RAMCON
ENVIRONMENTAL CORPORATION

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

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

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
HANDWERK MATERIALS, INC.
HUMMELSTOWN, PENNSYLVANIA
June 14, 1988

Mike Danz
Handwerk Materials, Inc.

G. Sumner Buck, III
President

Dave Armstrong
Team Leader

RAMCON
ENVIRONMENTAL CORPORATION

June 30, 1988

Mr. Mike Danz
Handwerk Materials, Inc.
326 Old Farm Road
Hummelstown, PA 17036

Re: Particulate Emissions Test - Hummelstown, Pennsylvania

Dear Mr. Danz:

Enclosed you will find five copies of our report on the particulate emissions test we conducted on your plant. Based on our test results, your plant does pass both EPA New Source Performance Standards and those set by the State of Pennsylvania. The average grain loading of the three test runs was below the allowable emissions standard set by EPA and the State of Pennsylvania. 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. Richard D. Roller
Pennsylvania Department of Environmental Resources
One Ararat Blvd.
Harrisburg, PA 17110

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
[illegible] IN TENNESSEE 901/458-7000 FAX 901-458-3868

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I. INTRODUCTION

On June 14, 1988, personnel from RAMCON Environmental Corporation (REC) conducted a source emissions test for particulate emissions compliance at Handwerk Material's CMI drum mix asphalt plant located in Hummelstown, Pennsylvania. RAMCON personnel conducting the test were Dave Armstrong, Team Leader, and Bill Turner. Kim Rea 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. Armstrong and Ms. Rea.

The purpose of the test was to determine if the rate of particulate 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 Pennsylvania.

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 Pennsylvania is .04 gr/dscf.

Mr. Richard D. Roller of the Pennsylvania Department of Environmental Resources observed the testing conducted by RAMCON.

The visible emissions test (Reference Method 9) was conducted by Bill Turner. The opacity on all three test runs ranged from 0% to 5%; therefore, this plant meets N.S.P.S. requirements.

TABLE I

SUMMARY OF TEST RESULTS
June 14, 1988

Test Run	Time	Grain Loading	Isokinetic Variation	Actual Emissions
1	07:51 to 10:45	0.0411 gr/DSCF	102.4%	4.7 lbs/hr
2	11:49 to 12:57	0.0191 gr/DSCF	90.5%	2.4 lbs/hr
3	14:33 to 15:39	0.0137 gr/DSCF	99.5%	1.7 lbs/hr
	Averages:	0.0246 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 Pennsylvania. Therefore, the plant is operating in compliance with State and Federal Standards.

III. TEST PROCEDURES

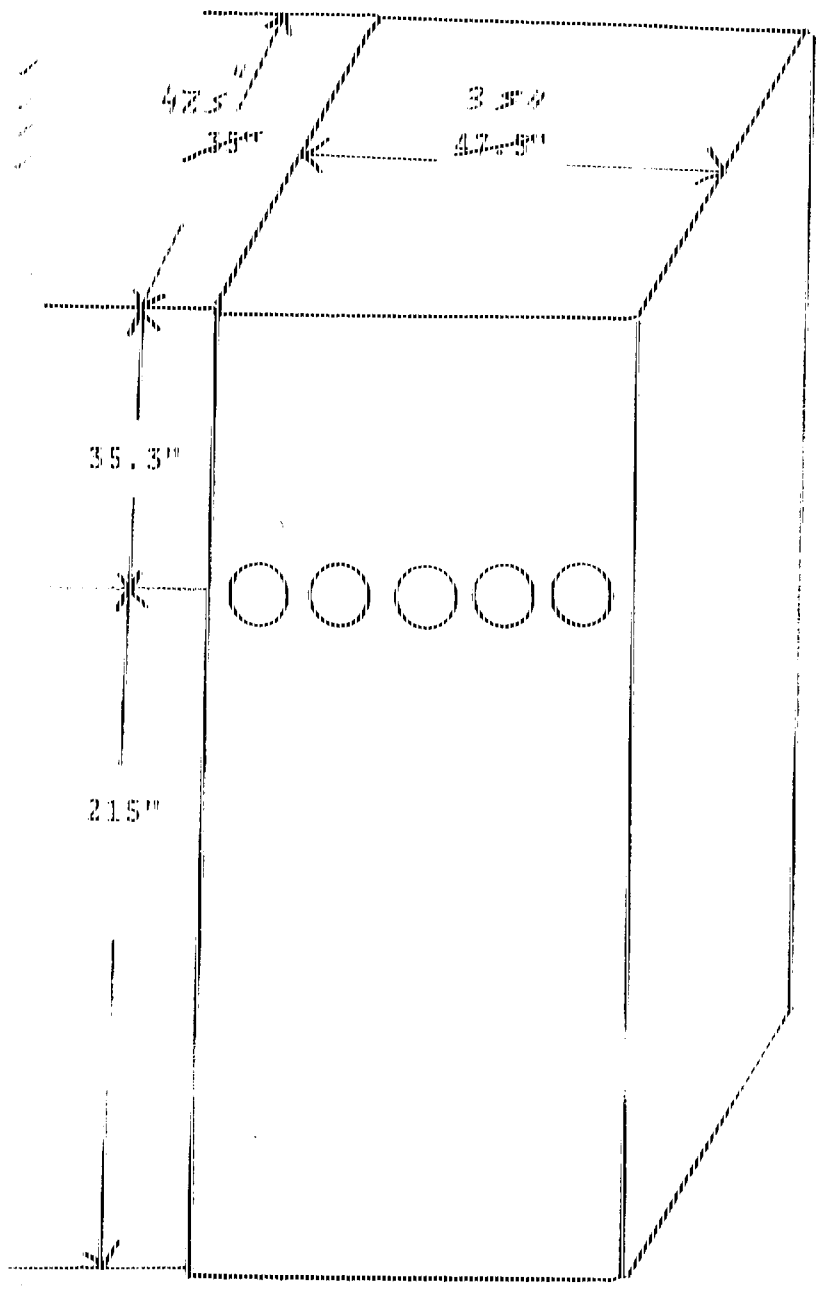
A. Method Used: The source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

B. Problems Encountered: No problems were encountered that affected testing. However, the sample volume for test runs #1 and #2 were slightly below the 50 cubic feet preferred by the State of Pennsylvania. Since the difference was very slight and since the source is operating below the .04 standard, RAMCON Environmental Corporation recommends acceptance of all three test runs as demonstration of compliance with State and EPA New Source Performance Standards.

C. Sampling Site: The emissions test was conducted after a baghouse on a rectangular stack measuring 35" x 47.5" with an equivalent diameter of 40.3". Six sampling ports were placed 35.3" down (0.88 ~~1.2~~ diameters upstream) from the top of the stack and 215" up (5.3 diameters downstream) from the last flow disturbance. Twenty points were sampled, four through each port for three minutes each for a total test time of sixty minutes per test run.

Points on a Diameter	Probe Mark
1	*11.9"
2	23.8"
3	35.7"
4	47.6"

*Measurements include a 6" standoff.



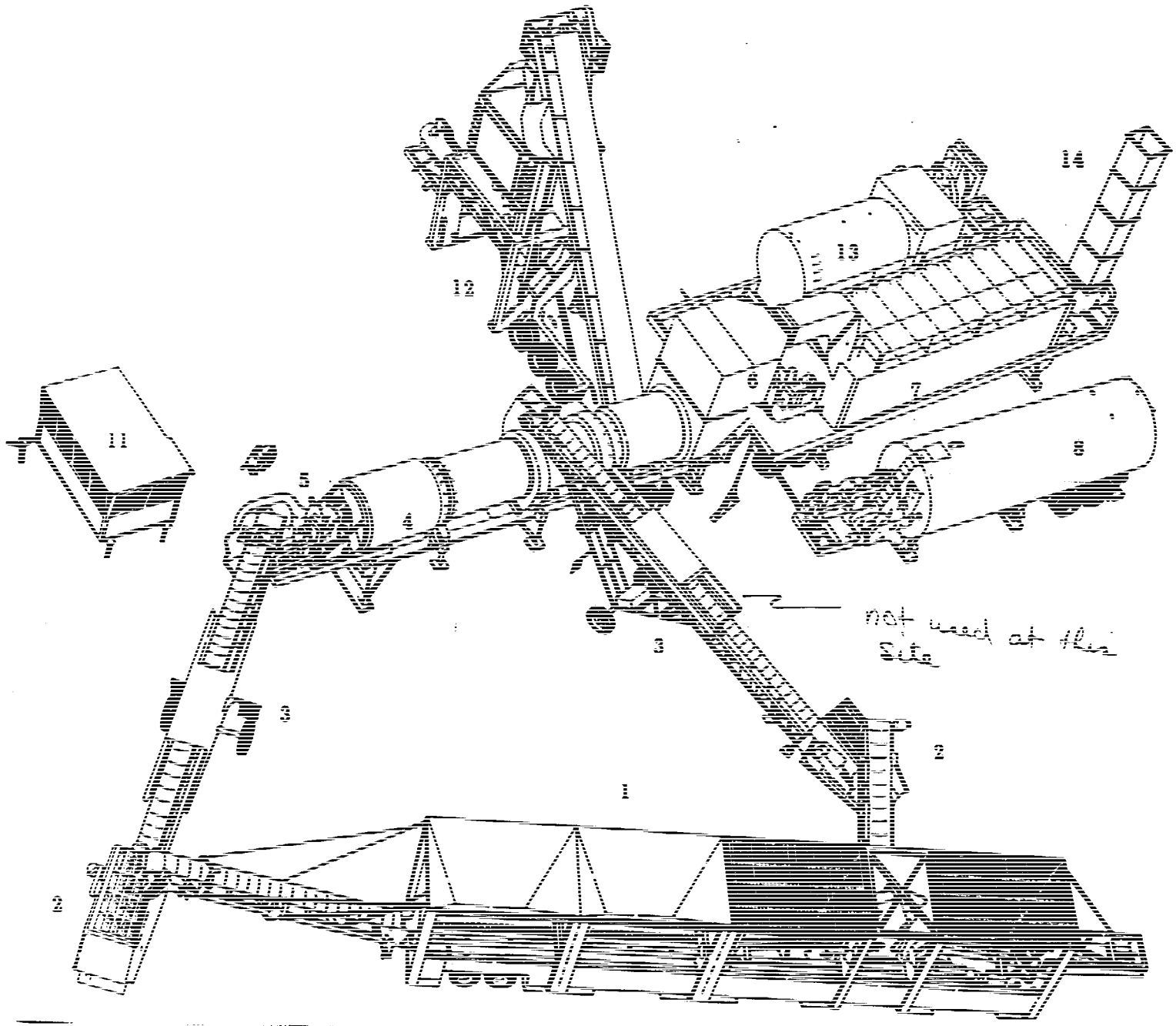
IV. THE SOURCE

IV. THE SOURCE

Handwerk Materials, Inc. employs a CMI drum mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt oil to bind the mixture together. After the hot asphalt mix is manufactured at the plant, it is transported to the location where it is to be applied. The hot asphalt mix is spread everly 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 required amount of hot asphalt oil is then injected onto and mixed into the dried aggregate. The now newly formed hot asphalt mix is pulled to the top of a storage silo by conveyor. The hot asphalt mix is then discharged from the storage silo through a slide gate into waiting dump trucks, which transport the material to a final destination for spreading. The rated capacity of the plant will vary with each aggregate mix and moisture content with a 5% surface moisture removal.

The drum mixer uses a burner fired with natural gas to heat air to dry the aggregate, and the motion of the rotating drum to blend the aggregate and hot asphalt oil thoroughly. The air is drawn into the system via an exhaust fan. After passing through the burner and the mixing drum, the exhaust gasses pass through a baghouse. The baghouse is manufactured by CMI. The exhaust gasses are drawn through the baghouse and discharged to the atmosphere through a stack. The design pressure drop across the tube-sheet is 1 - 6 inches of water. The particulate matter, which is removed by the baghouse, is reinjected into the drum mixer.



CMI drum mixer plant (baghouse)

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

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

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

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

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

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

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

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

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

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

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

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

13. Fuel Storage

14. Stack

(7)

DATA SUMMARY

Plant

1. Manufacturer of plant CMI.
2. Designed maximum operating capacity 300 TPH @ 5 % moisture.
3. Actual operation rate 285 TPH @ 5 % moisture.
4. Startup date 9-18-88.
5. Type of fuel used in dryer Natural Gas.
6. Quanity of fuel consumption _____.

Aggregate

7. Name/type of mix Type Binder.
8. Percent asphalt in mix 4.0 %.
9. Temperature of asphalt 290.
10. Sieve/Screening analysis % Passing;

1"		3/8"		#	
3/4"		#		#	
1/2"		#		#200	

Baghouse

11. Manufacturer CMI.
12. No. of bags 320. Type of bags Nomex.
13. Air to cloth ratio 5.34-1. Designed ACFM 40000.
14. Square feet of bags 7,540.
15. Type of cleaning: pulse jet ✓, reverse air _____, plenum pulse _____, other _____.
16. Cleaning cycle time Photohelic.
17. Interval between cleaning cycle 14 sec.
18. Pressure drop across baghouse 2 psi.
19. Pulse pressure on cleaning cycle 100 psi.

COMPANY NAME [illegible]. DATE 6-24-88

COMPANY REPRESENTATIVE [illegible]

(8)

PLANT DATA

COMPANY NAME Hanowerk Met. Inc.

COMPANY REP. RL Shade DATE 6/14/88 PHONE # 717-566-3711

DATA SOURCE

PLANT LOCATION Hummelstown, PA.

PLANT MFG. CMI Corp PLANT MODEL # SVM 1500 PLANT TYPE Drum mixe

MIX SPECIFICATION # ID-2A Binder 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
				N A			
7:30		60%	218		8.80	285	2
7:45		65	214		8.83	285	2
8:00		65	213		8.89	285	2
8:15		65	214		8.81	290	2
8:30		65	214	212 ave.	8.95	285	2
8:45		65	213		8.81	285	2
10:10		60	206		8.45	270	2
10:25		62	212		8.67	285	2
10:40		60	207		8.48	280	2
10:47		60	209		8.52	280	2
	Finish	first test		Start	second	test at	
11:45		55	210		7.54	295	2¼
12:00		60	213		8.83	275	2¼
12:15		60	211	211	8.81	280	2¼
12:30		60	217		8.93	280	2½
12:45		60	220		8.96	275	2¼
1:00		60	214		8.98	275	2¼
	End second	test		Start	third	test	
2:30		50	192		7.58	295	2½
2:45		60	201		7.62	280	3
3:00		60	211		8.79	275	3
3:15		60	211		8.82	275	3¼
3:30		60	215		8.90	275	3¼
3:45		60	216		8.92	280	3¼

REC #04

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 ≤ .001.

VI. LABORATORY PROCEDURES & RESULTS

LABORATORY PROCEDURES FOR PARTICULATE SAMPLING

I. Field Preparation

A. FILTERS: Fiberglass 4" sampling filters are prepared as follows:

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

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

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

II. Post-Testing Lab Analysis

A. FILTERS: The filters are returned to the lab in their sealed 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 ANALITICAL 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 Handwerk Materials Relative humidity in lab 45 %

Sample Location hot mix asphalt plant Density of Acetone (pa) .7853 mg/ml

Blank volume (V_a) 200 ml

Date/Time wt. blank 6/20/88 Gross wt. 101.0765 mg

Date/Time wt. blank 6/21/88 Gross wt. 101.0765 mg

Ave. Gross wt. 101.0765 mg

Tare wt. 101.0760 mg

Weight of blank (m_{ab}) .0005 mg

Acetone blank residue concentration (C_a) $(C_a) = (M_{ab}) / (V_a)(p_a) = (.000032 \text{ mg/g})$

Weight of residue in acetone wash: $W_a = C_a V_{aw} p_a = (.000032)(200)(.7853) = (.0005)$

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	200	200	200
Date/Time of wt 6/20/88 9:25 pm Gross wt	g	156.5387	167.1804	154.5063
Date/Time of wt 6/21/88 4:00 pm Gross wt	g	156.5382	167.1801	154.5062
Average Gross wt	g	156.5385	167.1803	154.5063
Tare wt	g	156.4420	167.1352	154.4841
Less acetone blank wt (W_a)	g	.0005	.0005	.0005
Wt of particulate in acetone rinse (m_a)	g	.0960	.0446	.0217

Filter Numbers	#	SG-2619	SG-2620	SG-2621
Date/Time of wt 6/20/88 9:25 pm Gross wt	g	.5351	.5306	.5394
Date/Time of wt 6/21/88 4:00 pm Gross wt	g	.5349	.5302	.5393
Average Gross wt	g	.5350	.5304	.5394
Tare wt	g	.5323	.5302	.5387
Plus Back-Half		.0284	.0136	.0211
Weight of particulate on filters(s) (m_f)	g	.0027	.0002	.0007
Weight of particulate in acetone rinse	g	.0960	.0446	.0217
Total weight of particulate (m_n)	g	.1271	.0584	.0435

Note: In no case should a blank residue greater than 0.01 mg/g (or 0.001% of the blank weight) be subtracted from the sample weight.

Remarks

Signature of analyst Kim Rea Signature of reviewer [signature]

According to Sumner Buck Used Pennsylvania analysis procedure

COMPANY NAME Handwerk Materials

Chloroform and Ethyl Ether Extraction for EPA Method 5 (back half) -

Relative humidity in lab 50%

~~Density of chloroform and ethyl ether~~

Run #1

			RUN 1	RUN 2	RUN 3
~~Chloroform and ethyl ether rinse volume~~		ml	.08 mm	.045 mm	.02 mm
Date/time of wt 6/21/88	Gross wt.	g	.0860	.0837	.0448
Date/time of wt 6/22/88	Gross wt.	g	.0860	.0836	.0448
Avg.	Gross wt.	g	.0860	.0837	.0448
	Tare wt.	g	.0737	.0788	.0336
Wt. of insoluble particulate ~~in chloroform ethyl ether rinse~~		g	.0123	.0049	.0112
Water evaporation		ml	390		
Date/time of wt. 6/21/88	Gross wt.	g	167.1790		
Date/time of wt. 6/22/88	Gross wt.	g	167.1786		
Avg.	Gross wt.	g	167.1788		
	Tare wt.	g	.167.1506		
Less water ~~chloroform & ehtyl either~~ blank wt.		g	.0000		
Weight of particulate from water (m_f) (Soluble)		g	.0282		
Wt. of insoluble particulate ~~in chloroform ethyl ether rinse~~		g	.0284		
Total weight of particulate (m_n)		g	.0566		

Note: In no case should a blank residue 0.02 mg/g or 0.001% of the weight of chloroform ethyl ether used be subtracted from the sample weight.

Remarks

Signature of Analyst Kim Rea

Signature of Reviewer [signature]

COMPANY NAME Handwerk Materials Used Pa DER

Chloroform and Ethyl Ether Extraction for EPA Method 5 (back half) Analysis procedure

Relative humidity in lab 51%

~~Density of chloroform and ethyl ether~~ _____

Run #2

	Filter size	#	~~RUN~~ 1	~~RUN~~ 2	~~RUN~~ 3
~~Chloroform and ethyl ether rinse volume~~		ml	.08 mm	.045 mm	.02 mm
Date/time of wt 6/22/88	Gross wt.	g	.0797	.0821	.0368
Date/time of wt 6/23/88	Gross wt.	g	.0796	.0820	.0366
Avg.	Gross wt.	g	.0797	.0821	.0367
	Tare wt.	g	.0744	.0776	.0329
Wt. of particulate ~~in chloroform ethyl ether rinse~~ insoluble		g	.0053	.0045	.0038
Water evaporation		mL	425		
Date/time of wt. 6/22/88	Gross wt.	g	158.8779		
Date/time of wt. 6/23/88	Gross wt.	g	158.8775		
Avg.	Gross wt.	g	158.8777		
	Tare wt.	g	158.8562		
Less ~~chloroform & ehtyl either~~ water blank wt.		g	.0000		
Weight of particulate from water (m_f) (soluble)		g	.0215		
Wt. of particulate ~~in chloroform ethyl ether rinse~~ filtered		g	.0136		
Total weight of particulate (m_n)		g	.0351		

Note: In no case should a blank residue 0.02 mg/g or 0.001% of the weight of chloroform ethyl ether used be subtracted from the sample weight.

Remarks _____

Signature of Analyst Kim Rea

Signature of Reviewer [signature]

According to Sumner Buck they used Pennsylvania analysis procedure

COMPANY NAME Handwork Materials

Chloroform and Ethyl Ether Extraction for EPA Method 5 (back half)

Relative humidity in lab 51%

~~Density of chloroform and ethyl ether~~ _____

Run #3

			~~RUN 1~~	~~RUN 2~~	~~RUN 3~~
	Filter Size				
~~Chloroform and ethyl ether rinse volume~~		~~ml~~	.08 mm	.045 mm	.02 mm
Date/time of wt 6/21/88	Gross wt.	g	.0886	.0782	.0357
Date/time of wt 6/22/88	Gross wt.	g	.0885	.0780	.0355
Avg.	Gross wt.	g	.0886	.0781	.0356
	Tare wt.	g	.0743	.0733	.0336
Wt. of insoluble particulate ~~in chloroform ethyl ether rinse~~		g	.0143	.0048	.0020
Water evaporation		ml	400		
Date/time of wt. 6/21/88	Gross wt.	g	135.7455		
Date/time of wt. 6/22/88	Gross wt.	g	135.7453		
Avg.	Gross wt.	g	135.7454		
	Tare wt.	g	135.7237		
Less ~~chloroform & ehtyl either~~ water blank wt.		g	.0000		
Weight of particulate from water (m_f) (Soluble)		g	.0216		
Wt. of insoluble particulate ~~in chloroform ethyl ether rinse~~		g	.0211		
Total weight of particulate (m_n)		g	.0427		

Note: In no case should a blank residue 0.02 mg/g or 0.001% of the weight of chloroform ethyl ether used be subtracted from the sample weight.

Remarks _____

Signature of Analyst Kim Bea

Signature of Reviewer [signature]

DER
AIR QUALITY CONTROL

JUL 14 1988

HARRISBURG REGION

VII. CALCULATIONS

HANDWERK MATERIALS, INC.
HUMMELSTOWN, PENNSYLVANIA
6/14/88

SUMMARY OF TEST DATA

		RUN #1	RUN #2	RUN #3
SAMPLING TRAIN DATA				
	start	07:51	11:49	14:33
	finish	10:45	12:57	15:39
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	102.4	90.5	99.5
5. Sample gas volume - meter cond., cf.	V_m	48.050	48.378	50.900
6. Average meter temperature, ^oR	T_m	554	566	573
7. Avg. orifice pressure drop, in. H_2O	dH	1.55	2.03	1.68
8. Total particulate collected, mg.	M_n	127.10	58.40	43.50
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2	A	11.50	11.50	11.50
10. Absolute stack gas pressure, in. Hg.	P_s	30.40	30.40	30.40
11. Barometric pressure, in. Hg.	P_{bar}	30.40	30.40	30.40
12. Avg. absolute stack temperature, R^o	T_s	704	705	707
13. Average $\sqrt{\text{vel. head}}$, (C_p= .80)	$\sqrt{dP}$	0.55	0.63	0.58
14. Average stack gas velocity, ft./sec.	V_s	35.59	40.87	37.55
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{lc}	406.00	439.00	412.00
16. Moisture in stack gas, %	B_{ws}	28.73	30.58	28.45
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	800	893	844
18. Stack gas flow rate, cfm	acfm	24557	28200	25910
19. Particulate concentration, gr/dscf	C_s	0.0411	0.0191	0.0137
20. Particulate concentration, lb/hr	E	4.70	2.44	1.65
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	3.50	4.00	4.00
23. Percent O_2 by volume	O_2	12.00	14.00	12.00
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	84.50	82.00	84.00

Format: summryR3

NAME: HANDWERK MATERIALS, INC.
LOCATION: HUMMELSTOWN, PENNSYLVANIA (18)
TEST DATE: 6/14/88

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 orifice 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 orifice meter, in. H_2O.

Y = Dry gas meter calibration factor.

13.6 = Inches water per inches Hg.

RUN 1:

$$V_{m(std)} = (17.64)(1.020)(48.050)\left[\frac{(30.40) + \frac{1.55}{13.6}}{554}\right] = 47.619 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(1.020)(48.378)\left[\frac{(30.40) + \frac{2.03}{13.6}}{566}\right] = 46.982 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(1.020)(50.900)\left[\frac{(30.40) + \frac{1.68}{13.6}}{573}\right] = 48.786 \text{ dscf}$$

Format: dgmR3

NAME: HANDWERK MATERIALS, INC. (19)
LOCATION: HUMMELSTOWN, PENNSYLVANIA
TEST DATE: 6/14/88

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:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{127.10}{47.619}\right] = 0.0411 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{58.40}{46.982}\right] = 0.0191 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{43.50}{48.786}\right] = 0.0137 \text{ gr./dscf.}$$

Format: csR3

NAME: HANDWERK MATERIALS, INC. (20)
LOCATION: HUMMELSTOWN, PENNSYLVANIA
TEST DATE: 6/14/88

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:

$$M_d = 0.44(3.50\%) + 0.32(12.00\%) + 0.28(.00\% + 84.50\%) = 29.04 \frac{lb}{lb\text{-}mole}$$

Run 2:

$$M_d = 0.44(4.00\%) + 0.32(14.00\%) + 0.28(.00\% + 82.00\%) = 29.20 \frac{lb}{lb\text{-}mole}$$

Run 3:

$$M_d = 0.44(4.00\%) + 0.32(12.00\%) + 0.28(.00\% + 84.00\%) = 29.12 \frac{lb}{lb\text{-}mole}$$

NAME: BANDWERK MATERIALS, INC.
LOCATION: HUMMELSTOWN, PENNSYLVANIA (21)
TEST DATE: 6/14/88

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) (390.0) = 18.4 cu.ft ✓
$V_{wsg(std)}$ = (0.04715) (16.0) = 0.8 cu.ft ✓

Run 2:

$V_{wc(std)}$ = (0.04707) (425.0) = 20.0 cu.ft
$V_{wsg(std)}$ = (0.04715) (14.0) = 0.7 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (400.0) = 18.8 cu.ft
$V_{wsg(std)}$ = (0.04715) (12.0) = 0.6 cu.ft

NAME: HANDWERK MATERIALS, INC. (22)
LOCATION: HUMMELSTOWN, PENNSYLVANIA
TEST DATE: 6/14/88

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:

$$B_{ws} = \frac{18.4 + 0.8}{18.4 + 0.8 + 47.619} \times 100 = 28.73\ \%$$

Run 2:

$$B_{ws} = \frac{20.0 + 0.7}{20.0 + 0.7 + 46.982} \times 100 = 30.58\ \%$$

Run 3:

$$B_{ws} = \frac{18.8 + 0.6}{18.8 + 0.6 + 48.786} \times 100 = 28.45\ \%$$

Format: bwsR3

NAME: HANDWERK MATERIALS, INC. (23)
LOCATION: HUMMELSTOWN, PENNSYLVANIA
TEST DATE: 6/14/88

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 = 29.04 (1 - 28.73) + 18 (28.73) = 25.87 (lb./lb.-mole)

Run 2:

M_s = 29.20 (1 - 30.58) + 18 (30.58) = 25.78 (lb./lb.-mole)

Run 3:

M_s = 29.12 (1 - 28.45) + 18 (28.45) = 25.96 (lb./lb.-mole)

NAME: HANDWERK MATERIALS, INC. (24)
LOCATION: HUMMELSTOWN, PENNSYLVANIA
TEST DATE: 6/14/88

Stack Gas Velocity

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

Where:

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

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

C_p = Pitot tube coefficient, (dimensionless).

dP = Velocity head of stack gas, in. H_2O.

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

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

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

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

t_s = Stack temperature, (^{o}f).

T_s = Absolute stack temperature, (^{o}R). = 460 + t_s.

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

Run 1:

$$V = (85.49)\ (\ .80)\ (\ 0.55) \sqrt{\frac{704}{(30.40)(25.87)}} = 35.59 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (\ .80)\ (\ 0.63) \sqrt{\frac{705}{(30.40)(25.78)}} = 40.87 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ .80)\ (\ 0.58) \sqrt{\frac{707}{(30.40)(25.96)}} = 37.55 \text{ ft/sec.}$$

Format: vsp2

NAME: HANDWERK MATERIALS, INC.
LOCATION: HUMMELSTOWN, PENNSYLVANIA (25)
TEST DATE: 6/14/88

Stack Gas Flow Rate

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

Where:

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

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

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

t_s = Stack temperature, (^oF).

T_s = Absolute stack temperature, (^oR).

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

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

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

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

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

Run 1:

$$Q_{sd} = 3600(1 - .2873)(35.59)(11.50)\left[\frac{528}{704}\right]\left[\frac{30.40}{29.92}\right] = 800218.1 \; \frac{dscf}{hr}$$

Run 2:

$$Q_{sd} = 3600(1 - .3058)(40.87)(11.50)\left[\frac{528}{705}\right]\left[\frac{30.40}{29.92}\right] = 893812.4 \; \frac{dscf}{hr}$$

Run 3:

$$Q_{sd} = 3600(1 - .2845)(37.55)(11.50)\left[\frac{528}{707}\right]\left[\frac{30.40}{29.92}\right] = 844007.7 \; \frac{dscf}{hr}$$

Format: qB3

NAME: HANDWERK MATERIALS, INC. (26)
LOCATION: HUMMELSTOWN, PENNSYLVANIA
TEST DATE: 6/14/88

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:

$$E = \frac{(0.0411)(800218.1)}{7000} = 4.70 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(0.0191)(893812.4)}{7000} = 2.44 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0137)(844007.7)}{7000} = 1.65 \text{ lb. / hr.}$$

Buzzycalc

Format: eR3

NAME: HANDWERK MATERIALS, INC. (27)
LOCATION: HUMMELSTOWN, PENNSYLVANIA
TEST DATE: 6/14/88

No Y which was equal to 1.02

Isokinetic Variation

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

Where:

I	=	Percent isokinetic sampling.
100	=	Conversion to percent.
T_s	=	Absolute average stack gas temperature, ^oR.
0.002669	=	Conversion factor, Hg - ft^3/ml - ^oR.
V_{lc}	=	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:

$$I = (100)(704)\left[\frac{(0.002669)(406.00) + \frac{48.050}{554}\left[30.40 + \frac{1.55}{13.6}\right]}{60\ (60.0)\ (35.59)\ (30.40)\ (.000668)} \right] = 102.4\%$$

Run 2:

$$I = (100)(705)\left[\frac{(0.002669)(439.00) + \frac{48.378}{566}\left[30.40 + \frac{2.03}{13.6}\right]}{60\ (60.0)\ (40.87)\ (30.40)\ (.000668)} \right] = 90.5\%$$

Run 3:

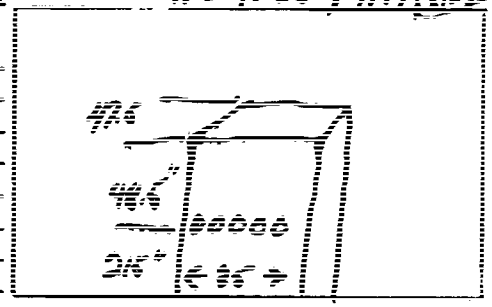
$$I = (100)(707)\left[\frac{(0.002669)(412.00) + \frac{50.900}{573}\left[30.40 + \frac{1.68}{13.6}\right]}{60\ (60.0)\ (37.55)\ (30.40)\ (.000668)} \right] = 99.5\%$$

VIII. FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant Hanover Materials (end) m: 4.36, 4.74

Location Hanover, PA.
Operator Dave Armstrong
Date 4/14/94
Run No. 1
Sample Box No. 1
Meter Box No. P-282
Meter H @ 1.08
C Factor 1.02
Pitot Tube Coefficient Cp .84



Ambient Temperature 75°F

Barometric Pressure	30.40 mmHg	596	526
Assumed Moisture, %	2.5 mmHg	240	512
Probe Length, m(ft)	5.4 mmHg	340	16

Nozzle Identification No. 0001441
Avg. Calibrated Nozzle Dia., (in.) .190/.188/.188
Probe Heater Setting 5
Leak Rate, m³/min. (cfm) 0.005 @ 20"
Probe Liner Material 316 Stainless Steel
Static Pressure, mm Hg(in.Hg) .05
Filter No. 56-3619

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	7:16 / 7:35	4	235 / 250	.16 (.1473)	.70	870.91 / 874.31	92	78	250	50
2	7:57	4	240 / 250	.44 (.7873)	1.9	871.75	90	78	250	50
3	8:00	7	265	.62 (.7874)	2.6	875.04	96	78	250	50
4	8:03	4	260	.42 (.6481)	1.8	877.71	96	78	250	50
B 1	8:05 / 8:08	4	245	.26 (.2916)	1.7	880.32	92	80	250	50
2	8:11	7	260	.71 (.9486)	3.4	883.72	94	80	250	50
3	8:14	7	255	.61 (.9)	3.9	887.46	94	80	250	50
4	8:17	7	265	.60 (.7746)	2.9	891.03	100	82	250	50
C 1	8:40 / 8:43	5	265	.39 (.6245)	1.9	893.52	96	90	250	50
2	10:09 / 10:12	4	220	.26 (.5099)	1.2	896.42	96	92	250	50
3	10:15	4	225	.32 (.5657)	1.5	898.57	104	94	250	50
4	10:18	5	250	.34 (.5831)	1.6	901.16	104	94	250	50
D 1	10:20 / 10:23	3	230	.18 (.4243)	.86	903.13	104	94	250	50

(82)

Form #REC-06 O^2 = 12 % CO = 3.5 %

RAMCON emissions test log sheet, cont. 5.23 DATE 6/14/88 LOCATION [illegible] TEST NO. 1

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME Vm (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
2	10:26	3	235	.19 .4359	.91	905.09	108	94	250	50
3	10:29	3	245	.22 .469	1.0	907.28	110	94	250	50
4	10:32	3	245	.20 .4472	.96	909.35	110	94	250	50
~~1~~ 1	~~10:33~~ 10:26	2	240	.09 .3	.48 ~~.09~~	910.92	108	94	250	50
2	10:39	2	245	.07 .2646	.36	912.25	110	96	250	50
3	10:42	3	245	.11 .3317	.54	913.82	110	96	250	50
4	10:45	3	245	.14 .3742	.73	915.557	110	96	250	50
						48.05				

(67)

RAMCON ENVIRONMENTAL CORPORATION

Plant Hardwick Materials (CMI) m: 6.23

Location Hanoverton, PA.
Operator Dave Alexander
Date 10/1/88
Run No. 2
Sample Box No. 2
Meter Box No. C-292
Meter H @ 1.08
C Factor 1.02
Pitot Tube Coefficient Cp .786

Schematic of Stack Cross Section

Ambient Temperature °F	[illegible]	[illegible]
Barometric Pressure 30.40 mm	605	530
Assumed Moisture, % 26% mm	260	376
Probe Length, m(ft) 6.6, mm	425	14

Nozzle Identification No. [illegible]
Avg. Calibrated Nozzle Dia., (in.) [illegible]
Probe Heater Setting 5
Leak Rate, m³/min. (cfm) 4.005 at 15"
Probe Liner Material [illegible] Steel
Static Pressure, mm Hg(in.Hg) 1.35
Filter No. 56 - 26 [illegible]

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	11:48 / 11:52	7	260	.22 (.469)	1.2	905.45 / 906.61	108	100	250	50
2	11:55	8	310	.65 (.7416)	2.9	914.93	110	98	250	50
3	11:59	9	250	.41 (.9539)	3.9	922.17	110	98	250	50
4	12:01	8	250	1.0	4.3	924.44	110	98	250	50
B 1	12:03 / 12:06	14	250	.51 (.735)	2.2	926.92	108	98	250	50
2	12:08	14	255	.75 (.846)	3.3	929.48	110	100	250	50
3	12:11	14	255	.80 (.8944)	3.4	931.75	112	100	250	50
4	12:14	14	250	.72 (.8965)	3.1	933.16	112	100	250	50
C 1	12:15 / 12:18	12	250	.31 (.56)	1.3	934.97	110	98	250	50
2	12:21	12	245	.66 (.9164)	2.9	937.63	112	100	250	50
3	12:24	12	250	.70 (.8367)	3.0	940.98	112	100	250	50
4	12:27	12	255	.40 (.6325)	1.7	944.36	114	100	250	50
D 1	12:30 / 12:33	8	245	.19 (.9359)	.99	946.75	108	100	250	50

Form #REC-06 O^2 = 14 % CO^2 = 4 %

RAMCON emissions test log sheet, cont. DATE 6/14/88 LOCATION [illegible] 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)
2	12:36	12	240	.28 .5292	1.5	949.35	114	100	250	50
3	12:39	12	245	.25 .5	1.3	952.10	112	100	250	50
4	12:42	12	245	.26 .5099	1.4	954.59	110	100	250	50
E 1	12:44 / 12:47	12	240	.09 .3	.47	957.21	110	100	250	50
2	12:50	5	246	.10 .3162	.52	959.25	114	102	250	50
3	12:53	5	255	.11 .3317	.57	961.69	116	102	250	50
4	12:57	5	255	.13 .3605	.68	964.075	116	102	250	50

RAMCON ENVIRONMENTAL CORPORATION

Plant Handwerk Materials (CMI)

Location Hummelstown, PA

Operator Dave Armstrong

Date 6/14/88

Run No. 3

Sample Box No. 3

Meter Box No. C-282

Meter H @ 1.08

C Factor 1.02

Pitot Tube Coefficient Cp .74

Ambient Temperature 94°F

Barometric Pressure 30.40

Assumed Moisture, % 25

Probe Length, m(ft) 5 ft

Nozzle Identification No. .0006681

Avg. Calibrated Nozzle Dia., (in.) .350/.350/.350

Probe Heater Setting 5

Leak Rate, m^3/min. (cfm) +.002 at 10"

Probe Liner Material 316 Stainless Steel

Static Pressure, mm Hg (in. Hg) .25

Filter No. SG-2621

	Impinger Volume, ml	Silica Gel Weight, g
Final	600	527
Initial	200	515
Difference	400	12

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 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	2:33 / 2:36	2	225	.3973 / .15	.78	964.30 / 966.18	110	106	250	50
2	2:39	4	235	.6673 / .44	2.3	969.12	114	104	250	50
3	2:42	6	235	.8485 / .72	3.7	973.10	118	104	250	50
4	2:45	6	240	.8944 / .80	3.4	976.95	120	104	250	50
B 1	2:46 / 2:49	3	250	.5916 / .35	1.5	979.66	118	104	250	50
2	2:52	5	245	.8185 / .67	2.9	983.10	122	104	250	50
3	2:55	6	245	.922 / .85	3.7	986.62	124	104	250	50
4	2:58	5	245	.8367 / .70	3.0	990.65	124	104	250	50
C 1	3:00 / 3:03	3	245	.5831 / .34	1.5	993.36	120	104	250	55
2	3:06	4	250	.671 / .45	1.9	996.25	120	104	250	55
3	3:09	4	250	.714 / .51	2.2	999.25	122	104	250	55
4	3:12	4	250	.6928 / .48	2.1	1002.31	122	104	250	55
D 1	3:13 / 3:16	2	255	.3464 / .12	.52	003.92	120	104	250	54

(32)

Form #RBC-08 CO_2 = 4 % O_2 = 12 %

RAMCON emissions test log sheet, cont. DATE 4/4/98 LOCATION [illegible] 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)	ORIFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
2	3:19	2	255	.3973 .15	.65	005.51	122	106	250	55
3	3:22	3	250	.4359 .19	.42	007.05	122	106	250	55
4	3:25	3	250	.4473 .20	.47	008.36	124	106	250	55
E 1	~~3:27~~ 3:28	2	260	.3 .01	.39	009.63	120	106	260	55
2	3:33	2	250	.3162 .10	.44	011.44	122	106	260	55
3	3:36	2	245	.2646 .07	.30	013.30	122	106	260	55
4	3:39	2	245	.3973 .15	.65	015.260	120	106	250	55

(3B)

IX. CALCULATIONS

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date [illegible] Meter box number [illegible]

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

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	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.0	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.5	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.0	10	[illegible]							
3.0	10								
4.0	10								
							Avg	[illegible]	[illegible]

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

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

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 7-2-88

Meter box number C-282 (700205)

Barometric pressure, P_b = 29.98 in. Hg Calibrated by S Bush

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	4.89	72	87.5	69	78.3	9:58	1.03	1.10
1.0	5	4.92	72	89	71	80	6:57	1.02	1.06
1.5	10	9.97	72	91	72.5	82	11:11	1.02	1.03
2.0	10								
3.0	10								
4.0	10								
							Avg	1.02	1.07

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

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

RAMCON ENVIRONMENTAL CORPORATION

Date 9-5-87 Thermocouple number Inlet

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

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

other

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °C/°F	Thermocouple Potentiometer Temperature, °C/°F	Temperature Difference,[c] %
A	Ice bath	33	33	0
B	oven	150	150	0
C	oven	175	175	0
D	Ambient	83	83	0
	6-14-88	75°F	75°F	0 %

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

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON ENVIRONMENTAL CORPORATION

Date 9-5-87 Thermocouple number Hot box #2

Ambient temperature 84 °F Barometric pressure 30.52 in. Hg

Calibrator CMK10 Reference: mercury-in-glass ✓

other

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[c] %
A	Ice bath	33	33	0
B	oven	150	150	0
C	oven	175	175	0
D	Ambient 6-19-88	84 75°F	84 75°F	0 0%

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

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON ENVIRONMENTAL CORPORATION

Date 3/9/88 Thermocouple number 51

Ambient temperature 54°F °F Barometric pressure 29.95 in. Hg

Calibrator S. Granwood Reference: mercury-in-glass ✓

other

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[c] %
A	ICE WATER	32°F	32°F	0%
B	BOILING WATER	212°F	211°F	.005%
C	OIL	380°F	382°F	.005%
D	Ambient 6-14-88	54°F 75°F	55°F 75°F	.01% 0%

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

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON

Lear Siegler Stack Sampler

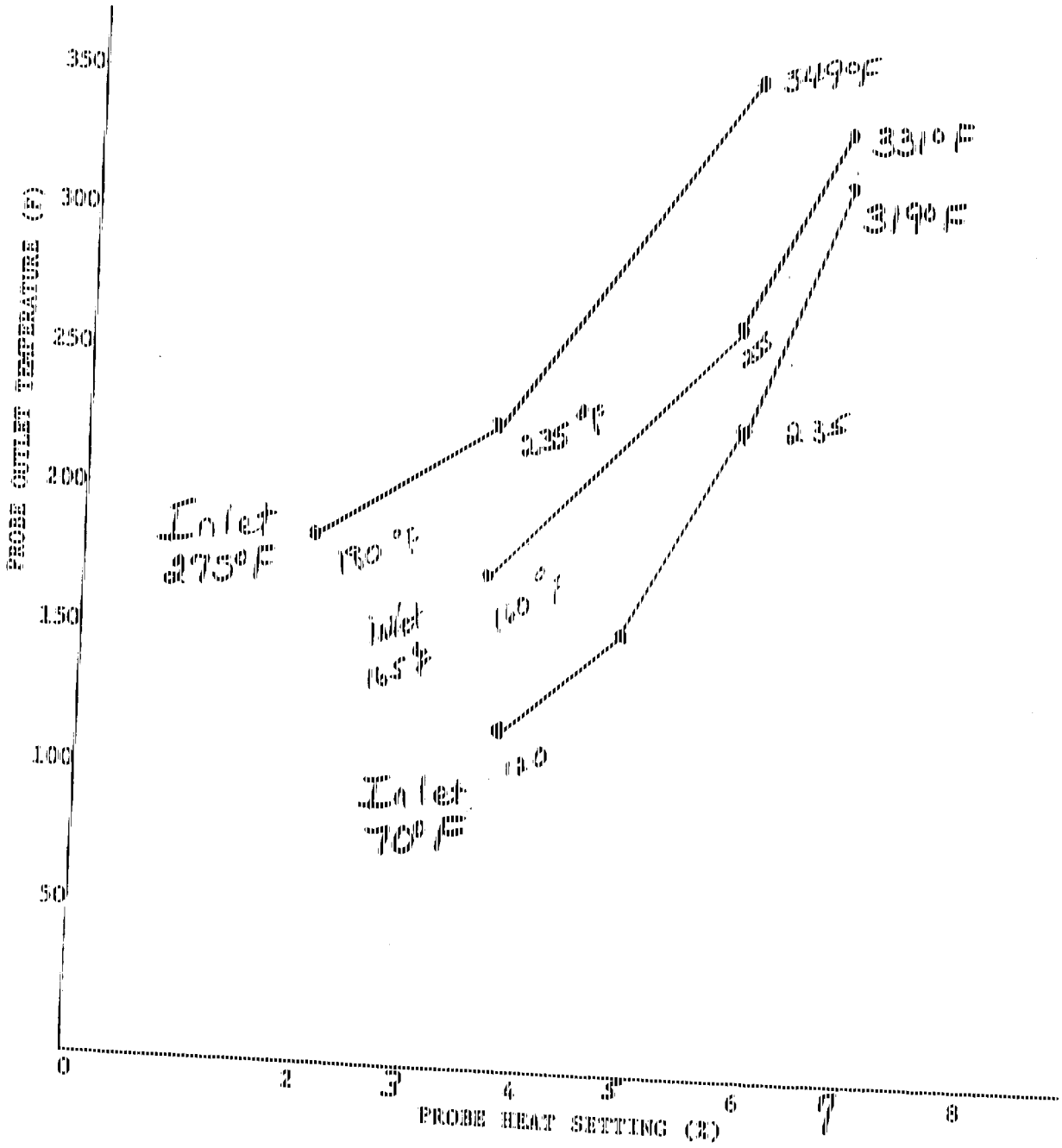
Heating Probe Calibration

Probe No. 51 Probe Length 5'

Date of Calibration 2-10-88 Signature Sam T. Tuang

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

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. 51 Date 1-3-88

Calibrated by: [illegible]

"A" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp (a) cm H_2O (in. H_2O)	$C_p(a)$	DEVIATION $C_p(a)-\bar{C}_p(A)$
1	0.90	.91	.799	.01
2	[illegible]	.94	.799	.01
3	0.41	.65	.794	.01
		$\bar{C}_p$ (SIDE A)	.797	

"B" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp (a) cm H_2O in. H_2O)	$C_p(a)$	DEVIATION $C_p(a)-\bar{C}_p(B)$
1	0.90	.94	.802	.01
2	0.66	.95	.795	.01
3	0.41	.64	.800	.01
		$\bar{C}_p$ (SIDE B)	.799	

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

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

$$C_p(a) = C_p(\text{std})\sqrt{\frac{\Delta p \text{ std}}{\Delta p_a}}$$

K. 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 44 years old and a graduate of the University of Mississippi with graduate studies at Memphis State University and State Technical Institute of Memphis.

Dave Armstrong - Team Leader

Dave Armstrong has been employed by RAMCON for three years. He has undergone extensive training in Methods 1 through 9. He is qualified as a team leader and has personally sampled over 150 stacks including over 100 asphalt plants. He is currently certified as a V.E. reader.

XI. VISIBLE EMISSIONS

(42)

Run 3

SOURCE NAME: Bauer Mfg.

ADDRESS:

CITY: | STATE: | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: | OPERATING MODE:

CONTROL EQUIPMENT: | OPERATING MODE:

DESCRIBE EMISSION POINT:

HEIGHT ABOVE GROUND LEVEL: | HEIGHT RELATIVE TO OBSERVER:

DISTANCE FROM OBSERVER: | DIRECTION FROM OBSERVER:

DESCRIBE EMISSIONS:

EMISSION COLOR: | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☐ YES ☐ | IS WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED:

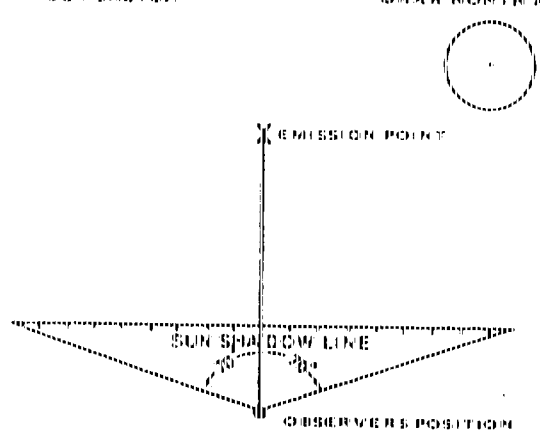
DESCRIBE BACKGROUND: Land

BACKGROUND COLOR: Green | SKY CONDITIONS: Clear

WIND SPEED: 5-10 | WIND DIRECTION:

AMBIENT TEMPERATURE: | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



COMMENTS: Run 3

OBSERVATION DATE: 6-4-88				START TIME: 2:30			STOP TIME:		
MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	5	0	31	0	5	5	0
2	5	5	0	0	32	0	5	0	5
3	0	5	0	0	33	5	0	0	0
4	5	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	5	0	5	5	36	5	0	0	0
7	0	0	0	0	37	0	0	0	0
8	5	5	0	5	38	0	0	0	5
9	0	0	5	5	39	0	0	0	5
10	0	5	5	0	40	0	0	0	0
11	0	5	0	5	41	0	0	0	0
12	0	0	5	0	42	0	5	0	0
13	5	5	0	5	43	0	5	0	5
14	0	5	0	0	44	5	0	0	5
15	0	5	0	0	45	0	5	5	0
16	0	0	0	0	46	5	0	0	0
17	5	0	5	0	47	0	5	5	5
18	0	5	0	0	48	0	5	0	5
19	5	0	0	0	49	0	0	0	5
20	0	0	0	0	50	0	5	5	0
21	0	0	0	0	51	5	5	0	0
22	0	5	0	0	52	0	0	5	0
23	0	5	5	0	53	5	5	0	0
24	5	0	0	5	54	5	5	0	5
25	0	5	5	5	55	0	5	5	5
26	0	5	0	0	56	0	0	5	5
27	0	5	0	0	57	0	5	0	5
28	0	5	5	0	58	5	0	0	0
29	5	0	0	0	59	5	0	5	5
30	5	0	0	0	60	0	[illegible]	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD: | NUMBER OF READINGS ABOVE 5% WERE:

RANGE OF OPACITY READINGS: MINIMUM | MAXIMUM

CUSTOMER REPRESENTATIVE: Bill Lane

OBSERVER'S SIGNATURE: [illegible] | DATE: 6-4-88

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE: | TITLE: | DATE:

CERTIFIED BY: [illegible] | DATE: 6-28-88

VERIFIED BY: | DATE:

TO/CH 1.4

Run 2

SOURCE NAME: Hanowerk

ADDRESS:

CITY: | STATE: | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: | OPERATING MODE:

CONTROL EQUIPMENT: | OPERATING MODE:

DESCRIBE EMISSION POINT:

HEIGHT ABOVE GROUND LEVEL: | HEIGHT RELATIVE TO OBSERVER:

DISTANCE FROM OBSERVER: | DIRECTION FROM OBSERVER:

DESCRIBE EMISSIONS:

EMISSION COLOR: | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☐ YES ☐ | IS WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED:

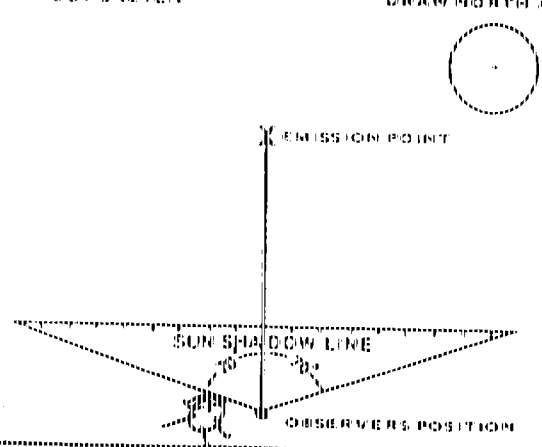
DESCRIBE BACKGROUND: Trees

BACKGROUND COLOR: green | SKY CONDITIONS: clear

WIND SPEED: | WIND DIRECTION: S

AMBIENT TEMPERATURE: | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH: | DRAW NORTH ARROW



COMMENTS: Run 2

OBSERVATION DATE: 6-19-88 | START TIME: 1145 | STOP TIME:

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

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

RANGE OF OPACITY READINGS: MINIMUM | MAXIMUM

OBSERVER'S NAME (PRINT): Bill Turner

OBSERVER'S SIGNATURE: Bill Turner | DATE: 6-14-88

ORGANIZATION: Ramon

CERTIFIED BY: Tenn | DATE: 6-8-88

VERIFIED BY: | DATE:

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE:

TITLE: | DATE:

DRC#14

(44)

SOURCE NAME

ADDRESS

CITY | STATE | ZIP

PHONE | SOURCE ID NUMBER

PROCESS EQUIPMENT | OPERATING MODE

CONTROL EQUIPMENT | OPERATING MODE

DESCRIBE EMISSION POINT

HEIGHT ABOVE GROUND LEVEL | HEIGHT RELATIVE TO OBSERVER

DISTANCE FROM OBSERVER | DIRECTION FROM OBSERVER

DESCRIBE EMISSIONS

EMISSION COLOR | PLUME TYPE: CONTINUOUS [] FUGITIVE [] INTERMITTENT []

WATER DROPLETS PRESENT NO [] YES [] | IS WATER DROPLET PLUME ATTACHED [] DETACHED []

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED

DESCRIBE BACKGROUND

Sky

BACKGROUND COLOR: Sky | SKY CONDITIONS

WIND SPEED | WIND DIRECTION

AMBIENT TEMPERATURE | RELATIVE HUMIDITY

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW

X EMISSION POINT

SUN SHADOW LINE

OBSERVER'S POSITION

OBSERVATION DATE: 6-8-88 | START TIME: 9:07 | STOP TIME

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

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

RANGE OF OPACITY READINGS: MINIMUM | MAXIMUM

COMMENTS: Self-observed Scrubbed Sandblasting

OBSERVER'S NAME (PRINT): Bill Fomer

SIGNATURE: Bill Fomer | DATE: 6-8-88

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE | TITLE | DATE

CERTIFIED BY: Zee | DATE: 6-8-88

VERIFIED BY | DATE

REC#14

(45) R-1 8-45

SOURCE NAME: Gaylord

ADDRESS:

CITY: Hamilton | STATE: IL | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Cook | OPERATING MODE:

CONTROL EQUIPMENT: | OPERATING MODE:

DESCRIBE EMISSION POINT:

HEIGHT ABOVE GROUND LEVEL: 32 | HEIGHT RELATIVE TO OBSERVER: 8

DISTANCE FROM OBSERVER: 600 | DIRECTION FROM OBSERVER: W

DESCRIBE EMISSIONS:

EMISSION COLOR: | PLUME TYPE: CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☐ YES ☐ | IS WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED:

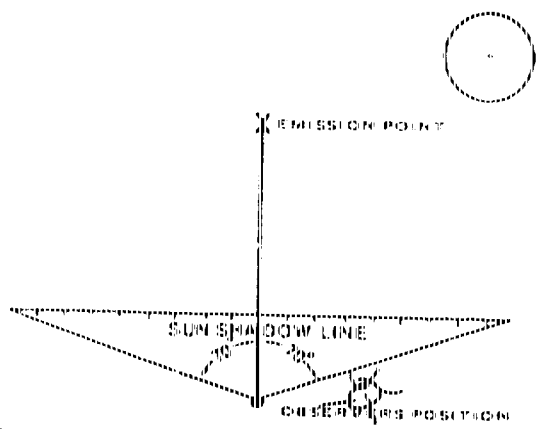
DESCRIBE BACKGROUND: Sky

BACKGROUND COLOR: Blue | SKY CONDITIONS: Clear

WIND SPEED: 0-5 | WIND DIRECTION:

AMBIENT TEMPERATURE: 75 | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



COMMENTS: Red

OBSERVATION DATE	START TIME	STOP TIME
6-8-88	7:45	8:45

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

AVERAGE OPACITY FOR HIGHEST PERIOD:

NUMBER OF READINGS ABOVE: % WERE

RANGE OF OPACITY READINGS: MINIMUM MAXIMUM

OBSERVER'S NAME (PRINT): Bill Kerr

OBSERVER'S SIGNATURE: Bill Kerr | DATE: 6-14-88

ORGANIZATION: Gaylord

I HAVE RECEIVED A COPY OF THE OPACITY OBSERVATIONS

SIGNATURE: | TITLE: | DATE:

CERTIFIED BY: Gaylord | DATE: 6-8-88

VERIFIED BY: | DATE:

DEC#14

TENNESSEE DEPARTMENT OF HEALTH AND ENVIRONMENT
CUSTOMS HOUSE
701 BROADWAY
NASHVILLE, TENNESSEE 37219-5403

JUN 2 1 1988

DER
AIR QUALITY CONTROL

Bill Turner
KAMCON
223 Scott
Memphis, TN 38112

JUL 14 1988

HARRISBURG REGION

RE: Certificate Number 1058

Dear Mr. Turner:

Enclosed you will find your certification card for successfully completing the June 7-9, 1988 Visible Emissions Evaluation School held in Memphis, Tennessee. In order to be certified as a qualified Visible Emissions Evaluator for all the methods approved by the Tennessee Air Pollution Control Board, one must meet an intensive array of criteria.

The individual reading criteria is as follows:

1. EPA Method 9 (6 Minute Average) requires a deviation of less than 7.5 on white and black smoke, and that the reader miss no reading by more than 15% opacity.

2. Tennessee Visible Emissions Evaluation Method 1 (Roads and Parking Areas) requires a worst-two-minute deviation of 8.8 or less.

3. TVEE Method 2 (Aggregate or Time Count) has the same criteria requirements as EPA Method 9.

4. TVEE Method 3 (Zero Percent Opacity) requires that the value assigned to a zero reading during a certification run shall not exceed 10% opacity, nor shall the combination of other zero readings exceed 10% opacity (i.e. two readings of five percent opacity).

5. TVEE Method 4 (Fugitive Dust Emissions from Non-Stack Emission Points) has the same criteria requirements as EPA Method 9.

Based on these criteria you are certified by the State of Tennessee to read EPA Method 9, and TVEE Methods 1, 2, 3, and 4 with sunglasses.

This certification is valid until December 08, 1988.

You must complete the requirements for recertification prior to this expiration date to retain your status as a qualified Visible Emissions Evaluator.

It was a pleasure having your participation in our Visible Emissions School. The Tennessee Division of Air Pollution Control would welcome any comments, or suggestions you may have concerning the operation of the school. Please forward any comments to the Division at (615)741-3931 or at the above address.

Sincerely yours,

Carl Koontz

Carl Koontz, Instructor
Visible Emissions Evaluation School
Division of Air Pollution Control

Enclosure