COMMONWEALTH OF VIRGINIA
Department of Air Pollution Control
INTRA-AGENCY MEMORANDUM

TO: File

FROM: Andy Hetz, Environmental Engineer

SUBJECT: B & S CONTRACTING, ROCKINGHAM COUNTY - REGISTRATION NO. 21103 - MAY 21, 1990 STACK TEST RESULTS

DATE: JUNE 21, 1990

Introduction

Results have been received for the May 21, 1990 stack test at B & S Contracting's Rockingham County plant. Testing for particulate and visible emissions evaluations were required by an October 11, 1988 State/NSPS permit. Ramcon Environmental Corporation performed the test, which was witnessed by the DAPC. For additional information not addressed in this memorandum, please consult the stack test report and my May 22, 1990 memo to file.

Equipment

The equipment tested was an Astec continuous drum mix asphalt plant, rated at 353 tons/hr capacity and equipped to burn No. 2 diesel fuel oil. The plant had recently been adapted to use recycled asphalt.

Particulate emissions from the drum mixer were controlled by a baghouse. Fugitive dust emissions were controlled by paving and wet suppression.

Operating Conditions During Test

The plant was operating using recycled asphalt - the recycle content averaged about 15 percent during the day. In addition, hydrated lime was being added to the mix. Surface mix was being produced at the following rates.

	Run #1	Run #2	Run #3	Average
Time(s) :	09:15-09:59 10:34-10:50	11:30-12:06 13:06-13:26 14:00-14:04	14:36-15:36	
Aggregate :	193 tons/hr	157 tons/hr	155 tons/hr	168 tons/hr
Hydrated Lime :	2 tons/hr	2 tons/hr	2 tons/hr	2 tons/hr
Recycled Asphalt:	36 tons/hr	31 tons/hr	29 tons/hr	32 tons/hr
Liquid Asphalt :	10 tons/hr	8 tons/hr	8 tons/hr	9 tons/hr
Total Production:	241 tons/hr	198 tons/hr	194 tons/hr	211 tons/hr

Test Results

	Run #1	Run #2	Run #3	Average
TSP Grain Loading (grains/dscf)	0.0175	0.0171	0.0175	0.0174
TSP Weight Rate (lbs/hr)	2.7	2.9	3.0	2.9

Visible Emissions: 0-4 % averaged opacity with condensing plume of 10-15 %. Readings taken by A. A. Hetz of the DAPC.

Permit Requirements (10/11/88 permit)

TSP Grain Loading: 0.04 grains/dscf
TSP Weight Rate : 9.65 lbs/hr
Opacity : 5 % (six minute average)

Conclusions

The plant tested in compliance with the permit requirements. The higher opacity readings from the condensing plume are not a particulate emissions concern at this time.

AAH

Andrew A. Hetz
Engineer, Region II

Attachments - Stack Test Report
cc: Division of Technical Services
B & S Contracting (without attachments)

5/21/90

COMMONWEALTH OF VIRGINIA
Department of Air Pollution Control
INTRA-AGENCY MEMORANDUM

TO: File

FROM: Andy Hetz, Environmental Engineer

SUBJECT: B & S CONTRACTING, ROCKINGHAM COUNTY - REGISTRATION NO. 21103 - ASPHALT PLANT STACK TEST - MAY 21, 1990

DATE: May 21, 1990

Background

The asphalt plant was tested as required by an October 11, 1988 permit. The permit was issued after the plant began operation (on July 1, 1988). A deadline had been set in General Condition 2 of the permit requiring particulate testing within 180 days after startup, or by December 28, 1988. This was not met and our office did not take enforcement action at that time. B & S made repeated efforts to schedule testing the following summer but could not find a job large enough to sustain the plant for the period of the test.

Testing was done by Ramcon Environmental Corporation of Memphis, Tennessee. EPA Method 5 was required at the baghouse outlet.

Personnel

B & S Contracting - George Weaver
Ramcon Environmental Corporation - Bill Turner, Dave Bailey
DAPC - Andy Hetz

Equipment

The equipment tested was an Astec continuous drum mix asphalt plant, rated at 353 tons/hr capacity and equipped to burn No. 2 diesel fuel oil. The plant had recently been adapted to use recycled asphalt.

Operating Conditions During Test

The plant was operating using recycled asphalt - the recycle content averaged about 15 percent during the day. In addition, hydrated lime was being added to the mix. Surface mix was being produced at the following rates.

	Run #1	Run #2	Run #3	Average
Time(s)	09:15-09:59 10:34-10:50	11:30-12:06 13:06-13:26 14:00-14:04	14:36-15:36	
Aggregate	193 tons/hr	157 tons/hr	155 tons/hr	168 tons/hr
Hydrated Lime	2 tons/hr	2 tons/hr	2 tons/hr	2 tons/hr
Recycled Asphalt	36 tons/hr	31 tons/hr	29 tons/hr	32 tons/hr
Liquid Asphalt	10 tons/hr	8 tons/hr	8 tons/hr	9 tons/hr
Total Production	241 tons/hr	198 tons/hr	194 tons/hr	211 tons/hr

Production was interrupted frequently during the tests. The tests were stopped and restarted on three occasions. Two interruptions occurred because B&S could not get enough trucks to haul away the asphalt as it was being produced and the surge hopper began to overflow. The third interruption occurred because of a brief power failure.

Because the asphalt could not be trucked off site at a sufficient rate, production had to be slowed down. Normal maximum production is about 300 tons/hr - the plant averaged 211 tons/hr during the test.

Opacity and Other Observations

Opacity during the test was 0 to 5 percent, with an occasional puff of 10 percent. I did notice a condensing plume of 10-15 percent about 10 to 20 feet from the stack exit. This is likely caused by condensed hydrocarbons from emitted from the recycled asphalt being used.

The filters appeared very clean. The catch was very fine and light grey in color.

Compliance in other areas of the plant was marginal. The baghouse on the lime silo had a tear in one of the bags and was emitting about 30 percent opacity. Plant personnel had mentioned that it would soon be repaired. In addition, hydrated lime dust was being blown from the aggregate conveyor upstream of the drum. These are issues that may deserve attention in later inspections.

We are now awaiting the test results.

Andrew A. Hetz
Engineer, Region I

Attachments
cc: Division of Technical Services

SOURCE NAME: B & S Contracting – George Weaver
LOCATION: Rockingham Co. (Z1103)
DATE: 5/20/90

OBSERVER'S NAME: A. A. Herz

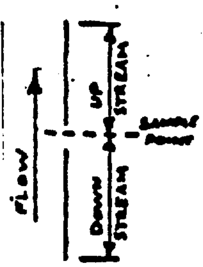
PURPOSE OF TEST: Compliance Test (10/88 Permit)
TESTING DONE BY: Ramcon Environmental
LAB ANALYSIS DONE BY:

COMPANY CONTACT: George Weaver TELEPHONE:
CONTROL EQUIPMENT OPERATING: baghouse
OPACITY READING MADE: YES ✓ NO

UNIT/PROCESS NAME: Astec drum mix asphalt plant
RATED CAPACITY: 353 tons/hr
TYPE FUEL USED: No. 2 diesel oil

APPROX. PROCESS RATE: 211 tons/hr
METHOD OF DETERMINING PROCESS RATE: weigh feeder/controls
STACK HEIGHT: ~30 ft
INDIVIDUAL STACK ✓ COMMON STACK
DIAMETER: (IF ROUND) Z equivalent diameter (IF RECTANGULAR) WIDTH LENGTH

I. SAMPLING POINT LOCATION 36"



A. DISTANCE DOWNSTREAM FROM ANY FLOW DISTURBANCE:
NATURE OF DISTURBANCE 85"
(BEND, CONTRACTION, EXPANSION, FAN, BAFFLES, ETC.)

B. DISTANCE UPSTREAM FROM ANY FLOW DISTRUBANCE:
NATURE OF DISTRUBANCE 19"
(BEND, STACK EXIT, CONTRACTION, FAN, BAFFLES, EXPANSION, ETC.)

C. NUMBER OF PORTS IN STACK: 6

D. NUMBER OF POINTS SAMPLED PER PORT: 5

II. STACK GAS 30 points / 2 minutes / point

A. STACK TEMPERATURE: 265-280

B. ORSAT ANALYSIS:
GRAB CONTINUOUS NUMBER OF INTEGRATED SAMPLES

C. PRELIMINARY ΔP: MIN. 0.10 MAX. 1.2 in H_2O

III. PARTICULATE TEST Avg 0.5 in H_2O

A. SAMPLING TRAIN:
1. MANUFACTURER Lear Siegler MODEL 100
2. TEST METHOD: EPA METHOD 5 ✓ ASME PTC 21/27
OTHER (DESCRIBE)
3. TYPE FILTERS Fiberglass
4. PROBE: LENGTH 48" MATERIAL
5. PROBE HEATER SETTING 5
6. HEATER BOX SETTING 250°F
7. METER CALIBRATION FACTOR 0.990
8. METER Δ H @ FACTOR 1.76
9. DATE OF LAST CALIBRATION CHECK 5/17/90
a. ORIFICE METER
b. DRY GAS METER
c. TEMPERATURE DEVICES
d. PITOT TUBE
e. NOZZLE DIAMETER
f. OTHER

B. NOMOGRAPH SETTINGS:

1. C FACTOR 0.996
2. ASSUMED MOISTURE CONTENT 25%
3. INDICATED NOZZLE SIZE 0.250 in

C. SAMPLING PROCEDURE

1. LEAK CHECK DONE: BEFORE ____ AFTER ✓
2. PITOT TUBE: TYPE S ✓ TYPE P ____
3. NOZZLE SIZE USED: .25 in
4. TIME AT EACH PT.: 2 minutes
5. TOTAL TIME OF TEST: ____
6. TEST INTERRUPTED: NO ____ YES(EXPLAIN) x, Runs 1 & 2

D. SAMPLE CLEAN-UP

1. FILTER HANDLED CAREFULLY: YES ✓ NO ____
2. FILTER HOLDER WASHED OUT: YES ✓ NO ____
3. PROBE WASHED OUT: YES ✓ NO ____
4. CYCLONE WASHED OUT : YES ✓ NO ____
5. WASHINGS SAVED: YES ✓ NO ____

MATERIAL USED: acetone

IV. ADDITIONAL COMMENTS:

Filters looked clean with fine grey dust

Leak checks < 0.01 ft³ all runs

pulled 2 inches vacuum during test

4 inches during leak check

Plant capacity 353 tons/hr

300 tons/hr

During test 0.11 in H_2O 191-255 tons/hr

avg 211

VIRGINIA STATE AIR POLLUTION CONTROL BOARD
VISIBLE EMISSION EVALUATION RECORD

DATE 5/21/90

COMPANY B&S Contracting (Run I) REGISTRATION NO. 21103

LOCATION Rockingham Co.

EMISSION POINT NAME Drum Mix Baghouse HEIGHT TO DISCHARGE POINT ~30'

OBSERVER AA Heiz CERTIFICATION EXPIRATION DATE 10/0/90

CLOCK TIME: INITIAL 9:30 (A.M.)/P.M. FINAL 10:04 (A.M.)/P.M.

VISIBLE EMISSION READINGS

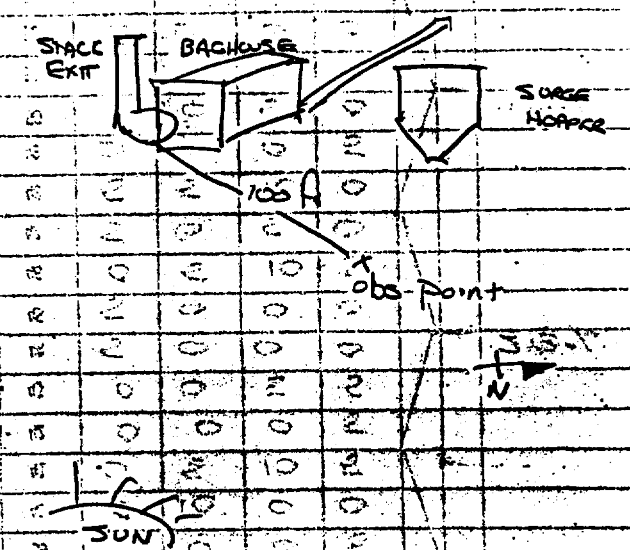
HR.	MIN.	SECONDS 0	15	30	45	STEAM PLUME CHECK IF APPLICABLE DET.	ATT.	COMMENT
10	0	0	5	0	5			
	1	5	0	0	0			
	2	5	5	0	5			
	3	5	5	5	0			
	4	0	0	0	5			
	5							
	6							
	7							
	8	RUN INTERRUPTED						
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

HR.	MIN.	SECONDS 0	15	30	45	STEAM PLUME CHECK IF APPLICABLE DET.	ATT.	COMMENT
9	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			1.6%
	33	0	0	0	0			
	34	5	5	0	5			
	35	0	5	0	5			
	36	5	5	5	0			
	37	5	10	5	0			
	38	5	0	0	0			3.1%
	39	0	0	0	5			
	40	0	10	0	0			
	41	0	5	10	5			
	42	0	0	0	5			
	43	0	0	5	5			
	44	5	0	0	0			2.3%
	45	5	0	0	0			
	46	0	5	10	5			
	47	5	0	5	0			
	48	5	5	10	0			
	49	0	0	0	5			
	50	0	0	5	0			1.7%
	51	0	0	0	5			
	52	0	0	0	0			
	53	0	0	5	0			
	54	0	0	5	0			
	55	0	0	0	0			
	56	0	0	0	5			0.8%
	57	5	0	5	0			
	58	0	0	0	0			
	59	0	0	0	0			

SAPCB Form 13
(5/1/75)

OBSERVER LOCATION	INITIAL	FINAL
DISTANCE TO DISCHARGE		100 ft
DIRECTION TO DISCHARGE		WEST
HEIGHT OF OBSERVATION POINT		~30 ft
BACKGROUND DESCRIPTION		sky
WEATHER CONDITIONS		
WIND DIRECTION		
WIND SPEED		0-5 mph
AMBIENT TEMPERATURE		65
SKY CONDITIONS		mostly sun
PLUME DESCRIPTION		
COLOR		
DISTANCE VISIBLE		

DIAGRAM OF OBSERVER AND EMISSION POINT



COMMENTS

Detached plume of 5-10% opacity about 15-20 ft from stack exit

OBSERVER SIGNATURE

REGION DIRECTOR SIGNATURE

VIRGINIA STATE AIR POLLUTION CONTROL BOARD
VISIBLE EMISSION EVALUATION RECORD

DATE 5/21/90

COMPANY B&S Contracting (Run 2) REGISTRATION NO. 21103

LOCATION Rockingham Co.

EMISSION POINT NAME Drum Mix Baghouse HEIGHT TO DISCHARGE POINT ~30'

OBSERVER A. A. Herz CERTIFICATION EXPIRATION DATE 10/8/90

CLOCK TIME: INITIAL 11:42 (A.M.)/P.M. FINAL 1:17 A.M./(P.M.)

VISIBLE EMISSION READINGS

HR.	MIN.	SECONDS 0	15	30	45	STEAM PLUME CHECK IF APPLICABLE DET.	ATT.	COMMENT
12	0	0	0	0	0			
	1	0	0	5	5			
	2	5	0	0	0			1.7%
	3	0	5	5	0			
	4	0	0	0	10			
	5	0	5	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	5	5	0			
	9	5	0	0	0			
	10							
	11							
	12							
	13	RUN INTERUPTED						
	14							
	15							
1:06	16	0	0	5	0			
	17	0	5	0	0			
	18	0	0	0	0			1.5%
	19	10	5	0	0			
1:10	20	0	0	0	5			
	21	5	0	0	0			
1:12	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			0.6%
1:15	25	0	0	0	0			
	26	0	5	0	0			
1:17	27	0	5	0	5			
	28							
	29							

HR.	MIN.	SECONDS 0	15	30	45	STEAM PLUME CHECK IF APPLICABLE DET.	ATT.	COMMENT
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
11	42	0	0	5	0			
	43	0	0	0	0			
	44	0	0	0	0			0.5%
	45	0	5	0	0			
	46	0	0	0	0			
	47	0	0	0	0			
	48	0	0	5	0			
	49	0	0	0	0			
	50	0	0	0	0			0.2%
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	5	0	0			
	55	5	5	0	0			
	56	5	10	0	0			1.7%
	57	5	0	0	0			
	58	0	5	0	0			
	59	5	0	0	0			

SAPCB Form 13
(5/1/75)

	INITIAL	FINAL
OBSERVER LOCATION		
DISTANCE TO DISCHARGE		100
DIRECTION TO DISCHARGE		
HEIGHT OF OBSERVATION POINT		
BACKGROUND DESCRIPTION		sky
WEATHER CONDITIONS		
WIND DIRECTION		from west
WIND SPEED		5-10mph
AMBIENT TEMPERATURE		70 F
SKY CONDITIONS		p. cloudy, hazy
PLUME DESCRIPTION		
COLOR		
DISTANCE VISIBLE		

DIAGRAM OF OBSERVER AND EMISSION POINT

SEE DIAGRAM OF RUN #1

COMMENTS

Detached plume of 10-15%

OBSERVER SIGNATURE [signature]

REGION DIRECTOR SIGNATURE

VIRGINIA STATE AIR POLLUTION CONTROL BOARD
VISIBLE EMISSION EVALUATION RECORD

DATE 5/21/90

COMPANY B&S Contracting (Row #3) REGISTRATION NO. 21103

LOCATION Rockingham County

EMISSION POINT NAME Drum Mix Baghouse HEIGHT TO DISCHARGE POINT ~30 ft.

OBSERVER A. A. Hertz CERTIFICATION EXPIRATION DATE 10/8/90

CLOCK TIME: INITIAL 2:36 A.M./(P.M.) FINAL 3:11 A.M./(P.M.)

VISIBLE EMISSION READINGS

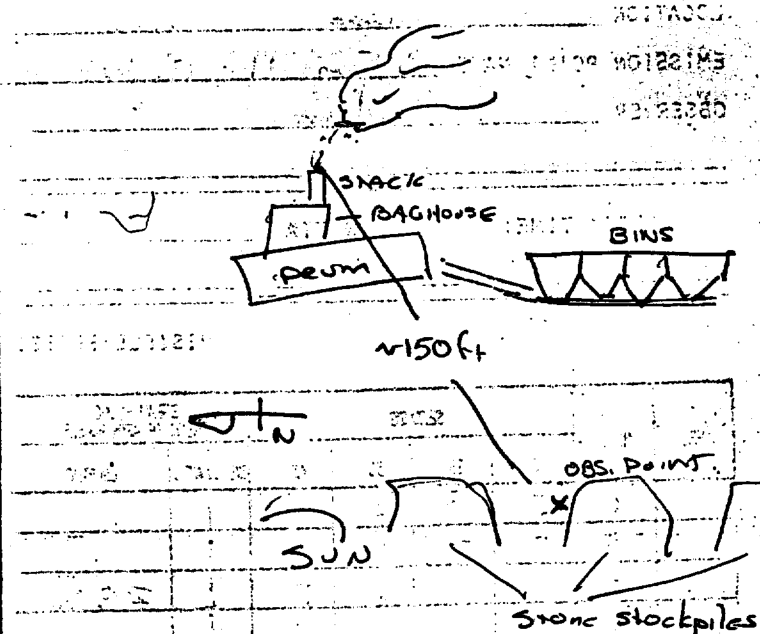
HR.	MIN.	SECONDS 0	15	30	45	STEAM PLUME CHECK IF APPLICABLE DET.	ATT.	COMMENT
	0	5	0	0	5			
	1	5	5	0	0			
	2	0	0	5	5			2.9%
	3	10	5	5	5			
	4	0	5	0	5			
	5	5	0	0	0			
	6	0	5	0	5			
	7	5	0	5	5			
	8	5	5	5	0			3.3%
	9	5	5	5	0			
	10	0	5	5	0			
	11	5	5	0	5			
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

HR.	MIN.	SECONDS 0	15	30	45	STEAM PLUME CHECK IF APPLICABLE DET.	ATT.	COMMENT
	30							
	31							
	32							
	33							
	34							
	35							
2	36	10	5	5	0			
	37	5	0	0	0			
	38	5	0	0	5			2.7%
	39	5	0	5	0			
	40	0	0	0	10			
	41	0	5	0	5			
	42	0	0	0	0			
	43	0	5	5	0			
	44	5	0	5	5			3.3%
	45	10	5	5	5			
	46	5	5	5	5			
	47	0	10	5	0			
	48	5	5	5	5			
	49	5	0	5	5			
	50	0	0	0	5			3.3%
	51	0	5	10	5			
	52	0	5	0	0			
	53	5	5	0	5			
	54	5	10	5	0			
	55	0	0	0	0			
	56	5	0	5	0			2.9%
	57	5	5	5	5			
	58	0	0	5	5			
	59	5	0	0	5			

SAPCB Form 13
(5/1/75)

	INITIAL	FINAL
OBSERVER LOCATION		
DISTANCE TO DISCHARGE		150 ft
DIRECTION TO DISCHARGE		E
HEIGHT OF OBSERVATION POINT		
BACKGROUND DESCRIPTION		trees/sky
WEATHER CONDITIONS		
WIND DIRECTION		West
WIND SPEED		5-10 mph
AMBIENT TEMPERATURE		75
SKY CONDITIONS		mostly cloudy
PLUME DESCRIPTION		
COLOR		white
DISTANCE VISIBLE		

DIAGRAM OF OBSERVER AND EMISSION POINT



COMMENTS

Detached plume ~15-20 ft from stack exit @ 10-15% opacity

OBSERVER SIGNATURE [signature]

REGION DIRECTOR SIGNATURE

RAMCON

ENVIRONMENTAL CORPORATION

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
B & S CONTRACTING COMPANY
NORTH HARRISONBURG, VIRGINIA
May 21, 1990

Ed Bunch
B & S Contracting Company

G. Sumner Buck, III
President

Bill Turner
Team Leader

RAMCON BUILDING, 223 SCOTT STREET, MEMPHIS, TENNESSEE 38112
TELEPHONE 800/458-4567 IN TENNESSEE 901/458-7000 FAX 901-458-3868

TABLE OF CONTENTS

RAMCON
ENVIRONMENTAL CORPORATION

June 11, 1990

Mr. Ed Bunch
B & S Asphalt
Route 5, Box 108-B
Staunton, VA 24401

Re: Particulate Emissions Test: North Harrisonburg, Virginia

Dear Mr. Bunch:

Enclosed you will find four copies of our report on the particulate emissions test we conducted at your plant. Based on our test results, the average grain loading of the three test runs do pass both EPA New Source Performance Standards and those set by the State of Virginia. 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. Andy Hetz
Virginia Air Quality
5338 Peters Creek Road
Roanoke, VA 24019

You will need to keep one copy of the report at the plant. We certainly have enjoyed working with you. Please let us know if we can be of further assistance.

Sincerely,

G. Sumner Buck, III
President

GSBIII:djb

Enclosures

RAMCON BUILDING, 223 SCOTT STREET, MEMPHIS, TENNESSEE 38112
TELEPHONE 800/458-4567 IN TENNESSEE 901/458-7000 FAX 901-458-3868

I. INTRODUCTION

On May 21, 1990, personnel from RAMCON Environmental Corporation conducted a source emissions test for particulate emissions compliance at B & S Contracting's Astec drum mix asphalt plant located in North Harrisonburg, Virginia. RAMCON personnel conducting the test were Bill Turner, Team Leader, and David Bailey. Bruce Shrader 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. Turner and Mr. Shrader.

The purpose of the test was to determine if the rate of particulate emissions from this plant's baghouse is below or equal to the allowable N.S.P.S. emissions limit set by US EPA and the State of Virginia.

II. TEST RESULTS

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

Mr. Andy Hetz of Virginia's Department of Air Quality observed the testing conducted by RAMCON Environmental and conducted the opacity test (Reference Method 9).

TABLE I

SUMMARY OF TEST RESULTS

May 21, 1990

Test Run	Time	Grain Loading	Isokinetic Variation	Actual Emissions
1	09:15 to 10:47	0.0175 gr/DSCF	93.5%	2.7 lbs/hr
2	11:28 to 13:02	0.0171 gr/DSCF	94.6%	2.9 lbs/hr
3	14:35 to 15:37	0.0175 gr/DSCF	94.8%	3.0 lbs/hr
	Average:	0.0174 gr/DSCF		2.9 lbs/hr

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

III. TEST PROCEDURES

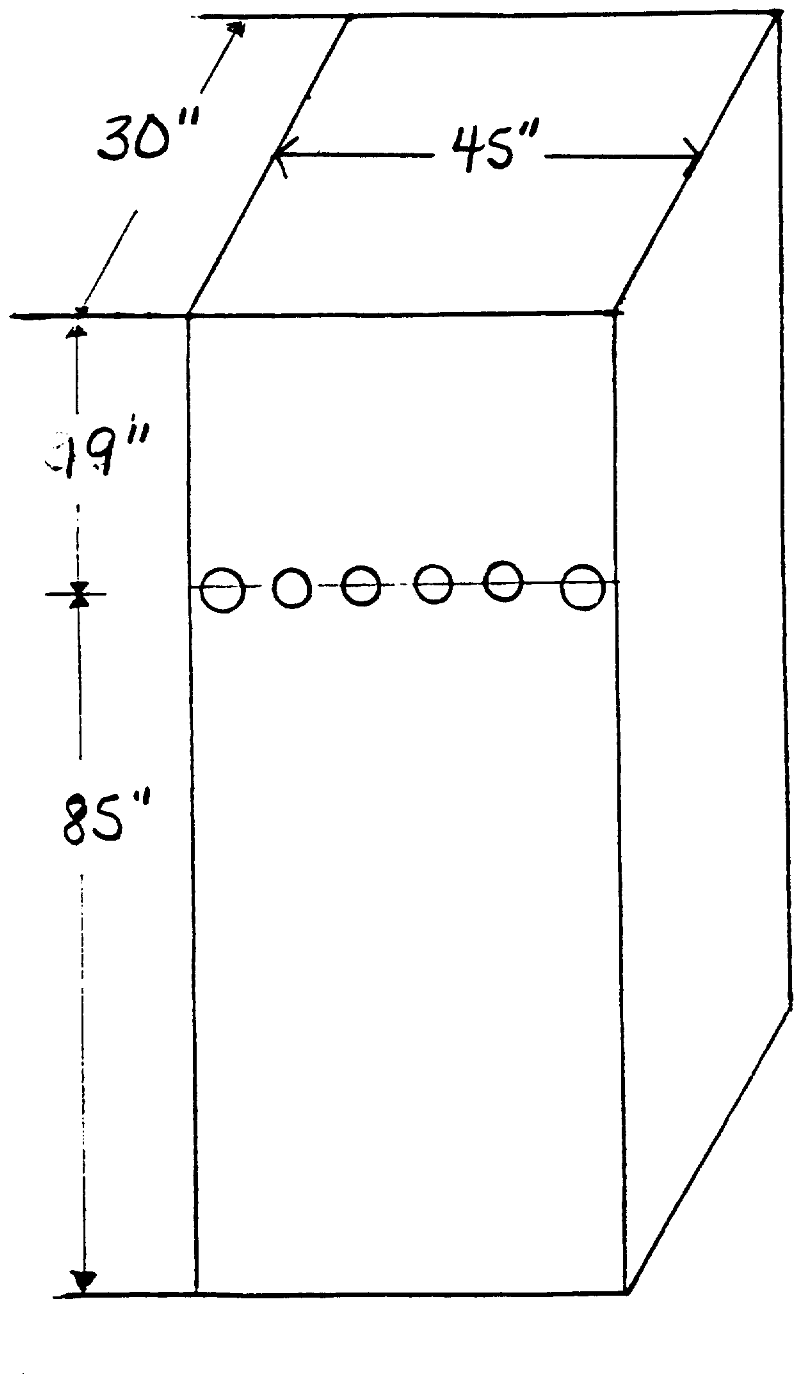
A. Method Used: Method 5 source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

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 30.0" x 45.0" with an equivalent diameter of 36.0". Six sampling ports were placed 19.0" down (0.5 diameters upstream) from the top of the stack and 85.0" up (2.4 diameters downstream) from the last flow disturbance. The ports were evenly spaced on 7.5" centers. The two outside ports are 3.75" from the side walls of the stack. Thirty points were sampled, five through each port for two minutes each.

Points on a Diameter	Probe Mark
1	*8.0"
2	14.0"
3	20.0"
4	26.0"
5	32.0"

*Measurements include a 5" standoff.



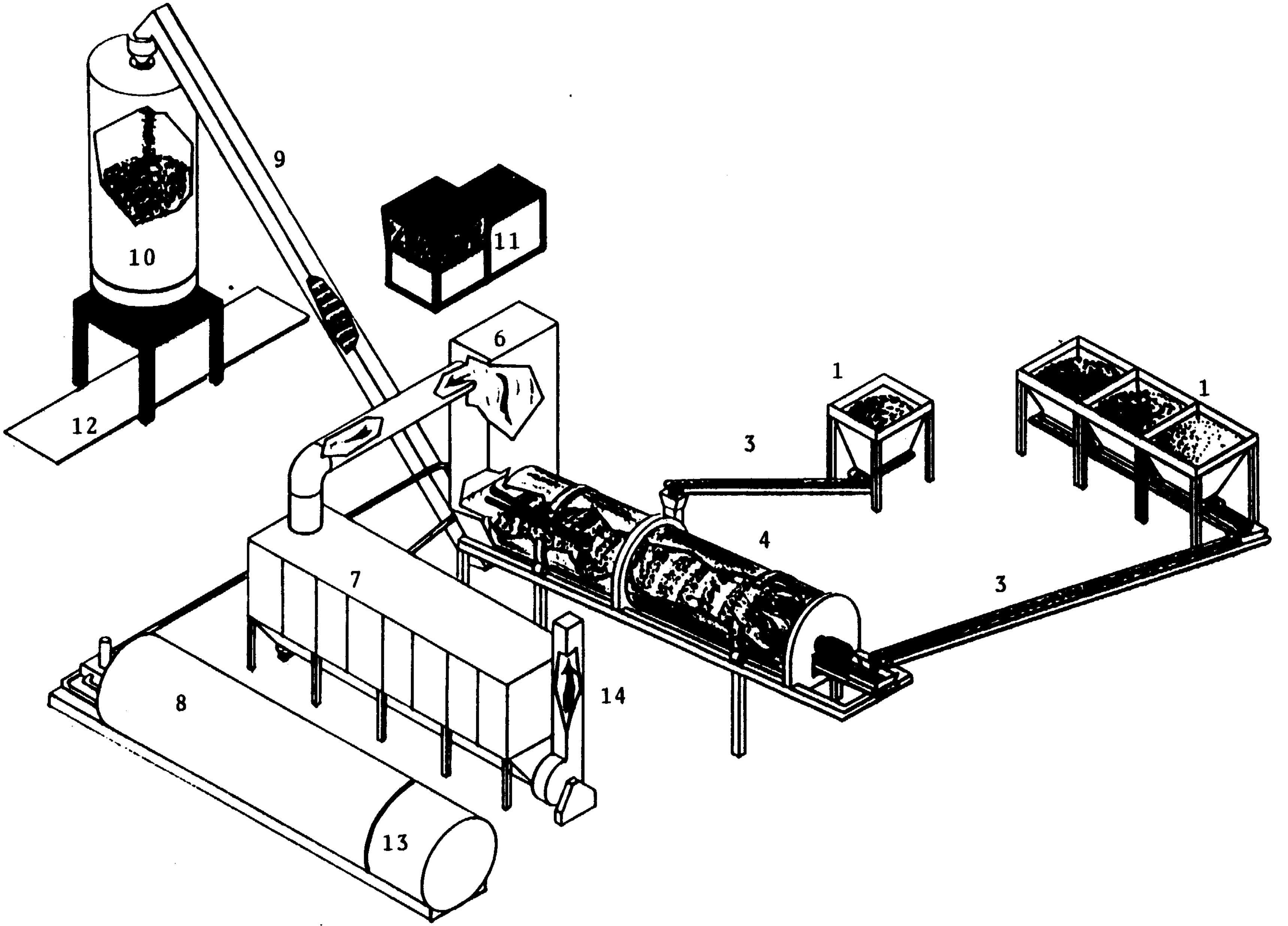
IV. THE SOURCE

IV. THE SOURCE

B & S Contracting 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 then compacted with a heavy roller to produce the final product.

The following to 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. When recycled asphalt mix is used, it is added halfway down the drum through a different weigh conveyor. 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 a conveyor. The hot asphalt mix is then discharged from the storage silo through a slide gate into waiting dump trucks which transports 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. The air is drawn into the system via an exhaust fan. After passing through the gas burner and the mixing drum, the air passes through a baghouse. The baghouse is manufactured by Astec. The exhaust gasses are drawn through the baghouse and discharged to the atmosphere through the stack. The design pressure drop across the tube sheet is 2-6 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

Form ...C#05

(7)

DATA ON FACILITY BEING STACK TESTED

COMPANY NAME B+S Contracting, Inc COMPANY REP. Frank W. Wilkins PHONE (703) 833-8811
LOCATION OF FACILITY North Harrisonburg ORIGINAL START-UP DATE 7:00AM DESIGNED CAPACITY 353 TPH
OEM ______ MODEL NO. 88-072 TYPE Astec AC TYPE ______

1	2	3	4	5		6	7	8	9		10	11	12
Time (24 HR)	Fuel Use	Burner Setting	Blower Pressure	Production Rate		Asphalt Cement	Mix Temp.	Exhaust Gas Temp.	__ Venturi Scrubber ✓ Baghouse		Ambient Temp.	Relative Humidity	Exhaust Damper Position
NOTE: check small box in column when moisture sample is taken	2# Fuel Oil ✓ Nat. Gas __ Propane __ Coal __ other			__ Mix __ Aggregate TPH	__ RAP TPH	%	°F	°F	Pressure Drop in w.g.	Water Pressure psi	°F	%	
				250	37.5								
	#2	38		~~200~~/206. ~~160.0~~	~~29.0~~	4.2	305	285°	5	.20	79°		
11:27	#2	35		200/160.	28.8	4.2	305	285°	3	.15	79°		
11:52	#2	36		200/160.0	29.3	4.2	300	270°	3.5	.17	82°		
3:02	#2	35		198/158.0	29.0	4.2	300	275°	3	.15	80°		
15:10	#2	33		193/157.7	30.0	4.2	310	290°	4	.14	80°		
5:30	#2	35		194/157.7	29.5	4.2	315	295°	3.5	.14	81°		

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.

V. EQUIPMENT USED

RAMCON ENVIRONMENTAL CORPORATION

Plant: B&S Asphalt
Location: Harrisonburg, Va.
Operator: W.L. Turner
Date: 5-21-90
Run No.: 3
Sample Box No.: 3
Meter Box No.: G185
Meter H @: 1.76
C Factor: .990
Pitot Tube Coefficient Cp: .811

Ambient Temperature: 85
Barometric Pressure: 28.62
Assumed Moisture, %: 25
Probe Length, ft: 4
Nozzle Identification No.: 0003-07
Avg. Calibrated Nozzle Dia., (in.): .250/.250/.250
Probe Heater Setting: 50
Leak Rate, m^3/min. (cfm): .003 @ 5"
Probe Liner Material: 316 SS.
Static Pressure, mm Hg (in.Hg): -.005
Filter No.: HB: 4081

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	442	222
INITIAL	200	210
DIFFERENCE	242	12

Schematic of Stack Cross Section

TRAVERSE POINT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	2:35:50 / 2:37	2	275	1.5	2.6	42.80 / 44.45	94	82	250	58
2	2:39	2	275	1.7	2.9	46.50	94	82	250	58
3	2:41	2	282	.85	1.5	47.89	98	82	250	58
4	2:43	2	284	.25	.43	48.88	98	82	250	58
5	2:45:35	2	280	.25	.43	49.55	100	82	250	58
B 1	2:45:50 / 2:47	2	280	1.2	2.0	52.11	100	82	250	58
2	2:49	2	280	.25	.43	52.11	100	82	250	58
3	2:51	2	280	.35	.60	53.00	102	84	250	58
4	2:53	1	275	.35	.60	54.00	102	84	250	58
5	2:55:50	1	275	.40	.68	55.00	102	84	250	58

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 5.21.90 LOCATION Harrisonburg TEST NO. 2

TRAVERSE [redacted]	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) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
(C) 1	11:50:46 / 11:52	3	268	1.5	2.6	10:50	106	84	255	60
2	11:54	2	270	.55	.94	11:75	106	84	255	60
3	11:56	2	270	.55	.94	12:99	108	84	255	60
4	11:58	2	270	.45	.77	14:00	108	84	255	60
5	12:00:40	2	268	.45	.77	15:18	108	84	255	60
(D) 1	12:01:10 / 12:03	3	268	1.5	2.6	17:00	108	84	255	60
2	12:05	3	268	1.3	2.2	18:77	108	84	255	60
3	12:07	3	268	1.3	2.2	20:[illegible]	108	84	255	60
4	12:59 / 1:01	3	275	1.0	1.7	22:45	90	84	255	60
5	1:0[illegible]	3	275	1.2	2.0	23:85	98	84	255	60
(E) 1	1:03:25 / 1:05	3	272	2.2	3.7	26:10	100	84	255	60
2	1:07	3	274	1.8	3.1	28:23	100	84	255	60
3	1:09	3	274	1.5	2.6	30:10	100	84	255	60
4	1:11	3	274	1.5	2.6	32:00	104	84	255	60
5	1:13:25	3	270	1.5	2.6	33:88	104	84	255	60
(F) 6	01:13:40 / 1:15	3	268	2.2	3.7	36:15	104	84	255	60
2	01:17	3	268	1.7	2.9	38:16	104	84	255	60
3	01:19	3	268	1.2	2.0	39:83	104	84	255	60
4	1:20	2	264	.85	1.5	41:30	86	84	255	60
5	1:02	2	266	.80	1.4	42:70	92	84	255	60

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 5-21-90 LOCATION Harrisonburg Va TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
(C) 1	2:56:10/2:58	2	275	2.0	3.4	57:00	104	84	255	60
2	3:00	2	280	.6	1.0	58:37	104	84	255	60
3	3:02	2	280	.6	1.0	59:72	104	84	255	60
4	3:04	2	280	.4	.68	60:81	104	84	255	60
5	3:06:10	2	278	.45	.77	61:92	104	84	255	60
([illegible]) 1	3:06:35/3:08	3	278	1.5	2.6	63:86	106	84	255	60
2	3:10	3	278	1.5	2.6	65:36	106	84	255	60
3	3:12	3	280	1.1	1.9	67:00	106	84	255	60
4	3:14	3	280	1.2	2.0	68:82	106	84	255	60
5	3:16:35	3	280	1.6	2.7	70.23	108	84	255	60
(E) 1	3:17/3:19	3	280	2.0	3.4	72:75	106	84	255	60
2	3:21	3	280	1.4	2.4	74:62	106	84	255	60
3	3:23	3	275	1.5	2.6	76:53	106	84	255	60
4	3:25	3	275	1.5	2.6	78:50	106	84	255	60
5	3:27	3	275	1.5	2.6	80:36	108	84	255	60
(A) 1	3:27:20/3:29	3	270	1.8	3.1	82:51	108	84	255	60
2	3:31	3	270	1.2	2.0	84:15	108	84	255	60
3	3:33	3	270	1.0	1.7	85:36	108	84	255	60
4	3:35	2	270	.85	1.5	87:22	108	84	255	60
5	3:37:20	2	270	.65	1.1	88:53	108	84	255	60

IX. CALIBRATION

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 6-1-90 Meter box number C-185

Barometric pressure, P_b = 29.72 in. Hg Calibrated by [illegible signature]

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	$ΔH@_i$ in. H_2O
0.5	5								
1.0	5	[illegible]	77	96 / 100	74 / 76	86.5	8.75	.988	1.72
1.5	10								
2.0	10	525.10 / 535.360	77	98 / 102	76 / 78	88.5	12.4	.990	1.72
3.0	10	535.80 / 546.05	77	98 / 104	78 / 78	89.5	10.16	.991	1.73
4.0	10								
							Avg	.99	1.72

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b\ (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368		
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.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 5-17-90 Meter box number C-185

Barometric pressure, P_b = 30.12 in. Hg Calibrated by [signature]

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								
1.0	5	916.34 / 921.428	75.2	88 / 90	70 / 72	81.5	8.63	.992	1.66
1.5	10								
2.0	10	931.90 / 942.108	75.2	92 / 100	74 / 76	85.5	12.86	.986	1.83
3.0	10	942.40 / 952.631	75.2	96 / 102	76 / 76	87.5	10.37	.993	1.78
4.0	10								
							Avg	.990	1.76

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737	5.088	
1.5	0.110		
2.0	0.147	10.288	
3.0	0.221	10.231	
4.0	0.294		

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-7-89 Thermocouple number inlet/outlet

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator [illegible] Reference: mercury-in-glass ✓

other ______

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	Ice Bath	32	32	0
B.	Boiling water	212	212	0
C	Boiling oil	381	381	0
D	Ambient 5/21/90	65	65	0

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-7-89 Thermocouple number Hotbox

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator Turner Reference: mercury-in-glass ✓

other ______

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	Ice Bath	32°F	32	0
B	Boiling water	212	212	0
C	Boiling oil	381	381	0
D	Ambient 5/21/90	65	65	0

[a]Type of calibration system used.

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

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) 41

Pitot Tube Identification No. ______ Date 5-4-90

Calibrated by: Sam T. Turn

"A" SIDE CALIBRATION # 41

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	2.05	3.10	.813	0.002
2	1.05	1.6	.810	0.002
3	.42	.64	.810	0.001
		$\bar{C}_p$ (SIDE A)	.811	

"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	2.05	3.10	.813	0.002
2	1.05	1.6	.810	0.002
3	.42	.64	.810	0.001
		$\bar{C}_p$ (SIDE B)	.811	

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

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

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

Form No. EED-17-1

Date 5-10-90 Thermocouple number 41

Ambient temperature 24 °C Barometric pressure 29.8 in. Hg

Calibrator [illegible] 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	32°	32°	0
B	Boiling water	212°	212°	0
C	Oil Boiling	392°	392°	0
D	Ambient 5/4/90	65°	65°	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

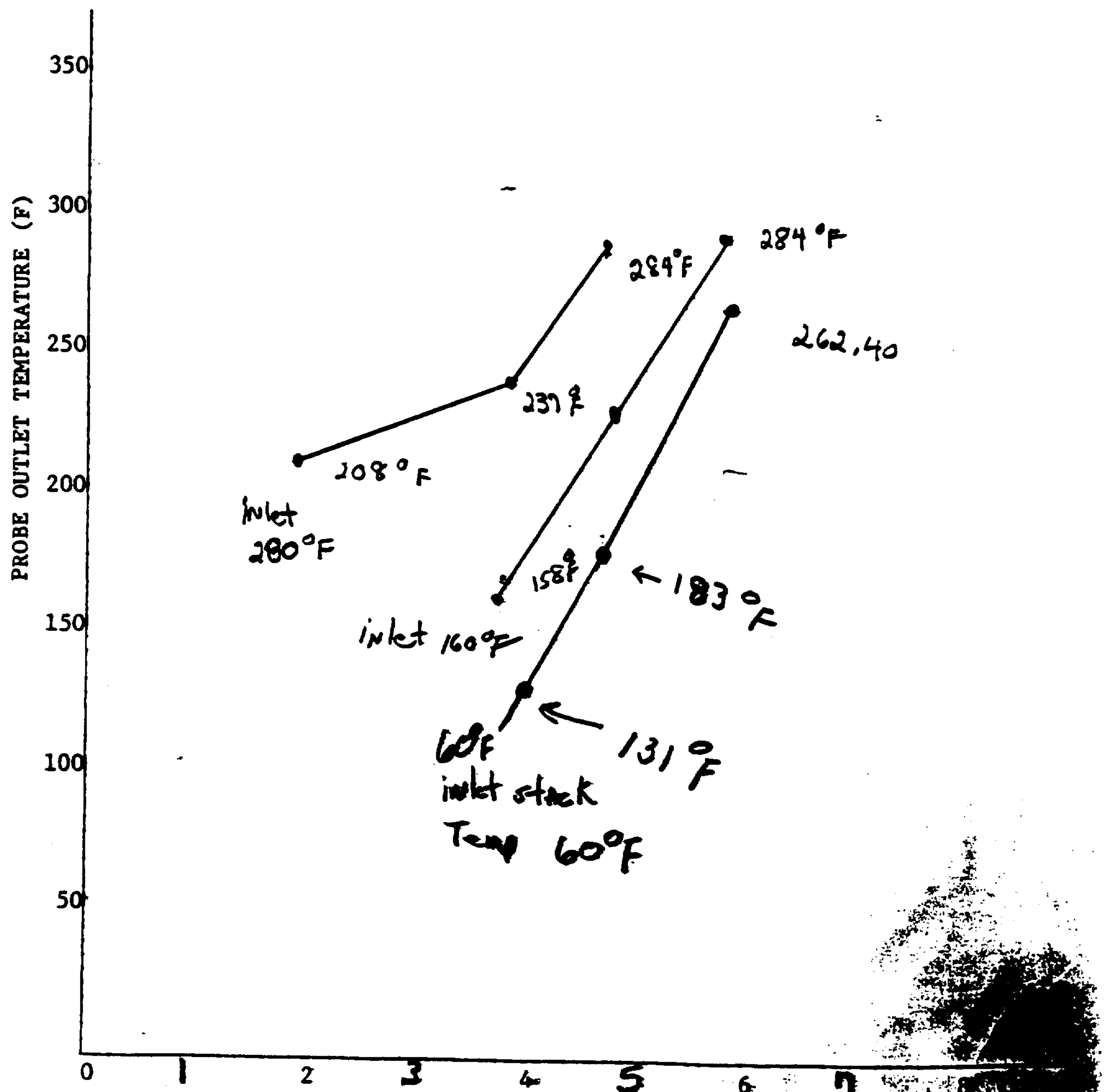
Heating Probe Calibration

Probe No. 41 Probe Length 4'

Date of Calibration 5-8-89 Signature Sam T. Turner

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



X. RAMCON PERSONNEL

RAMCON Environmental Stack Test Team

Sumner Buck - President

Sumner Buck is the President of RAMCON Environmental Corporation. He is a graduate of the EPA 450 "Source Sampling for Particulate Pollutant's" course and the 474 "Continuous Emissions Monitoring" course all given at RTP. Mr. Buck is a certified V.E. reader with current certification. Mr. Buck has personally sampled over 400 stacks including over 300 asphalt plants. He is 47 years old and a graduate of the University of Mississippi with graduate studies at Memphis State University and State Technical Institute of Memphis.

William Turner - Team Leader

Bill Turner has been employed by RAMCON for two years. He has undergone extensive training in Method 1 through 9. He is qualified as a team leader and is currently certified as a V.E. reader.

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 desiccator to dry for at least 24 hours. Clean plastic petri dishes, also numbered, top and bottom, are placed in the desiccator with the filters. After desiccation, 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 books. 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 at 175°C for two hours. The open jars are removed and placed in a desiccator until cool for two hours and then tightly sealed. The jars are then numbered and weighed on the triple beam balance to the closest tenth of a gram. 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 desiccator for at least 24 hours. Then the filters are weighed continuously every six hours until a constant weight is achieved. All data is recorded on the laboratory forms that will be bound in the test report.

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 to the lab in sealed mason jars 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: A blank analysis of acetone is conducted from the one gallon glass container used in the field preparation. This acetone was used in the field for rinsing the probe, nozzle, and top half of the filter holder. A blank analysis is performed prior to testing on all new containers of acetone received from the manufacturer to insure that the quality of the acetone used will be 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. 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 the "zero" position. The beam arrest lever (on the lower left hand side toward the rear of the balance) is then slowly pressed downward to the full release position. The lighted vernier scale on the front of the cabinet should align with 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 the 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 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 B & S

Relative humidity in lab 50 %

Sample Location hot mix asphalt plant

Density of Acetone (p_a) .7857 mg/ml

Blank volume (V_a) 200 ml

Date/Time wt. blank 5-31-90; 8:00 Am

Date/Time wt. blank 5-31-90; 4:00 pm

Gross wt. 96.3805 mg

Gross wt. 96.3807 mg

Ave. Gross wt. 96.3806 mg

Tare wt. 96.3800 mg

Weight of blank (m_{ab}) 0.0006 mg

Acetone blank residue concentration (C_a) $(C_a) = (M_{ab}) / (V_a)(p_a)$ = (0.0000038 mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} P_a$ = (0.0000038)(200)(0.7857) = (0.0006)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	200	200	200
Date/Time of wt 5-31-90; 8:00 am Gross wt	g	147.5703	158.9164	137.8355
Date/Time of wt 5-31-90; 4:00 pm Gross wt	g	147.5705	158.9168	137.8359
Average Gross wt	g	147.5704	158.9166	137.8357
Tare wt	g	147.5318	158.8852	137.7996
Less acetone blank wt (W_a)	g	0.0006	0.0006	0.0006
Wt of particulate in acetone rinse (m_a)	g	0.0380	0.0308	0.0355

Filter Numbers	#	HB-4079	HB-4080	HB-4081
Date/Time of wt 5-31-90; 8:00 am Gross wt	g	0.7181	0.7358	0.7329
Date/Time of wt 5-31-90; 4:00 pm Gross wt	g	0.7183	0.7358	0.7329
Average Gross wt	g	0.7182	0.7358	0.7329
Tare wt	g	0.7147	0.7215	0.7212

Weight of particulate on filters(s) (m_f)	g	0.0035	0.0143	0.0117
Weight of particulate in acetone rinse	g	0.0380	0.0308	0.0355
Total weight of particulate (m_n)	g	0.0415	0.0451	0.0472

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 [signature] Signature of reviewer [signature]

B & S Asphalt	5-21-90
Company Name	Date

REFERENCE METHOD 3: GAS ANALYSIS BY FYRITE

FUEL	**F_o FACTORS**
WOOD	1.0540
BARK	1.0830
ANTHRACITE	1.0699
BITUMINOUS	1.1398
LIGNITE	1.0761
OIL	1.3465
GAS	1.7489
PROPANE	1.5095
BUTANE	1.4791

$$O_2\% = 20.9 - [F_o \times CO_2\%]$$

RUN #1: ____ = 20.9 - [____ x ____]

RUN #2: ____ = 20.9 - [____ x ____]

RUN #3 ____ = 20.9 - [____ x ____]

RUN 1:	CO_2%	0	CO_2%	0	CO_2%	0	AVG.	0
	O_2%	21.0	O_2%	21.0	O_2%	21.0	AVG.	21.0
	N_2%		N_2%		N_2%		AVG.	79.0
RUN 2:	CO_2%	0	CO_2%	0	CO_2%	0	AVG.	0
	O_2%	21.0	O_2%	21.0	O_2%	21.0	AVG.	21.0
	N_2%		N_2%		N_2%		AVG.	79.0
RUN 3:	CO_2%	0	CO_2%	0	CO_2%	0	AVG.	0
	O_2%	21.0	O_2%	21.0	O_2%	21.0	AVG.	21.0
	N_2%		N_2%		N_2%		AVG.	79.0

VII. CALCULATIONS

B & S CONTRACTING, INC.
NORTH HARRISONBURG, VIRGINIA

SUMMARY OF TEST DATA

		5-21-90 RUN #1	5-21-90 RUN #2	5-21-90 RUN #3
SAMPLING TRAIN DATA				
	start	09:15	11:28	14:35
	finish	10:47	13:02	15:37
1. Sampling time, minutes	θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.2500	.2500	.2500
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000341	.000341	.000341
4. Isokinetic variation	I	93.5	94.6	94.8
5. Sample gas volume - meter cond., cf.	V_m	43.856	44.640	45.730
6. Average meter temperature, ^oR	T_m	545	553	554
7. Avg. oriface pressure drop, in. H_2O	dH	1.74	1.73	1.79
8. Total particulate collected, mg.	M_n	41.50	45.10	47.20
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2.	A	9.40	9.40	9.40
10. Absolute stack gas pressure, in. Hg.	P_s	25.82	28.62	28.62
11. Barometric pressure, in. Hg.	P_{bar}	25.82	28.62	28.62
12. Avg. absolute stack temperature, R^o	T_s	733	729	737
13. Average $-\sqrt{\text{vel. head}}$, (C_p= .81)	$-\sqrt{dP}$	0.94	0.96	0.98
14. Average stack gas velocity, ft./sec.	V_s	67.80	65.36	67.01
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	253.00	256.00	254.00
16. Moisture in stack gas, %	B_{ws}	24.61	22.99	22.45
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1075	1180	1205
18. Stack gas flow rate, cfm	acfm	38239	36863	37794
19. Particulate concentration, gr/dscf	C_s	0.0175	0.0171	0.0175
20. Particulate concentration, lb/hr	E	2.69	2.88	3.01
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	.00	.00	.00
23. Percent O_2 by volume	O_2	21.00	21.00	21.00
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	79.00	79.00	79.00

Format: summryR3

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:

$$V_{m(std)} = (17.64)(\ .990)(\ 43.856) \left[\frac{(25.82) + \frac{1.74}{13.6}}{545}\right] = 36.464 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(\ .990)(\ 44.640) \left[\frac{(28.62) + \frac{1.73}{13.6}}{553}\right] = 40.526 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(\ .990)(\ 45.730) \left[\frac{(28.62) + \frac{1.79}{13.6}}{554}\right] = 41.446 \text{ dscf}$$

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:

$$c_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{41.50}{36.464}\right] = 0.0175 \text{ gr./dscf.}$$

Run 2:

$$c_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{45.10}{40.526}\right] = 0.0171 \text{ gr./dscf.}$$

Run 3:

$$c_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{47.20}{41.446}\right] = 0.0175 \text{ gr./dscf.}$$

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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:

$$M_d = 0.44(\ .00\%) + 0.32(21.00\%) + 0.28(\ .00\% + 79.00\%) = 28.84 \ \frac{lb}{lb\text{-}mole}$$

Run 2:

$$M_d = 0.44(\ .00\%) + 0.32(21.00\%) + 0.28(\ .00\% + 79.00\%) = 28.84 \ \frac{lb}{lb\text{-}mole}$$

Run 3:

$$M_d = 0.44(\ .00\%) + 0.32(21.00\%) + 0.28(\ .00\% + 79.00\%) = 28.84 \ \frac{lb}{lb\text{-}mole}$$

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) (236.0) = 11.1 cu.ft
$V_{wsg(std)}$ = (0.04715) (17.0) = 0.8 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (240.0) = 11.3 cu.ft
$V_{wsg(std)}$ = (0.04715) (16.0) = 0.8 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (242.0) = 11.4 cu.ft
$V_{wsg(std)}$ = (0.04715) (12.0) = 0.6 cu.ft

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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:

$$B_{ws} = \frac{11.1 + 0.8}{11.1 + 0.8 + 36.464} \times 100 = 24.61\ \%$$

Run 2:

$$B_{ws} = \frac{11.3 + 0.8}{11.3 + 0.8 + 40.526} \times 100 = 22.99\ \%$$

Run 3:

$$B_{ws} = \frac{11.4 + 0.6}{11.4 + 0.6 + 41.446} \times 100 = 22.45\ \%$$

Format: bwsR3

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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 = 28.84 (1 - 24.61) + 18 (24.61) = 26.17 (lb./lb.-mole)

Run 2:

M_s = 28.84 (1 - 22.99) + 18 (22.99) = 26.35 (lb./lb.-mole)

Run 3:

M_s = 28.84 (1 - 22.45) + 18 (22.45) = 26.41 (lb./lb.-mole)

Stack Gas Velocity

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

Where:

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

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

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:

$$V = (85.49)(\ .81)(0.94)\sqrt{\frac{733}{(25.82)(26.17)}} = 67.80 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)(\ .81)(0.96)\sqrt{\frac{729}{(28.62)(26.35)}} = 65.36 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)(\ .81)(0.98)\sqrt{\frac{737}{(28.62)(26.41)}} = 67.01 \text{ ft/sec.}$$

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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:

$$Q_{sd}=3600(1- .2461)(67.80)(9.40)\left[\frac{528}{733}\right]\left[\frac{25.82}{29.92}\right] = 1075222.6 \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1- .2299)(65.36)(9.40)\left[\frac{528}{729}\right]\left[\frac{28.62}{29.92}\right] = 1180059.6 \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1- .2245)(67.01)(9.40)\left[\frac{528}{737}\right]\left[\frac{28.62}{29.92}\right] = 1205108.8 \frac{dscf}{hr}$$

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Emissions Rate from Stack

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

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:

$$E = \frac{(0.0175)(1075222.6)}{7000} = 2.69 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(0.0171)(1180059.6)}{7000} = 2.88 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0175)(1205108.8)}{7000} = 3.01 \text{ lb. / hr.}$$

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Isokinetic Variation

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

Where:

I	=	Percent isokinetic sampling.
100	=	Conversion to percent.
T_s	=	Absolute average stack gas temperature, ^oR.
0.002669	=	Conversion factor, Hg - ft^3/ml - ^oR.
V_{ic}	=	Ttl vol of liquid collected in impingers and silica gel, ml.
T_m	=	Absolute average dry gas meter temperature, ^oR.
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:

$$I = (100)(733) \left[\frac{(0.002669)(253) + \frac{43.856}{545} \left[25.82 + \frac{1.74}{13.6} \right]}{60 \ (60.0) \ (67.80) \ (25.82) \ (.000341)} \right] = 93.5\%$$

Run 2:

$$I = (100)(729) \left[\frac{(0.002669)(256) + \frac{44.640}{553} \left[28.62 + \frac{1.73}{13.6} \right]}{60 \ (60.0) \ (65.36) \ (28.62) \ (.000341)} \right] = 94.6\%$$

Run 3:

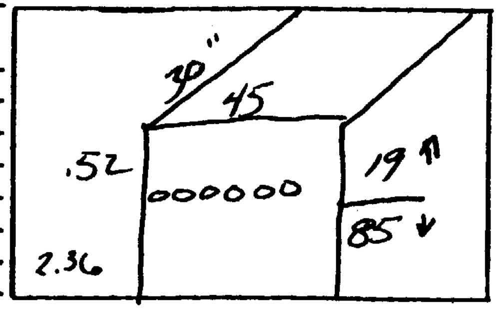
$$I = (100)(737) \left[\frac{(0.002669)(254) + \frac{45.730}{554} \left[28.62 + \frac{1.79}{13.6} \right]}{60 \ (60.0) \ (67.01) \ (28.62) \ (.000341)} \right] = 94.8\%$$

VIII. FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant B & S Asphalt

Location Harrisonburg Va.
Operator Wal Turner
Date 5-21-90
Run No. 1
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.76
C Factor .990
Pitot Tube Coefficient Cp .811



Schematic of Stack Cross Section

Ambient Temperature 65
Barometric Pressure 25.82
Assumed Moisture, % 25
Probe Length, ft 4
Nozzle Identification No. .0003407
Avg. Calibrated Nozzle Dia., (in.) .250/.250/.250
Probe Heater Setting 5.0
Leak Rate, m³/min.(cfm) .008 @ 4" vac
Probe Liner Material 316 SS
Static Pressure, mm Hg(in.Hg) .005
Filter No. 86-4079

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	436	220
INITIAL	200	203
DIFFERENCE	236	17

[redacted] NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
(A) 1	9:15 / 9:17	2	268	1.5	2.6	953:30 / 955:13	76	70	235	48
2	9:19	2	268	.55	.94	956:37	84	70	235	48
3	9:21	2	270	.25	.43	957:20	86	72	245	50
4	9:23	2	270	.15	.26	957:23	86	72	245	50
5	9:25	2	265	.25	.43	958:61	90	72	250	50
(B) 1	9:25:05 / 9:27	2	270	1.4	2.4	960:31	90	72	250	50
2	9:29	2	270	.4	.68	961:33	90	72	250	50
3	9:31	2	270	.25	.43	962:12	92	72	250	50
4	9:33	2	270	.15	.25	962:73	94	72	250	50
5	9:35:25	2	266	.15	.26	963:37	94	72	250	50

Form #REC-05

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 5.21.90 LOCATION [illegible] 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 Vm (ft³)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
C 1	~~9:35:30~~ 9:37	2	270	~~.71~~ 1.0	~~.12~~ 1.7	964.77	96	74	250	50
2	9:39	2	270	.45	.77	965.91	96	74	250	50
3	9:41	2	270	.45	.77	966.99	96	74	250	50
4	9:43	2	268	.45	.77	968.00	98	76	250	50
5	9:45:50	2	270	.35	0.600	968.93	100	76	250	50
D 1	~~9:46:45~~ 9:48	2	275	1.6	2.7	970.82	98	76	250	50
2	9:50	2	275	1.6	2.7	972.75	100	76	250	50
3	9:52	2	275	1.2	2.0	974.45	100	76	250	50
4	9:54	2	275	1.2	2.0	976.10	102	76	250	50
5	9:56:45	2	275	1.2	2.0	977.76	102	76	250	50
E 1	~~9:57:10~~ 9:59	3	270	2.5	4.3	980.00	100	76	250	50
2	10:01:10	3	270	2.5	4.3	982.89	100	76	250	50
3	~~10:33:20~~ [illegible]	3	275	1.5	2.6	984.75	90	80	250	50
4	10:38	3	280	1.5	2.6	986.60	96	80	255	50
5	10:39:20 ~~10:39:[illegible]~~	2	282	1.2	2.0	988.39	100	80	255	50
F 1	~~10:39:50~~ 10:41	3	282	2.5	4.3	990.65	100	80	255	50
2	10:43	3	285	~~2.0~~ 1.5	~~3.4~~ 2.6	992.60	100	80	255	50
3	10:45	2	285	1.0	1.7	994.18	100	80	255	50
4	10:47	2	282	.85	1.5	995.73	100	80	255	50
5	10:49:50	2	282	.85	1.5	997.156	100	80	255	50

RAMCON ENVIRONMENTAL CORPORATION

Plant B&S Asphalts

1.7

Location Harrisonburg VA.
Operator D Bailey w/ Bill Turner
Date 5-21-90
Run No. 2
Sample Box No. 2
Meter Box No. C-185
Meter H @ 1.76
C Factor .990
Pitot Tube Coefficient Cp .811

Ambient Temperature 70
Barometric Pressure 28.62
Assumed Moisture, % 25
Probe Length, ft 4
Nozzle Identification No. .0002407
Avg. Calibrated Nozzle Dia., (in.) .250/.250/.250
Probe Heater Setting 5
Leak Rate, m^3/min. (cfm) .005 @ 4"
Probe Liner Material 316 SS
Static Pressure, mm Hg (in. Hg) .005
Filter No. H6-4080

	IMPINGER VOLUME ml	SILICA GEL WEIGHT g
FINAL	440	238
INITIAL	200	222
DIFFERENCE	240	16

Schematic of Stack Cross Section

[redacted] NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
(A) 1	11:28 / 11:30	2	265	1.6	2.7	997.4 / 999.2	90	82	250	60
2	11:32	2	270	.7	1.2	000.65	96	84	250	60
3	11:34	1	270	.45	.77	001.99	100	84	250	60
4	11:36	1	270	.25	.43	002.94	100	84	250	60
5	11:38	1	270	.25	.43	003.63	100	84	250	60
(B) 1	11:40:10 / 11:42	2	270	1.0	1.7	5:11	100	84	250	60
2	11:44	2	270	.25	.43	5:92	102	84	250	60
3	11:46	2	270	.4	.68	6:99	104	84	255	60
4	11:48	2	265	.25	.43	7:75	104	84	255	60
5	11:50:10	2	262	.25	.43	8:57	106	84	255	60

Form #RFC-05