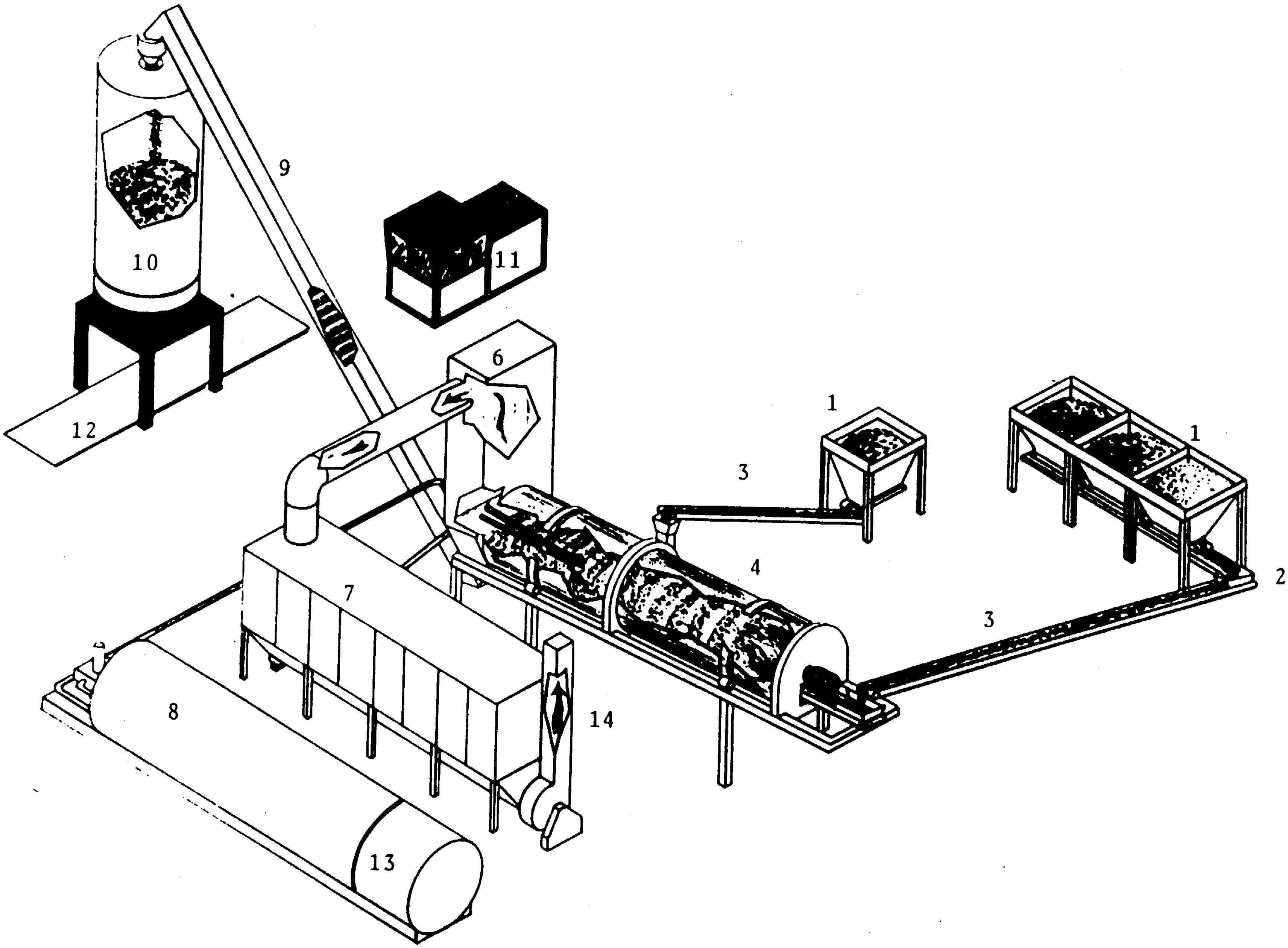
# IV. THE SOURCE

## IV. THE SOURCE

Piedmont Asphalt Paving 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$^{o}$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 #2 fuel oil 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.
2. Designed maximum operating capacity 150 TPH @ 3 % moisture.
3. Actual operation rate 115 TPH @ 5.5 % moisture.
4. Startup date 2-1-88.
5. Type of fuel used in dryer #2 Fuel.
6. Quanity of fuel consumption 1.7 gal per ton.

## Aggregate

7. Name/type of mix I-2.
8. Percent asphalt in mix 6.0 %.
9. Temperature of asphalt 290.
10. Sieve/Screening analysis: % Passing;

| | | | | | |
|---|---|---|---|---|---|
| 1" | | 3/8" | 95 | #40 | 21 |
| 3/4" | 100 | #4 | 77 | #80 | 13 |
| 1/2" | 98 | #8 | 67 | #200 | 5.8 |

## Baghouse

11. Manufacturer Astec.
12. No. of bags 630. Type of bags Nomex.
13. Air to cloth ratio 5 to 1. Designed ACFM 28000.
14. Square feet of bags 5525.
15. Type of cleaning; pulse jet ✓, reverse air ____, plenum pulse ____, other ____.
16. Cleaning cycle time .2 sec.
17. Interval between cleaning cycle 10 sec.
18. Pressure drop across baghouse 6 in psi.
19. Pulse pressure on cleaning cycle 110 psi.

COMPANY NAME Piedmont Asphalt Paving DATE 2-1-88

COMPANY REPRESENTATIVE Pete Galloway

(8)

**PLANT DATA** Page 1 of 2

COMPANY NAME Piedmont Asphalt Paving Comp

COMPANY REP. ______ DATE 2/1/88 PHONE # 704-279-8225

DATA SOURCE ______

PLANT LOCATION Gold Hill N.C.

PLANT MFG. Astec PLANT MODEL # 4 Load PLANT TYPE drum mix

MIX SPECIFICATION # ______ 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 |
|---|---|---|---|---|---|---|---|
| 2:26 | No 2 | 35% | 102 | | 4.8 | 319 | 4 |
| 2:35 | | 50% | 106.5 | | 5.1 | 320 | 4 |
| 2:47 | | 62% | 107.6 | | 5.4 | 308 | 4 |
| 2:57 | | 72% | 109 | | 52 | 316 | 5½ |
| 3:05 | | 72% | 111.2 | | 5.3 | 315 | 5½ |
| 3:15 | | 54% | 113.3 | | 5.4 | 303 | 5½ |
| 3:26 | | 65% | 113.6 | | 5.0 | 290 | 6 |
| 3:36 | | 61% | 113.9 | | 5.1 | 310 | 6 |
| 3:45 | | 65% | 115.8 | | 5.2 | 295 | 6 |
| 3:55 | | 60% | 116.0 | | 4.9 | 265 | 6 |
| 4:05 | | 58% | 113.7 | | 5.1 | 280 | 6 |
| 4:15 | | 56% | 110.1 | | 4.4 | 279 | 6½ |
| ~~4:25~~ | | | | | | | |
| 8:40 ~~4:35~~ | | 55% | 101.2 | | 3.8 | 3.10 | 4 |
| 8:50 ~~4:45~~ | | 60% | 102.3 | | 3.9 | 3.19 | 5 |
| 9:00 ~~4:55~~ | | 65% | 103.2 | | 3.9 | 3.10 | 6 |
| 9:10 ~~5:05~~ | | 65% | 103.7 | | 3.9 | 309 | 6½ |
| ~~9:20~~ ~~5:15~~ | | 65% | 103.6 | | 3.9 | 306 | 7 |
| 9:30 ~~5:25~~ | | 65% | 104.9 | | 4.0 | 3.00 | 7¼ |
| 10:30 ~~5:35~~ | | 60% | 104.5 | | 4.0 | 2.95 | 7½ |
| ~~10:40~~ 10:40 | | 70% | 104.6 | | 4.0 | 3.00 | 7½ |
| 10:50 | | 80% | 105.8 | | 4.2 | 2.95 | 8 |
| 11:00 | | 90% | 106.1 | | 4.2 | 2.90 | 9¼ |
| 11:10 | | 95% | 106.3 | | 4.2 | 265 | 10½ |
| 11:20 | | 78% | 110.4 | | 4.2 | 255 | 9¼ |

REC #04

# PLANT DATA

COMPANY NAME ____________________

COMPANY REP. ____________ DATE ____________ PHONE # ____________

DATA SOURCE ____________________

PLANT LOCATION ____________________

PLANT MFG. ____________ PLANT MODEL # ____________ PLANT TYPE ____________

MIX SPECIFICATION # ____________ OIL SPECIFICATION # ____________

| Time 24 Hour | __ Fuel Oil __<br>Nat. Gas __<br>Propane __<br>Coal __<br>______ | Burner Setting<br>______ | Aggregate TPH | Recycle TPH | Liquid Asphalt TPH | Mix Temp. °F | __ Venturi<br>__ Baghouse<br>Pressure Drop<br>Inches Water |
|---|---|---|---|---|---|---|---|
| 11:30 | NO. 2 | 98% | 110.5 | | 41.2 | 290 | 9 1/4 |
| ~~11:40~~ | | | | | | | |
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# 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 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.

## 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

**SAMPLE ANALYTICAL DATA FORM**

Plant Location Piedmont Asphalt Relative humidity in lab 52 %

Sample Location hot mix asphalt plant Density of Acetone (pa) .7858 mg/ml

Blank volume ($V_a$) 200 ml

Date/Time wt. blank 2/3/88 Gross wt. 154.3742 mg

Date/Time wt. blank 2/4/88 Gross wt. 154.3733 mg

Ave. Gross wt. 154.3738 mg

Tare wt. 154.3735 mg

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

Acetone blank residue concentration ($C_a$) ($C_a$) = ($M_{ab}$) / ($V_a$) ($p_a$) = (.0000019 mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} P_a$ = .0000019 (.7858) (200) = (.0003)

| | | Run # 1 | Run # 2 | Run # 3 |
|---|---|---|---|---|
| Acetone rinse volume ($V_{aw}$) | ml | 200 | 200 | 200 |
| Date/Time of wt 2/3/88 3:15 pm Gross wt | g | 157.2425 | 132.7749 | 163.0370 |
| Date/Time of wt 2/4/88 8:30 Am Gross wt | g | 157.2411 | 132.7735 | 163.0351 |
| Average Gross wt | g | 157.2418 | 132.7742 | 163.0360 |
| Tare wt | g | 157.2005 | 132.7545 | 162.9957 |
| Less acetone blank wt ($W_a$) | g | .0003 | .0003 | .0003 |
| Wt of particulate in acetone rinse ($m_a$) | g | .0410 | .0194 | .0410 |

| | | | | |
|---|---|---|---|---|
| Filter Numbers | # | SG-2476 | SG-2475 | SG-2478 |
| Date/Time of wt 2/3/88 3:15 pm Gross wt | g | .5875 | .5518 | .5742 |
| Date/Time of wt 2/4/88 8:30 Am Gross wt | g | .5877 | .5514 | .5740 |
| Average Gross wt | g | .5876 | .5516 | .5741 |
| Tare wt | g | .5184 | .5211 | .5185 |

| | | | | |
|---|---|---|---|---|
| Weight of particulate on filters(s) ($m_f$) | g | .0692 | .0305 | .0556 |
| Weight of particulate in acetone rinse | g | .0410 | .0194 | .0410 |
| Total weight of particulate ($m_n$) | g | .1102 | .0499 | .0966 |

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 [signature]

# VII. CALCULATIONS

NAME: PIEDMONT ASPHALT

| | | | | | |
|---|---|---|---|---|---|
| LOCATION: GOLD HILL, NORTH CAROLINA | | date | 2/01/88 | 2/02/88 | 2/02 |
| | SUMMARY OF TEST DATA | | RUN # 1 | RUN # 2 | RUN |
| | SAMPLING TRAIN DATA | start | 14:32 | 08:30 | 10: |
| | | finish | 15:43 | 09:35 | 11: |
| 1 | Sampling time, minutes | θ | 64 | 64 | 6 |
| 2 | Sampling nozzle diameter, in. | Dn | .230 | .230 | .23 |
| 3 | Sampling nozzle cross-sectional area, $ft^2$ | An | .000289 | .000289 | .00028 |
| 4 | Isokinetic variation | I | 104 | 103 | 10 |
| 5 | Sample gas volume - meter conditions, cf. | Vm | 38.08 | 35.46 | 34.2 |
| 6 | Average meter temperature, °R | Tm | 554 | 546 | 55 |
| 7 | Average oriface pressure drop, in.$H_2O$ | ΔH | 1.07 | .97 | .8 |
| 8 | Total particulate collected mg. | Mn | 110.2 | 49.9 | 96. |
| | VELOCITY TRAVERSE DATA | | | | |
| 9 | Stack area, $ft^2$ | A | 5.1 | 5.1 | 5. |
| 10 | Absolute stack gas pressure, in. Hg. | Ps | 29.58 | 29.58 | 29.5 |
| 11 | Barometric pressure, in. Hg. | Pbar | 29.58 | 29.58 | 29.5 |
| 12 | Average absolute stack temperature, °R | Ts | 743 | 735 | 73 |
| 13 | Average $\sqrt{\text{velocity head}}$ , ( Cp= .79 ) | $\sqrt{\Delta P}$ | .92 | .86 | .8 |
| 14 | Average stack gas velocity ft. / sec. | Vs | 61 | 56 | 5 |
| | STACK MOISTURE CONTENT | | | | |
| 15 | Total water collected by train, ml. | Vic | 275.0 | 235.0 | 233. |
| 16 | Moisture in stack gas, % | Bws | 26.2 | 24.4 | 25. |
| | EMISSIONS DATA: | | | | |
| 17 | Stack gas flow rate, dscf/hr. (000's) | Qsd | 583 | 558 | 53 |
| 18 | Total particulate concentration, gr/dscf | Cs | .0467 | .0224 | .045 |
| 19 | Total particulate concentration, lbs/hr | E | 3.9 | 1.8 | 3. |
| 20 | Total particulate concentration, lbs/mbtu | E' | .0000 | .0000 | .000 |
| | ORSAT DATA | | | | |
| 21 | Percent CO2 by volume | CO2 | 5.3 | 6.5 | 7. |
| 22 | Percent O2 by volume | O2 | 10.8 | 10.8 | 10. |
| 23 | Percent CO by volume | CO | .0 | .0 | . |
| 24 | Percent N2 by volume | N2 | 83.9 | 82.7 | 82. |

Buzzycalc

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 ( $528^\circ R$)

$\Delta H$ = Average pressure drop across oriface meter, in.$H_2O$

Y = Dry gas meter calibration factor

13.6 = Inches water per inches Hg.

Run # 1 $$V_{m(std)} = 17.64 \quad (1.01)(38.08) \left[ \frac{(29.58) + \frac{1.07}{13.6}}{554} \right] = 36.32 \text{ ds}$$

Run # 2 $$V_{m(std)} = 17.64 \quad (1.01)(35.46) \left[ \frac{(29.58) + \frac{.97}{13.6}}{546} \right] = 34.31 \text{ ds}$$

Run # 3 $$V_{m(std)} = 17.64 \quad (1.01)(34.23) \left[ \frac{(29.58) + \frac{.89}{13.6}}{555} \right] = 32.57 \text{ ds}$$

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: $$C_s' = \left[ 0.0154 \frac{gr}{mg} \right] \left[ \frac{110.2}{36.32} \right] = .0467 \text{ gr./dscf.}$$

Run # 2: $$C_s' = \left[ 0.0154 \frac{gr}{mg} \right] \left[ \frac{49.9}{34.31} \right] = .0224 \text{ gr./dscf.}$$

Run # 3: $$C_s' = \left[ 0.0154 \frac{gr}{mg} \right] \left[ \frac{96.6}{32.57} \right] = .0457 \text{ gr./dscf.}$$

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: $M_d = 0.44(\ 5.3\%\ ) + 0.32(10.8\%\ ) + 0.28(\ \ .0\% + 83.9\%\ ) =$ 29.3 lb./lb.-mo

Run # 2: $M_d = 0.44(\ 6.5\%\ ) + 0.32(10.8\%\ ) + 0.28(\ \ .0\% + 82.7\%\ ) =$ 29.5 lb./lb.-mo

Run # 3: $M_d = 0.44(\ 7.8\%\ ) + 0.32(10.0\%\ ) + 0.28(\ \ .0\% + 82.2\%\ ) =$ 29.6 lb./lb.-mo

Water vapor condensed :

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

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

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

$V_f$ = Final volume of impinger contents, ml.

$V_i$ = Initial volume of impinger contents

p = Density of water, (0.002201 lb/ml).

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

$M_w$ = Molecular weight of water vapor (18.0 lb/lb-mole).

$T_{std}$ = Absolute temperature at standard conditions, 528$^\circ$R.

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

Run # 1: $V_{wc(std)}$ = (0.04707) (260.0) = 12.2 cu.ft
$V_{wsg(std)}$ = (0.04715) ( 15.0) = .7 cu.ft

Run # 2: $V_{wc(std)}$ = (0.04707) (220.0) = 10.4 cu.ft
$V_{wsg(std)}$ = (0.04715) ( 15.0) = .7 cu.ft

Run # 3: $V_{wc(std)}$ = (0.04707) (218.0) = 10.3 cu.ft
$V_{wsg(std)}$ = (0.04715) ( 15.0) = .7 cu.ft

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: $$B_{ws} = \frac{12.2 + .7}{12.2 + .7 + 36.32} \times 100 = 26.2\ \%$$

Run # 2: $$B_{ws} = \frac{10.4 + .7}{10.4 + .7 + 34.31} \times 100 = 24.4\ \%$$

Run # 3: $$B_{ws} = \frac{10.3 + .7}{10.3 + .7 + 32.57} \times 100 = 25.2\ \%$$

---

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: $M_s$ = 29.3 (1- .262 ) + 18 ( .262 ) = 26.3 (lb./lb.-mole).

Run # 2: $M_s$ = 29.5 (1- .244 ) + 18 ( .244 ) = 26.7 (lb./lb.-mole).

Run # 3: $M_s$ = 29.6 (1- .252 ) + 18 ( .252 ) = 26.7 (lb./lb.-mole).

Stack gas velocity:

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

Where:

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

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

$C_p$ = Pitot tube coefficient,( dimensionless ).

$\Delta P$ = 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, (°f).

$T_s$ = Absolute stack temperature, (°R). = 460 + $t_s$.

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

Run # 1: $V = (85.49)(.79)(.92)\sqrt{\frac{743\ \ 283}{(29.58)(26.34)}} = 60.68$ ft/s

Run # 2: $V = (85.49)(.79)(.86)\sqrt{\frac{735\ \ 275}{(29.58)(26.69)}} = 56.04$ ft/s

Run # 3: $V = (85.49)(.79)(.83)\sqrt{\frac{730\ \ 270}{(29.58)(26.68)}} = 53.91$ ft/s

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:

$$Q_{sd} = 3600\ (1-.262)\ (\ 60.68)\ (\ \ 5.1) \left[\frac{528}{743}\right] \left[\frac{29.58}{29.92}\right] = 583302 \text{ dsc}$$

Run # 2:

$$Q_{sd} = 3600\ (1-.244)\ (\ 56.04)\ (\ \ 5.1) \left[\frac{528}{735}\right] \left[\frac{29.58}{29.92}\right] = 557844 \text{ dsc}$$

Run # 3:

$$Q_{sd} = 3600\ (1-.252)\ (\ 53.91)\ (\ \ 5.1) \left[\frac{528}{730}\right] \left[\frac{29.58}{29.92}\right] = 534599 \text{ dsc}$$

**Emissions rate from stack:**

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

Where:

E = Emissions rate, lb./hr.

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

Q = Dry volumetric stack gas flow rate corrected to standard conditions, (dscf/hr).

Run # 1: $$E = \frac{(.0467)\ (583302)}{7000} = 3.9\ \text{lb. / hr.}$$

Run # 2: $$E = \frac{(.0224)\ (557844)}{7000} = 1.8\ \text{lb. / hr.}$$

Run # 3: $$E = \frac{(.0457)\ (534599)}{7000} = 3.5\ \text{lb. / hr.}$$

Isokinetic variation : $$I = 100\, T_s \left[ \frac{0.002669\, V_{ic} + (V_m/T_m)(P_{bar} + \Delta H/13.6)}{60 \quad O \quad V_s \quad P_s \quad A_n} \right]$$

Where:

| | | |
|---|---|---|
| I | = | Percent isokinetic sampling. |
| 100 | = | Conversion to percent. |
| $T_s$ | = | Absolute average stack gas temperature, °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 |
| 13.6 | = | Specific gravity of mercury. |
| 60 | = | Conversion seconds to minutes |
| O | = | 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:

$$I = 100 \times 743 \left[ \frac{(0.002669)(275.0) + \frac{38.1}{554}\left[29.58 + \frac{1.07}{13.6}\right]}{60\,(\,64\,)\,(\,60.68\,)\,(29.58\,)\,(\,.000289\,)} \right] = 104$$

Run # 2:

$$I = 100 \times 735 \left[ \frac{(0.002669)(235.0) + \frac{35.5}{546}\left[29.58 + \frac{.97}{13.6}\right]}{60\,(\,64\,)\,(\,56.04\,)\,(29.58\,)\,(\,.000289\,)} \right] = 103$$

Run # 3:

$$I = 100 \times 730 \left[ \frac{(0.002669)(233.0) + \frac{34.2}{555}\left[29.58 + \frac{.89}{13.6}\right]}{60\,(\,64\,)\,(\,53.91\,)\,(29.58\,)\,(\,.000289\,)} \right] = 102$$

# VIII. FIELD DATA

8 of 2

RAMCON ENVIRONMENTAL CORPORATION

Plant: Piedmont asphalt / Sherrill Paving
Location: Gold Hill North Carolina
Operator: Shawn Greenwood
Date: 2/1/88
Run No.: 1
Sample Box No.: 2
Meter Box No.: 147810 \ C124
Meter H @: 1.74
C Factor: 1.01
Pitot Tube Coefficient Cp: 0.79

$\Delta H$ = 1.24

22½" · 26.75" · 14" · 8 ports · 61" · 33' · As = 5.15

Schematic of Stack Cross Section

Ambient Temperature: 72°
Barometric Pressure: 29.58
Assumed Moisture, %: 25
Probe Length, m(ft): 3 ft
Nozzle Identification No.: 0.0002085
Avg. Calibrated Nozzle Dia., (in.): .230/.230/.230
Probe Heater Setting: 5
Leak Rate, $m^3$/min. (cfm): +0.0185@15in \ +0.0168@7in
Probe Liner Material: 316 Stainless Steel
Static Pressure, mm Hg (in. Hg): .05
Filter No.: 56-2476

| | IMPINGER VOLUME, ml | SILICA GEL WEIGHT, g |
|---|---|---|
| FINAL | 460 | 312 |
| INITIAL | 200 | 297 |
| DIFFERENCE | 260 | 15 |

| TRAV. PT NO. | SAMPLING TIME (θ)min. | VACUUM in. Hg | STACK TEMP ($T_s$) °F | VELOCITY HEAD ($P_s$) in H2O | PRESSURE DIFF. ORF. MTR in H2O | 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 | 14:32 / 14:34 | 3 | 237 | 0.68 | 0.85 | 121.08 / 122.17 | 88 | 75 | 240 | 55 |
| 2 | 14:36 | 4 | 264 | 0.81 | 1.06 | 123.30 | 90 | 75 | 250 | 55 |
| 3 | 14:38 | 5 | 281 | 0.94 | 1.15 | 124.53 | 90 | 75 | 250 | 55 |
| 4 | 14:40 | 5 | 282 | 0.90 | 1.10 | 125.75 | 95 | 75 | 250 | 55 |
| B) 1 | 14:41 / 14:43 | 3 | 277 | 0.65 | 0.81 | 126.88 | 95 | 75 | 245 | 55 |
| 2 | 14:45 | 3 | 282 | 0.70 | 0.87 | 127.83 | 100 | 75 | 245 | 55 |
| 3 | 14:47 | 4 | 282 | 0.83 | 1.05 | 129.02 | 100 | 80 | 250 | 55 |
| 4 | 14:49 | 5 | 283 | 0.91 | 1.15 | 130.27 | 100 | 80 | 255 | 55 |
| C) 1 | 14:50 / 14:52 | 2 | 274 | 0.56 | 0.69 | 131.17 | 100 | 80 | 250 | 55 |
| 2 | 14:54 | 3 | 280 | 0.63 | 0.78 | 132.21 | 105 | 80 | 250 | 55 |
| 3 | 14:56 | 4 | 282 | 0.77 | 0.95 | 133.32 | 105 | 80 | 255 | 60 |
| 4 | 14:58 | 6 | 285 | 1.20 | 1.50 | 134.73 | 110 | 80 | 255 | 60 |
| D) 1 | 14:59 / 15:01 | 3 | 280 | 0.51 | 0.63 | 135.70 | 105 | 80 | 255 | 60 |

$O_2$ = 10.5%  $CO_2$ = 5.5%

Form #REC-06 Part 2

**RAMCON** emissions test log sheet, cont. DATE 2/1/88 LOCATION [illegible] TEST NO. 1

| TRAVERSE POINT | SAMPLING TIME θ (min) | VACUUM mm Hg (in. Hg) | STACK TEMP $T_s$ (°F) | VELOCITY HEAD $\Delta P_s$ (in. $H_2O$) | ORFICE DIFF. PRESSURE $\Delta H$ (in. $H_2O$) | GAS VOLUME Vm (ft.$^3$) | GAS SAMPLE TEMP. (°F) in | GAS SAMPLE TEMP. (°F) out | SAMPLE BOX TEMP. (°F) | IMPINGER TEMP (°F) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 15:03 | 3 | 285 | 0.59 | 0.73 | 136.69 | 105 | 80 | 260 | 60 |
| 3 | 15:05 | 4 | 286 | 0.75 | 0.93 | 137.86 | 110 | 85 | 260 | 60 |
| 4 | 15:07 | 6 | 288 | 1.30 | 1.60 | 139.22 | 110 | 85 | 255 | 60 |
| E) 1 | 15:08 / 15:10 | 3 | 283 | 0.57 | 0.71 | 140.33 | 110 | 85 | 255 | 60 |
| 2 | 15:12 | 3 | 286 | 0.60 | 0.74 | 141.34 | 110 | 85 | 255 | 60 |
| 3 | 15:14 | 4 | 288 | 0.73 | 0.91 | 142.42 | 110 | 85 | 255 | 60 |
| 4 | 15:16 | 6 | 290 | 1.30 | 1.60 | 143.88 | 115 | 85 | 250 | 60 |
| F) 1 | 15:17 / 15:19 | 3 | 283 | 0.47 | 0.58 | 144.82 | 110 | 85 | 245 | 60 |
| 2 | 15:21 | 3 | 286 | 0.55 | 0.68 | 145.78 | 110 | 85 | 245 | ~~[illegible]~~ 60 |
| 3 | 15:23 | 5 | 290 | 0.88 | 1.10 | 147.03 | 110 | 85 | 245 | 60 |
| 4 | 15:25 | 6 | 290 | 1.30 | 1.60 | 148.47 | 115 | 85 | 245 | 60 |
| G) 1 | 15:26 / 15:28 | 3 | 284 | 0.54 | 0.67 | 149.51 | 110 | 85 | 245 | 60 |
| 2 | 15:30 | 3 | 287 | 0.64 | 0.79 | 150.54 | 110 | 85 | 250 | 60 |
| 3 | 15:32 | 5 | 288 | 0.98 | 1.20 | 151.82 | 110 | 85 | 250 | 60 |
| 4 | 15:34 | 7 | 290 | 1.50 | 1.90 | 153.40 | 115 | 85 | 250 | 60 |
| H) 1 | 15:35 / 15:37 | 5 | 280 | 0.96 | 1.20 | 154.76 | 110 | 85 | 250 | 60 |
| 2 | 15:39 | 5 | 289 | 1.10 | 1.35 | 156.07 | 110 | 85 | 250 | 60 |
| 3 | 15:41 | 6 | 291 | 1.30 | 1.61 | 157.55 | 115 | 90 | 255 | 60 |
| 4 | 15:43 | 7 | 291 | 1.50 | 1.90 | 159.16 | 115 | 90 | 255 | 60 |

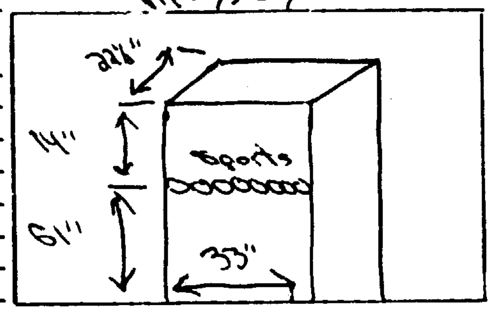
$\sqrt{\Delta P}$ = [illegible]

P. 1 of 2

RAMCON ENVIRONMENTAL CORPORATION

Plant: Sherrill Paving
Location: Gold Hill, North Carolina
Operator: K. Allmendinger
Date: 2-2-88
Run No.: 2
Sample Box No.: 1
Meter Box No.: 147810 C124
Meter H @: 1.74
C Factor: 1.01
Pitot Tube Coefficient Cp: 0.79

M = 1.24




Schematic of Stack Cross Section

Ambient Temperature: 55
Barometric Pressure: 29.98
Assumed Moisture, %:
Probe Length, m(ft): 3 ft.
Nozzle Identification No.: .0002885
Avg. Calibrated Nozzle Dia., (in.): .230/.230/.230
Probe Heater Setting: 5
Leak Rate, $m^3$/min. (cfm): <.013 @ 7"
Probe Liner Material: 316 Stainless Steel
Static Pressure, mm Hg (in. Hg): .05
Filter No.: DA-2386

| | IMPINGER VOLUME ml | SILICA GEL WEIGHT, g |
|---|---|---|
| FINAL | 420 | 300 |
| INITIAL | 200 | 285 |
| DIFFERENCE | 220 | 15 |

| TRAV. PT NO. | SAMPLING TIME (θ) min. | VACUUM in. Hg | STACK TEMP ($T_s$) °F | VELOCITY HEAD ($P_s$) in H2O | PRESSURE DIFF. ORF. MTR in H2O | 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 | 8:30:45 / 8:32 | 2 | 245 | .55 | .68 | 159.354 / 160.33 | 70 | 65 | 240 | 60 |
| 2 | 8:34 | 3 | 250 | .70 | .87 | 161.38 | 80 | 65 | 240 | 60 |
| 3 | 8:36 | 3 | 255 | .75 | .93 | 162.48 | 80 | 65 | 245 | 55 |
| 4 | 8:38:45 | 4 | 240 | .78 | .97 | 163.605 | 85 | 65 | 245 | 55 |
| B) 1 | 8:39:30 / 8:41 | 2 | 260 | .55 | .68 | 164.58 | 85 | 65 | 245 | 55 |
| 2 | 8:43 | 2 | 265 | .55 | .68 | 165.52 | 90 | 70 | 245 | 55 |
| 3 | 8:45 | 4 | 265 | .75 | .93 | 166.64 | 90 | 70 | 250 | 55 |
| 4 | 8:47:30 | 4 | 270 | .80 | .99 | 167.765 | 95 | 70 | 250 | 55 |
| C) 1 | 8:47:45 / 8:49 | 2 | 270 | .40 | .50 | 168.62 | 95 | 70 | 250 | 55 |
| 2 | 8:51 | 3 | 270 | .55 | .68 | 169.58 | 95 | 70 | 250 | 55 |
| 3 | 8:53 | 4 | 275 | .75 | .93 | 170.72 | 100 | 70 | 250 | 55 |
| 4 | 8:55:45 | 4 | 275 | .75 | .93 | 171.80 | 100 | 70 | 250 | 55 |
| D) 1 | 8:56 / 8:58 | 2 | 275 | .45 | .56 | 172.72 | 100 | 75 | 255 | 55 |

O₂ - 10.5 CO₂ - 7.0

Form #REC-06

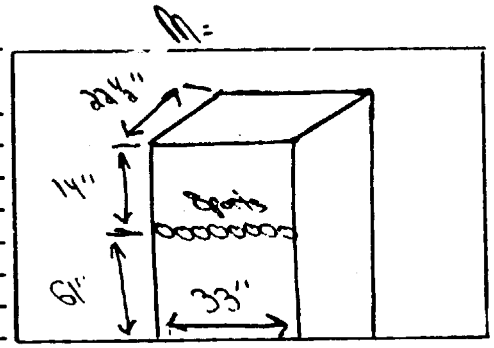
**RAMCON** emissions test log sheet, cont. DATE 2-2-85 LOCATION [illegible] TEST NO. 2

| TRAVERSE POINT | SAMPLING TIME θ (min) | VACUUM mm Hg (in. Hg) | STACK TEMP $T_s$ (°F) | VELOCITY HEAD $\Delta P_s$ (in. $H_2O$) | ORFICE DIFF. PRESSURE $\Delta H$ (in. $H_2O$) | GAS VOLUME $V_m$ (ft.$^3$) | GAS SAMPLE TEMP. (°F) in | GAS SAMPLE TEMP. (°F) out | SAMPLE BOX TEMP. (°F) | IMPINGER TEMP (°F) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 9:00 | 2 | 275 | .45 | .56 | 173.60 | 100 | 75 | 255 | 55 |
| 3 | 9:02 | 3 | 275 | .55 | .68 | 174.69 | 100 | 75 | 255 | 55 |
| 4 | 9:04 | 5 | 280 | .95 | 1.2 | 175.855 | 100 | 75 | 255 | 55 |
| E) 1 | 9:04:30 / 9:06 | 2 | 280 | .40 | .50 | 176.73 | 100 | 75 | 255 | 55 |
| 2 | 9:08 | 2 | 280 | .45 | .56 | 177.61 | 100 | 75 | 260 | 55 |
| 3 | 9:10 | 3 | 280 | .55 | .68 | 178.58 | 100 | 75 | 260 | 55 |
| 4 | 9:12:30 | 5 | 285 | .95 | 1.2 | 179.845 | 105 | 75 | 260 | 55 |
| F) 1 | 9:13 / 9:15 | 2 | 280 | .45 | .56 | 180.72 | 100 | 80 | 260 | 55 |
| 2 | 9:17 | 2 | 285 | .45 | .56 | 181.60 | 105 | 80 | 260 | 55 |
| 3 | 9:19 | 4 | 285 | 1.0 | 1.2 | 182.83 | 105 | 80 | 260 | 55 |
| 4 | 9:21 | 5 | 285 | 1.1 | 1.4 | 184.65 | 105 | 80 | 260 | 55 |
| G) 1 | 9:21:15 / 9:23 | 2 | 285 | .50 | .62 | 185.16 | 105 | 80 | 260 | 55 |
| 2 | 9:25 | 3 | 285 | .55 | .68 | 186.12 | 105 | 80 | 260 | 55 |
| 3 | 9:27 | 5 | 285 | 1.3 | 1.6 | 187.52 | 105 | 80 | 260 | 55 |
| 4 | 9:29:15 | 6 | 290 | 1.6 | 2.0 | 189.07 | 110 | 80 | 260 | 55 |
| H) 1 | 9:29:40 | 5 | 280 | 1.0 | 1.2 | 190.50 | 105 | 80 | 255 | 55 |
| 2 | 9:31 | 5 | 285 | 1.2 | 1.5 | 191.74 | 105 | 80 | 255 | 55 |
| 3 | 9:33 | 6 | 285 | 1.5 | 1.9 | 193.26 | 110 | 80 | 255 | 55 |
| 4 | 9:35:40 | 6 | 285 | 1.6 | 2.0 | 194.852 | 110 | 80 | 255 | 55 |

1 of 2

RAMCON ENVIRONMENTAL CORPORATION

Plant Sherill Paving
Location Gold Hill North Carolina
Operator K. Allmendinger
Date 2-2-88
Run No. 3
Sample Box No. 3
Meter Box No. 147810 / C124
Meter H @ 1.74
C Factor 1.01
Pitot Tube Coefficient Cp 0.79




Schematic of Stack Cross Section

Ambient Temperature 65
Barometric Pressure 29.98
Assumed Moisture, %
Probe Length, m(ft) 3ft.
Nozzle Identification No. .0002885
Avg. Calibrated Nozzle Dia., (in.) .230/.230/.2
Probe Heater Setting 5
Leak Rate, $m^3$/min. (cfm) 4.016 @7"
Probe Liner Material 316 Stainless Steel
Static Pressure, mm Hg (in.Hg) .05
Filter No. 56 3478

| | IMPINGER VOLUME ml | SILICA GEL WEIGHT g |
|---|---|---|
| FINAL | 418 | 321 |
| INITIAL | 200 | 306 |
| DIFFERENCE | 218 | 15 |

| TRAV. PT NO. | SAMPLING TIME (θ)min. | VACUUM in. Hg | STACK TEMP ($T_s$) °F | VELOCITY HEAD ($P_s$) in H2O | PRESSURE DIFF. ORF. MTR in H2O | 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 | 10:26:20 / 10:28 | 2 | 260 | .75 | .93 | 195.336 / 196.44 | 90 | 85 | 235 | 60 |
| 2 | 10:30 | 4 | 270 | 1.3 | 1.4 | 197.51 | 95 | 80 | 240 | 60 |
| 3 | 10:32 | 4 | 270 | 1.3 | 1.6 | 198.71 | 100 | 80 | 240 | 60 |
| 4 | 10:34:20 | 5 | 270 | 1.4 | 1.7 | 199.92 | 95 | 80 | 240 | 60 |
| B) 1 | 10:35 / 10:37 | 3 | 265 | .55 | .68 | 200.90 | 95 | 80 | 240 | 55 |
| 2 | 10:39 | 3 | 270 | .63 | .78 | 202.04 | 100 | 80 | 240 | 55 |
| 3 | 10:41 | 5 | 270 | 1.0 | 1.2 | 203.33 | 100 | 80 | 245 | 55 |
| 4 | 10:43 | 5 | 275 | 1.1 | 1.4 | 204.81 | 100 | 80 | 245 | 55 |
| C) 1 | 10:43:40 / 9:45 | 2 | 270 | .40 | .50 | 205.66 | 100 | 80 | 245 | 55 |
| 2 | 10:47 | 2 | 270 | .40 | .50 | 206.58 | 100 | 80 | 250 | 55 |
| 3 | 10:49 | 3 | 270 | .78 | .97 | 207.72 | 105 | 80 | 250 | 55 |
| 4 | 10:51:40 | 5 | 275 ~~270~~ | 1.2 | 1.5 | 209.134 | 110 | 80 | 250 | 55 |
| D) 1 | 10:52:45 / 9:54 | 2 | 270 ~~40~~ | .40 | .50 | 210.02 | 100 | 80 | 250 | 55 |

$O_2$ = 10.0 $CO_2$ = 9.5

Form #REC-06

Rast 2

- 36 -

**RAMCON** emissions test log sheet, cont. DATE 2-2-88 LOCATION Cold Hill NC TEST NO. 3

| TRAVERSE POINT | SAMPLING TIME θ (min) | VACUUM mm Hg (in. Hg) | STACK TEMP $T_s$ (°F) | VELOCITY HEAD $\Delta P_s$ (in. $H_2O$) | ORFICE DIFF. PRESSURE $\Delta H$ (in. $H_2O$) | GAS VOLUME $V_m$ (ft.$^3$) | GAS SAMPLE TEMP. (°F) in | GAS SAMPLE TEMP. (°F) out | SAMPLE BOX TEMP. (°F) | IMPINGER TEMP (°F) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 10:54 | 2 | 270 | .45 | .55 | 210.90 | 105 | 85 | 255 | 55 |
| 3 | 10:58 | 2 | 270 | .45 | .55 | 211.78 | 110 | 85 | 255 | 55 |
| 4 | 11:00:45 | 4 | 275 | .55 | 1.2 | 213.052 | 110 | 85 | 260 | 55 |
| E) 1 | ~~11:01:15~~ 11:03 | 2 | 265 | .40 | .50 | 213.53 | 110 | 85 | 260 | 55 |
| 2 | 11:05 | 2 | 270 | .45 | .55 | 214.83 | 110 | 85 | 260 | 55 |
| 3 | 11:07 | 2 | 270 | .50 | .62 | 215.77 | 110 | 85 | 260 | 55 |
| 4 | 11:09:15 | 4 | 270 | .87 | 1.1 | 216.971 | 110 | 85 | 260 | 55 |
| F) 1 | ~~11:09:50~~ 11:11 | 2 | 265 | .43 | .53 | 217.79 | 110 | 85 | 260 | 55 |
| 2 | 11:13 | 2 | 270 | .43 | .53 | 218.67 | 110 | 85 | 260 | 55 |
| 3 | 11:15 | 3 | 270 | .60 | .74 | 219.63 | 110 | 85 | 255 | 55 |
| 4 | 11:17:50 | 5 | 270 | .80 | .99 | 220.80 | 110 | 85 | 255 | 55 |
| G) 1 | ~~11:18:20~~ 11:20 | 3 | 265 | .45 | .56 | 221.71 | 110 | 85 | 255 | 55 |
| 2 | 11:22 | 2 | 270 | .52 | .64 | 222.67 | 110 | 85 | 255 | 55 |
| 3 | 11:24 | 3 | 270 | .70 | .87 | 223.77 | 110 | 85 | 255 | 55 |
| 4 | 11:26:20 | 3 | 270 | .83 | 1.0 | 224.937 | 115 | 85 | 255 | 55 |
| H) 1 | ~~11:26:45~~ 11:28 | 2 | 265 | .50 | .62 | 225.89 | 110 | 85 | 255 | 55 |
| 2 | 11:30 | 3 | 270 | .77 | .95 | 227.04 | 115 | 85 | 255 | 55 |
| 3 | 11:32 | 3 | 275 | .90 | 1.1 | 228.29 | 115 | 90 | 255 | 55 |
| 4 | 11:34:45 | 3 | 275 | .90 | 1.1 | 229.562 | 115 | 90 | 255 | 55 |

# IX. CALIBRATIONS

# METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 2-3-88 Meter box number 147810 (C-124)

Barometric pressure, $P_b$ = 29.55 in. Hg Calibrated by KAA

| Orifice manometer setting ($\Delta H$), 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 ($\Theta$), min | $Y_i$ | $\Delta H@_i$ in. $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 5 | 269.04 / 274.235 | 68 | 100 / 100 | 75 / 75 | 87.5 | 12:23 | 1.0000 | 1.66 |
| 1.0 | 5 | 262.53 / 267.683 | 68 | 100 / 102 | 75 / 75 | 88 | 8:52 | 1.0046 | 1.70 |
| 1.5 | 10 | 251.47 / 261.671 | 68 | 100 / 103 | 70 / 74 | 86.75 | 14:26 | 1.0114 | 1.69 |
| 2.0 | 10 | | | | | | | | |
| 3.0 | 10 | | | | | | | | |
| 4.0 | 10 | | | | | | | | |
| | | | | | | | Avg | 1.0053 | 1.68 |

| $\Delta H$, in. $H_2O$ | $\frac{\Delta H}{13.6}$ | $Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$ | $\Delta H@_i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\Theta}{V_w}\right]^2$ |
|---|---|---|---|
| 0.5 | 0.0368 | $\frac{5 \cdot 29.85 \cdot 547.5}{5.178 (29.55 + .0368) 528}$ 1.0000 | 1.66 |
| 1.0 | 0.0737 | $\frac{5 \cdot 29.85 \cdot 548}{5.153 (29.55 + .0735) 528}$ 1.0046 | 1.70 |
| 1.5 | 0.110 | $\frac{10 \cdot 29.85 \cdot 546.75}{10.201 (29.55 + .1103) 528}$ 1.0114 | 1.69 |
| 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 $t_d$.

# METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 11-6-87 Meter box number 147810 C-124

Barometric pressure, $P_b$ = 29.84 in. Hg Calibrated by [illegible]

| Orifice manometer setting ($\Delta H$), 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 ($\Theta$), min | $Y_i$ | $\Delta H@_i$ in. $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 5 | 64.57 / 69.72 | 71.6 | 102 / 104 | 80 / 80 | 92 | 12:24 | 1.0069 | 1.67 |
| 1.0 | 5 | 58.95 / 64.065 | 71.6 | 104 / 107 | 78 / 79 | 92 | 8:59 | 1.0125 | 1.75 |
| 1.5 | 10 | 48.36 / 58.50 | 71.6 | 102 / 106 | 75 / 76 | 89.75 | 14:47 | 1.0161 | 1.79 |
| 2.0 | 10 | | | | | | | | |
| 3.0 | 10 | | | | | | | | |
| 4.0 | 10 | | | | | | | | |
| | | | | | | | Avg | 1.0118 | 1.74 |

| $\Delta H$, 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. 33 Date 9-5-87

Calibrated by: C. Mitchell

"A" SIDE CALIBRATION Impact

| Run No. | $\Delta p$ std cm $H_2O$ (in. $H_2O$) | $\Delta p$ (s) cm $H_2O$ (in. $H_2O$) | $C_p(s)$ | DEVIATION $C_p(s)-\bar{C}_p(A)$ |
|---|---|---|---|---|
| 1 | 1.10 | 1.70 | 0.804 | +0.009 |
| 2 | 0.56 | 0.88 | 0.798 | +0.003 |
| 3 | 0.33 | 0.54 | 0.782 | -0.01 |
| | | $\bar{C}_p$ (SIDE A) | 0.795 | |

"B" SIDE CALIBRATION

| Run No. | $\Delta p$ std cm $H_2O$ (in. $H_2O$) | $\Delta p(s)$ cm $H_2O$ in. $H_2O$) | $C_p(s)$ | DEVIATION $C_p(s)-\bar{C}_p(B)$ |
|---|---|---|---|---|
| 1 | 1.10 | 1.70 | 0.804 | +0.003 |
| 2 | 0.56 | 0.87 | 0.802 | +0.001 |
| 3 | 0.33 | 0.52 | 0.797 | -0.004 |
| | | $\bar{C}_p$ (SIDE B) | 0.801 | |

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

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

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

Form No. EED-17-1

RAMCON ENVIRONMENTAL CORPORATION

Date 9-5-87 Thermocouple number Inlet

Ambient temperature 83 ~~°C~~ °F Barometric pressure 30.52 in. Hg

Calibrator C. Mitchell Reference: mercury-in-glass ✓

other ______

| Reference point number[a] | ~~Source[b] (specify)~~ | Reference Thermometer Temperature, ~~°C~~ °F | Thermocouple Potentiometer Temperature, ~~°C~~ °F | Temperature Difference,[c] % |
|---|---|---|---|---|
| A | Ice bath | 33 | 33 | 0 |
| B | oven | 150 | 150 | 0 |
| C | oven | 175 | 175 | 0 |
| D | Ambient | 83 | 83 | 0 |
| | 2-1-86 | 72 | 72 | 0 |

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

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

Date 9-5-87 Thermocouple number Hotbox #2

Ambient temperature 84 ~~°C~~ °F Barometric pressure 30.52 in. Hg

Calibrator C. Mitchell Reference: mercury-in-glass ✓

other ______

| Reference point number[a] | Source[b] (specify) | Reference Thermometer Temperature, ~~°C~~ °F | Thermocouple Potentiometer Temperature, ~~°C~~ °F | Temperature Difference,[c] % |
|---|---|---|---|---|
| A | Ice bath | 33 | 33 | 0 |
| B | oven | 150 | 150 | 0 |
| C | oven | 175 | 175 | 0 |
| D | Ambient | 84 | 84 | 0 |
| | 2-1-88 | 72 | 72 | 0 |

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

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON

Lear Siegler Stack Sampler

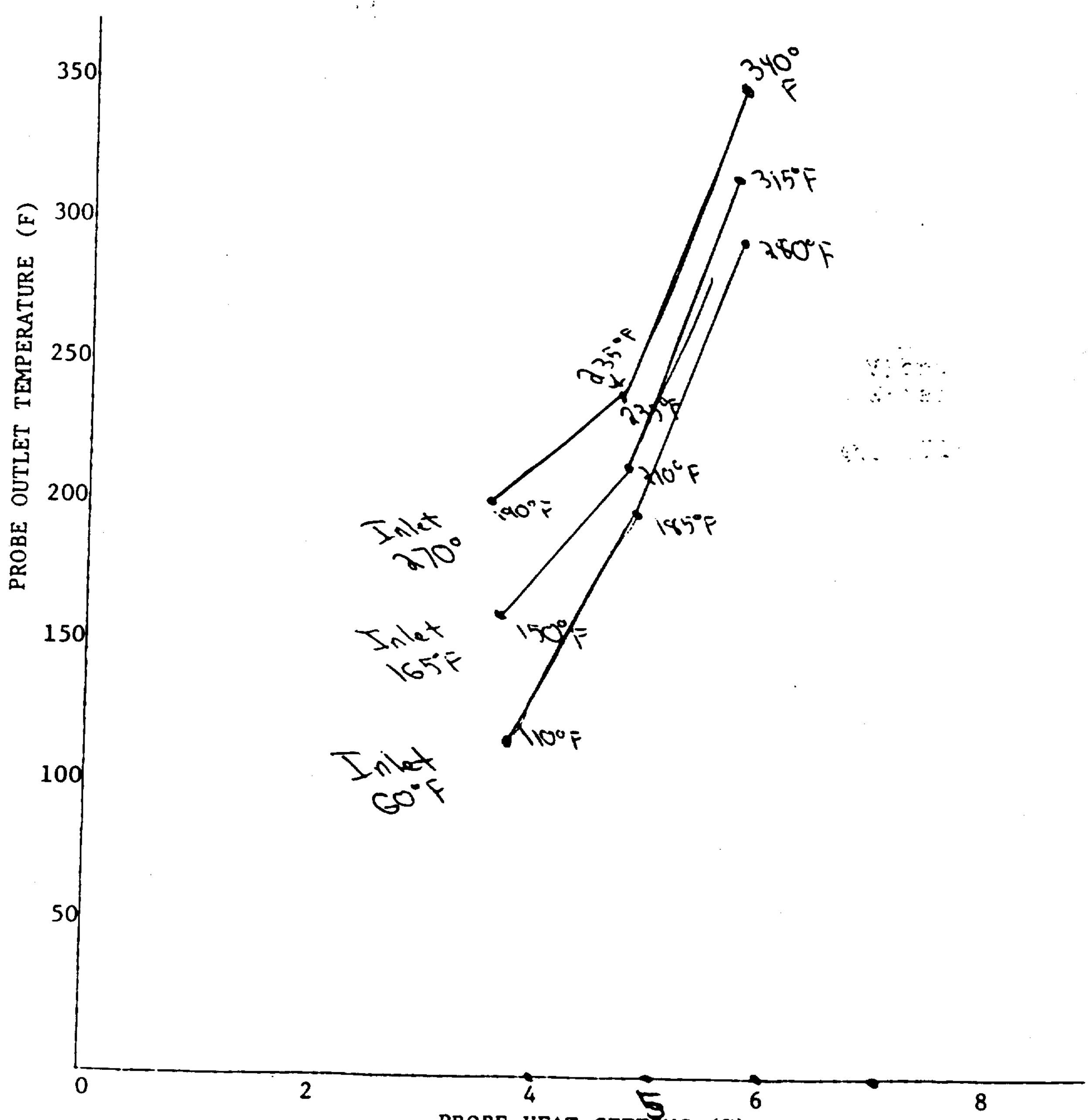
Heating Probe Calibration

Probe No. 33 Probe Length 3ft.

Date of Calibration 1/09/87 Signature Shawn Greenwood

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




Form No. EED-17-2

RAMCON ENVIRONMENTAL CORPORATION

Date 9-5-87 Thermocouple number 33

Ambient temperature 85 °F Barometric pressure 30.52 in. Hg

Calibrator C. Mitchell Reference: mercury-in-glass ✓

other ______

| Reference point number[a] | Source[b] (specify) | Reference Thermometer Temperature, °F | Thermocouple Potentiometer Temperature, °F | Temperature Difference,[c] % |
|---|---|---|---|---|
| A | Ice bath | 33 | 33 | 0 |
| B | oven | 150 | 150 | 0 |
| C | Oven | 175 | 175 | 0 |
| D | Ambient | 85 | 85 | 0 |
| | 2-1-88 | 72 | 72 | 0 |

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

[b] Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

# X. RAMCON PERSONNEL

# 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

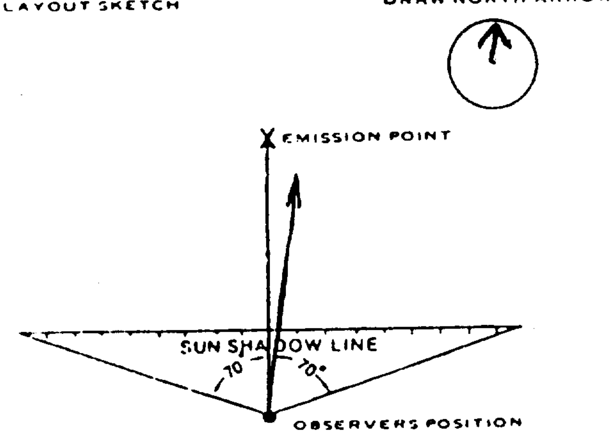
Ken Allmendinger has been employed with RAMCON for three years. He has sampled over 100 asphalt plants with extensive training in Methods 1 through 5. He is qualified as a team leader and has current certification as a V.E. reader.

# XI. VISIBLE EMISSIONS

| | |
|---|---|
| SOURCE NAME | ~~Sherrill~~ Paving |
| ADDRESS | Piedmont Asphalt |
| CITY | Gold Hill |
| STATE | ~~SC~~ N.C. |
| ZIP | |
| PHONE | |
| SOURCE ID NUMBER | , |
| PROCESS EQUIPMENT | Astec D.M. |
| OPERATING MODE | |
| CONTROL EQUIPMENT | Astec B.H. |
| OPERATING MODE | |
| DESCRIBE EMISSION POINT | Rectangular stack exit from B.H. |
| HEIGHT ABOVE GROUND LEVEL | 25' |
| HEIGHT RELATIVE TO OBSERVER | 15' |
| DISTANCE FROM OBSERVER | 60' |
| DIRECTION FROM OBSERVER | |
| DESCRIBE EMISSIONS | |
| EMISSION COLOR | |
| 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 | stack exit |
| DESCRIBE BACKGROUND | Trees |
| BACKGROUND COLOR | green/brown + sky |
| SKY CONDITIONS | PC |
| WIND SPEED | 0-5 |
| WIND DIRECTION | Var. |
| AMBIENT TEMPERATURE | 72°F |
| RELATIVE HUMIDITY | |

SOURCE LAYOUT SKETCH

DRAW NORTH ARROW




COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE

DATE

| OBSERVATION DATE | START TIME | STOP TIME |
|---|---|---|
| 2-1-88 | 2:37 Pm | |

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

| | |
|---|---|
| AVERAGE OPACITY FOR HIGHEST PERIOD | 10 |
| NUMBER OF READINGS ABOVE | 10 % WERE 27 |
| RANGE OF OPACITY READINGS | 0 MINIMUM 20 MAXIMUM |
| OBSERVER'S NAME (PRINT) | Ken B. Allmendinger |
| OBSERVER'S SIGNATURE | K.B. Allmendinger |
| DATE | 2-1-88 |
| ORGANIZATION | Ramcon Environmental Corp. |
| CERTIFIED BY | State of N |
| DATE | Dec 87 |
| VERIFIED BY | |
| DATE | |

(40)

SOURCE NAME
~~Sherrill Paving~~

ADDRESS
Piedmont Asphalt

CITY
Gold Hill

STATE
NC

ZIP

PHONE

SOURCE ID NUMBER

PROCESS EQUIPMENT
Aztec Drum Mix Asphalt Plant

OPERATING MODE

CONTROL EQUIPMENT
Aztec Baghouse

OPERATING MODE

DESCRIBE EMISSION POINT
Rectangular Stack Exit from Baghouse

HEIGHT ABOVE GROUND LEVEL
25 ft.

HEIGHT RELATIVE TO OBSERVER
0 ft

DISTANCE FROM OBSERVER
5 ft.

DIRECTION FROM OBSERVER
NW

DESCRIBE EMISSIONS
Continuous Wet Plume

EMISSION COLOR
Blue/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
At Plume Drop-Off, 100ft from Exit

DESCRIBE BACKGROUND
Sky

BACKGROUND COLOR
Blue/White

SKY CONDITIONS
Mostly Cloudy

WIND SPEED
0-5 mph

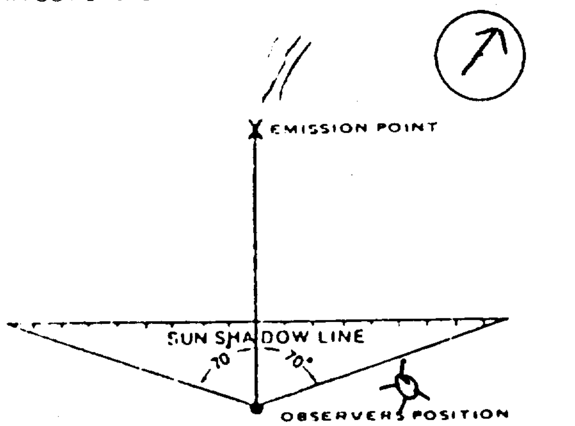
WIND DIRECTION
North

AMBIENT TEMPERATURE
55°

RELATIVE HUMIDITY
70%

SOURCE LAYOUT SKETCH

DRAW NORTH ARROW




COMMENTS
Difficult to read because of Overcast conditions; some blue smoke evident

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE

DATE

OBSERVATION DATE: 2/3/88

START TIME: 8:31:00

STOP TIME: 9:30:45

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

AVERAGE OPACITY FOR HIGHEST PERIOD: 8.75%

NUMBER OF READINGS ABOVE 8.75 % WERE 28

RANGE OF OPACITY READINGS: 0% MINIMUM 15% MAXIMUM

OBSERVER'S NAME (PRINT)
Shaun A. Greenwood

OBSERVER'S SIGNATURE
Shaun Greenwood

DATE
2/3/88

ORGANIZATION
Ramcon Environmental Corp.

CERTIFIED BY
St. of TN

DATE
12/1/87

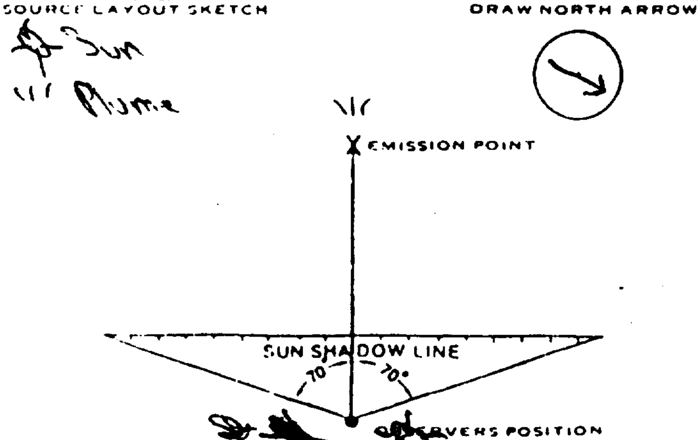
VERIFIED BY

DATE

(41)

| | |
|---|---|
| SOURCE NAME | ~~[illegible]~~ |
| ADDRESS | Piedmont Asphalt |
| CITY | Gold Hill |
| STATE | NC |
| ZIP | |
| PHONE | |
| SOURCE ID NUMBER | - |
| PROCESS EQUIPMENT | Aztec Drum Mix Asphalt Plant |
| OPERATING MODE | |
| CONTROL EQUIPMENT | Aztec Baghouse |
| OPERATING MODE | |
| DESCRIBE EMISSION POINT | Rectangular Stack Exit from Baghouse |
| HEIGHT ABOVE GROUND LEVEL | 25' |
| HEIGHT RELATIVE TO OBSERVER | 10 ft |
| DISTANCE FROM OBSERVER | 125 ft. |
| DIRECTION FROM OBSERVER | ~~West~~ NW |
| DESCRIBE EMISSIONS | Continuous Plume Blue Smoke |
| EMISSION COLOR | White/Blue |
| 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 | At Stack Exit |
| DESCRIBE BACKGROUND | Sky, Tree Line |
| BACKGROUND COLOR | Blue/White/Brown |
| SKY CONDITIONS | Ptly Cldy |
| WIND SPEED | 0-5 mph |
| WIND DIRECTION | Variable |
| AMBIENT TEMPERATURE | |
| RELATIVE HUMIDITY | 70% |

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW




COMMENTS: Cloudy Skies, Blue Smoke Visible
Some Fugitive Emissions

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE | DATE

OBSERVATION DATE: 2/2/88 | START TIME: 10:27 00 | STOP TIME: 11:26 45

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

AVERAGE OPACITY FOR HIGHEST PERIOD: 9.375%

NUMBER OF READINGS ABOVE 9.375% WERE 64

RANGE OF OPACITY READINGS: 0% MINIMUM 15% MAXIMUM

OBSERVER'S NAME (PRINT): Shawn A. Greenwood

OBSERVER'S SIGNATURE: Shawn A. Greenwood | DATE: 2/2/88

ORGANIZATION: Ramcon Environmental Corp.

CERTIFIED BY: St of TN | DATE: 12/1/87

VERIFIED BY | DATE

(42)

# TENNESSEE AIR POLLUTION CONTROL SMOKE SCHOOL TRAINING FORM

NAME Shawn Greenwood RUN# Q/A SUNGLASSES ____

COMPANY Ran... Corp... COURSE LOCATION State Tech at ...

DATE 12/1/87 SKY Overcast WIND 7 mph DISTANCE & DIRECTION TO STACK ____

| READING # | | | | | | | | | | | | | | | | | | | | | | ERROR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 1 |
| 1 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 2 |
| 2 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 3 |
| 3 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 4 |
| 4 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 5 |
| 5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 6 |
| 6 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 7 |
| 7 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 8 |
| 8 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 9 |
| 9 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 10 |
| 10 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 11 |
| 11 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 12 |
| 12 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 13 |
| 13 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 14 |
| 14 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 15 |
| 15 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 16 |
| 16 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 17 |
| 17 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 18 |
| 18 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 19 |
| 19 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 20 |
| 20 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 21 |
| 21 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 22 |
| 22 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 23 |
| 23 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 24 |
| 24 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 25 |
| 25 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | | | | | | | | | |

QUALIFIED

DEVIATION 5.2 5.2

| | | | | | | | | | | | | | | | | | | | | | | ERROR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 26 |
| 26 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 27 |
| 27 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 28 |
| 28 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 29 |
| 29 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 30 |
| 30 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 31 |
| 31 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 32 |
| 32 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 33 |
| 33 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 34 |
| 34 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 35 |
| 35 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 36 |
| 36 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 37 |
| 37 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 38 |
| 38 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 39 |
| 39 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 40 |
| 40 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 41 |
| 41 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 42 |
| 42 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 43 |
| 43 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 44 |
| 44 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 45 |
| 45 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 46 |
| 46 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 47 |
| 47 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 48 |
| 48 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 49 |
| 49 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 50 |
| 50 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | | | | | | | | | | |

DEVIATION 3.0

I hereby certify that the above readings are my own. Shawn Greenwood

PH-0... APC

# TENNESSEE AIR POLLUTION CONTROL SMOKE SCHOOL TRAINING FORM

NAME Ken Allmendinger RUN# 2-1 SUNGLASSES ——

COMPANY Rincon COURSE LOCATION S-1

DATE 12-1-87 SKY cl/o.c WIND NW DISTANCE & DIRECTION TO STACK NW 40'

| READING # | | | | | | | | | | | | | | | | | | | | | | ERROR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 1 |
| 2 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 2 |
| 3 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 3 |
| 4 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 4 |
| 5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 5 |
| 6 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 6 |
| 7 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 7 |
| 8 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 8 |
| 9 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 9 |
| 10 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 10 |
| 11 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 11 |
| 12 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 12 |
| 13 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 13 |
| 14 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 14 |
| 15 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 15 |
| 16 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 16 |
| 17 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 17 |
| 18 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 18 |
| 19 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 19 |
| 20 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 20 |
| 21 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 21 |
| 22 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 22 |
| 23 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 23 |
| 24 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 24 |
| 25 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 25 |

QUALIFIED

DEVIATION 4.6

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 26 |
| 27 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 27 |
| 28 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 28 |
| 29 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 29 |
| 30 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 30 |
| 31 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 31 |
| 32 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 32 |
| 33 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 33 |
| 34 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 34 |
| 35 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 35 |
| 36 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 36 |
| 37 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 37 |
| 38 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 38 |
| 39 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 39 |
| 40 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 40 |
| 41 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 41 |
| 42 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 42 |
| 43 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 43 |
| 44 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 44 |
| 45 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 45 |
| 46 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 46 |
| 47 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 47 |
| 48 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 48 |
| 49 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 49 |
| 50 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 50 |

DEVIATION [illegible]

I hereby [illegible] that the above [illegible]