RAMCON
ENVIRONMENTAL CORPORATION

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

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

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
W.C. HARGIS & SON
BRAZIL, INDIANA
June 15, 1990

Warren Artz
W.C. Hargis & Son

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

DEH, ac HC
Rec'd. 7/27/90
RS

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

INDIANAPOLIS

OFFICE MEMORANDUM

DATE: August 3, 1990

TO: Dan Hancock

THRU: Ed Surla
Woodard Smith
Herm Carney

FROM: Raymond Schick

SUBJECT: W.C. Hargis & Son Asphalt Plant, Brazil

The subject company has submitted a report concerning particulate sampling of their drum mix asphalt plant. Sampling was conducted on June 15, 1990, by Ramcon Environmental Corporation. The purpose of the sampling was to determine the compliance status of the plant with regards to permit conditions. I have reviewed this report and found the sampling procedures used and results to be acceptable to this Office. The following is a summary of the test results. A copy of the test report is filed in the Enforcement Section.

Average Particulate Concentration: .0085 gr/dscf

Allowable Emissions: .04 gr/dscf

Average Process Weight Rate: 130 TPH

Maximum Source Capacity: 140 TPH

STATUS: IN COMPLIANCE

cc: DMD

RAMCON
ENVIRONMENTAL CORPORATION

June 22, 1990

Mr. Warren Artz
W.C. Hargis & Son
100 N. 10th Street
Terre Haute, IN 47807

Re: Particulate Emissions Test: Brazil, Indiana

Dear Mr. Artz:

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 Indiana. 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. Raymond Schick
Dept. of Environmental Mgmt.
Emissions Sampling Section
5500 West Bradbury Avenue
Indianapolis, IN 46241

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:kh

Enclosures

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

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I. INTRODUCTION

On June 15, 1990, personnel from RAMCON Environmental Corporation conducted a source emissions test for particulate emissions compliance at W.C. Hargis & Son's AEDCO drum mix asphalt plant located in Brazil, Indiana. RAMCON personnel conducting the test were Bill Turner, Team Leader and Dave 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 scrubber is below or equal to the allowable N.S.P.S. emissions limit set by US EPA and the State of Indiana.

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 Indiana are the same as those set by EPA.

Raymond Schick of Indiana's Department of Environmental Management observed the testing conducted by RAMCON Environmental Bill Turner of RAMCON Environmental conducted the opacity test (Reference Method 9) which was 0% on all three runs and therefore meets N.S.P.S. requirements.

TABLE I

SUMMARY OF TEST RESULTS

June 15, 1990

Test Run	Time	Grain Loading	Isokinetic Variation	Actual Emissions
2	13:09 to 14:11	0.0127 gr/DSCF	94.2%	0.8 lbs/hr
3	14:49 to 15:49	0.0086 gr/DSCF	95.5%	0.5 lbs/hr
4	16:12 to 17:14	0.0042 gr/DSCF	94.5%	0.3 lbs/hr
	Average:	0.0085 gr/DSCF		0.5 lbs/hr

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

III. TEST PROCEDURES

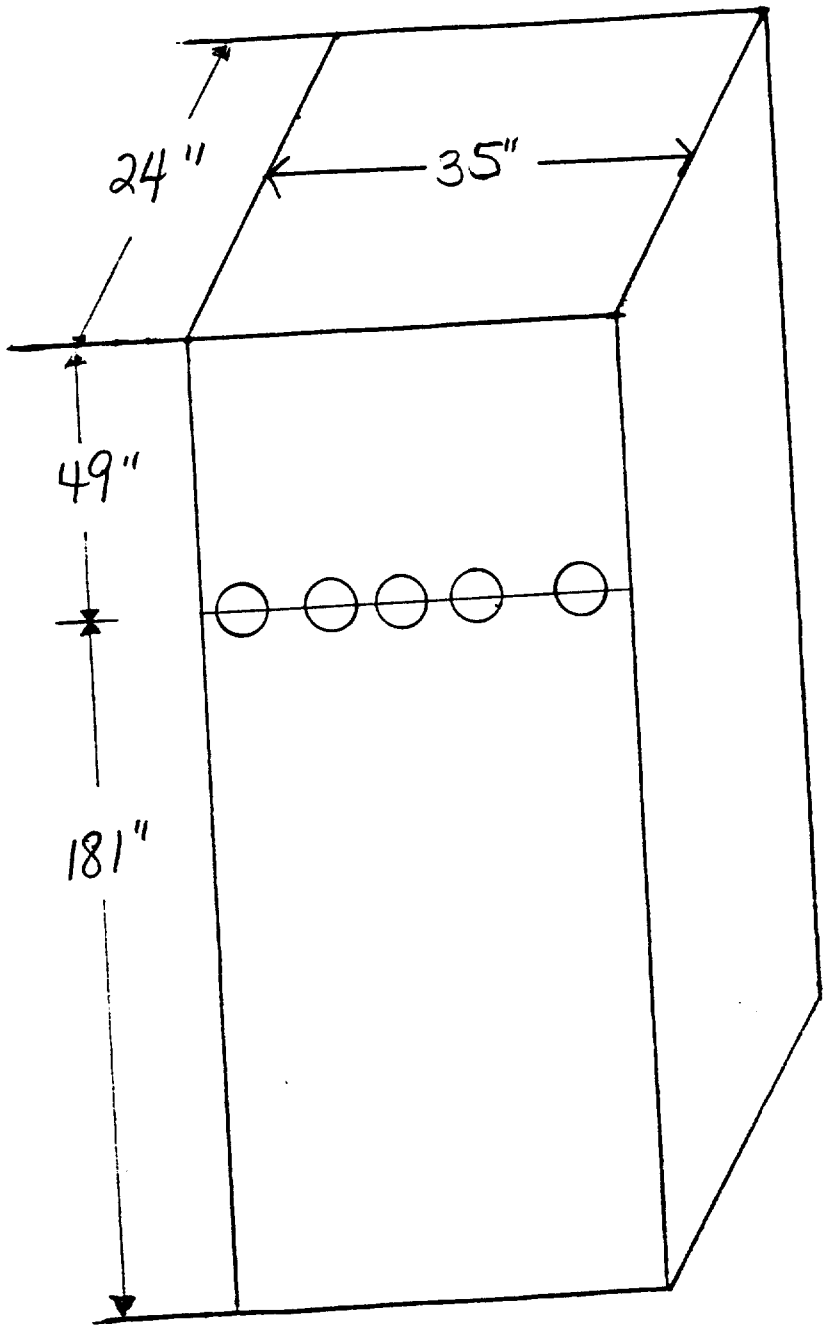
A. Method Used: Method 5 source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

B. Problems Encountered: Test run #1 was voided and repeated at the request of the source. Apparently, the plant was using old fuel from the previous year and the probe wash looked oily at the end of the run, so the tester suggested voiding this run and repeating it using fresh oil. The run that was voided would have passed the .04 gr/dscf limit anyway, but at the time it looked as if may not. Therefore, RAMCON Environmental recommends accepting test runs two, three and four as demonstration of compliance with N.S.P.S. standards.

C. Sampling Site: The emissions test was conducted after a scrubber on a rectangular stack measuring 24.0" x 35.0" with an equivalent diameter of 28.5". Five sampling ports were placed 49.0" down (1.7 diameters upstream) from the top of the stack and 181" up (6.4 diameters downstream) from the last flow disturbance. The ports were evenly spaced on 7.0" centers. The two outside ports are 3.5" from the side walls of the stack. Thirty points were sampled, six through each port for two minutes each.

Points on a Diameter	Probe Mark
1	*11.0"
2	15.0"
3	19.0"
4	23.0"
5	27.0"
6	31.0"

*Measurements include a 9.0" standoff.



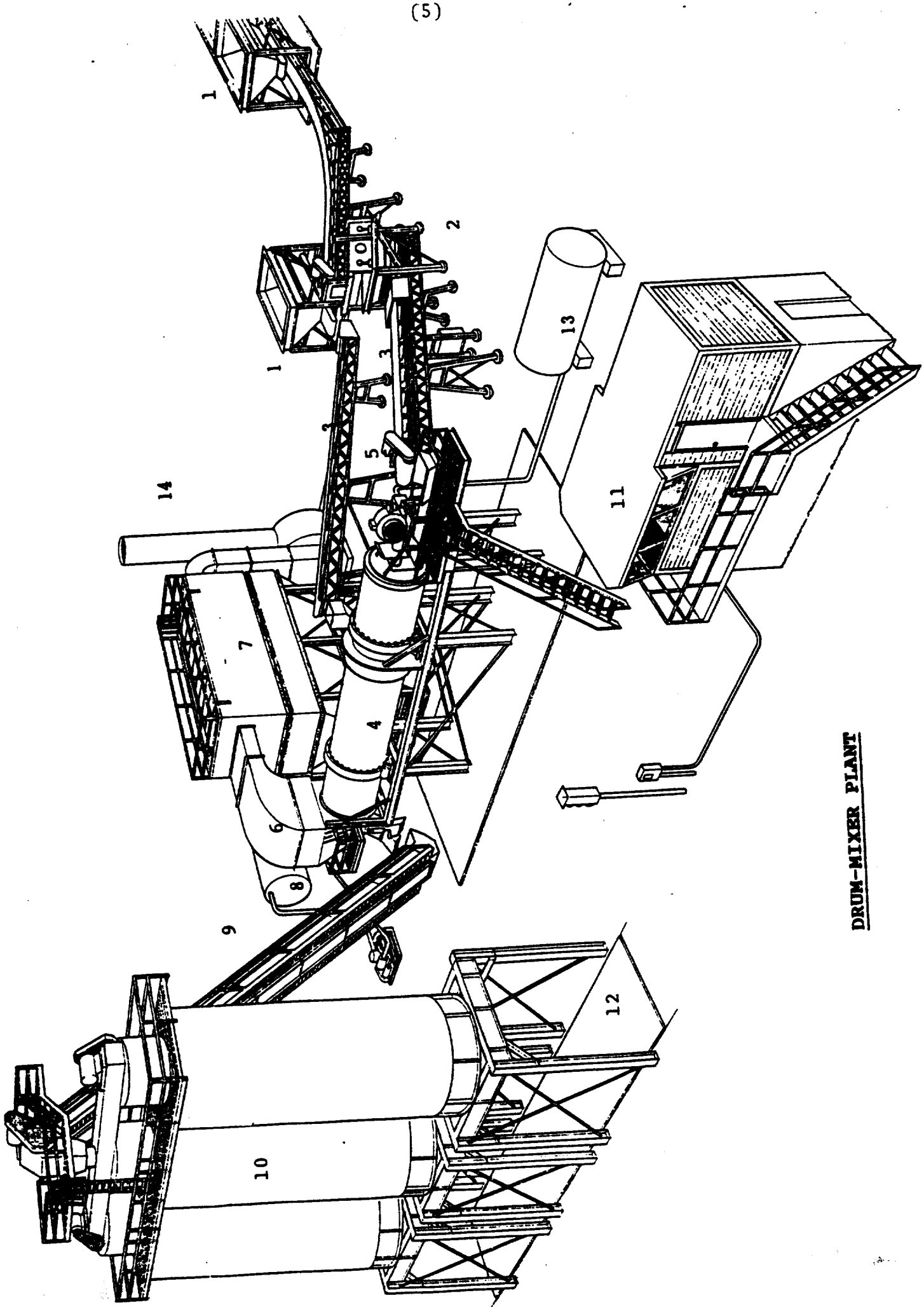
IV. THE SOURCE

IV. THE SOURCE

W.C. Hargis & Son employs an AEDCO 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 separate 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 mixer uses a burner fired with #4 fuel oil to heat air to dry the aggregate. The air is drawn into the system via an exhaust fan. After passing through the gas burner, the air passes through a high efficiency scrubber. The scrubber is manufactured by AEDCO. The exhaust gases are blown through the scrubber and discharged to the atmosphere through the stack. The design pressure drop across the venturi is in excess of 15 inches of water. The particulate matter, which is removed by the scrubber, is fed into a scrubber pond where it drops out of suspension.



DRUM-MIXER PLANT

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

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

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

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

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

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

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

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

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

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

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

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

13. Fuel Storage

DATA ON FACILITY BEING STACK TESTED

COMPANY NAME W.C. HARGIS & SON COMPANY REP. GEORGE SZILAGYI PHONE (219) 749-2335

LOCATION OF FACILITY BRAZIL IN ORIGINAL START-UP DATE 1981 DESIGNED CAPACITY 130-150 T.P.H

OEM AEDCO MODEL NO. 7228 TYPE DRUM MIX AC TYPE AC20

1 Time (24 HR) NOTE: check small box in column when moisture sample is taken	2 Fuel Use: #Fuel Oil, Nat. Gas, Propane, Coal, other	3 Burner Setting	4 Blower Pressure	5 Production Rate: Mix Aggregate TPH	5 Production Rate: RAP TPH	6 Asphalt Cement %	7 Mix Temp. °F	8 Exhaust Gas Temp. °F	9 Venturi Scrubber / Baghouse: Pressure Drop in w.g.	9 Venturi Scrubber / Baghouse: Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position
					3RD	TEST							15%
		65%		130		6	273	285	22	80	95		13%
14:50		65%		130		6	270	284	23	80			15%
15:05		66%		130		6	274	285	22	80			15%
15:20		64%		130		6	275	286	22	80			13%
15:35		65%		130		6	278	289	23	80			
15:50	198 GALS				4TH	TEST							15%
		60%		130		6	275	288	22	80	95		14%
16:15		64%		130		6	278	290	23	80			15%
16:30		63%		130		6	279	289	22	80			15%
16:45		62%		130		6	277	288	22	80			15%
17:00		61%		130		6	275	287	22	80			
17:15	197 GALS												

1 Time (24 HR) NOTE: check small box in column when moisture sample is taken	2 Fuel Use ~~4~~ #Fuel Oil ___ Nat. Gas ___ Propane ___ Coal ___ other	3 Burner Setting	4 Blower Pressure	5 Production Rate ✓ Mix ___ Aggregate TPH	5 ___ RAP TPH	6 Asphalt Cement %	7 Mix Temp. °F	8 Exhaust Gas Temp. °F	9 ___ Venturi Scrubber ___ Baghouse Pressure Drop in w.g.	9 Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position 0-100%
11:20		60%		130		6%	285	295	22"	80	90		15%
11:35		61%		130		6%	285	298	21½"	80	90		16%
11:50		56%		130		6%	270	283	23"	80	90		13%
12:05		55%		130		6%	273	284	23½"	80	95		13%
12:20	195 gals	64%		130		6%	273	283	23"	80	95		13½%
~~12:35~~				~~130~~		~~6%~~				~~80~~	~~90~~		
				~~130~~		~~6%~~				~~80~~	~~90~~		
				END TEST #1									
				START TEST #2									
13:15		65%		130		6	270	285	23"	80	95		13%
13:30		66%		130		6	273	284		80	95		
13:45		65%		130		6	272	283		80	95		
~~14:00~~				130		6	273	285		80	95		
14:15	195 gals			130		6				80	95		

(8)

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.

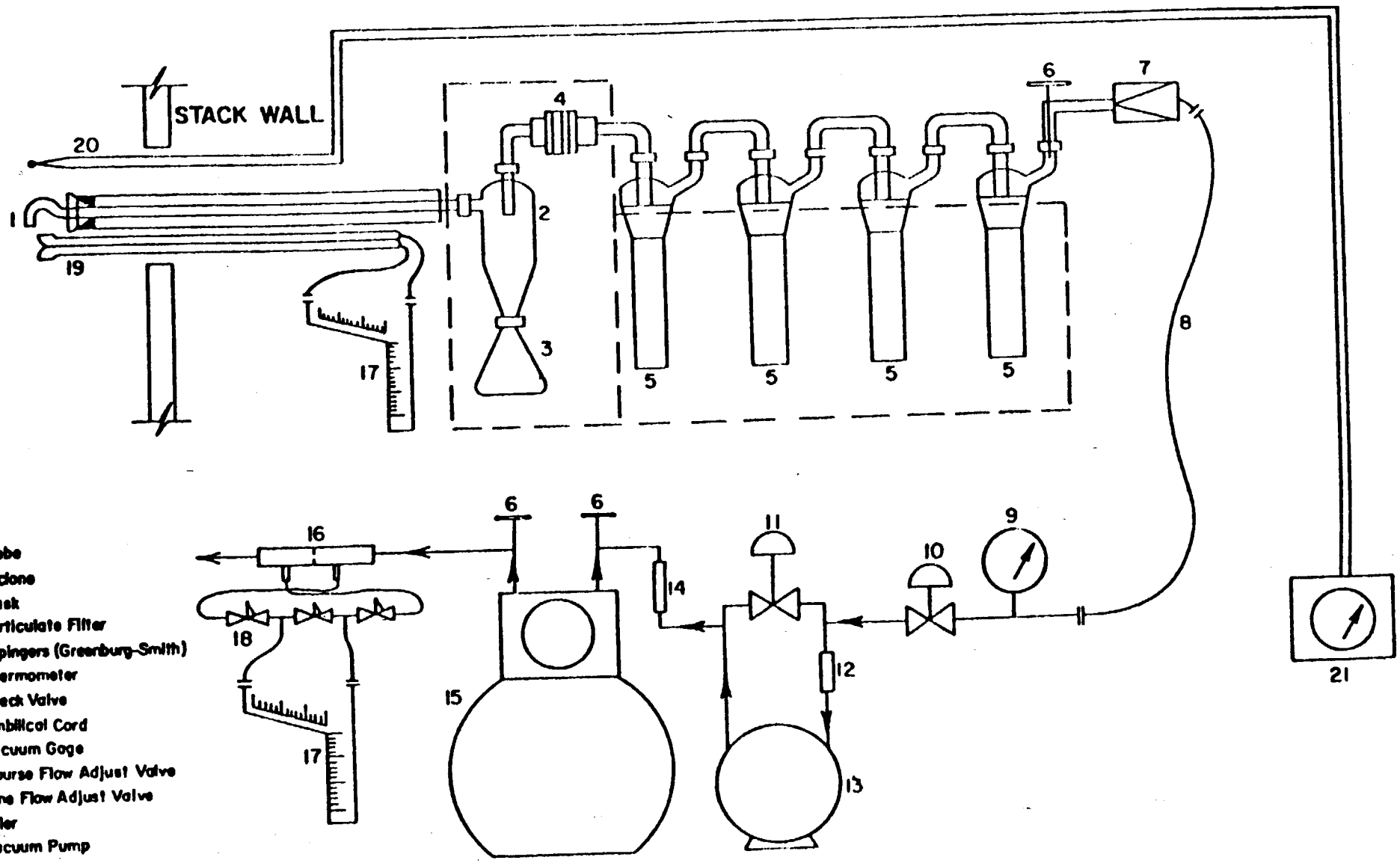
B. An Airguide Instruments Model 211-B (uncorrected) aneroid barometer was used to check the barometric pressure.

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.



1) Probe
2) Cyclone
3) Flask
4) Particulate Filter
5) Impingers (Greenburg-Smith)
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Gage
10) Course Flow Adjust Valve
11) Fine Flow Adjust Valve
12) Oiler
13) Vacuum Pump
14) Filter
15) Dry Gas Meter
16) Orifice Tube
17) Incline Manometer
18) Solenoid Valves
19) Pitot
20) Thermocouple
21) Pyrometer

SAMPLING TRAIN
USED FOR ISOKINETIC SAMPLING

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

W.C.

Plant Location HARRIS Relative humidity in lab 50 %

Sample Location hot mix asphalt facility Density of Acetone (pa) .7852 mg/ml

Blank volume (V_a) 300 ml

Date/Time wt. blank 6-19-90:12:30 p.m. Gross wt. 157.6325 mg

Date/Time wt. blank 6-21-90:1:00 p.m. Gross wt. 157.6325 mg

Ave. Gross wt. 157.6325 mg

Tare wt. 157.6310 mg

Weight of blank (m_{ab}) 0.0015 mg

Acetone blank residue concentration (C_a) (C_a) = (M_{ab}) / (V_a) (p_a) = (0.0000063 mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} p_a = (6.3 \times 10^{-6})(300)(0.7852) = 0.0015$

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	300	300	300
Date/Time of wt 6-19-90:12:30 p.m. Gross wt	g	135.1593	164.7032	159.6133
Date/Time of wt 6-21-90:1:00 p.m. Gross wt	g	135.1598	164.7036	159.6134
Average Gross wt	g	135.1595	164.7034	159.6134
Tare wt	g	135.1334	164.6726	159.5927
Less acetone blank wt (W_a)	g	0.0015	0.0015	0.0015
Wt of particulate in acetone rinse (m_a)	g	0.0246	0.0293	0.0192

Filter Numbers	#	BS-4261	BS-4254	BS-4255
Date/Time of wt 6-19-90:1:00 p.m. Gross wt	g	0.5861	0.5702	0.5702
Date/Time of wt 6-21-90:1:00 p.m. Gross wt	g	0.5859	0.5706	0.5704
Average Gross wt	g	0.5860	0.5707	0.5703
Tare wt	g	0.5638	0.5645	0.5654

Weight of particulate on filters(s) (m_f)	g	0.0222	0.0062	0.0049
Weight of particulate in acetone rinse	g	0.0246	0.0293	0.0192
Total weight of particulate (m_n)	g	0.0468	0.0355	0.0241

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 Run #1 Void

Signature of analyst Mark Landy Signature of reviewer

Form REC#8 **SAMPLE ANALYTICAL DATA FORM**

Plant Location HARRIS Relative humidity in lab 50 %

Sample Location Density of Acetone (pa) .7857 mg/ml

Blank volume (V_a) 300 ml

Date/Time wt. blank 6-19-90:12:30 p.m. Gross wt. 152.6325 mg

Date/Time wt. blank 6-21-90:1:00 p.m. Gross wt. 152.6325 mg

Ave. Gross wt. 157.6325 mg

Tare wt. 157.6310 mg

Weight of blank (m_{ab}) 0.0015 mg

Acetone blank residue concentration (C_a) (C_a) = (M_{ab}) / (V_a) (p_a) = ~~(0.000063~~ mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} p_a = (6.3 \times 10^{-6})(300)(0.7857) = 0.0015$

		Run # 4	Run #	Run #
Acetone rinse volume (V_{aw})	ml	300		
Date/Time of wt 6-19-90:12:30 p.m. Gross wt	g	137.8082		
Date/Time of wt 6-21-90:1:00 p.m. Gross wt	g	137.8085		
Average Gross wt	g	137.8084		
Tare wt	g	137.7999		
Less acetone blank wt (W_a)	g	0.0015		
Wt of particulate in acetone rinse (m_a)	g	.0070		

Filter Numbers	#	DS-4256		
Date/Time of wt 6-19-90:1:00 p.m. Gross wt	g	0.5680		
Date/Time of wt 6-21-90:1:00 p.m. Gross wt	g	0.5677		
Average Gross wt	g	.5679		
Tare wt	g	0.5634		

Weight of particulate on filters(s) (m_f)	g	.0045		
Weight of particulate in acetone rinse	g	.0070		
Total weight of particulate (m_n)	g	.0115		

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 Mark Landry Signature of reviewer S Tuck

VII. CALCULATIONS

BRAZIL, INDIANA
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SUMMARY OF TEST DATA

		6-15-90 RUN #2	6-15-90 RUN #3	6-15-90 RUN #4
SAMPLING TRAIN DATA				
1. Sampling time, minutes	start	13:09	14:49	16:12
	finish	14:11	15:49	17:14
	θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.3300	.3300	.3300
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000594	.000594	.000594
4. Isokinetic variation	I	94.2	95.5	94.5
5. Sample gas volume - meter cond., cf.	V_m	47.612	47.860	46.887
6. Average meter temperature, ^oR	T_m	571	576	574
7. Avg. oriface pressure drop, in. H_2O	dH	1.94	1.89	1.85
8. Total particulate collected, mg.	M_n	35.50	24.10	11.50
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2	A	5.83	5.83	5.83
10. Absolute stack gas pressure, in. Hg.	P_s	29.46	29.46	29.46
11. Barometric pressure, in. Hg.	P_{bar}	29.46	29.46	29.46
12. Avg. absolute stack temperature, R^o	T_s	620	620	620
13. Average $-\sqrt{\text{vel. head}}$, (C_p= .81)	$-\sqrt{dP}$	0.61	0.60	0.60
14. Average stack gas velocity, ft./sec.	V_s	38.50	37.89	37.93
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	465.00	466.00	468.00
16. Moisture in stack gas, %	B_{ws}	33.69	33.87	34.36
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	449	440	438
18. Stack gas flow rate, cfm	acfm	13467	13254	13268
19. Particulate concentration, gr/dscf	C_s	0.0127	0.0086	0.0042
20. Particulate concentration, lb/hr	E	0.82	0.54	0.26
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	2.00	2.00	2.00
23. Percent O_2 by volume	O_2	18.20	18.20	18.20
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	79.80	79.80	79.80

Format: summryR3

BRAZIL, INDIANA
0

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 2:

$$V_{m(std)} = (17.64)(.990)(47.612)\left[\frac{(29.46) + \frac{1.94}{13.6}}{571}\right] = 43.107 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(.990)(47.860)\left[\frac{(29.46) + \frac{1.89}{13.6}}{576}\right] = 42.950 \text{ dscf}$$

RUN 4:

$$V_{m(std)} = (17.64)(.990)(46.887)\left[\frac{(29.46) + \frac{1.85}{13.6}}{574}\right] = 42.219 \text{ dscf}$$

Format: dgmR3

BRAZIL, INDIANA
0

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 2:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{35.50}{43.107}\right] = 0.0127 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{24.10}{42.950}\right] = 0.0086 \text{ gr./dscf.}$$

Run 4:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{11.50}{42.219}\right] = 0.0042 \text{ gr./dscf.}$$

BRAZIL, INDIANA
0

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 2:

$$M_d = 0.44(\ 2.00\%) + 0.32(18.20\%) + 0.28(\ .00\% + 79.80\%) = 29.05\ \frac{lb}{lb\text{-mole}}$$

Run 3:

$$M_d = 0.44(\ 2.00\%) + 0.32(18.20\%) + 0.28(\ .00\% + 79.80\%) = 29.05\ \frac{lb}{lb\text{-mole}}$$

Run 4:

$$M_d = 0.44(\ 2.00\%) + 0.32(18.20\%) + 0.28(\ .00\% + 79.80\%) = 29.05\ \frac{lb}{lb\text{-mole}}$$

BRAZIL, INDIANA
0

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 2:

$$B_{ws} = \frac{21.3 + 0.6}{21.3 + 0.6 + 43.107} \times 100 = 33.69\ \%$$

Run 3:

$$B_{ws} = \frac{21.2 + 0.8}{21.2 + 0.8 + 42.950} \times 100 = 33.87\ \%$$

Run 4:

$$B_{ws} = \frac{21.4 + 0.7}{21.4 + 0.7 + 42.219} \times 100 = 34.36\ \%$$

BRAZIL, INDIANA
0

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 2:

$M_s = 29.05 (1 - 33.69) + 18 (33.69) = 25.33$ (lb./lb.-mole)

Run 3:

$M_s = 29.05 (1 - 33.87) + 18 (33.87) = 25.31$ (lb./lb.-mole)

Run 4:

$M_s = 29.05 (1 - 34.36) + 18 (34.36) = 25.25$ (lb./lb.-mole)

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

Where:

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

K_p = 85.49 ft/sec $\sqrt{(g/g\text{-mole})\text{-(mm Hg)} / (^{o}K)(\text{ mm } H_2O)}$

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 2:

$$V = (85.49)\ (\ .81)\ (\ 0.61) \sqrt{\frac{620}{(29.46)(25.33)}} = 38.50 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ .81)\ (\ 0.60) \sqrt{\frac{620}{(29.46)(25.31)}} = 37.89 \text{ ft/sec.}$$

Run 4:

$$V = (85.49)\ (\ .81)\ (\ 0.60) \sqrt{\frac{620}{(29.46)(25.25)}} = 37.93 \text{ ft/sec.}$$

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

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

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 2:

$V_{wc(std)}$ = (0.04707) (453.0) = 21.3 cu.ft

$V_{wsg(std)}$ = (0.04715) (12.0) = 0.6 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (450.0) = 21.2 cu.ft

$V_{wsg(std)}$ = (0.04715) (16.0) = 0.8 cu.ft

Run 4:

$V_{wc(std)}$ = (0.04707) (454.0) = 21.4 cu.ft

$V_{wsg(std)}$ = (0.04715) (14.0) = 0.7 cu.ft

Emissions Rate from Stack

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

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 2:

$$E = \frac{(0.0127)\ (449287.4)}{7000} = 0.82 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0086)\ (440968.5)}{7000} = 0.54 \text{ lb. / hr.}$$

Run 4:

$$E = \frac{(0.0042)\ (438163.2)}{7000} = 0.26 \text{ lb. / hr.}$$

BRAZIL, INDIANA
0

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 2:

$$I = (100)(620)\left[\frac{(0.002669)(465) + \frac{47.612}{571}\left[29.46 + \frac{1.94}{13.6}\right]}{60\ (60.0)\ (38.50)\ (29.46)\ (.000594)} \right] = 94.2\%$$

Run 3:

$$I = (100)(620)\left[\frac{(0.002669)(466) + \frac{47.860}{576}\left[29.46 + \frac{1.89}{13.6}\right]}{60\ (60.0)\ (37.89)\ (29.46)\ (.000594)} \right] = 95.5\%$$

Run 4:

$$I = (100)(620)\left[\frac{(0.002669)(468) + \frac{46.887}{574}\left[29.46 + \frac{1.85}{13.6}\right]}{60\ (60.0)\ (37.93)\ (29.46)\ (.000594)} \right] = 94.5\%$$

VIII. FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant Hays

Location Bristol, Tn

Operator [illegible] Turner

Date 6-15-90

Run No. 1

Sample Box No. 1

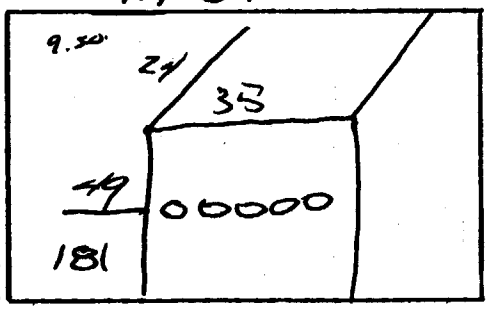
Meter Box No. C-185

Meter H @ 1.77

C Factor .99

Pitot Tube Coefficient Cp .81

M-5.1



Schematic of Stack Cross Section

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature	80		
Barometric Pressure	29.46 FINAL	574	
Assumed Moisture, %	35 INITIAL	200	
Probe Length, ft	4 DIFFERENCE	374	

Nozzle Identification No. .00584

Avg. Calibrated Nozzle Dia., (in.) .316/.320/.320

Probe Heater Setting 5.0

Leak Rate, m^3/min. (cfm) .002 @ 7"

Probe Liner Material 316 SS

Static Pressure, mm Hg (in. Hg) .009

Filter No. BS-4261

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H_2O	PRESSURE DIFF. ORF. MTR in H_2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	11:14:30 / 11:16	2	162	.5	2.6	986.787 / 988.14	98	96	265	62
2	11:18	2	161	.54	2.8	990.50	102	96	265	62
3	11:20	3	166	.54	2.8	992.40	104	96	265	62
4	11:22	3	168	.54 / .58	2.8 / 3.0	994.40	108	96	265	62
5	11:24	3	168	.48	2.5	996.0	110	96	268	62
6	11:26:30	3	166	.48	2.5	997.00	110	96	268	62
B 1	11:28 / 11:30	3	156	.42	2.4	999.81	108	96	268	62
2	11:32	3	160	.48	2.5	1.25	110	96	265	62
3	11:34	3	165	.5	2.6	3.14	112	96	265	62
4	11:36	3	165	.55	2.8	5.0	114	96	268	62
5	11:38	3	165	.55	2.8	6.74	114	96	265	62
6	11:40	3	165	.52	2.7	8.23	114	96	265	62

COL 1.5 COL 2.0 COL 2.0

(27)

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-15-90 LOCATION Boiler 1 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 (ft^3)	GAS SAMPLE TEMP.(°F) in	GAS SAMPLE TEMP.(°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
C 1	11:41 11:43	2	162	.38	1.9	10:15	112	96	265	62
2	11:45	2	164	.4	2.0	11:8	114	96	265	62
3	11:47	2	168	.3	1.5	12.92	114	96	265	62
4	11:49	2	168	.25	1.3	14.52	114	96	265	62
5	11:51	3	170	.34	1.7	16.0	116	96	265	62
6	11:53	3	165	.34	1.7	17.5	116	96	265	62
D 1	11:54:40 11:56	2	168	.32	1.6	18.93	112	96	265	62
2	11:58	2	168	.32	1.6	20:10	114	96	265	62
3	12:00	2	168	.3	1.5	21:80	116	96	265	62
4	12:02	2	170	.3	1.5	23:35	118	96	265	62
5	12:04	3	168	.38	1.8	24:80	118	96	268	62
6	12:06:40	3	168	.36	1.8	26:31	118	96	265	62
E 1	12:06:40 12:08	2	150	.28	1.4	27.70	116	96	265	62
2	12:10	2	158	.35	1.8	29:24	118	96	265	62
3	12:12	2	165	.25	1.3	30.65	118	96	265	62
4	12:14	2	165	.20	1.0	31.86	120	96	265	62
5	12:16	2	165	.18	.92	32.92	120	96	268	62
6	12:18	2	165	.18	.92	34:068	120	96	268	62
F	12									

RAMCON ENVIRONMENTAL CORPORATION

Plant Hard

Location Brawley Inn

Operator W.L. Turner

Date 6-15-90

Run No. 2

Sample Box No. 2

Meter Box No. C-185

Meter H @ 1.76

C Factor .99

Pitot Tube Coefficient Cp .811

M-5.1

Ambient Temperature 85

Barometric Pressure 29.46

Assumed Moisture, % 35

Probe Length, ft 4

Nozzle Identification No. 006594

Avg. Calibrated Nozzle Dia., (in.) .330/.334/.330

Probe Heater Setting 5.0

Leak Rate, m^3/min. (cfm) .02/.04

Probe Liner Material 316SS

Static Pressure, mm Hg (in.Hg) .61

Filter No. BS 4254

	Impinger Volume, ml	Silica Gel Weight, g
FINAL	653	522
INITIAL	760	510
DIFFERENCE	-153	12

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A) 1	1:01:33 / 11:11	3	155	.55	2.0	34:16 / 35.9	109	104	255	64
2	1:13	2	158	.5	>2.6	37:68	110	104	255	64
3	1:15	2	162	.52	2.7	39:41	114	104	255	64
4	1:17	2	164	.52	2.7	41.32	114	104	255	64
5	1:19	2	164	.48	2.4	43:15	116	102	255	64
6	1:21:35	2	162	.5	2.6	45:11	118	102	255	64
B) 1	1:00:32 / 1:24	2	162	.44	2.2	46.63	114	102	255	64
2	1:26	2	164	.48	2.5	48:48	116	102	255	64
3	1:28	3	164	.5	2.6	50:35	116	102	255	64
4	1:30	3	164	.55	2.8	52:22	118	102	255	64
5	1:32	3	164	.55	2.8	54:13	118	102	255	64
6	1:34	3	164	.44	2.2	58:11	118	102	255	64

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-15-90 LOCATION Brandstar TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME Vm (ft^3)	GAS SAMPLE TEMP.(°F) in	GAS SAMPLE TEMP.(°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
C 1	1:35 2:37	2	155	.42	2.1	57:53	118	102	255	64
2	1:39	2	155	.4	2.0	59:22	120	102	255	64
3	1:41	2	160	.32	1.6	60.66	120	102	255	64
4	1:43	2	162	.26	1.3	62:02	120	102	255	64
5	1:45	2	165	.26	1.3	63:48	122	102	255	64
6	1:47	2	165	.38	1.9	64:96	122	102	255	64
D 1	1:47 1:49	2	158	.36	1.8	66.65	120	102	255	64
2	1:51	2	160	.32	1.6	68:04	122	102	255	64
3	1:53	2	160	.3	1.5	69:49	122	102	255	64
4	1:55	2	160	.3	1.5	70:90	122	102	255	64
5	1:57	2	162	.36	1.8	72:47	122	102	255	64
6	1:59:30	2	160	.36	1.8	74:01	122	102	255	64
E 1	1:59 2:01	2	155	.26	1.3	75:68	122	102	255	64
2	2:03	2	155	.30	1.5	76:81	124	102	255	62
3	2:05	2	155	.22	1.1	78:22	124	102	255	62
4	2:07	2	155	.22	1.1	79:42	124	102	255	62
5	2:09	2	162	.20	1.0	8063	124	102	255	62
6	2:11:48	2	162	.20	1.0	81.72	124	102	255	62

RAMCON ENVIRONMENTAL CORPORATION

Plant: Margis
Location: Brazil, IND
Operator: Wilford
Date: 6-15-90
Run No. 3
Sample Box No. 3
Meter Box No. C-185
Meter H @ 1.72
C Factor .99
Pitot Tube Coefficient Cp .811

Ambient Temperature 90
Barometric Pressure 29.46
Assumed Moisture, % 35
Probe Length, ft 4'
Nozzle Identification No. 00594
Avg. Calibrated Nozzle Dia., (in.) .330/.331/.330
Probe Heater Setting 5
Leak Rate, m3/min. (cfm) .005
Probe Liner Material 316 SS
Static Pressure, mm Hg (in.Hg) .618
Filter No. 85-4255

	IMPINGER VOLUME ml	SILICA GEL WEIGHT g
FINAL	650	524
INITIAL	200	508
DIFFERENCE	450	16

Schematic of Stack Cross Section

TRAV. PT 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 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	2:49 / 2:51	2	156	.52	2.7	83.83 / 83.82	114	112	263	64
2	2:53	2	156	.55	2.8	85.55	116	112	265	64
3	2:55	2	158	.52	2.7	87.66	120	110	265	64
4	2:57	2	158	.50	2.6	89.55	124	110	265	64
5	2:59	2	162	.50	2.6	91.30	124	110	265	64
6	3:01	2	165	.48	2.4	93.00	124	110	265	64
(B) 1	3:01:10 / 3:03	2	155	.42	2.1	94.95	124	110	265	64
2	3:05	2	155	.44	2.2	96.72	124	110	265	64
3	3:07	2	162	.52	2.7	98.46	124	110	265	64
4	3:09	2	164	.48	2.5	100.32	126	110	265	64
5	3:11	2	164	.48	2.5	102.22	126	110	265	64
6	3:13:10	2	158	.42	2.1	103.89	126	110	265	64

CO2 (20) CO2 20 CO2 20

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-18-98 LOCATION Board, Inc 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 Vm (ft^3)	GAS SAMPLE TEMP.(°F) in	GAS SAMPLE TEMP.(°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
C 1	~~3:13:35~~ 3:15	2	162	.45	2.3	105:62	126	108	265	64
2	3:17	2	162	.38	1.9	107:30	126	108	265	64
3	3:19	2	160	.32	1.6	108:75	126	108	265	64
4	3:21	2	162	.25	1.3	110:13	126	108	265	64
5	3:23	2	162	.35	1.8	111:66	124	108	265	64
6	3:25:25	2	162	.35	1.8	113:28	124	108	265	64
D 1	~~3:25:35~~ 3:27	2	160	.34	1.7	114:86	124	108	265	64
2	3:29	2	162	.36	1.8	115:92	124	108	268	64
3	3:31	2	162	.32	1.6	117:98	122	108	268	64
4	3:33	2	162	.32	1.6	119:48	122	108	265	64
5	3:35	2	162	.34	1.7	121:00	122	~~108~~ 106	268	64
6	3:37:35	2	162	.34	1.7	122:66	122	~~108~~ 106	265	64
E 1	~~3:37:45~~ 3:39	2	158	.18	.92	123:72	122	106	265	64
2	3:41	2	~~160~~ 160	.18	.92	124:87	122	106	265	64
3	3:43	2	160	.18	.92	126:15	122	106	265	64
4	3:45	2	158	.20	1.0	127:35	122	106	268	64
5	3:47	2	158	.20	1.0	128:52	122	106	265	64
6	3:49:45	2	158	.22	1.1	129:71	122	106	265	64

RAMCON ENVIRONMENTAL CORPORATION

Plant Hayes

Location Brazil Two
Operator W. C. Turner
Date 6-25-80
Run No. 4
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.72
C Factor .99
Pitot Tube Coefficient Cp .811

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature 92			
Barometric Pressure 28.46	FINAL	654	52
Assumed Moisture, % 55	INITIAL	600	507
Probe Length, ft 4	DIFFERENCE	454	14

Nozzle Identification No. CX0594
Avg. Calibrated Nozzle Dia., (in.) .334/.330/.330
Probe Heater Setting 300
Leak Rate, m^3/min. (cfm) .000 @ 1"
Probe Liner Material 316 SS
Static Pressure, mm Hg (in. Hg) .01
Filter No. BS 4254

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H_2O	PRESSURE DIFF. ORF. MTR in H_2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F		FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
							Inlet	Outlet		
A) 1	4:10 / 4:14	2	155	.52	2.7	129.80 / 133.36	112	106	260	65
2	4:16	2	155	.52	2.7	133.64	116	106	260	65
3	4:18	2	155	.50	2.6	135.32	120	106	260	65
4	4:20	2	160	.48	2.4	132.25	122	106	260	65
5	4:22	2	160	.48	2.4	138.85	122	106	260	63
6	4:24:15	2	160	.54	2.8	140.86	122	106	260	68
1	4:24.25 / 4:26	2	162	.42	2.1	142.62	122	106	260	68
2	4:28	2	155	.48	2.5	144.40	124	106	260	68
3	4:30	2	155	.5	2.6	146.31	124	106	248	65
4	4:32	2	158	.54	2.8	148.25	124	106	260	65
5	4:34	2	160	.46	2.4	150.00	124	106	260	65
6	4:36 29	2	162	.46 .38	2.4 1.9	151.36	124	106	260	65

COR TO COR TO COR TO

(33)

Form #REC-05

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-18-96 LOCATION Brown Dr. TEST NO. 4

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)
2 1	4:36 ~~4:38~~	2	160	.38	1.9	153.34	124	106	268	65
2	4:40	2	160	.38	1.9	155.79	124	106	265	65
3	4:42	2	160	.30	1.5	156:25	124	106	265	65
4	4:44	2	160	.36	1.8	157.58	124	106	265	65
5	4:46	2	160	.32	1.6	159:15	124	106	268	65
6	4:48 ~~4:50~~	2	160	.34	1.6	160:51	124	106	265	65
3 1	4:50 ~~4:52~~	2	160	.34	1.7	162:15	124	106	265	65
2	4:52	2	160	.32	1.6	163:50	124	106	263	65
3	4:54	2	162	.3	1.5	164:95	124	106	265	65
4	4:56	2	162	.3	1.5	166:48	124	106	265	65
5	4:58	2	162	.34	1.7	167:88	124	106	265	65
6	5:00 ~~5:00~~	2	162	.34	1.7	169:42	124	106	265	65
4 1	5:02 ~~5:04~~	2	160	.24	1.2	171:60	124	106	265	65
2	5:06	2	160	.22	1.1	172:00	124	106	265	65
3	5:08	2	160 ~~158~~	.18	.92	173:22	124	106	263	68
4	5:10	2	~~160~~ 160	.18	.92	174:28	124	106	263	68
5	5:12	2	160	.20	1.0	175:28	124	106	263	68
6	5:14	2	160	.20	1.0	176:6287	124	106	268	69

IX. CALIBRATION

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 6-18-90 Meter box number G185

Barometric pressure, P_b = 29.80 in. Hg Calibrated by BOOTheiner

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	198.66 / 203.171	75.2	90 / 90	76 / 76	83.5	8.68	1.00	1.68
1.5	10								
2.0	10	203.45 / 213.08	75.2	94 / 101	76 / 76	87	12.45	1.00	1.72
3.0	10	213.89 / 223.958	75.2	96 / 101	76 / 78	88	10.18	1.00	1.69
4.0	10								
							Avg	1.00	1.69

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

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

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 [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	529.97 / 534.71	77	96 / 100	74 / 76	86.5	8.75	.988	1.72
1.5	10								
2.0	10	530.0 / 535.36	77	98 / 102	76 / 78	88.5	12.4	.990	1.72
3.0	10	535.80 / 541.05	77	98 / 104	78 / 78	89.5	10.16	.991	1.73
4.0	10								
							Avg	.99	1.72

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

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

Quality Assurance Handbook M4-2.3A (front side)

Form #REC-02

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-7-89 Thermocouple number mid/outlet

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator Lurry 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 6/15/90	80	80	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 6/15/90	80	80	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. Turner

"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	

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

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

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

Form No. EED-17-1

(40)

Date 5-40-90 Thermocouple number 41

Ambient temperature 24 °C Barometric pressure 29.8 in. Hg

Calibrator Jun Reference: mercury-in-glass V

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 6/15/90	80°	80°	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

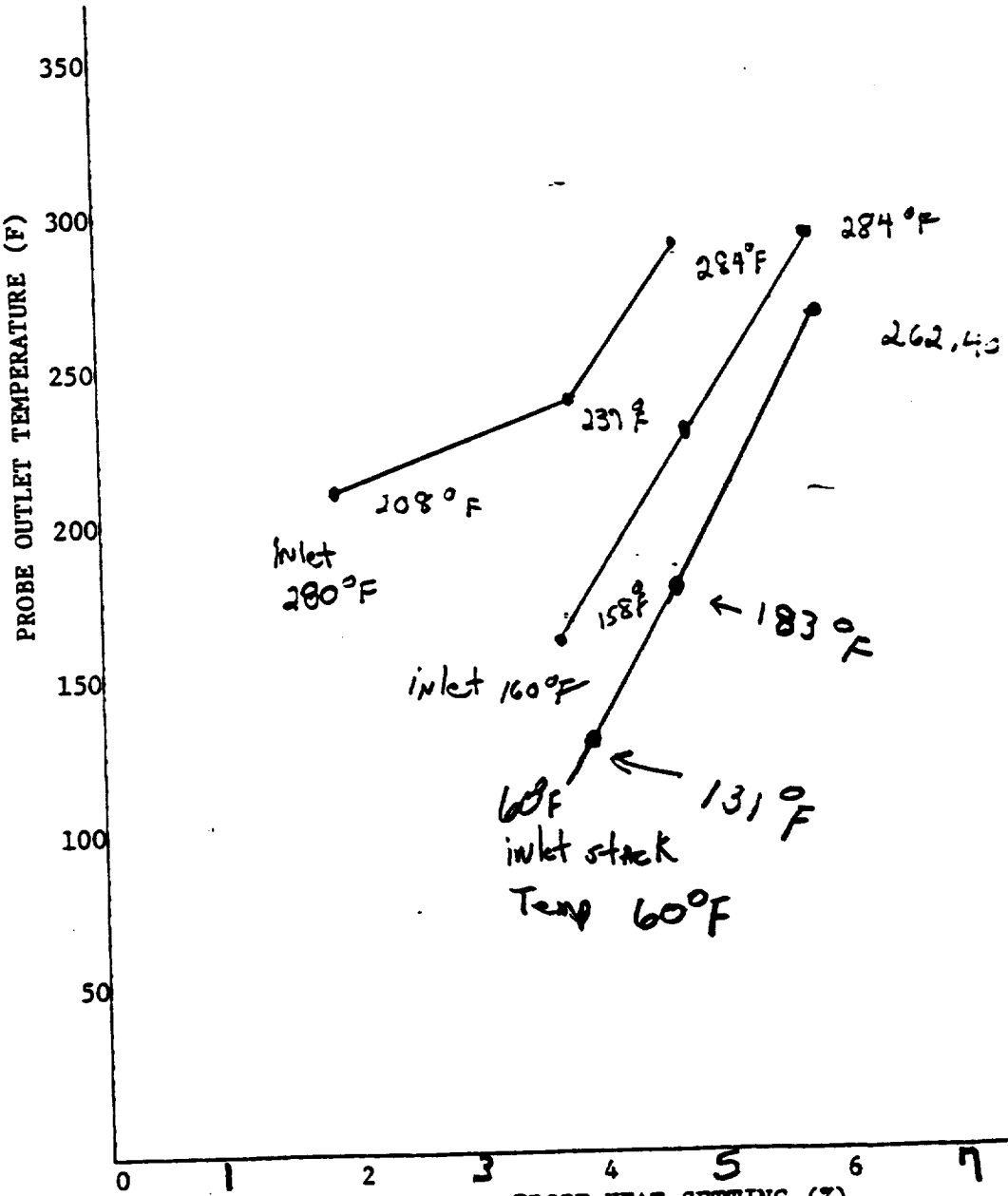
Heating Probe Calibration

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.

XI. VISIBLE EMISSIONS

SOURCE NAME: Hagis

ADDRESS:

CITY: Brazil | STATE: Ind | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Scrubber | OPERATING MODE:

CONTROL EQUIPMENT: | OPERATING MODE:

DESCRIBE EMISSION POINT:

HEIGHT ABOVE GROUND LEVEL: | HEIGHT RELATIVE TO OBSERVER:

DISTANCE FROM OBSERVER: | 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:

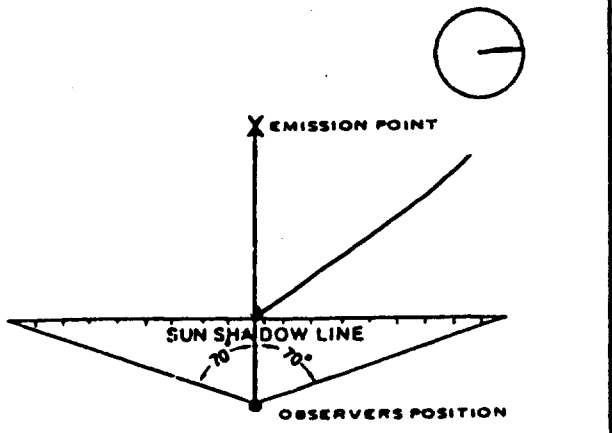
DESCRIBE BACKGROUND:

BACKGROUND COLOR: Blue | SKY CONDITIONS: clear

WIND SPEED: 0-5 | WIND DIRECTION:

AMBIENT TEMPERATURE: 85 | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



OBSERVATION DATE | START TIME: 11:14 | STOP TIME: 12:14

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

AVERAGE OPACITY FOR HIGHEST PERIOD: | NUMBER OF READINGS ABOVE: % WERE

COMMENTS:

RANGE OF OPACITY READINGS: MINIMUM: MAXIMUM:

OBSERVER'S NAME (PRINT): Bill Turner

OBSERVER'S SIGNATURE: | DATE: 6-15-90

ORGANIZATION: Rancon

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE:

TITLE: | DATE:

CERTIFIED BY: Bill Turner | DATE:

VERIFIED BY: | DATE:

EPA TI 0101

REC#14

SOURCE NAME: Hayes

ADDRESS:

CITY | STATE | ZIP

PHONE | SOURCE ID NUMBER

PROCESS EQUIPMENT | OPERATING MODE

CONTROL EQUIPMENT | OPERATING MODE

DESCRIBE EMISSION POINT

HEIGHT ABOVE GROUND LEVEL | HEIGHT RELATIVE TO OBSERVER

DISTANCE FROM OBSERVER | 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

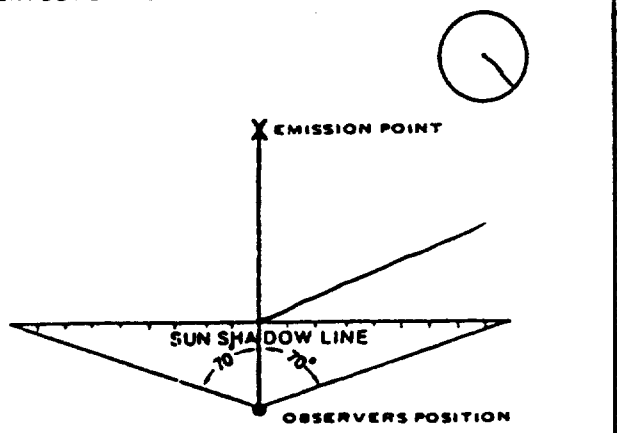
DESCRIBE BACKGROUND

BACKGROUND COLOR: Clear Blue | SKY CONDITIONS: Clear

WIND SPEED: 0-5 | WIND DIRECTION:

AMBIENT TEMPERATURE: 92 | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



OBSERVATION DATE: 6-18-99 | START TIME: 2:49 | STOP TIME: 3:19

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

AVERAGE OPACITY FOR HIGHEST PERIOD

NUMBER OF READINGS ABOVE ____ % WERE

RANGE OF OPACITY READINGS: MINIMUM MAXIMUM

COMMENTS

OBSERVER'S NAME (PRINT): Bill Turner

OBSERVER'S SIGNATURE | DATE: 6-18-99

ORGANIZATION: Ramco

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE | DATE

CERTIFIED BY | DATE

VERIFIED BY | DATE

EPA FORM

REC#14

SOURCE NAME: Hargis

ADDRESS:

CITY | STATE | ZIP

PHONE | SOURCE ID NUMBER

PROCESS EQUIPMENT | OPERATING MODE

CONTROL EQUIPMENT | OPERATING MODE

DESCRIBE EMISSION POINT

HEIGHT ABOVE GROUND LEVEL | HEIGHT RELATIVE TO OBSERVER

DISTANCE FROM OBSERVER | 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

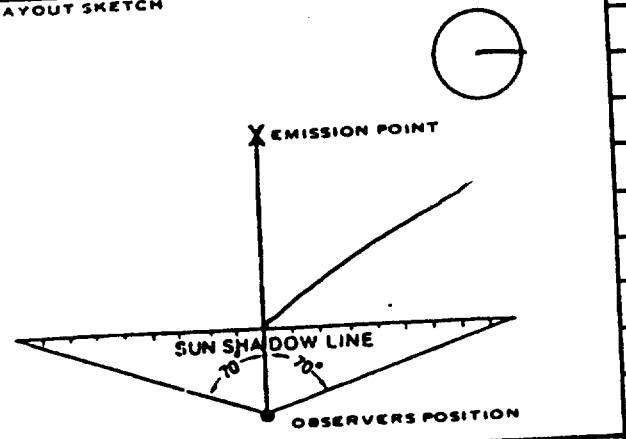
DESCRIBE BACKGROUND

BACKGROUND COLOR: Blue | SKY CONDITIONS: clear

WIND SPEED: 0-5 | WIND DIRECTION

AMBIENT TEMPERATURE: 92 | RELATIVE HUMIDITY

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



OBSERVATION DATE: 6-15-90 | START TIME: 1:10 | STOP TIME: 2:10

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

AVERAGE OPACITY FOR HIGHEST PERIOD

NUMBER OF READINGS ABOVE ____ % WERE

RANGE OF OPACITY READINGS: MINIMUM ____ MAXIMUM ____

COMMENTS

OBSERVER'S NAME (PRINT): Bill Rymer

OBSERVER'S SIGNATURE | DATE: 6-15-90

ORGANIZATION: Ramco

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE | DATE

TITLE

CERTIFIED BY: SG TN | DATE

VERIFIED BY | DATE