OBSERVER'S REPORT

COMPLIANCE TEST FOR

Particulate Emissions

Conducted on: October 14, 1991

Source: Valley Asphalt Plant #13
Ross, Ohio

Premise Number: 1409000029 P902

Test Firm: Ramcon, 223 Scott St., Memphis, Tennessee 38112

Prepared by: Trent R. Lewis II
LeRoy R. Gruber, AQE

Date Prepared: November 13, 1991

SOUTHWESTERN OHIO AIR POLLUTION CONTROL AGENCY

(S.W.O.A.P.C.A.)

APPENDIX K

OEPA STACK TEST REVIEW SUMMARY FORM

APPLICATION NUMBER 1409000029 P902

FACILITY NAME Valley Asphalt Plant #13

SOURCE DESCRIPTION (OR SCC CODE) Bituminous Concrete

CONTROL EQUIPMENT Bag Room

DATE(S) OF TEST 10-14-91

FINAL TEST REPORT RECEIVED ON 11-10-91

POLLUTANT(S) TESTED Particulate Emissions

TEST METHOD USEPA M5

TEST FIRM Ramcon

EMISSION RATES*:

ACTUAL (lb(s)/Hr) 1.84#/hr ALLOWABLE** 63#/hr

OPERATING RATES*:

DURING TEST** 290 TPH MAXIMUM** 300 TPH

EMISSION FACTOR***

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.

11/25/91
DATE OF REVIEW

L. R. Gruber & Trent Lewis II
REVIEWED BY

* BASED ON - RUN AVERAGE
** SPECIFY APPLICATION UNITS
*** SPECIFY IN UNITS OF MASS/INPUT

Testing for particulate emissions and visible emissions took place 10-14-91 at Valley Asphalt Plant #13 in Ross, Ohio.The drum dryer and asphalt mix towers are vented to a baghouse. The plant has a 300 TPH asphalt throughout rating. Up to 320 TPH can be run on dry days.OAC Rule 3745-17-17 mass emissions limits particulate at 63 #/hr. Visible emissions must be less than 20% opacity per hour; with a single six minute period allowable for over 20%. Last testing occurred Sept. 1986 and 29 #/hr. was measured. The baghouse was rebagged early October 1991.

USEPA Reference Methods 1-5 were utilized for testing. Particulate emissions averaged 1.84 #/hr. Usual run to run variations were seen. Stack Volumetric flow was measured at 24,464.8 dscfm at 281 degrees F and 11.63% moisture. The last test showed 1.43 mdscfh at 303 degrees F and 11.53% moisture.

Testing was done at five ports,six points for each port or 30 points total were sampled in the square stack. Visible emissions averaged near zero opacity and the baghouse pulsed about every five seconds.

The doghouse pulse pressure was 100 PSIG. A pressure drop of 4 to 5.4 was seen. Some fugitives were coming from the plant. A bluish haze came from the truck loading hopper. The roads were wet to minimize road fugitives.

Numerous jobs were run, including a 404 top mix, 402 intermediate and a 301 mix base. The plant averaged about 285 TPH, which was verified by truck weights. Plant #13 was using natural gas for drying. The feed material were damp to prevent fugitives.

Quality assurance measures included leak checks(main sample line, pitots) calibrations, (DGM thermocouples, scales) and proper documentation. All testing was observed by SWOAPCA. Calculations of flow rate, isokinetic ratio, and mass rate of emissions were checked and found to be correct

In conclusion, data of sufficient accuracy and precision was obtained. Testing was conducted at 97% capacity. Testing does not represent worst case conditions as rebagging recently occurred. Testing at permit renewal is a recommended permit condition.

24.21 2.83

1004 1020 1051

2.24 1.70

Source Valley Asphalt Plant #13 By Trent Lewis

Premise No. 140900029 Date 11-12-91

DATA SHEET

Examples		Run 1		
38.847	Vm(dcf)	37.555	40.037	38.7[illegible]
1.01	Y	1.01	1.01	1.01
27.93	Pbar(inHg)	29.95	30.01	30.[illegible]
2.35	DHP(H2O)	.91	.997	.90
96°	Tm, °F	86.72	70°	85
78.5	Vlc(ml)	256.00	[illegible]	245
12.0	CO2(percent)	5	5.30	530
08.7	02	14	14.[illegible]	14.30
80.8	N	81	[illegible]	80.40
00.1	CO	0	0	0
.84	Cp	.827	.827	.827
.4201	SQPD avg.	.411	.439	.434
230	Ts(°F)	276°	266°	302°
27.91	Ps(in,Hg.Pb+Ps)	29.95	30.01	30.01
21"	Stack diam	60"×60"	60"×60"	60"×60"
110.6	Mn(mg.)	27.4	21.1	16.9
.25"	Dn(in)	.35	.35	.35
72	Theta(min)	60	60	60
9820	F (Optional)			
4	H			
70	C			
10	S			
14	N			
6	O			
Allowable GCV (Optional)BTU/lb.				

Valley Ross #13 10-14-91 JR?
Randal OPERATOR - Charles - Plant Mgr
300TPH Asphalt Plant
- Charles Crook - RAMCON
Jobs 404 301 402
Firing on Natural GAS + Permit Condition *
OR RETEST

89931
-89873
48

Baghouse
4.0" .11" 5.2" 12 NOON

Baghouse pulse every 5 secs
* REBAGGED w/ BAGS LAST WEEK

+188
250 ml
438 - 400 = 38

ΔPs Stack .06" - AVG 230°F
LAST TEST AVG .3"

Y = 1.02
Cp .827

Asphalt Temp 320°F

OOM 545 - 584 VAC 3.5 max pretest leak 0.
Ts 270°F Imps ≅ 60°

RAMCON
ENVIRONMENTAL CORPORATION

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
VALLEY ASPHALT PLANT #13
ROSS, OHIO
October 14 & 15, 1991

Paul Prottengeier
Valley Asphalt Plant #13

G. Sumner Buck, III
President

Charles Crook
Team Leader

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

RAMCON
ENVIRONMENTAL CORPORATION

October 29, 1991

Mr. Paul Prottengeier
Valley Asphalt Plant
11641 Mosteller Road
Cincinnati, Ohio 45421

Re: Particulate Emissions Test: Ross, Ohio

Dear Mr. Prottengeier:

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 Ohio. 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. Lee Gruber
Air Quality Engineer
Southwestern Ohio Air Pollution Control Agency
1632 Central Parkway
Cincinnati, OH 45210

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

Sincerely,

G. Sumner Buck, III
President

GSBIII:djb

Enclosures

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

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I. INTRODUCTION

On October 14 & 15, 1991 personnel from RAMCON Environmental Corporation conducted a source emissions test for particulate emissions compliance at Valley Asphalt Plant #13 batch mix asphalt plant located in Ross, Ohio. RAMCON personnel conducting the test were Charles Crook, Team Leader and Brian McElyea. Tim Huey 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. Crook and Mr. McElyea.

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

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 Ohio are the same as those set by EPA.

Mr. Lee Gruber of Southwestern Ohio Air Pollution Control Agency observed the testing conducted by RAMCON Environmental.

SUMMARY OF TEST RESULTS

TABLE I

October 14 & 15, 1991

Test Run	Time	Grain Loading gr/DSCF	Isokinetic Variation	Emissions Lbs/Hr
1	10:53 - 12:13	0.0111	100.4%	2.24
2	09:20 - 10:27	0.0079	102.0%	1.70
3	12:08 - 13:23	0.0067	105.1%	1.32
	Average:	0.0086		1.75

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 Ohio. Therefore, the plant is operating in compliance with State and Federal Standards.

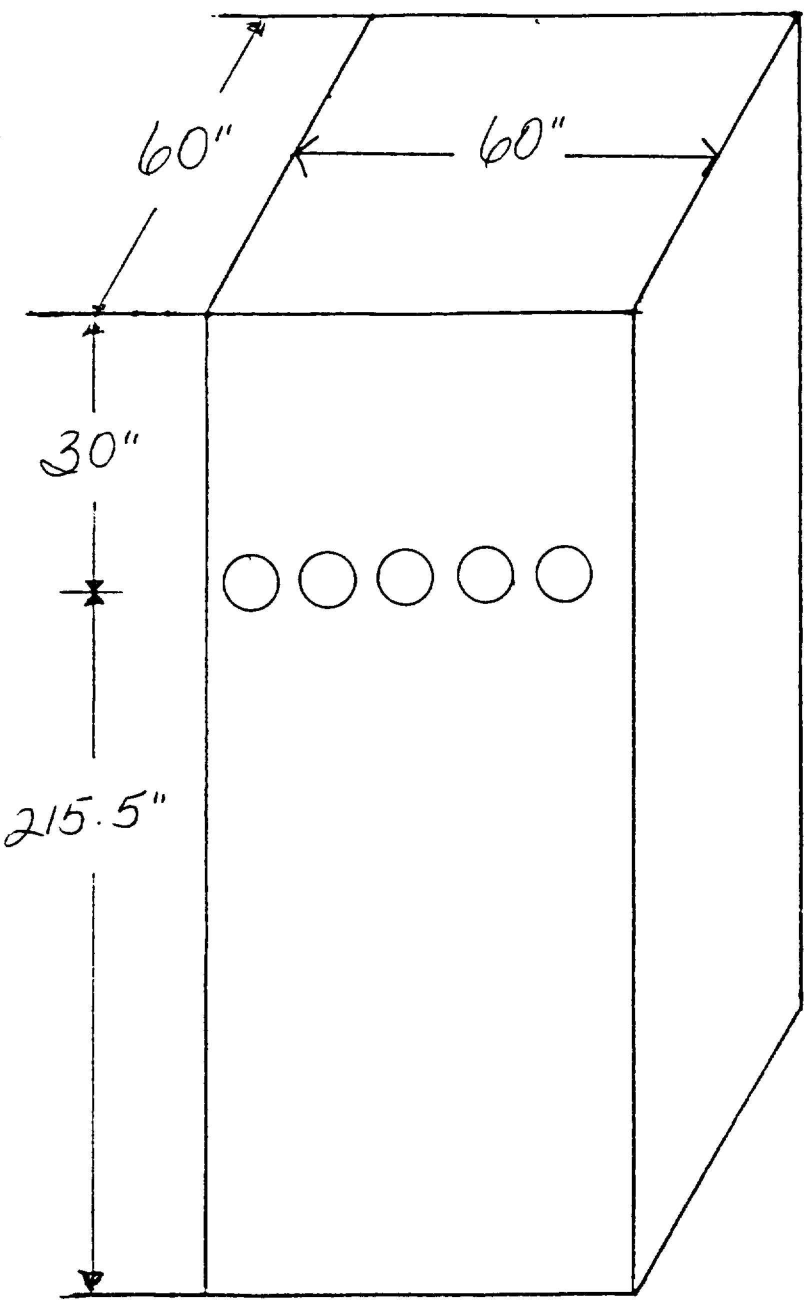
III. TEST PROCEDURES

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

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

C. Sampling Site: The emissions test was conducted after a baghouse on a square stack measuring 60.0" x 60.0" with an equivalent diameter of 60.0". Five sampling ports were placed 30.0" down (0.5 diameters upstream) from the top of the stack and 215.5" up (3.6 diameters downstream) from the last flow disturbance. The ports were evenly spaced on 12.0" centers. The two outside ports are 6.0" 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	*5.0"
2	15.0"
3	25.0"
4	35.0"
5	45.0"
6	55.0"



IV. THE SOURCE

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Valley Asphalt Plant #13 employs a McCarter 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 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. When recycled asphalt mix is used, it is added directly into the pugmill. 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 pavement 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 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 Natural Gas 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 baghouse. The baghouse is manufactured by McCarter. 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 2 - 6 inches of water. The particulate matter, which is removed by the baghouse, is reinjected into the pugmill.

...m ...#03

(5)

DATA ON FACILITY BEING STACK TESTED

COMPANY NAME Valley Asphalt Corp COMPANY REP. C. Ryan PHONE (513) 738-2644
LOCATION OF FACILITY Ross, Ohio ORIGINAL START-UP DATE ______ DESIGNED CAPACITY 300 TPH
OEM ______ MODEL NO. ______ TYPE ______ AC TYPE AC-20

1	2	3	4	5		6	7	8	9		10	11	12
Time (24 HR)	Fuel Use	Burner Setting	Blower Pressure	Production Rate 290 TPH		Asphalt Cement	Mix Temp.	Exhaust Gas Temp.	__ Venturi Scrubber ✓ Baghouse		Ambient Temp.	Relative Humidity	Exhaust Damper Position
NOTE: check small box in column when moisture sample is taken	__ #Fuel Oil Nat. Gas ✓ Propane __ Coal __ __ other			__ Mix __ Aggregate TPH	__ RAP TPH	%	°F	°F	Pressure Drop in w.g.	Water Pressure psi	°F	%	
11:55		72%		285		5%	270°	240°	5"		62°		100%
12:10		78%		288		5%	275	230°	5.2"		63°		100%
12:25		81%		280		5%	275	235°	5.3"		63°		100%
12:40		79%		286		5%	270	240°	5.2"		63°		100%
12:55		65%		260		5%	280	245°	5.3"		63°		100%
1:10		70%		267		5%	275	230	5.2"		63°		100%
2:00	1.88	82%		253		5.7%	275	240	5.1"		63°		100%
9:15		78%		270		5.1%	270	240	6.1"		40°		100%
9:30		78%		271		5.1%	270	240	5.8"		43°		100%
9:45		79%		280		5.1%	275	240	6.0"		43°		100%
10:00		65%		240		5.1%	280	220	5.8		44°		100%
10:15		75%		270		5.1%	275	230	5.4		45°		100%
10:30		70%		260		5.1%	280	230	5.3		46°		100%
11:00		70%		270		5.1%	285	235	5.2		48°		100%
12:00		78%		270		5.1%	280	240	5.1		50°		100%
12:15		80%		260		5.1%	275	250	5.1		52°		100%
12:30		80%		281		5.1%	280	255	5.2		54°		100%
12:45		79%		283		5.1%	275	245	5.1		55°		100%

Form REC#04

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 Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position
1:00		75%		280		5.1%	280°	250°	5.2		56°		100%
1:15		85%		283		5.1%	275	255°	5.3		54°		100%
1:30		80%		280		5.1%	275	240°	5.2		54°		100%

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DATA SUMMARY (?) ON STACK BEING TESTED

AGGREGATE

1. Name/type of mix 301 Base
2. Name/type of 2nd mix (if used) 404 Surface
3. Type/temperature of Liquid Asphalt AC-20 / 300 °F
4. Sieve/Screening analysis: ______ % Passing;

	1st mix / 2nd mix		1st mix / 2nd mix		1st mix / 2nd mix
1"	___ / ___	3/8"	___ / ___	#___	___ / ___
3/4"	___ / ___	#200	___ / ___	#___	___ / ___
1/2"	___ / ___	#___	___ / ___	#___	___ / ___

CONTROL SYSTEM

Manufacturer McCarter Corp.

A. Baghouse:

1. Type of bags Nomex # of bags 756 Sq. ft. of bags 10,206
2. Air to cloth ratio ______ Designed ACFM ______
3. Type of cleaning - pulse jet ✓ reverse air ______ plenum pulse ______ other ______
4. Cleaning cycle time .2 Sec. Interval between cleaning cycle 6 Sec.
5. Pulse pressure on cleaning cycle 90 # psi

B. Scrubber:

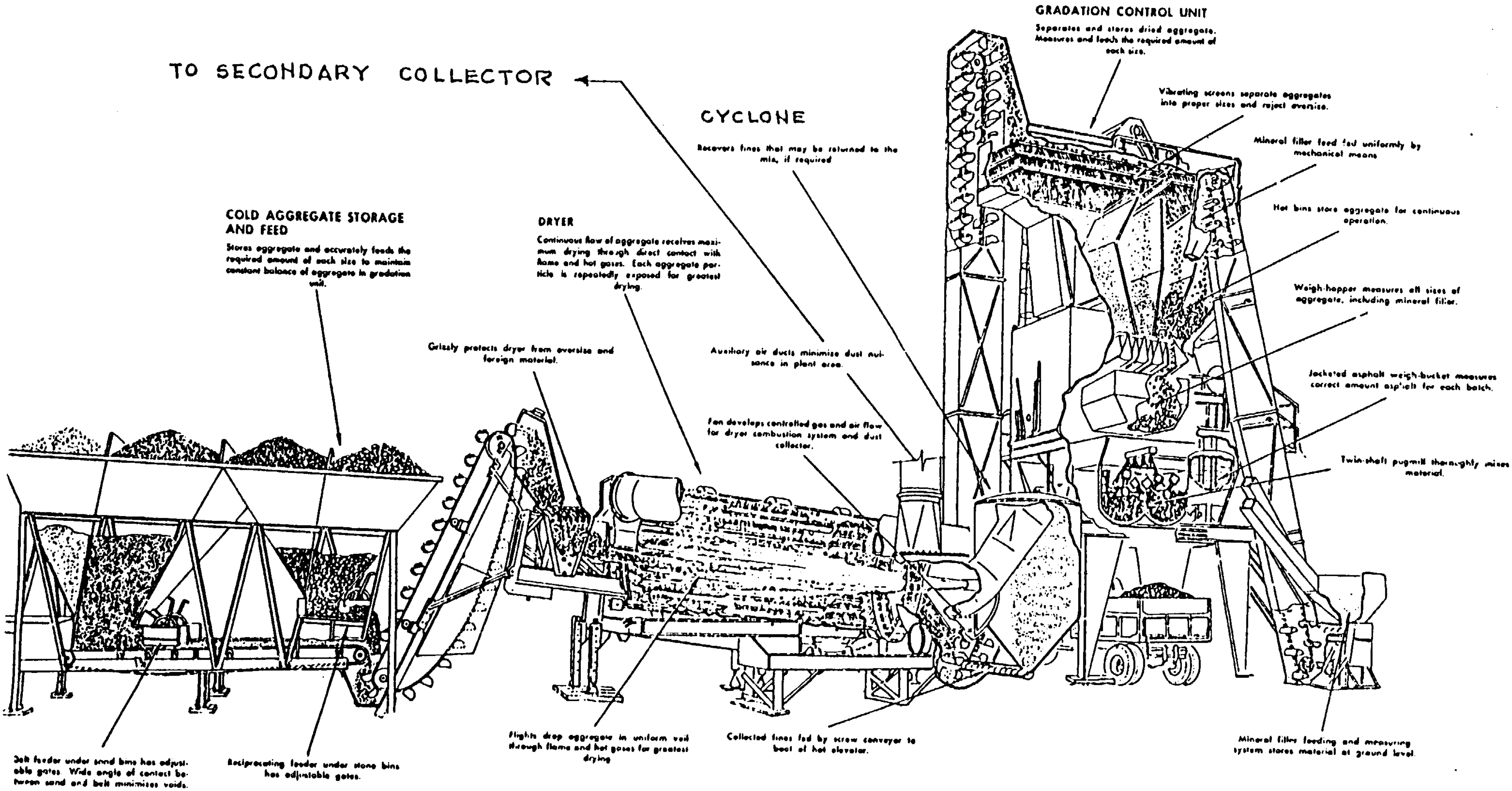
1. Type - Venturi ______ Wet Washer ______
   Spray Booth ______ Other ______
2. Gallons per minute through system ______
3. Water source ______ (i.e., pond, lagoon, etc.)
4. Number of spray nozzles ______

Company Name ______ Date ______

Company Representative ______

Figure 4-1

ASPHALT BATCH MIX PLANT - AN EXPLODED VIEW



(8)

Source: Asphalt Plant Manual, The Asphalt Institute, 1967

1. Aggregate bins: Virgin aggregate is fed individually into bins by type. It is metered onto a conveyor belt running under the bins to a shaker screen. The proportion to 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 an outer shell of this drum. Hot liquid asphalt is injected in the outer shell of the 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 baffling: A baffling 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 product.

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 lading scale which tells the plant operator the amount of asphalt that is being trucked on each individual load.

13. Fuel storage.

14. Stack

V. EQUIPMENT USED

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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.

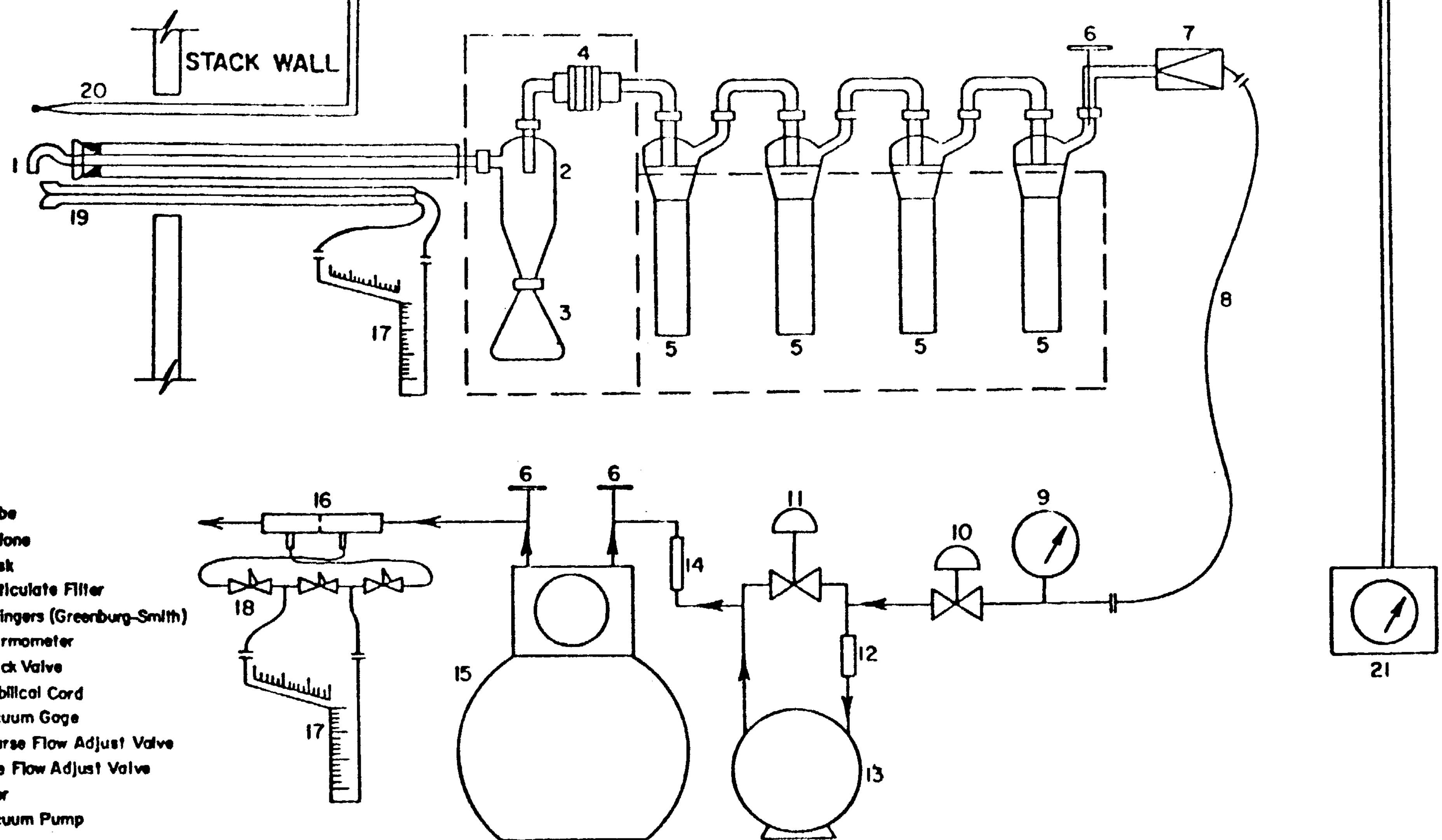
B. An Airguide Instruments Model 211-B (uncorrected) aneroid barometer was used to check the barometric pressure.

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

(14)

SAMPLE ANALYTICAL DATA FORM

Company Name VALLEY 13

Sample Location Stack

Blank Volume (V_a) 228 ml

Date/Time wt. blank 10/22

Date/Time wt. blank 10/23

Relative Humidity in Lab 39 %

Density of Acetone (ρ_a) .7857 mg/ml

Gross wt. 171.7687 g

Gross wt. 171.7685 g

Ave. Gross wt. 171.7686 g

Tare wt. 171.7682 g

Weight of blank (m_{ab}) 0.0004 g

Acetone blank residue concentration (C_a) : (C_a) = (m_{ab}) / (V_a) (ρ_a) = (0,000002 mg/g)

Acetone Blank Wt. : $W_a = C_a V_{aw} \rho_a$ = (0,000002) (293) (.7857) = (0,000460 g)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	293	293	293
Date/Time of wt. 10/22 10:00 Am Gross wt.	g	161.5600	165.1130	162.6769
Date/Time of wt. 10/23 8:00 Am Gross wt.	g	161.5597	165.1128	162.6774
Average Gross wt.	g	161.5599	165.1129	162.6772
Tare wt.	g	161.5379	165.0954	162.6660
Less Acetone blank wt. (W_a)	g	0.0005	0.0005	0.0005
Weight of particulate in acetone rinse (m_a)	g	0,0215	0,0170	0.0107

Filter Numbers	#	PT5388	PT5113	PT5112
Date/Time of wt. 10/22 10:00 Am Gross wt.	g	0.5901	0.5636	0.5666
Date/Time of wt. 10/23 8:00 Am Gross wt.	g	0.5909	0.5640	0.5672
Average Gross wt.	g	0.5905	0.5638	0.5669
Tare wt.	g	0.5846	0.5597	0.5607

Weight of particulate on filter (m_f)	g	0.0059	0.0041	0.0062
Weight of particulate in acetone rinse (m_a)	g	0.0215	0.0170	0.0107
Total weight of particulate (m_n)	g	0.0274	0.0211	0.0169

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 K. Hipson   Signature of Reviewer [signature]

D:\DONNA\FORMS\LAB\SAMPLE.TBL

Valley Asphault #13
Company Name

10-14-91
Date

REFERENCE METHOD 3: GAS ANALYSIS BY FYRITE

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

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

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

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

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

RUN 1:	$CO_{2\%}$	5	$CO_{2\%}$	5	$CO_{2\%}$	5	AVG.	5
	$O_{2\%}$	14	$O_{2\%}$	14	$O_{2\%}$	14	AVG.	14.0
	$N_{2\%}$		$N_{2\%}$		$N_{2\%}$		AVG.	81.0
RUN 2:	$CO_{2\%}$	5	$CO_{2\%}$	6	$CO_{2\%}$	5	AVG.	5.3
	$O_{2\%}$	14	$O_{2\%}$	15	$O_{2\%}$	14	AVG.	14.3
	$N_{2\%}$		$N_{2\%}$		$N_{2\%}$		AVG.	80.4
RUN 3:	$CO_{2\%}$	6	$CO_{2\%}$	5	$CO_{2\%}$	5	AVG.	5.3
	$O_{2\%}$	14	$O_{2\%}$	14	$O_{2\%}$	15	AVG.	14.3
	$N_{2\%}$		$N_{2\%}$		$N_{2\%}$		AVG.	80.4

OHIO BACK-HALF ANALYSIS

EVAPORATION

Plant Location VALLEY 13

Sample Location

Blank Volume (V_{wb}) 200 mℓ

Date/Time wt. blank 10-25/9A

Date/Time wt. blank 10-25/3P

Date 10-22-91

Relative Humidity in lab 39 %

Density of Water (ρ_w) = 1.0

Gross wt. 175.2107 g

Gross wt. 175.2105 g

Ave. Gross wt. 175.2106 g

Tare wt. 175.2104 g

Weight of blank (m_{wb}) 0.0002 g

Water blank residue concentration (C_w) $(C_w) = (M_{wb}) / (V_{wb}) (\rho_w)$ = (0.000001 mg/g)

Weight of blank residue in impinger rinse: $W_w = C_w V_w$

		Run # 1	Run # 2	Run # 3
Impinger rinse volume (V_w)	mℓ	440	440	445
Date/Time of wt 10-28/9A Gross wt	g	173.5529	165.1054	164.6853
Date/Time of wt 10-28/3P Gross wt	g	173.5534	165.1059	164.6858
Average Gross wt	g	173.5532	165.1057	164.6856
Tare wt	g	173.5386	165.0927	164.6742
Less Water blank wt (W_w)	g	0.0004	0.0004	0.0004
Wt of particulate in impinger rinse (m_w)	g	0.0142	0.0126	0.0110

Remarks:

Signature of Analyst [signature]

Signature of Reviewer

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VII. CALCULATIONS

VALLEY ASPHALT PLANT #13
ROSS, OHIO

SUMMARY OF TEST DATA

		10-14-91 RUN #1	10-15-91 RUN #2	10-15-91 RUN #3
SAMPLING TRAIN DATA				
	start	10:53	09:20	12:08
	finish	12:13	10:27	13:23
1. Sampling time, minutes	θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.3500	.3500	.3500
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000668	.000668	.000668
4. Isokinetic variation	I	100.4	102.0	105.1
5. Sample gas volume - meter cond., cf.	V_m	38.355	40.037	38.737
6. Average meter temperature, ^oR	T_m	547	530	543
7. Avg. oriface pressure drop, in. H_2O	dH	0.91	1.00	0.90
8. Total particulate collected, mg.	M_n	27.40	21.10	16.90
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2.	A	25.00	25.00	25.00
10. Absolute stack gas pressure, in. Hg.	P_s	29.95	30.01	30.01
11. Barometric pressure, in. Hg.	P_{bar}	29.95	30.01	30.01
12. Avg. absolute stack temperature, R^o	T_s	727	726	760
13. Average -\/vel. head, (C_p= .83)	-\/dP	0.42	0.44	0.42
14. Average stack gas velocity, ft./sec.	V_s	28.46	29.66	29.06
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	256.00	258.00	267.00
16. Moisture in stack gas, %	B_{ws}	24.21	22.83	24.46
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1411	1502	1376
18. Stack gas flow rate, cfm	acfm	42690	44490	43590
19. Particulate concentration, gr/dscf	C_s	0.0111	0.0079	0.0067
20. Particulate concentration, lb/hr	E	2.24	1.70	1.32
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	5.00	5.30	5.30
23. Percent O_2 by volume	O_2	14.00	14.30	14.30
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	81.00	80.40	80.40

Format: summryR3

Dry Gas Volume

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

Where:

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

V_m = Dry Gas Volume measured by meter, cu. ft.

P_{bar} = Barometric pressure at oriface meter, in. Hg.

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

T_m = Absolute temperature at meter ^oR.

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

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

Y = Dry gas meter calibration factor.

13.6 = Inches water per inches Hg.

RUN 1:

$$V_{m(std)} = (17.64)(1.020)(\ 38.355) \left[\frac{(29.95) + \frac{0.91}{13.6}}{547} \right] = 37.870 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(1.020)(\ 40.037) \left[\frac{(30.01) + \frac{1.00}{13.6}}{530} \right] = 40.890 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(1.020)(\ 38.737) \left[\frac{(30.01) + \frac{0.90}{13.6}}{543} \right] = 38.605 \text{ dscf}$$

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:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{27.40}{37.870}\right] = 0.0111 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{21.10}{40.890}\right] = 0.0079 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{16.90}{38.605}\right] = 0.0067 \text{ gr./dscf.}$$

Dry Molecular Weight

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

Where:

M_d = Dry molecular weight, lb./lb.-mole.

$\%CO_2$ = Percent carbon dioxide by volume (dry basis).

$\%O_2$ = Percent oxygen by volume (dry basis).

$\%N_2$ = Percent nitrogen by volume (dry basis).

%CO = Percent carbon monoxide by volume (dry basis).

0.264 = Ratio of O_2 to N_2 in air, v/v.

0.28 = Molecular weight of N_2 or CO, divided by 100.

0.32 = Molecular weight of O_2 divided by 100.

0.44 = Molecular weight of CO_2 divided by 100.

Run 1:

$$M_d = 0.44(5.00\%) + 0.32(14.00\%) + 0.28(.00\% + 81.00\%) = 29.36 \frac{lb}{lb\text{-}mole}$$

Run 2:

$$M_d = 0.44(5.30\%) + 0.32(14.30\%) + 0.28(.00\% + 80.40\%) = 29.42 \frac{lb}{lb\text{-}mole}$$

Run 3:

$$M_d = 0.44(5.30\%) + 0.32(14.30\%) + 0.28(.00\% + 80.40\%) = 29.42 \frac{lb}{lb\text{-}mole}$$

Water Vapor Condensed

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

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

Where:

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

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

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

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

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

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

p_w = Density of water, 0.002201 lb/ml.

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

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

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

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

Run 1:

$V_{wc(std)}$ = (0.04707) (240.0) = 11.3 cu.ft

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

Run 2:

$V_{wc(std)}$ = (0.04707) (240.0) = 11.3 cu.ft

$V_{wsg(std)}$ = (0.04715) (18.0) = 0.8 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (245.0) = 11.5 cu.ft

$V_{wsg(std)}$ = (0.04715) (22.0) = 1.0 cu.ft

Moisture Content of Stack Gases

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

Where:

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

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

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

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

Run 1:

$$B_{ws} = \frac{11.3 + 0.8}{11.3 + 0.8 + 37.870} \quad X \quad 100 = 24.21\ \%$$

Run 2:

$$B_{ws} = \frac{11.3 + 0.8}{11.3 + 0.8 + 40.890} \quad X \quad 100 = 22.83\ \%$$

Run 3:

$$B_{ws} = \frac{11.5 + 1.0}{11.5 + 1.0 + 38.605} \quad X \quad 100 = 24.46\ \%$$

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 = 29.36 (1 - 24.21) + 18 (24.21) = 26.61 (lb./lb.-mole)

Run 2:

M_s = 29.42 (1 - 22.83) + 18 (22.83) = 26.81 (lb./lb.-mole)

Run 3:

M_s = 29.42 (1 - 24.46) + 18 (24.46) = 26.63 (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 $\left[(g/g\text{-mole})\text{-}(mm\ Hg)\ /\ (^oK)(mm\ H_2O)\right]^{1/2}$

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:

$$V = (85.49)\ (.83)\ (0.42) \sqrt{\frac{727}{(29.95)(26.61)}} = 28.46 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (.83)\ (0.44) \sqrt{\frac{726}{(30.01)(26.81)}} = 29.66 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (.83)\ (0.42) \sqrt{\frac{760}{(30.01)(26.63)}} = 29.06 \text{ ft/sec.}$$

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, (^{o}f).

T_s = Absolute stack temperature, (^{O}R).

T_{std} = Standard absolute temperature, (528^{O}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:

$$Q_{sd}=3600(1- .2421)(28.46)(25.00)\left[\frac{528}{727}\right]\left[\frac{29.95}{29.92}\right] = 1411315.3 \; \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1- .2283)(29.66)(25.00)\left[\frac{528}{726}\right]\left[\frac{30.01}{29.92}\right] = 1502670.9 \; \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1- .2446)(29.06)(25.00)\left[\frac{528}{760}\right]\left[\frac{30.01}{29.92}\right] = 1376701.7 \; \frac{dscf}{hr}$$

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:

$$E = \frac{(0.0111)\,(1411315.3)}{7000} = 2.24 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(0.0079)\,(1502670.9)}{7000} = 1.70 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0067)\,(1376701.7)}{7000} = 1.32 \text{ lb. / hr.}$$

Isokinetic Variation

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

Where:

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

Run 1:

$$I = (100)(727)\left[\frac{(0.002669)(256.0) + \frac{38.355}{547}\left[29.95 + \frac{0.91}{13.6}\right]}{60\,(60.0)\,(28.46)\,(29.95)\,(.000668)}\right] = 100.4\%$$

Run 2:

$$I = (100)(726)\left[\frac{(0.002669)(258.0) + \frac{40.037}{530}\left[30.01 + \frac{1.00}{13.6}\right]}{60\,(60.0)\,(29.66)\,(30.01)\,(.000668)}\right] = 102.0\%$$

Run 3:

$$I = (100)(760)\left[\frac{(0.002669)(267.0) + \frac{38.737}{543}\left[30.01 + \frac{0.90}{13.6}\right]}{60\,(60.0)\,(29.06)\,(30.01)\,(.000668)}\right] = 105.1\%$$

VALLEY ASPHALT PLANT #13
ROSS, OHIO
10-14-91

PERCENT EXCESS AIR

$$\% E_a = \frac{100 \times (\% O_2) - 0.5 (\% CO)}{0.264 (\% N_2) - (\% O_2) + 0.5 (\% CO)}$$

Where: $\%E_a$ = Percent excess air.

$\%O_2$ = Percent oxygen by volume, dry basis.

$\%CO$ = Percent carbon monoxide by volume, dry basis.

$\%CO_2$ = Percent carbon dioxide by volume, dry basis.

$\%N_2$ = Percent nitrogen by volume, dry basis.

Run # 1: $$\frac{100 \times (\% \; 14.00) - .05 (\% \; .00)}{0.264 (\% \; 81.00) - (\% \; 14.00) + 0.5 (\% \; .00)} = 189.6 \%$$

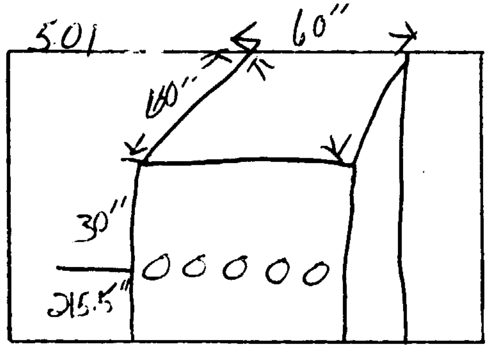
Run # 2: $$\frac{100 \times (\% \; 14.30) - .05 (\% \; .00)}{0.264 (\% \; 80.40) - (\% \; 14.30) + 0.5 (\% \; .00)} = 206.5 \%$$

Run # 3: $$\frac{100 \times (\% \; 14.30) - .05 (\% \; .00)}{0.264 (\% \; 80.40) - (\% \; 14.30) + 0.5 (\% \; .00)} = 206.5 \%$$

VIII. FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant: Valley Asphalt #13
Location: Ross Ohio
Operator: C. Crock
Date: 10-14-91
Run No.: 1
Sample Box No.: 1
Meter Box No.: C-100
Meter H @: 1.40
C Factor: 1.02
Pitot Tube Coefficient Cp: .827



Schematic of Stack Cross Section

Ambient Temperature: 70
Barometric Pressure: 29.95
Assumed Moisture, %: 20
Probe Length, m(ft): 5 ft
Nozzle Identification No.: 0.000668
Avg. Calibrated Nozzle Dia., (in.): .351/.351/.35
Probe Heater Setting: 4
Leak Rate, m^3/min. (cfm): 0 @ 7"
Probe Liner Material: SS
Static Pressure, mm Hg (in. Hg): -.01
Filter No.: P55388

	IMPINGER VOLUME ml	SILICA GEL WEIGHT, g
FINAL	440	216
INITIAL	200	200
DIFFERENCE	240	16

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	10:53 / 10:55	1	250	.08	.40	545.900 / 546.7	74	68	260	60
2	10:57	1	270	.10	.50	547.6	80	68	250	60
3	10:59	2	270	.15	.75	548.8	86	68	250	60
4	11:01	2	270	.18	.90	550.5	88	68	250	60
5	11:03	2	270	.18	.90	551.6	92	70	250	60
6	11:05	2	270	.20	1.0	552.8	94	70	250	60
B 1	11:10 / 11:12	1	265	.10	.50	553.6	90	72	250	60
2	11:14	2	270	.15	.75	554.7	92	72	250	60
3	11:16	2	270	.18	.90	556.2	96	72	250	60
4	11:18	3	270	.23	1.2	557.6	100	74	250	60
5	11:20	3	270	.20	1.0	558.8	100	74	250	60
6	11:22	3	265	.22	1.1	560.2	102	74	250	60

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 10-14-91 LOCATION Ross OH. 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	11:30 / 11:32	2	270	.10	.50	561.2	90	80	250	60
2	11:34	2	270	.15	.75	562.5	98	78	250	60
3	11:36	3	270	.21	1.1	563.8	102	78	250	60
4	11:38	3	270	.25	1.3	565.4	102	78	250	60
5	11:40	3	270	.25	1.3	567.0	102	78	250	60
6	11:42	3	270	.20	1.0	568.3	102	78	250	60
D 1	11:44 / 11:46	2	270	.18	.90	569.4	98	78	250	60
2	11:48	3	275	.18	.90	570.7	102	78	250	60
3	11:50	3	270	.22	1.1	572.3	106	78	250	60
4	11:52	3	270	.25	1.3	573.9	106	78	250	60
5	11:54	3	270	.21	1.1	575.2	106	78	250	60
6	11:56	3	265	.20	1.0	576.5	106	78	250	60
E 1	12:01 / 12:03	2	260	.10	.50	577.7	100	80	250	60
2	12:05	3	265	.17	.85	578.9	104	80	250	60
3	12:07	2	260	.15	.75	580.0	106	80	250	60
4	12:09	3	260	.21	1.1	581.5	108	80	250	60
5	12:11	3	260	.20	1.0	582.8	108	80	250	60
6	12:13	3	255	.20	1.0	584.255	108	80	250	60

(29)

RAMCON ENVIRONMENTAL CORPORATION

Plant: Valley Asphault #13

Location: Ross Ohio

Operator: C. Crook

Date: 10-15-91

Run No.: 2

Sample Box No.: 1

Meter Box No.: C-100

Meter H @: 1.4

C Factor: 1.02

Pitot Tube Coefficient Cp: .827

Schematic of Stack Cross Section: 5 Ω

Ambient Temperature: 50

Barometric Pressure: 30.01

Assumed Moisture, %: 25

Probe Length, m(ft): 5

Nozzle Identification No.: .000668

Avg. Calibrated Nozzle Dia., (in.): .35/.35/.35

Probe Heater Setting: 4

Leak Rate, m^3/min.(cfm): .15 @ 15"

Probe Liner Material: SS

Static Pressure, mm Hg (in.Hg): +.01

Filter No.: PT5113

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	440	218
INITIAL	200	200
DIFFERENCE	240	18

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	9:20 / 9:22	2	265	.18	.90	584.8 / 586.3	60	52	250	60
2	9:24	1	265	.10	.50	587.2	68	52	250	60
3	9:26	2	265	.12	.60	588.3	72	54	250	60
4	9:28	2	265	.12	.60	589.4	72	54	250	60
5	9:30	3	265	.23	1.2	590.5	76	54	250	60
6	9:32	3	265	.21	1.1	591.9	78	54	250	60
B 1	9:34 / 9:36	3	265	.25	1.3	593.5	72	54	250	60
2	9:38	3	265	.18	.90	594.8	76	54	250	60
3	9:40	3	265	.18	.90	596.1	80	54	250	60
4	9:42	3	265	.20	1.0	597.6	82	56	250	60
5	9:44	3	265	.24	1.2	598.5	84	56	250	60
6	9:46	3	265	.22	1.1	600.2	84	56	250	60

Form #REC-05

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 10-15-91 LOCATION Ross OHIO 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	9:47 / 9:49	3	265	.21	1.1	601.6	80	56	250	60
2	9:51	3	265	.18	.90	602.9	84	56	250	60
3	9:53	3	265	.23	1.2	604.5	86	56	250	60
4	9:55	3	265	.27	1.4	606.1	88	58	250	60
5	9:57	3	265	.21	1.1	607.4	88	58	250	60
6	9:59	3	265	.25	1.3	608.9	88	58	250	60
D 1	10:01 / 10:03	3	255	.16	.80	610.3	80	58	250	60
2	10:05	3	255	.19	.95	611.8	86	60	250	60
3	10:07	3	260	.22	1.1	613.5	88	60	250	60
4	10:09	3	265	.25	1.3	614.4	90	60	250	60
5	10:11	3	265	.25	1.3	616.0	90	60	250	60
6	10:13	3	270	.20	1.0	617.3	90	60	250	60
E 1	10:15 / 10:17	3	270	.20	1.0	618.8	86	60	250	60
2	10:19	3	270	.13	.65	619.7	88	60	250	60
3	10:21	3	270	.13	.65	620.9	90	60	250	60
4	10:23	3	275	.18	.90	622.1	90	60	250	60
5	10:25	3	275	.21	1.1	623.5	92	60	250	60
6	10:27	3	270	.17	.85	624.837	92	60	250	60
			7970							

(31)

RAMCON ENVIRONMENTAL CORPORATION

Plant Valley Paving #13
Location Ross OHIO
Operator C. Crook
Date 10-15-91
Run No. 3
Sample Box No. 1
Meter Box No. C-100
Meter H @ 1.4
C Factor 1.02
Pitot Tube Coefficient Cp .827

Ambient Temperature 65
Barometric Pressure 30.01
Assumed Moisture, %
Probe Length, m(ft) 5 Ft
Nozzle Identification No. C 600668
Avg. Calibrated Nozzle Dia., (in.) .35/.35/.35
Probe Heater Setting 4
Leak Rate, m^3/min.(cfm) .008 @ 15"
Probe Liner Material SS
Static Pressure, mm Hg(in.Hg) +.01
Filter No. PT 5112

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	445	222
INITIAL	200	200
DIFFERENCE	245	22

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 H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	12:08 / 12:10	1	300	.06	.30	625.2 / 626.6	74	66	250	60
2	12:12	2	300	.11	.55	627.5	80	66	250	60
3	12:14	2	300	.20	1.0	628.9	86	66	250	60
4	12:16	2	300	.18	.90	630.1	88	66	250	60
5	12:18	2	315	.19	.95	631.9	90	66	250	60
6	12:20	2	310	.15	.75	632.7	92	68	250	60
B 1	12:23 / 12:25	3	305	.23	1.2	634.4	88	70	250	60
2	12:27	3	310	.19	.95	635.5	90	70	250	60
3	12:29	3	315	.20	1.0	636.9	94	70	250	60
4	12:31	3	315	.21	1.1	638.5	96	70	250	60
5	12:33	3	315	.23	1.2	639.9	96	70	250	60
6	12:35	3	310	.16	.80	641.0	98	70	250	60

Form #REC-05

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 10-15-91 LOCATION Ross OH. TEST NO. 3

TRAVERSE POINT [redacted]	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
						642.6	90	72	250	60
C 1	12:38 / 12:40	3	295	.23	1.2	643.8	94	72	250	60
2	12:42	2	300	.16	.80	645.2	98	72	250	60
3	12:44	3	300	.20	1.0	646.5	100	72	250	60
4	12:46	3	300	.20	1.0	648.2	100	72	250	60
5	12:48	3	300	.21	1.1	649.4	100	72	250	60
6	12:50	3	295	.20	1.0	650.5	94	74	250	60
D 1	12:54 / 12:56	3	300	.12	.60	651.9	98	74	250	60
2	12:58	3	300	.21	1.1	652.8	98	74	250	60
3	1:00	3	300	.21	1.1	654.9	98	74	250	60
4	1:02	3	300	.20	1.0	656.2	100	74	250	60
5	1:04	3	305	.19	.95	657.5	102	74	250	60
6	1:06	3	305	.21	1.1	659.0	96	74	250	60
E 1	1:09 / 1:13	2	310	.12	.60	660.2	98	74	250	60
2	1:15	2	310	.12	.60	660.9	100	76	250	60
3	1:17	2	300	.09	.45	662.1	102	76	250	60
4	1:19	3	295	.20	1.0	663.5	102	76	250	60
5	1:21	3	290	.16	.80	664.4/37	102	76	250	60
6	1:23	3	280	.16	.80					

IX. CALIBRATION

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ________ Date 10-26-91 Meter box number C-100 Plant ________

Barometric pressure, P_b = 30.37 in. Hg Dry gas meter number ________ Pretest Y ________

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: Inlet (t_{d_i}), °F	Dry gas meter: Outlet (t_{d_o}), °F	Dry gas meter: Average[a] (t_d), °F				$\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1	~~10~~ 5	73.960 / 68.800	71	112 / 104	78 / 78	93	8.13		1.00	
2	10	68.485 / 58.300	71	114 / 110	78 / 74	95	11.45		1.02	
3	10	57.261 / 47.300	71	104 / 110	76 / 76	92	9.41		1.03	
									Y = 1.01	ΔH@ 1.40

[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.

Form #REC-01

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ________ Date 10-11-91 Meter box number C-KO Plant C.C lock

Barometric pressure, P_b = 29.94 in. Hg Dry gas meter number ________ Pretest Y ________

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: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \dfrac{V_w P_b (t_d + 460)}{V_d \left(P_b + \dfrac{\Delta H}{13.6}\right)(t_w + 460)}$
1	~~10~~ 5	536.200 / 541.332	72	110 / 112	84 / 84	97.5	8.1		1.01	
2	10	[illegible]1.300 / 534.172	72	114 / 116	84 / 84	99.5	11.45		1.02	
3	10	51[illegible] / 523.986	72	114 / 116	84 / 84	99.5	9.4		1.03	
									Y = 1.02	ΔH@ 1.4

[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.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 4-5-91 Thermocouple number Inlet / Outlet

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, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
A	Ice Bath	32	32	0
B	Boiling oil	381	381	0
C	Boiling water	212	212	0
D	ambient 10-14-91	70°F	70°F	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 4-5-91 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	32	0
B	Boiling water	212	212	0
C	Boiling oil	381	381	0
D	Ambient 10-14-91	70°F	70°F	0

[a]Type of calibration system used.

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

Pitot Tube Calibration (S Type)

Pitot Tube Identification No. 52 Date: 4-2-91

Calibrated by: [signature]

"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	.35	.51	.828	.001
2	.58	.85	.826	.001
3	1.1	1.6	.829	.002
		$\bar{C}_p$ (SIDE A)	.827	

"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	.35	.51	.828	< .01
2	.58	.85	.826	< .01
3	1.1	1.6	.829	< .01
		$\bar{C}_p$ (SIDE B)	.827	

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

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

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

RAMCON

Lear Siegler Stack Sampler

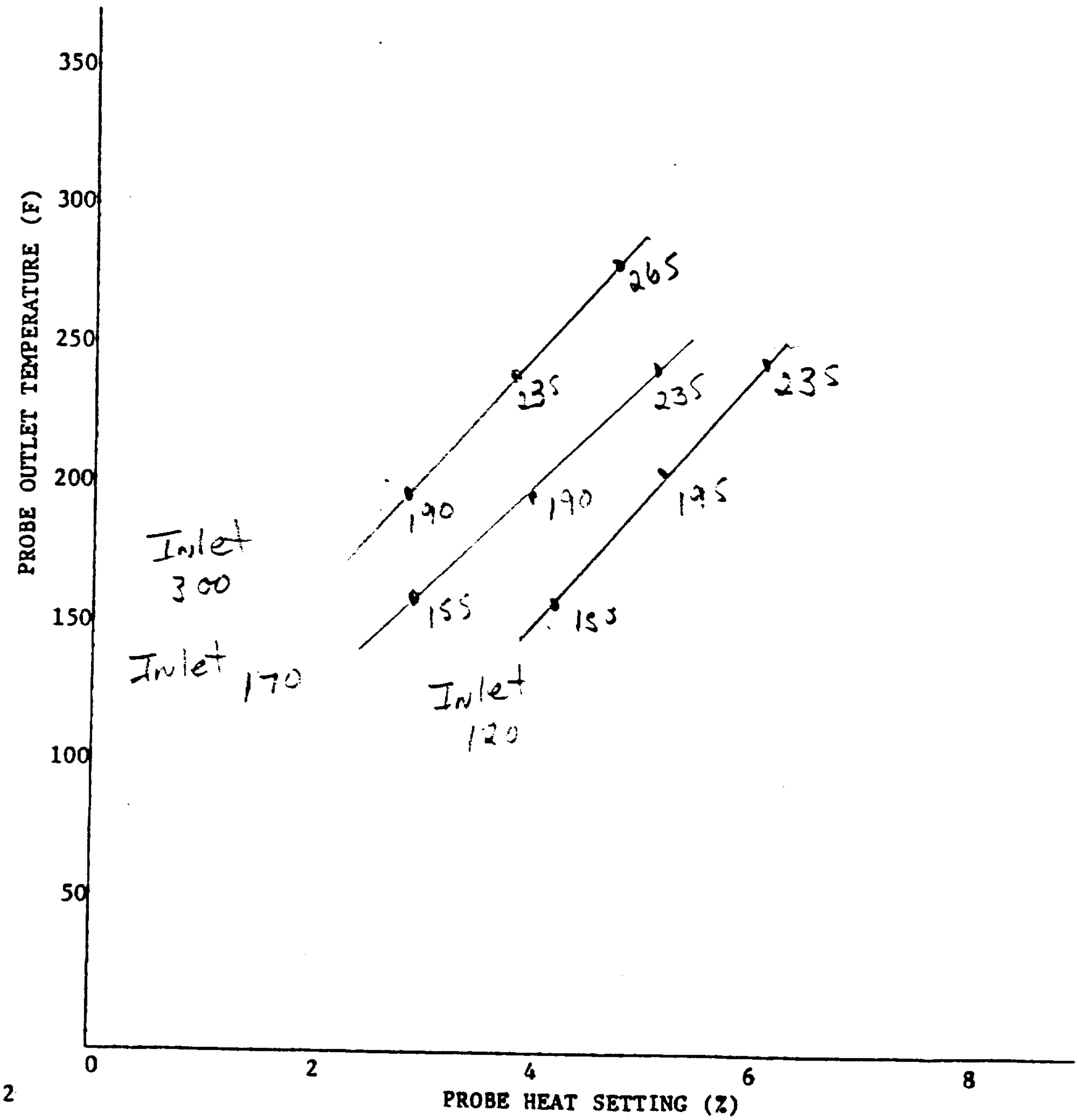
Heating Probe Calibration

Probe No. 52 Probe Length 5'

Date of Calibration 5-7-89 Signature Sam 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



Form No. EED-17-2

RAMCON ENVIRONMENTAL CORPORATION

Date 4-8-91 Thermocouple number 52

Ambient temperature 68 °F Barometric pressure 29.96 in. Hg

Calibrator S Turns Reference: mercury-in-glass ✓

other ______

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °C	Thermocouple Potentiometer Temperature, °C	Temperature Difference,[c] %
Boiling H2O		145°F	147°F	-1.4
Boiling oil		442°F	445°F	-0.68
Ice water		32°F	32°F	0
Ambient Temp	10-14-91	70°F	70°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.

X. RAMCON PERSONNEL

Name: **Mr. G. Sumner Buck, III**
Title: **President**

Qualifications:

Mr. Buck is a graduate of the University of Mississippi with graduate studies at Memphis State University and State Technical Institute of Memphis. He is a graduate of the EPA 450 "Source Sampling for Particulate Pollutant's" course and the 474 "Continuous Emissions Monitoring" courses outlined by EPA at Research Triangle Park, N.C. He has been directly involved in conducting and supervising air emission testing for over 15 years. He has personally conducted over 400 air emission tests. He currently sponsors and directs visual emission certification schools for US EPA Method 9.

Project Duties:

Mr. Buck will be responsible for the overall supervision of the project. He provided supervision for the project preparation, testing schedules for each team on-site, and overall organization between the testing crews and facility.

Name: **Mr. Tim Huey**
Title: **Laboratory Technician**

Qualifications:

Mr. Huey is currently serving as Laboratory Technician. He is proficient in conducting many analysis procedures such as front and back-half particulate analysis, titrations, extractions, etc. He received an associate degree in Chemical Engineering from State Technical Institute in Memphis.

Project Duties:

Mr. Huey conducts the laboratory analysis on the particulate samples. He is also responsible for accepting the remaining field samples from the Field Sample Bank Manager and performing inspection as to integrity. He documents the transfer on the chain of custody forms and distributed the subcontracted samples to the respective laboratories.

Name: **Mr. Charles Crook**
Title: **Team Leader**

Qualifications:

Mr. Crook has been employed by RAMCON Environmental Corp. for three years. He has recently completed Team Leader training in isokinetic and proportional test methods. He currently is certified in conducting Method 9 for opacity. He has been involved in conducting tests on process stacks, incinerators, boilers, etc. He has served as a Field Technician for over two years, however he has recently been upgraded to Team Leader.

Project Duties:

Mr. Crook is responsible for conducting isokinetic sampling procedures at the facility(s). He is responsible for preparation, calibration and cleaning of the necessary equipment for this testing. His duties on-site include assembling the sample train, leak checking the system, operation of the train and recording the test data on the field data forms.