OHIO EPA

PERFORMANCE OF AIR PERMIT REPORTING REQUIREMENTS

OHIO VALLEY PAVING CORP. PLT.#2

APPLICATION NUMBER	EFFECTIVE DATE	REPORT TYPE	DATE REQUIRED
1 7 0 7 1 0 0 1 0 9 P 9 0 1	87 / 07 / 16	0A	90 / 02 / 15

PERFORMANCE

SECTION A:

88 / 09 / 05
YY MM DD
DATE RECEIVED

NN NF SR SN SF [✓ SC]
SUITABILITY (CIRCLE ONE)

REVIEWER

88 / 09 / 09
YY MM DD
DATE REVIEW COMPLETED

** REQUIRED FOR NF SF **

SECTION B:

1 2 3 4 5 6 7 8 9
ACTION CODE (CIRCLE 5 OR LESS)

__ / __ / __
YY MM DD
DATE OF ACTION

__ / __ / __
YY MM DD
RE-SUBMISSION TARGET DATE (OPTIONAL)

1
ID

P F
TYPE

SECTION C:

COMMENTS (IF NEEDED - 30 CHARACTERS)

3
ID

SECTION D:

REPORT TYPE DESCRIPTION

4
ID

CONTINUE REPORT TYPE DESCRIPTION

5
ID

SECTION E:

PREMISE NUMBER

ADDITIONAL SOURCES

6
ID

[illegible]

APPENDIX K

OEPA STACK TEST REVIEW SUMMARY FORM

APPLICATION NUMBER 1707100109P901

FACILITY NAME Ohio Valley Paving Corp.

SOURCE DESCRIPTION (OR SCC CODE) Barber Green Asphalt PLANT

CONTROL EQUIPMENT Bag house

DATE(S) OF TEST august , 18, 1988

FINAL TEST REPORT RECEIVED ON Sept. 8, 1988

POLLUTANT(S) TESTED Particulate

TEST METHOD 1-5

TEST FIRM Ramcon Environmental Corp

EMISSION RATES*:

ACTUAL ~~(lb(s)/hr)~~ .0193 gr/DSCF ALLOWABLE** .04 gr/DSCF

OPERATING RATES*:

DURING TEST** 165 T/HR MAXIMUM** 180 TPH

EMISSION FACTOR*** $\frac{2.9\#/HR}{165\ T/HR}$ = .018 #/TON CONTROLLED

COMMENTS:

I HEREBY VERIFY THAT THE INFORMATION CONTAINED WITHIN THE STACK TEST REPORT HAS BEEN REVIEWED AND IT HAS BEEN DETERMINED THAT THE TEST PROCEDURES, ANALYSES AND CALCULATIONS ARE;

[X] AN ACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

[ ] AN UNACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

9/9/88
DATE OF REVIEW

Al Carducci
REVIEWED BY

* BASED ON 3 RUN AVERAGE
** SPECIFY APPLICABLE UNITS
*** SPECIFY IN UNITS OF MASS/INPUT

RAMCON
ENVIRONMENTAL CORPORATION

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
OHIO VALLEY PAVING CORPORATION
MORRISTOWN, OHIO
August 18, 1988

Ralph Kyanko
Ohio Valley Paving Corp.

G. Sumner Buck, III
President

Sam Turner
Field Supervisor

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

RAMCON
ENVIRONMENTAL CORPORATION

August 26, 1988

Mr. Ralph Kyanko
Ohio Valley Paving Corporation
243 West Main St.
St. Clarksville, OH 43950

Re: Particulate Emissions Tests - Morristown, Ohio

Dear Mr. Kyanko:

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

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

Mr. Harold Strohmeyer
North Ohio Valley Air Authority
814 Adams St.
Steubenville, Ohio 43952

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

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

Sincerely,

G. Sumner Buck, III
President

GSBIII:mew

Enclosures

RAMCON BUILDING, 223 SCOTT STREET, MEMPHIS, TENNESSEE 38112

TABLE OF CONTENTS

I. INTRODUCTION

On August 18, 1988, personnel from RAMCON Environmental Corporation (REC) conducted a source emissions test for particulate emissions compliance at Ohio Valley Paving Corporation's batch mix asphalt plant located in Morristown, Ohio. RAMCON personnel conducting the test were Sam Turner, Field Supervisor, and Kevin Powell. Bruce Shrader was responsible for the particulate laboratory analysis including taring the beakers and filters and recording final data in the laboratory record books. Custody of the samples was limited to Mr. Turner and Mr. Shrader.

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

II. TEST RESULTS

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

Mr. Harold Strohmeyer of the North Ohio Valley Air Authority observed the testing conducted by RAMCON.

TABLE I

SUMMARY OF TEST RESULTS
August 18, 1988

Test Run	Time	Grain Loading	Isokinetic Variation	Actual Emissions
1	07:38 to 08:42	0.0218 gr/DSCF	103.8%	3.2 lbs/hr
2	09:20 to 10:24	0.0182 gr/DSCF	100.0%	2.9 lbs/hr
3	11:02 to 12:04	0.0178 gr/DSCF	100.4%	2.7 lbs/hr
	Average:	0.0193 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 emissions limitation set by US EPA and the State of Ohio. Therefore, the plant is operating in compliance with State and Federal Standards.

III. TEST PROCEDURES

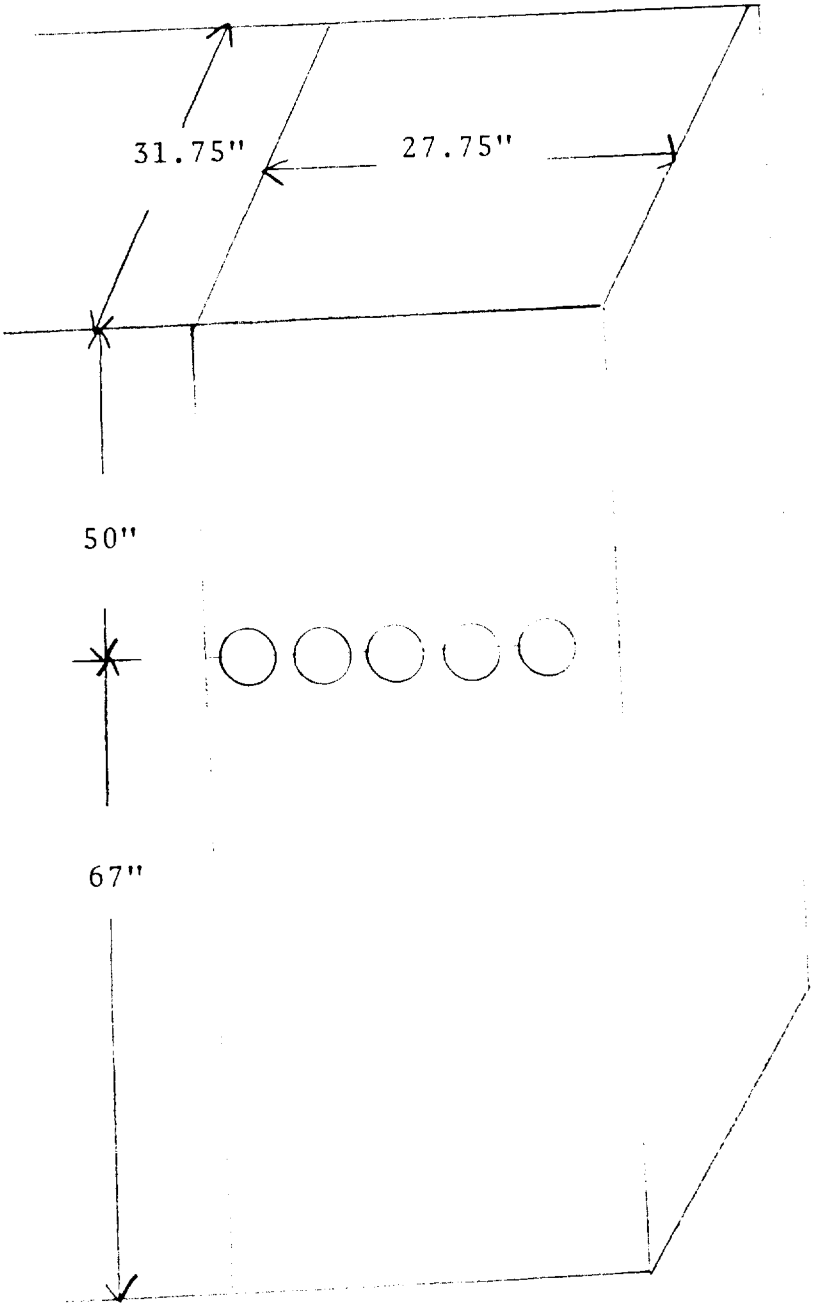
A. Method Used: The source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

B. Problems Encountered: ~~No problems were encountered~~ that affected ~~testing.~~ Test run three was completed with a leak rate slightly above the allowable set by the method. The dry gas volume was corrected according to paragraph 6.5 of method 5. No other problems were encountered.

C. Sampling Site: The emissions test was conducted after a baghouse on a rectangular stack measuring 31.75" x 27.75" with an equivalent diameter of 29.6". Five sampling ports were placed 50" down (1.7 diameters upstream) from the top of the stack and 67" up (2.3 diameters downstream) from the last flow disturbance. Thirty points were sampled, six through each port for 2 minutes each for a total test time of sixty minutes per test run.

Points on a Diameter	Probe Mark
1	10.4"
2	15.7"
3	21.0"
4	26.3"
5	31.6"
6	36.9"

*Measurements include a 7.8" standoff.



IV. THE SOURCE

IV. THE SOURCE

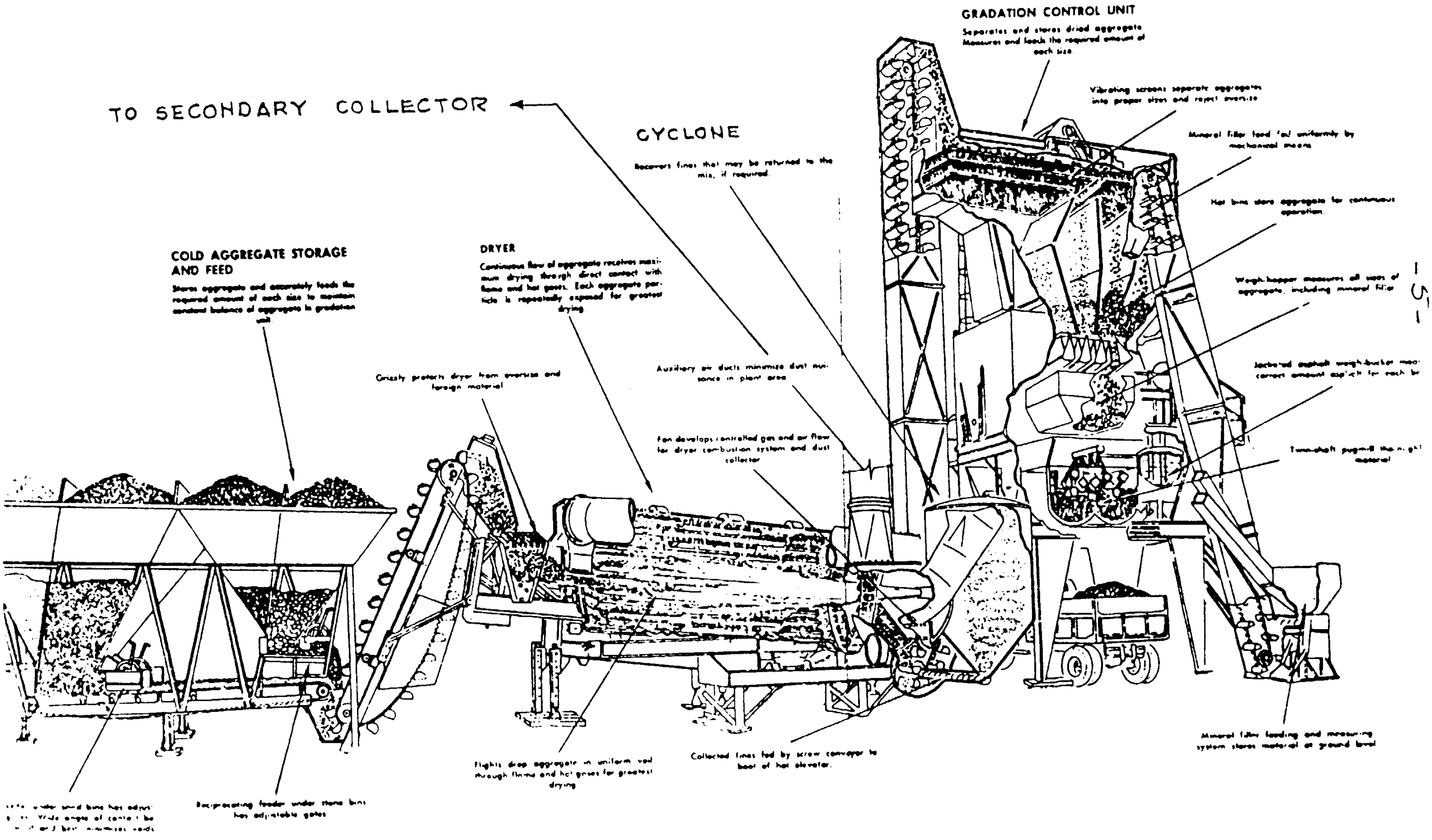
Ohio Valley Paving Corporation employs a Barber-Greene batch mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt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

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

The drum dryer 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 burner and the mixing drum, the air passes through a baghouse. The baghouse is manufactured by Barber-Greene. The exhaust gas is drawn through the baghouse and discharged to the atmosphere through the stack. The design pressure drop across the tube sheet is 1 - 6 inches of water. The particulate matter, which is removed by the baghouse is reinjected into the pugmill. The following sketch shows a typical batch mix asphalt plant.

Figure 4-1

ASPHALT BATCH MIX PLANT - AN EXPLODED VIEW



-5-

PLANT DATA

COMPANY NAME OHIO VALLEY PAVING CORP.
COMPANY REP. RALPH E. KYANKO DATE 8/18/88 PHONE # (614) 782-1240
DATA SOURCE
PLANT LOCATION MORRISTOWN, OH.
PLANT MFG. BARBER GREENE PLANT MODEL # BC 60 PLANT TYPE BATCH
MIX SPECIFICATION # 448 TYPE I OIL SPECIFICATION # AC 20

Time 24 Hour	__ Fuel Oil __ Nat. Gas __ Propane __ Coal __	Burner Setting	Aggregate TPH	Recycle TPH	Liquid Asphalt TPH	Mix Temp. °F	__ Venturi __ Baghouse Pressure Drop Inches Water
7:30	FUEL OIL	30	160		6 %	290	6.5
7:40	#4	25				300	6.5
7:50		30				295	6.5
8:00		25				295	6.0
8:10		25				290	6.5
8:20		25				295	7.0
8:30		25				295	6.0
8:40		25				290	7.0
8:50		20				295	7.0
9:00		20				300	7.5
9:10		25				255	6.5
9:20		25				290	7.0
9:30		20				300	6.5
9:40		25				290	6.5
9:50		25				295	6.5
10:00		25				290	6.5
10:10		20				300	7.0
10:20		25				290	6.5
10:30		25				295	7.0
10:40		25				290	7.0
10:50		20				295	6.5
11:00		25				295	6.5
11:10		25				295	6.5
11:20		20				295	6.5
11:30		25				285	7.0

PLANT DATA

COMPANY NAME____________________

COMPANY REP.__________ DATE__________ PHONE #__________

DATA SOURCE____________________

PLANT LOCATION____________________

PLANT MFG.__________ PLANT MODEL #__________ PLANT TYPE__________

MIX SPECIFICATION #__________ OIL SPECIFICATION #__________

Time 24 Hour	__ Fuel Oil __ Nat. Gas __ Propane __ Coal __	Burner Setting	Aggregate TPH	Recycle TPH	Liquid Asphalt TPH	Mix Temp. °F	__ Venturi __ Baghouse Pressure Drop Inches Water
11:40	FUEL OIL	30	160		6%	285	7.0
11.50	#4	30				295	7.0
12.00		30				290	6.5
12.10		25				295	7.0

DATA SUMMARY

Plant

1. Manufacturer of plant BARBER GREENE.
2. Designed maximum operating capacity 180 TPH @ 5 % moisture.
3. Actual operation rate 160-170 TPH @ 5 % moisture.
4. Startup date ________.
5. Type of fuel used in dryer #4 FUEL OIL.
6. Quanity of fuel consumption 1.3 GAL/TON.

Aggregate

7. Name/type of mix 448 TYPE I SURFACE COURSE.
8. Percent asphalt in mix 6 %.
9. Temperature of asphalt 285°.
10. Sieve/Screening analysis: % Passing;

1"	100	3/8"	99	# 16	34
3/4"	100	# 4	64	# 50	11
1/2"	100	# 8	44	#200	3.8

Baghouse

11. Manufacturer BARBER GREENE.
12. No. of bags 498. Type of bags NOMEX.
13. Air to cloth ratio 6.1. Designed ACFM 32,000.
14. Square feet of bags 5200.
15. Type of cleaning; pulse jet ✓, reverse air ____,
    plenum pulse ________, other ________.
16. Cleaning cycle time .1 SEC.
17. Interval between cleaning cycle 20 SEC.
18. Pressure drop across baghouse 6.0 - 7.5 psi.
19. Pulse pressure on cleaning cycle 90 psi.

COMPANY NAME OHIO VALLEY PAVING CORP. DATE 8/18/88

COMPANY REPRESENTATIVE RALPH E. KVANKO Form #REC-03

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.

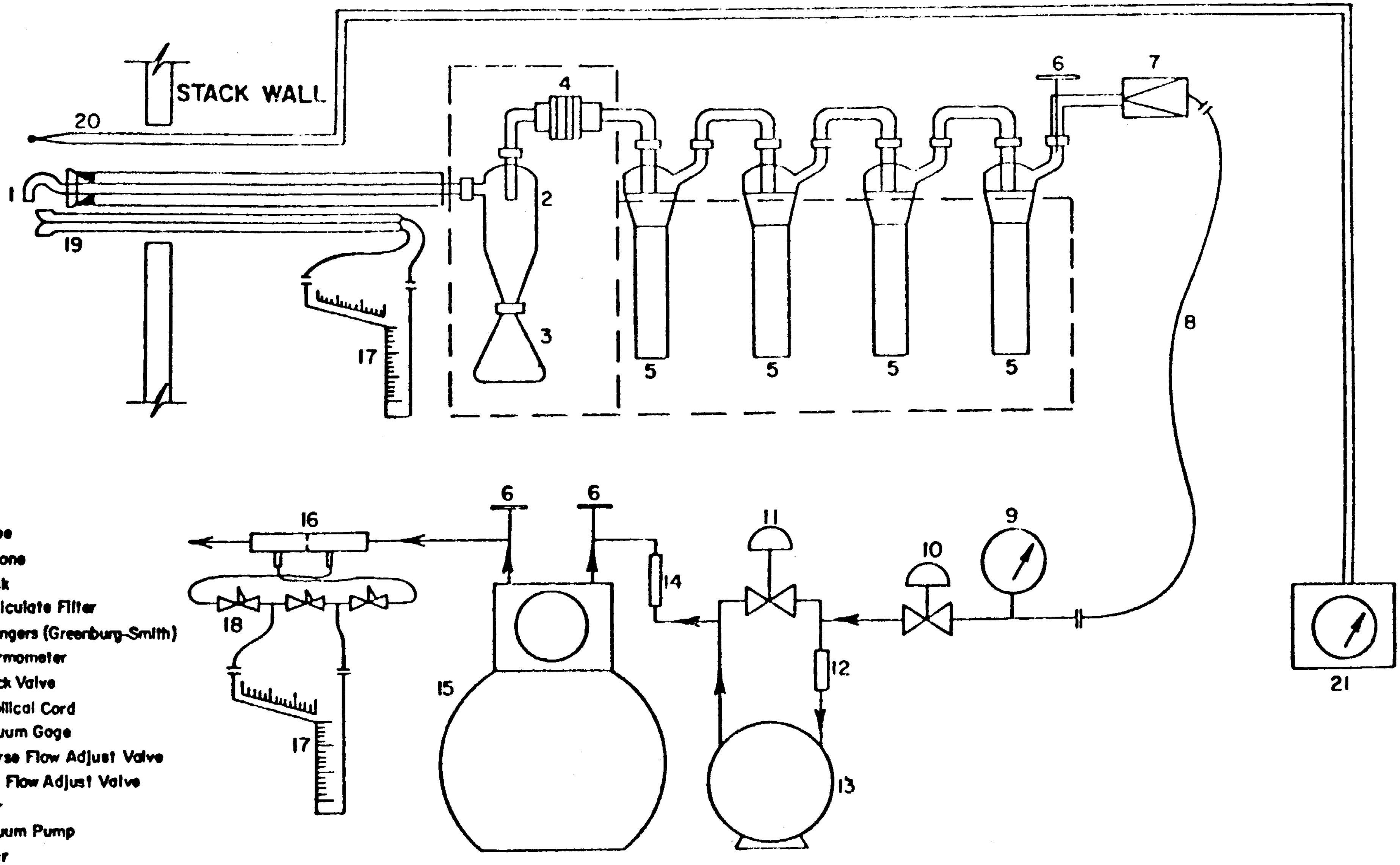
B. An Airguide Instruments Model 211-B (uncorrected) aneroid barometer was used to check the barometric pressure.

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

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

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

II. Post-Testing Lab Analysis

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

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

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

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

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

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

SPECIAL NOTE

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

WEIGHING PROCEDURE - SARTORIUS ANALYTICAL BALANCE

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

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

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

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

Form REC#8

SAMPLE ANALYTICAL DATA FORM

Plant Location OHIO VALLEY

Sample Location hot mix asphalt plant

Blank volume (V_a) 200 ml

Date/Time wt. blank 8-22-88

Date/Time wt. blank 8-23-88

Relative humidity in lab 58 %

Density of Acetone (pa) .7853 mg/ml

Gross wt. 123.7354 mg

Gross wt. 123.7350 mg

Ave. Gross wt. 123.7352 mg

Tare wt. 123.7350 mg

Weight of blank (m_{ab}) .0002 mg

Acetone blank residue concentration (C_a) $(C_a) = (M_{ab}) / (V_a) (p_a) =$ (.0000013 mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} P_a =$ (.0000013)(200)(.7853) = (.0002)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	200	200	200
Date/Time of wt 8-22-88 Gross wt	g	138.8578	158.2212	157.8433
Date/Time of wt 8-23-88 Gross wt	g	138.8574	158.2210	157.8429
Average Gross wt	g	138.8576	158.2211	157.8431
Tare wt	g	138.8319	158.2055	157.8172
Less acetone blank wt (W_a)	g	.0002	.0002	.0002
Wt of particulate in acetone rinse (m_a)	g	.0255	.0154	.0257

Filter Numbers	#	KP2839	KP2800	KP2804
Date/Time of wt 8-22-88 Gross wt	g	0.5565	0.5600	0.5520
Date/Time of wt 8-23-88 Gross wt	g	0.5565	0.5598	0.5522
Average Gross wt	g	0.5565	0.5599	0.5521
Tare wt	g	0.5284	0.5287	0.5339

Weight of particulate on filters(s) (m_f)	g	.0281	.0312	.0182
Weight of particulate in acetone rinse	g	.0255	.0154	.0257
Total weight of particulate (m_n)	g	.0536	.0466	.0439

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 BS

Signature of reviewer

VII. CALCULATIONS

OHIO VALLEY PAVING CORPORATION
MORRISTOWN, OHIO

SUMMARY OF TEST DATA

		8/18/88 RUN #1	8/18/88 RUN #2	8/18/88 RUN #3
SAMPLING TRAIN DATA				
	start	07:38	09:20	11:02
	finish	08:42	10:24	12:04
1. Sampling time, minutes	θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.2000	.2000	.2000
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000218	.000218	.000218
4. Isokinetic variation	I	103.8	100.0	100.4
5. Sample gas volume - meter cond., cf.	V_m	39.180	41.650	40.645
6. Average meter temperature, ^oR	T_m	545	555	563
7. Avg. oriface pressure drop, in. H_2O	dH	1.32	1.45	1.40
8. Total particulate collected, mg.	M_n	53.60	46.60	43.90
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2.	A	6.10	6.10	6.10
10. Absolute stack gas pressure, in. Hg.	P_s	30.06	30.06	30.06
11. Barometric pressure, in. Hg.	P_{bar}	30.06	30.06	30.06
12. Avg. absolute stack temperature, R^o	T_s	683	677	682
13. Average $-\sqrt{\text{vel. head}}$, (C_p= .81)	$-\sqrt{dP}$	1.27	1.33	1.31
14. Average stack gas velocity, ft./sec.	V_s	81.62	84.65	84.00
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	292.00	265.00	285.00
16. Moisture in stack gas, %	B_{ws}	26.71	23.88	26.06
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1020	1108	1060
18. Stack gas flow rate, cfm	acfm	29873	30982	30744
19. Particulate concentration, gr/dscf	C_s	0.0218	0.0182	0.0178
20. Particulate concentration, lb/hr	E	3.18	2.88	2.70
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	5.50	5.00	5.50
23. Percent O_2 by volume	O_2	14.00	14.50	14.00
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	80.50	80.50	80.50

Format: summryR3

Dry Gas Volume

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

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 ^{o}R.

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

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:

$$V_{m(std)} = (17.64)(\ .990)(\ 39.180)\left[\frac{(30.06) + \frac{1.32}{13.6}}{545}\right] = 37.861 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(\ .990)(\ 41.650)\left[\frac{(30.06) + \frac{1.45}{13.6}}{555}\right] = 39.535 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(\ .990)(\ 40.645)\left[\frac{(30.06) + \frac{1.40}{13.6}}{563}\right] = 38.028 \text{ dscf}$$

Total Contaminants by Weight: GRAIN LOADING

Particulate concentration C_s' gr./dscf.

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

Where:

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

M_n = Total amount of particulate matter collected, mg.

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

Run 1:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{53.60}{37.861} \right] = 0.0218 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{46.60}{39.535} \right] = 0.0182 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{43.90}{38.028} \right] = 0.0178 \text{ gr./dscf.}$$

-17-

Dry Molecular Weight

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

Where:

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

Run 1:

$$M_d = 0.44(\ 5.50\%) + 0.32(14.00\%) + 0.28(\ .00\% + 80.50\%) = 29.44\ \frac{lb}{lb\text{-}mole}$$

Run 2:

$$M_d = 0.44(\ 5.00\%) + 0.32(14.50\%) + 0.28(\ .00\% + 80.50\%) = 29.38\ \frac{lb}{lb\text{-}mole}$$

Run 3:

$$M_d = 0.44(\ 5.50\%) + 0.32(14.00\%) + 0.28(\ .00\% + 80.50\%) = 29.44\ \frac{lb}{lb\text{-}mole}$$

Water Vapor Condensed

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

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

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)(^{o}R).

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

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

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

Run 1:

$V_{wc(std)}$ = (0.04707) (286.0) = 13.5 cu.ft
$V_{wsg(std)}$ = (0.04715) (6.0) = 0.3 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (258.0) = 12.1 cu.ft
$V_{wsg(std)}$ = (0.04715) (7.0) = 0.3 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (280.0) = 13.2 cu.ft
$V_{wsg(std)}$ = (0.04715) (5.0) = 0.2 cu.ft

Moisture Content of Stack Gases

$$B_{ws} = \frac{V_{wc_{std}} + V_{wsg_{std}}}{V_{wc_{std}} + V_{wsg_{std}} + V_{m_{std}}} \times 100$$

Where:

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

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

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

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

Run 1:

$$B_{ws} = \frac{13.5 + 0.3}{13.5 + 0.3 + 37.861} \times 100 = 26.71\ \%$$

Run 2:

$$B_{ws} = \frac{12.1 + 0.3}{12.1 + 0.3 + 39.535} \times 100 = 23.88\ \%$$

Run 3:

$$B_{ws} = \frac{13.2 + 0.2}{13.2 + 0.2 + 38.028} \times 100 = 26.06\ \%$$

Molecular Weight of Stack Gases

$$M_s = M_d (1 - B_{ws}) + 18 (B_{ws})$$

Where:

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

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

Run 1:

M_s = 29.44 (1 - 26.71) + 18 (26.71) = 26.38 (lb./lb.-mole)

Run 2:

M_s = 29.38 (1 - 23.88) + 18 (23.88) = 26.66 (lb./lb.-mole)

Run 3:

M_s = 29.44 (1 - 26.06) + 18 (26.06) = 26.46 (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 $\left[(g/g\text{-mole})\text{-}(mm\ Hg)\ /\ (^{o}K)(\ mm\ H_2O\right]^{1/2}$

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:

$$V = (85.49)\ (\ .81)\ (\ 1.27) \sqrt{\frac{683}{(30.06)(26.38)}} = 81.62 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (\ .81)\ (\ 1.33) \sqrt{\frac{677}{(30.06)(26.66)}} = 84.65 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ .81)\ (\ 1.31) \sqrt{\frac{682}{(30.06)(26.46)}} = 84.00 \text{ ft/sec.}$$

Stack Gas Flow Rate

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

Where:

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

A = Cross sectional area of stack, (ft.^{2}).

3600 = Conversion factor, (sec./hr.).

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

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

T_{std} = Standard absolute temperature, (528°R).

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

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

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

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

Run 1:

$$Q_{sd}=3600(1- .2671)(81.62)(6.10)\left[\frac{528}{683}\right]\left[\frac{30.06}{29.92}\right] = 1020268.0 \ \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1- .2388)(84.65)(6.10)\left[\frac{528}{677}\right]\left[\frac{30.06}{29.92}\right] = 1108742.6 \ \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1- .2606)(84.00)(6.10)\left[\frac{528}{682}\right]\left[\frac{30.06}{29.92}\right] = 1060884.3 \ \frac{dscf}{hr}$$

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:

$$E = \frac{(0.0218)\ (1020268.0)}{7000} = 3.18\ \text{lb. / hr.}$$

Run 2:

$$E = \frac{(0.0182)\ (1108742.6)}{7000} = 2.88\ \text{lb. / hr.}$$

Run 3:

$$E = \frac{(0.0178)\ (1060884.3)}{7000} = 2.70\ \text{lb. / hr.}$$

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, °R.
0.002669 = Conversion factor, Hg - ft^3/ml - °R.
V_{ic} = Ttl vol of liquid collected in impingers and silica gel, ml.
T_m = Absolute average dry gas meter temperature, °R.
P_{bar} = Barometric pressure at sampling site, (in. Hg).
dH = Av pressure differential across the oriface meter, (in.H_2O).
13.6 = Specific gravity of mercury.
60 = Conversion seconds to minutes.
θ = Total sampling time, minutes.
V_s = Stack gas velocity, ft./sec.
P_s = Absolute stack gas pressure, in. Hg.
A_n = Cross sectional area of nozzle, ft^2.

Run 1:

$$I = (100)(\;683\;) \left[\frac{(0.002669)(292.00) + \frac{39.180}{545} \left[30.06 + \frac{1.32}{13.6} \right]}{60\;(\;60.0\;)\;(\;81.62\;)\;(\;30.06\;)\;(\;.000218\;)} \right] = 103.8\%$$

Run 2:

$$I = (100)(\;677\;) \left[\frac{(0.002669)(265.00) + \frac{41.650}{555} \left[30.06 + \frac{1.45}{13.6} \right]}{60\;(\;60.0\;)\;(\;84.65\;)\;(\;30.06\;)\;(\;.000218\;)} \right] = 100.0\%$$

Run 3:

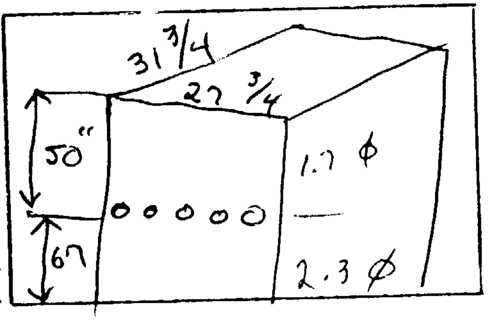
$$I = (100)(\;682\;) \left[\frac{(0.002669)(285.00) + \frac{40.645}{563} \left[30.06 + \frac{1.40}{13.6} \right]}{60\;(\;60.0\;)\;(\;84.00\;)\;(\;30.06\;)\;(\;.000218\;)} \right] = 100.4\%$$

VIII. FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

.82

Plant Ohio Valley
Location Morristown Ohio
Operator Sam Turner
Date 8-18-88
Run No. 1
Sample Box No. ~~C-185~~ 1
Meter Box No. C-185
Meter H @ 1.84
C Factor .987
Pitot Tube Coefficient Cp .81
Pitot Tube leak CK OK



Schematic of Stack Cross Section

Ambient Temperature 78
Barometric Pressure 30.06
Assumed Moisture, % 25
Probe Length, m(ft) 4'
Nozzle Identification No. .0002182
Avg. Calibrated Nozzle Dia., (in.) .20/.200/.200
Probe Heater Setting 4
Leak Rate, m3/min. (cfm) .004 at 4" Vac
Probe Liner Material Stainless Steel
Static Pressure, mm Hg (in.Hg) .04
Filter No. KR-2839

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	486	206
INITIAL	200	200
DIFFERENCE	286	6

(52)

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		FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
							Inlet	Outlet		
A) 1	7:38 / 7:40	1	218	1.2	.98	979.335 / 980.60	74	70	255	60
2	7:42	2	225	2.0	1.6	982.00	82	70	255	60
3	7:44	2	232	1.9	1.6	983.30	86	70	255	60
4	7:46	2	230	1.5	1.2	984.60	90	70	245	45
5	7:48	1	226	1.0	.82	985.60	92	70	245	45
6	7:50	1	225	.98	.80	986.63	92	70	245	45
B) 1	7:51 / 7:53	2	225	2.1	1.7	988.00	90	70	240	45
2	7:55	2	232	2.0	1.6	989.40	94	72	240	45
3	7:57	2	226	1.8	1.5	990.80	96	72	235	50
4	7:59	2	226	1.5	1.2	992.10	96	72	235	50
5	8:01	2	226	1.4	1.1	993.40	98	72	245	50
6	8:03	2	220	1.4	1.1	994.52	98	72	245	50

CO2 = 5.5 CO2 = 5.5 O2 = 14.0 O2 = 14.0 CO2 = 6.0 O2 = 14.0

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 8-18-88 LOCATION ______ TEST NO. 1

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
C) 1	8:04 8:06	3.0	220	2.1	1.7	996.10	96	74	245	50
2	8:08	2.0	224	1.8	1.5	997.50	100	74	245	50
3	8:10	2.0	222	1.5	1.2	998.60	100	74	240	50
4	8:12	2.0	224	1.4	1.1	999.80	100	74	240	50
5	8:14	2.0	224	1.5	1.2	001.10	100	75	240	50
6	8:16	2.0	217	1.6	1.3	002.41	100	75	245	50
D) 1	8:17 8:19	2.0	ST ~~195~~ 220	1.5	1.2	003.60	96	75	245	50
2	8:21	2.0	222	1.7	1.4	4.90	100	75	240	50
3	8:23	2.0	223	1.7	1.4	6.30	100	75	240	50
4	8:25	2.0	222	1.6	1.3	7.6	102	75	240	50
5	8:27	2.0	221	1.6	1.3	9.0	102	75	245	50
6	8:29	2.0	221	1.8	1.5	10.36	102	75	245	50
E) 1	8:30 8:32	2.0	225	1.6	1.3	11.60	98	75	235	55
2	8:34	3.0	226	2.2	1.8	13.30	101	75	235	55
3	8:36	2.5	223	2.0	1.6	14.60	102	76	240	55
4	8:38	2.5	213	1.7	1.4	16.10	102	76	240	55
5	8:40	2.0	220	1.4	1.1	17.30	103	76	245	55
6	8:42	2.0	221	1.4	1.1	18.515	103	76	245	55

RAMCON ENVIRONMENTAL CORPORATION

Plant Ohio Valley
Location Mornitown Ohio
Operator Sam Young
Date 8-18-88
Run No. 2
Sample Box No. 2
Meter Box No. C-185
Meter H @ 1.84
C Factor .987
Pitot Tube Coefficient Cp .81

Ambient Temperature 80
Barometric Pressure 30.06
Assumed Moisture, % 25
Probe Length, m(ft) 4
Nozzle Identification No. .0002182
Avg. Calibrated Nozzle Dia., (in.) .200/.200/.200
Probe Heater Setting 4
Leak Rate, m3/min. (cfm) .003 at 5.5 " Vac
Probe Liner Material Stainless Steel
Static Pressure, mm Hg (in. Hg) .04
Filter No. KP-2000

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	458	207
INITIAL	200	200
DIFFERENCE	258	7

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	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	9:20 / 9:22	2	218	1.5	1.2	18.65 / 20.0	90	86	225	60
2	9:24	2.5	219	1.9	1.6	21.4	97	86	235	55
3	9:26	3.0	220	1.9	1.6	22.90	100	86	235	55
4	9:28	3.0	220	1.9	1.6	24.20	102	86	245	50
5	9:30	3.0	221	1.7	1.4	25.40	103	85	245	50
6	9:32	3.0	221	1.7	1.4	27.00	104	85	245	50
B) 1	9:33 / 9:35	3.0	220	2.2	1.8	28.50	100	84	245	50
2	9:37	2.5	220	2.0	1.6	30.20	103	84	245	50
3	9:39	2.0	210	1.7	1.4	31.40	104	84	245	50
4	9:41	2.0	217	1.5	1.2	32.50	104	84	240	50
5	9:43	2.0	215	1.4	1.1	33.90	106	84	240	50
6	9:45	2.0	216	1.7	1.4	35.20	106	84	240	50

co2 = 5.0   o2 = 14.5   co2 = 5.0   o2 = 14.5

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 8-18-88 LOCATION ____________ TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
C) 1	9:46 9:48	3	220	2.1	1.7	36.70	106	84	240	50
2	9:50	3	220	1.9	1.6	38.00	106	84	240	50
3	9:52	2.5	220	1.6	1.3	39.60	108	84	240	50
4	9:54	2.0	218	1.5	1.2	40.80	108	84	255	50
5	9:56	2.0	218	1.5	1.2	42.00	108	84	255	50
6	9:58	3.0	216	1.7	1.4	43.40	108	84	255	50
D) 1	9:59 10:01	3.5	212	2.3 ~~1.6~~	1.9	45.00	105	84	255	50
2	10:03	3.0	213	2.1	1.7	46.60	108	84	255	50
3	10:05	3.0	217	1.8	1.5	48.00	108	84	250	50
4	10:07	3.0	215	1.8	1.5	49.50	110	84	250	50
5	10:09	3.0	216	1.3	1.1	50.60	110	84	255	55
6	10:11	3.0	216	1.5	1.2	52.00	110	84	255	55
E) 1	10:12 10:14	2.0	216	1.5	1.2	53.20	104	84	250	55
2	10:16	3.0	207	2.3	1.9	54.70	108	84	250	55
3	10:18	3.0	213	2.0	1.6	56.20	110	84	250	55
4	10:20	3.0	213	2.0	1.6	57.70	110	84	250	55
5	10:22	3.0	223	1.8	1.5	59.00	110	84	250	55
6	10:24	3.0	221	1.4	1.1	60.30	110	84	250	55

RAMCON ENVIRONMENTAL CORPORATION

Plant Ohio Valley
Location Morristown, Ohio
Operator Kevin Powell
Date 8-18-88
Run No. 3
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.84
C Factor .987
Pitot Tube Coefficient Cp .81

.82

Schematic of Stack Cross Section

★ Vm Corrected = (.025-.02)60 = 40.645

Ambient Temperature
Barometric Pressure 30.06
Assumed Moisture, % 25
Probe Length, m(ft) 4'
Nozzle Identification No. .000 2182
Avg. Calibrated Nozzle Dia., (in.) .20/.200/.200
Probe Heater Setting 4
★ Leak Rate, m³/min. (cfm) ~~.005 @ 4"~~ .025 at 4"
Probe Liner Material 316 Stainless steel
Static Pressure, mm Hg (in. Hg) .04
Filter No. KP-2804

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	480	205
INITIAL	200	200
DIFFERENCE	280	5

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	11:02:15 11:04:15	2	212	1.8	1.5	060.505 061.99	98	92	235	60
2	11:06:15	2	222	2.2	1.8	063.49	106	92	260	55
3	11:08:15	2	220	2.1	1.7	064.90	110	92	260	55
4	11:10:15	2	220 ~~1.6~~ KP	~~1.3~~ 1.6 KP	1.3	066.26	112	92	260	55
5	11:12:15	2	221	1.3	1.1	067.50	112	92	240	50
6	11:14:15	2	221	2.0	1.6	068.99	114	92	245	50
B) 1	11:14:45 11:16:45	2	220	2.2	1.8	070.46	112	92	245	50
2	11:18:45	2	221	1.9	1.6	071.85	114	92	245	50
3	11:20:45	2	220	1.5	1.2	073.15	116	92	245	50
4	11:22:45	2	221	1.6	1.3	074.46	116	90	240	50
5	11:24:45	2	220	1.9	1.6	075.87	116	92	240	50
6	11:26:45	2	218	1.9	1.6	077.30	116	92	240	50
C) 1	11:27:15 11:29:15	2	217	1.8	1.5	078.71	116	92	245	45

$CO_2 = 5.5$

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 8/18/88 LOCATION Morristown Ohio 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) 2	11:34:15	2	219	1.9	1.5	080.12	116	92	245	50
3	11:33:15	2	219	1.6	1.3	081.57	118	92	245	50
4	11:35:15	2	217	1.5	1.2	082.79	116	92	245	50
5	11:37:15	2	218	1.5	1.2	084.07	116	92	245	50
6	11:39:15	2	222	1.4	1.1	085.31	116	92	235	50
D) 1	11:40 11:42	2	221	1.7	1.4	086.67	112	92	235	50
2	11:44	3	218	2.0	1.6	088.10	116	92	235	50
3	11:46	2	226	1.8	1.5	089.52	116	92	250	50
4	11:48	2	228	2.0	1.6	090.95	116	94	250	50
5	11:50	2	216	1.4	1.2	092.26	118	94	250	50
6	11:52	2	222	1.5	1.2	093.55	116	94	250	50
E) 1)	11:52:30 11:54:30	2	214	1.5	1.2	094.83	114	94	250	50
2	11:56:30	3	237	21	1.7	096.30	116	94	250	50
3	11:58:30	2	234	1.7	1.4	097.69	116	94	245	50
4	12:01:30	2	230	1.5	1.2	098.90	116	94	240	50
5	12:03:30	2	232	1.3	1.1	100.22	116	94	230	50
6	12:04:45 12:04:30 12:05:45	2	231	1.3	1.1	101.45	116	94	230	50

stop restart @ 12:04:30 KR

IX. CALIBRATIONS

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number — Date 8-26-88 Meter box number C-185 Plant —

Barometric pressure, P_b = 29.96 in. Hg Dry gas meter number 670775 Pretest Y .987

Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), °F	Dry gas meter						$\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
				Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average[a] (t_d), °F				
1.5	10	10.32	74	100	77	88.5	15.00	5	.992	1.86
1.5	10	10.30	74	102	77	89.5	14.88	5	.995	1.82
1.5	10	10.32	74	104	77	90.5	14.75	5	.995	1.79
									Y = .994	1.82

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

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 8-15-88 Meter box number C-185

Barometric pressure, P_b = 30.05 in. Hg Calibrated by Sam Turner

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	826.60 / 831.82	73	96 / 103	96 / 78	88.25	9.08	.983	1.8
1.5	10								
2.0	10	832.00 / 842.386	73	~~106~~ 98 / 106	77 / 77	89.50	12.99	.988	1.84
3.0	10	842.60 / 852.965	73	102 / 106	77 / 77	90.5	10.72	.989	1.88
4.0	10								
							Avg	.987	1.84

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.

Quality Assurance Handbook M4-2.3A (front side)

Form #REC-02

RAMCON ENVIRONMENTAL CORPORATION

EPA QA MANUAL VOL. III
Section No. 3.4.2
Revision No. 0
Date January 15, 1980
Page 17 of 22

Date 2-10-88 Thermocouple number Outlet

Ambient temperature 55°F °C Barometric pressure 29.96 in. Hg

Calibrator S. Greenwood 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 BATH	33° F	32° F	.03%
B	OVEN	152° F	150° F	.01%
C	OVEN	175° F	175° F	0%
D	Ambient	55° F	55° F	0%
	5-18-88	75° F	76° F	0%

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

[b] Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON ENVIRONMENTAL CORPORATION

Date 2-10-88 Thermocouple number Inlet

Ambient temperature 55°F °C Barometric pressure 29.96 in. Hg

Calibrator S. Greenwood 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 BATH	33°F	33°F	0%
B	OVEN	150°F	151°F	.007%
C	OVEN	175°F	173°F	.01%
D	AMBIENT	55°F	54°F	.02%
	5-18-88	75°F	78°F	Ok

[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

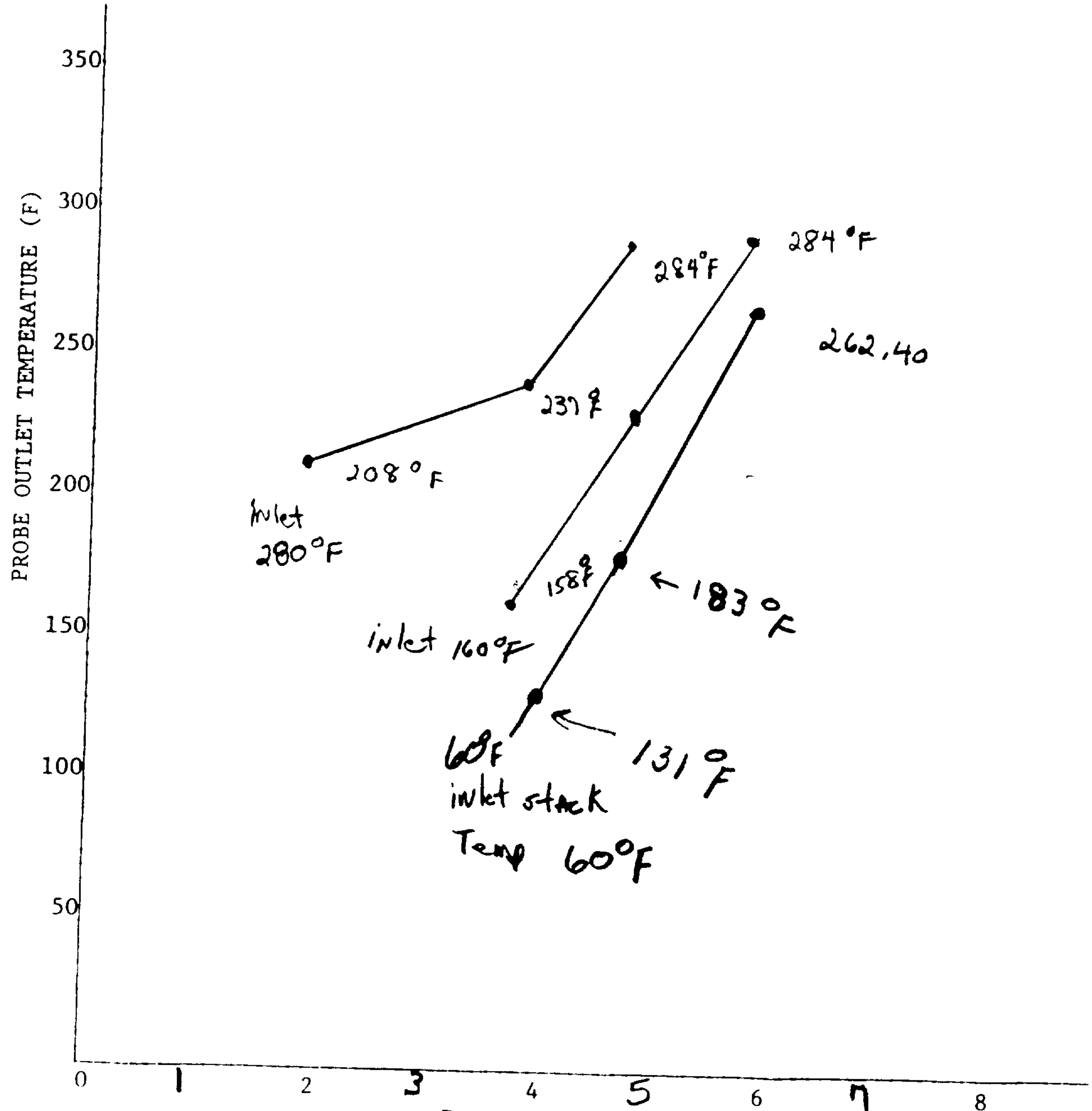
Heating Probe Calibration

Probe No. 41 Probe Length 4'

Date of Calibration 1-21-88 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



RAMCON ENVIRONMENTAL CORPORATION

Date 2-9-88 Thermocouple number 41

Ambient temperature 54 °C Barometric pressure 29.95 in. Hg

Calibrator S. Greenwood 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° F	31°F	.03%
B	Boiling Water	212°F	211°F	.005%
C	Oil	380°F	377°F	.008%
D	Ambient	54°F	53°F	.02%
	5/15 88	75°F	75°F	0%

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

[b] Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON ENVIRONMENTAL CORPORATION

Lear Siegler Stack Sampler

Nozzle Diameter Calibration

Date ____________ Signature ____________

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

Pitot Tube Calibration (S Type)

Pitot Tube Identification No. 41 Date 2-3-86

Calibrated by: Sam T. Turner

"A" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp (s) cm H_2O (in. H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(A)$
1	0.90	1.37	.811	< .01
2	0.60	.91	.812	< .01
3	0.41	.62	.806	< .01
		$\bar{C}_p$ (SIDE A)	.810	

"B" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp(s) cm H_2O in. H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(B)$
1	0.90	1.38	.808	< .01
2	0.60	.92	.808	< .01
3	0.41	.62	.807	< .01
		$\bar{C}_p$ (SIDE B)	.808	

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

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

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

Form No. EED-17-1

X. RAMCON PERSONNEL

RAMCON Environmental Stack Test Team

Sumner Buck - President

Sumner Buck is the President of RAMCON Environmental. He is a graduate of the EPA 450 "Source Sampling for Particulate Pollutants" course and the 474 "Continuous Emissions Monitoring" course all given at RTP. Mr. Buck is a qualified V.E. reader with current certification. Mr. Buck has personally sampled over 400 stacks including over 300 asphalt plants. He is 42 years old and a graduate of the University of Mississippi with graduate studies at Memphis State University and State Technical Institute of Memphis.

Sam Turner - Field Supervisor

Sam Turner has five years experience in the Air Division and is our field supervisor. He has sampled over 30 large boiler stacks and approximately 200 asphalt plants. He is a graduate of State Technical Institute of Memphis, and holds an Associate Degree in Environmental Engineering. He also has current certification as a V.E. reader.

RAMCON
ENVIRONMENTAL CORPORATION

RECEIVED
JUL 18 1988
N.O.V.A.A.
STEUBENVILLE, OH.

July 15, 1988

Mr. Ralph Kyanko
Ohio Valley Paving
243 W. Main Street
St. Clarksville, OH 43950
614/782-1240

Dear Ralph:

Confirming our conversation, weather permitting, RAMCON Environmental will schedule the test for EPA and Ohio N.S.P.S. emissions compliance on your Barber-Greene batch hot mix baghouse located near Morristown, Ohio. We will plan to test the week of August 8 with August 11, 1988 as a target date.

The State will want you to demonstrate compliance while operating the plant at or near capacity for the duration of the test which will take six to eight hours. We will begin testing around 7:30 a.m. that morning.

Should anything come up to alter this schedule, I will notify everyone concerned.

Sincerely,

G. Sumner Buck, III
President

GSBIII:mew

cc: Mr. Harold Strohmeyer
North Ohio Valley Air Authority
814 Adams Street
Steubenville, OH 43952
614/282-3908

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

RAMCON
ENVIRONMENTAL CORPORATION

PRETEST INFORMATION for PARTICULATE EMISSIONS TESTING

OHIO VALLEY PAVING
243 W. Main Street
St. Clarksville, OH 43950
614/782-1240

Sumner Buck
G. Sumner Buck, III
President

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

PRE-TEST INFORMATION

Personnel from RAMCON Environmental Corporation (REC) will be conducting a particulate emissions test for EPA and Ohio N.S.P.S. compliance at Ohio Paving's Barber-Greene batch mix asphalt plant located near Morristown, Ohio. Personnel conducting the test will be Ken Allmendinger, Team Leader and Bill Turner. The test samples will be brought back to our office at which time Kim Rea will be responsible for conducting the final laboratory analyses and the recording final data in the laboratory record books. Custody of the samples will be limited to Mr. Allmendinger and Ms. Rea.

The purpose of the test is to determine if the rate of particulate emissions from the plant's baghouse and the total contaminants by weight (grain loading) is below the allowable N.S.P.S. limits set by EPA and the State of Ohio. The allowable particulate emissions for EPA and the State of Ohio is .04 gr/DSCF.

Testing will be conducted according to EPA's Method 5 and will consist of three runs. The minimum volume of gas that will be sampled is .53 cubic feet per minute.

Testing will consist of:

1. Method 5 for particulate matter concentrations and moisture traverse.
2. Method 1 for sample and velocity traverse.
3. Method 2 for velocity and volumetric flow rate.
4. Method 3 for gas analysis.
5. Method 9 for visible emissions (if required).

All process data relevant to the sampling will be recorded and submitted with the final test report. All current calibrations on the equipment used in the testing will be available for the observers at the test site before the testing occurs. All laboratory procedures and data sheets used in the report will be the same as those previously submitted to the State in Ohio by RAMCON Environmental Corporation.

IV. THE SOURCE

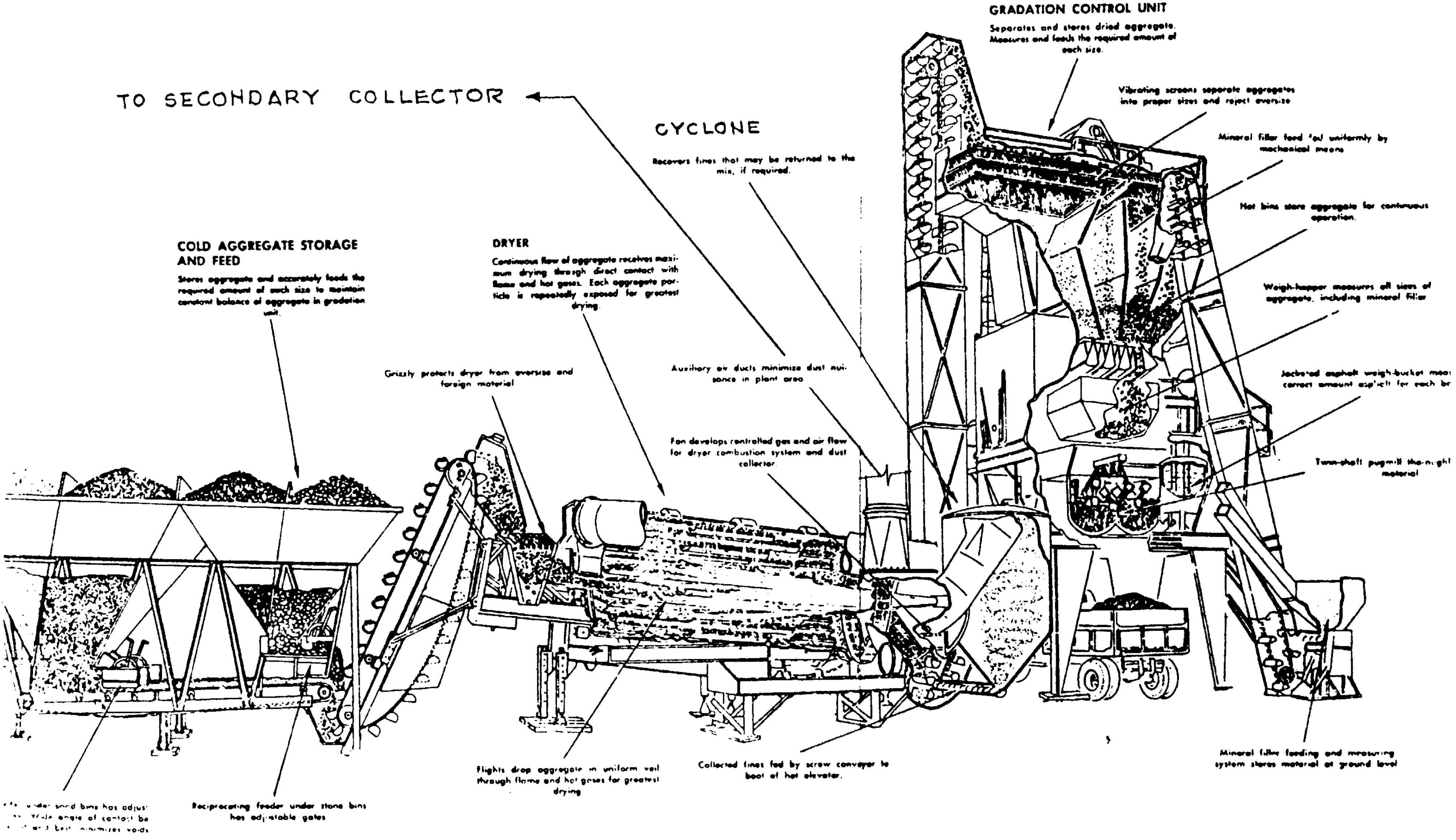
Ohio Paving employs a Barber-Greene batch mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt oil to bind the mixture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

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

The drum dryer uses a burner fired with fuel oil to heat air to dry the aggregate. The air is drawn into the system via an exhaust fan. After passing through the burner and the mixing drum, the air passes through a baghouse. The baghouse is manufactured by Barber-Greene. The exhaust gas is drawn through the baghouse and discharged to the atmosphere through the stack. The design pressure drop across the tube sheet is 1 - 6 inches of water. The particulate matter, which is removed by the baghouse is reinjected into the pugmill. The following sketch shows a typical batch mix asphalt plant.

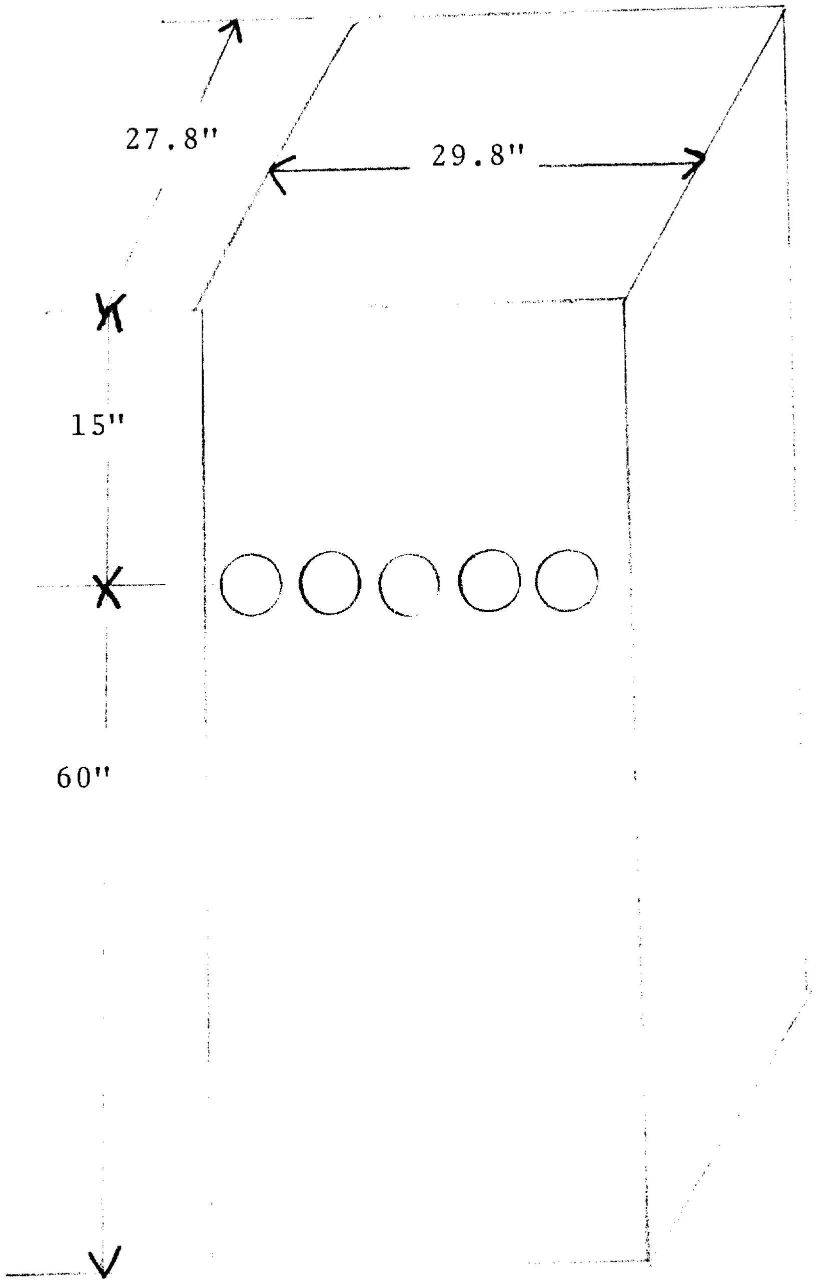
Figure 4-1

ASPHALT BATCH MIX PLANT - AN EXPLODED VIEW



Sampling Site: The emissions test will be conducted after a baghouse on a rectangular stack measuring 29.8" x 27.8" with an equivalent diameter of 28.7". Five sample ports are placed 15" down (0.5 diameters upstream) from the top of the stack and 60" up (2.09 diameters downstream) from the last flow disturbance. Thirty points will be sampled, six through each port for two minutes each for a total testing time of sixty minutes each test run.

Points on a Diameter	Probe Mark
1	2.3"
2	6.9"
3	11.5"
4	16.2"
5	20.8"
6	25.4"



Agency Use Only
Date Received ____________
No. Assigned ____________
Premise No. ____________

INTENT TO TEST NOTIFICATION

Proposed Test Date ____________
Pre-Test Meeting Desired? Yes ☐ No ☐

A. **Facility Information**

Name Ohio Valley Paving
Contact Person Ralph Kyanko
Address 243 W. Main St., St. Clarksville OH 43950
Telephone Number 614-782-1240

B. **Testing Firm Information**

Name Ramcon Environmental
Contact Person Sumner Buck
Address 223 Scott St., Memphis, TN 38112
Telephone Number 901/458-7000

C. **Source Sampling Information:** Identify all sources and pollutants to be sampled.

Source	Control Equipment	Monitoring Equipment	Pollutant to be Tested	EPA Test Method	Filter Box Temperature	Number of Sampling Points	Total Time for Test Run	Number of Sampling Runs
hot mix Asphalt plant	baghouse	N/A	particulate	1-5	250°±25	30	60	3

Any modifications to USEPA Reference Method(s)? Yes ☐ No ☒ ; If yes explain ____________

Sampling Location(s): Inlet ☐ Outlet ☒ Simultaneous ☐ Will cyclonic flow check(s) be conducted? Yes ☒ No ☐

Fuel Sampling: Coal - Proximate ☐ Ultimate ☐ Other (specify) N/A

Emission Rate to be calculated using: F-Factor ☐ Ultimate Coal Analysis ☐ Other (specify) grains/dscf

Are concurrent Method 9 readings to be performed? Yes ☒ No ☐ If required

D. **Sample Train Calibration:** All affected measuring and metering equipment should be calibrated within 60 days of the scheduled testing.