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.

Quality Materials SMS

327.5 TPH, 1.2 lb/hr → .00366 lb/ton

PM

327.5 TPH, 3.4 lb/hr → .01038 lb/ton

328.3 TPH, 4.1 lb/hr → .01249 lb/ton

---

cyclone / baghouse controlled

front/back total

invalid

328 TPH

2.9 lb PM/hr.

0.0088 lb PM/ton

note: PM results inconsistent

RAMCON

ENVIRONMENTAL CORPORATION

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
QUALITY MATERIALS
EDISON, NEW JERSEY
JUNE 27 & 30, 1989

Gil Gerard
Trap Rock Industries

G. Sumner Buck, III
President

Dave Armstrong
Team Leader

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

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
CN 027
Trenton, N.J. 08625-0027
(609) 984-6721
Fax # (609) 292-1074

William O'Sullivan, P.E., Assistant Director
Air Quality Engineering and Technology

August 10, 1989

MEMORANDUM

TO: Michael Osvai

THROUGH: Edward Choromanski

FROM: Michael Pratt

SUBJECT: Quality Material, Inc.
APC Plant ID No. 15,129
NJ Stack No. 007
Permit/Certificate to Operate (P/CT) No. 080971

Emission test were conducted at the above referenced facility on an asphalt plant controlled by a cyclone and a baghouse.

The purpose of these tests was to determine particulate, CO and THC emission rates and then compare them to P/CT No. 080971 allowables.

Stafford Stewart reviewed the submitted test report. His review indicates compliance with P/CT No. 080971 particulates allowables emissions.

NOTES:

1) The folllowing plant data were submitted as part of stack testing report for the 2nd, 4th, and 6th test runs:

Test Run	Average Fuel Oil Consumption GPM	Average Aggregate TPH *	Mix Temperature °F	Baghouse Presure Drop in Inches of Water
2	8.5	327.5	Constant at 310	Constant at 3
4	8.5	327.5	Constant at 310	Constant at 3
6	8.7	328.3	Constant at 310	Constant at 3

* Test runs No. 2 and 4 were at 93.6% of P/CT 080971 (700,000 lb/hr), and test run No. 6 at 93.8% maximum production rate.

2) Ramcon Environmental Corporation (testing consulting firm) submitted protocol called for particulates, CO and THC emission testing. However, only particulates emission rates were determined during June 1989 testing. Additional stack test for CO and THC emission rates will be performed in the future.

CONCLUSION:

1) Particulate emission rates were within P/CT No. 080971 allowables.

2) Stack test for CO and THC was not performed yet.

RECOMMENDATION:

Keep P/CT No. 080971 temporary (until CO and THC tests evaluation).

cc: Milton Polakovic
Lou Mikolajczyk
Joe DePierro
Stafford Stewart

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
CN 027
Trenton, N.J. 08625-0027
(609) 984-6721
Fax # (609) 292-1074

William O'Sullivan, P.E., Assistant Director
Air Quality Engineering and Technology

July 20, 1989

MEMORANDUM

TO: Michael Pratt

FROM: Stafford Stewart

SUBJECT: Quality Materials
Edison, N.J.
N.J DEP ID No. 15129
N.J Stack No. 007

On June 27th and June 30th, 1989 Ramcon Environmental Corporation conducted source emissions tests for particulate emissions compliance at Quality Materials. The results of these tests are as follows:

PARTICULATE EMISSIONS

RUN No.	Date	Emissions (lb/hr)	Allowable (lb/hr)
2	6/27/89	1.2	10.6
4	6/27/89	3.4	10.6
6	6/30/89	4.1	10.6

Note: Run Nos. 1, 3, and 5 were voided due to failed leak checks.

Test results indicated that for all runs, emission rates were within the allowables listed on P&CT No. 080971.

The production data was acceptable for all test runs and all results provided by Ramcon Environmental Corp. were in agreement with those obtained by Technical Services.

Let's protect our earth

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
CENTRAL REGIONAL OFFICE, AIR PROGRAM
TWIN RIVERS PROFESSIONAL BLDG.
EAST WINDSOR, NJ 08520

To: File

From: Greg Walker, Env. Eng.

Date: Nov. 27, 1989

Subject: Quality Materials (ID #15129) Stack test of p/ct. #80971 NJ #007 conducted on Nov. 20, 1989

On Nov. 20, 1989, Quality Materials conducted the second part of the required stack test for p/ct #80971, NJ #007. This test was conducted to check for CO & THC emissions from the rotary dryer. Readings taken during the two runs witnessed are attached. Explanations of the column headings follow:

Time: military time

Temp: Degrees F. Represents temperature of dried material in hot elevator. Controlled at 350 F.

Feed: Number on master feed control dial. 6 represents equipment maximum.

Burner%: The % burner capacity indicated on the temperature controller. The percentage is vaired in order to maintain the 350 F material temperature.

Oil GPM: The gallons per minute of oil burned based on burner %. 80% = 9 G.P.M.

Quality Materials, Edison
ID #15129
Stack test of p/ct #80971, NJ #007, conducted Nov. 20, 1989

Run #1:

Time	Temp	Feed	Burner %	Oil GPM
0955	360	6	65	7.3
1005	358	6	64	7.2
1015	341	6	78	8.8
1025	349	6	68	7.7
1035	357	6	53	6.0
1045	347	6	67	7.5
1055	349	6	70	7.9
1105	352	6	68	7.7
1115	360	6	53	6.0
1125	348	6	61	6.9
Avg.	352	6	64.7	7.3

Run #2

Time	Temp	Feed	Burner %	Oil GPM
1300	359	5	50	5.6
1310	347	5	64	7.2
1320	362	5.5	45	5.1
1330	360	5.5	33	3.7
1340	357	6	34	3.8
1350	353	6	64	7.2
1400	352	6	64	7.2
1410	351	6	67	7.5
1420	350	6	67	7.5
Avg.	354	5.7	54.2	6.1

RAMCON

ENVIRONMENTAL CORPORATION

July 11, 1989

Mr. Gil Gerard
Quality Materials, Inc.
P.O. Box 419
Kingston, NJ 08528

Re: Particulate Emissions Test: Edison, New Jersey

Dear Mr. Gerard:

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 does pass both EPA New Source Performance Standards and those set by the State of New Jersey. Therefore, the plant is operating in compliance with State and Federal Standards.

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

Mr. Frederick G. Ballay
State of New Jersey
Department of Environmental Protection
Division of Environmental Quality
CN 027
Trenton, NJ 08625

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:kr

Enclosures

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

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	TEST RESULTS	1
III.	TEST PROCEDURES	2
IV.	THE SOURCE	4
V.	EQUIPMENT USED	10
VI.	LABORATORY PROCEDURES & RESULTS	11
VII.	CALCULATIONS	18
VIII.	FIELD DATA	29
IX.	CALIBRATIONS	40
X.	RAMCON PERSONNEL	47

I. INTRODUCTION

On June 27 & 30, 1989, personnel from RAMCON Environmental Corporation conducted a source emissions test for particulate emissions compliance at Quality Materials' (APC Plant ID#15129, NJ Stack #007) McCarter batch mix asphalt plant located in Edison, New Jersey. RAMCON personnel conducting the test were Dave Armstrong, Team Leader, and Joey Barrett. Bruce Shrader was responsible for the laboratory analysis including taring the beakers and filters and recording final data in the laboratory record books. Custody of the samples was limited to Mr. Armstrong and Mr. Shrader.

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

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 New Jersey is .02 gr/ACF.

Mr. Fred Ballay of New Jersey's Department of Environmental Protection observed the testing conducted by RAMCON Environmental.

TABLE I

SUMMARY OF TEST RESULTS

June 27 & 30, 1989

Test Run	Time	Grain Loading	Isokinetic Variation	Actual Emissions
2	07:42 to 09:31	0.0049 gr/DSCF	91.1%	1.2 lbs/hr
4	13:35 to 15:15	0.0130 gr/DSCF	101.1%	3.4 lbs/hr
6	08:31 to 09:40	0.0141 gr/DSCF	100.9%	4.1 lbs/hr
	Average:	0.0107 gr/DSCF		2.9 bs/hr

On the basis of these test results, the average grain loading of the three test runs was below the .04 gr/DSCF allowable emissions limitation set by EPA and the .02 gr/ACF allowable emissions limitation set by the State of New Jersey. Therefore, the plant is operating in compliance with State and Federal Standards.

III. TEST PROCEDURES

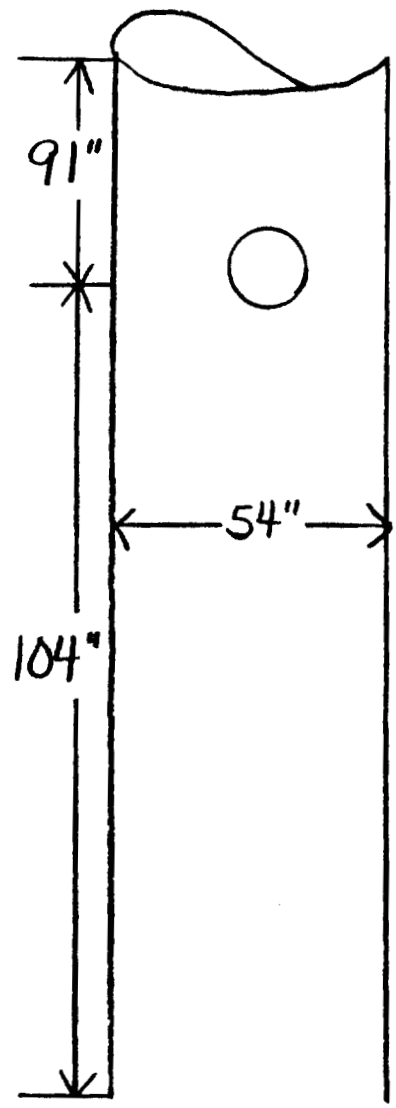
A. Method Used: Method 5 source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

B. Problems Encountered: Test runs #1, 3 & 5 were voided and repeated when a post leak test was conducted and leaks were detected in the system. Test runs #2, 4 & 6 are reported for compliance. The average of the three test runs does easily passes N.S.P.S., therefore, RAMCON Environmental recommends acceptance of all three test runs as demonstration of compliance with emissions standards.

C. Sampling Site: The emissions test was conducted after a baghouse on a round stack with a diameter of 54.0". The sampling ports were placed 91" down (1.9 diameters upstream) from the top of the stack and 104" up (1.9 diameters downstream) from the last flow disturbance. Twenty four points were sampled, twelve through each traverse for 2.5 minutes each.

Points on a Diameter	Probe Mark
1	*8.1"
2	10.6"
3	13.4"
4	16.6"
5	20.5"
6	26.2"
7	31.8"
8	47.5"
9	52.4"
10	54.6"
11	57.4"
12	59.9"

*Measurements include a 7" standoff.



IV. THE SOURCE

IV. THE SOURCE

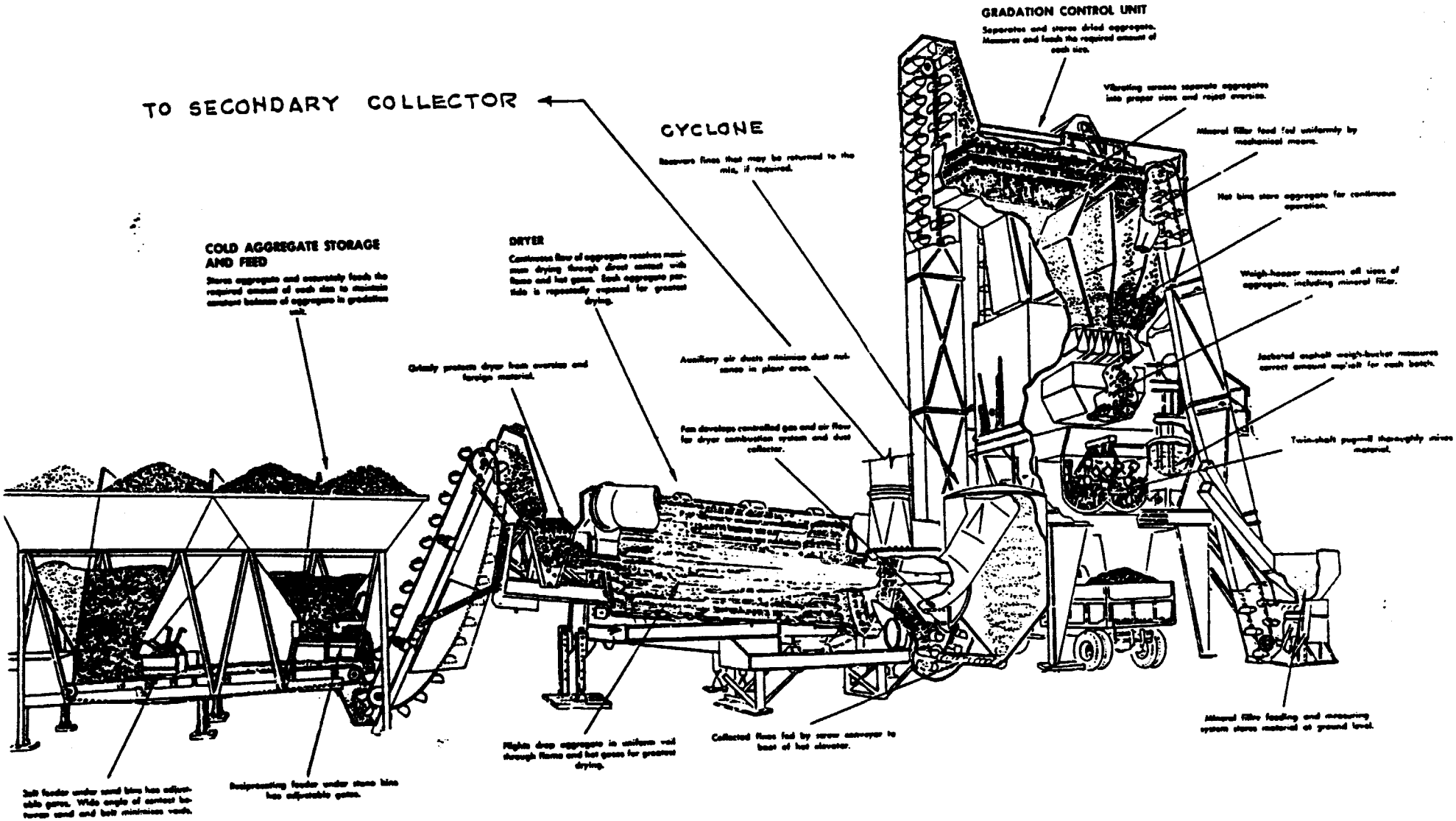
Quality Materials employs a McCarter batch mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt oil to bind the 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 to a general description of the plant's manufacturing process: The cold feed materials (aggregate) are dumped into four separate bins which in turn feed a common continuous conveyor. The aggregate is dispensed from the bins in accordance with the desired formulation onto the cold feed system conveyor, to an inclined weigh conveyor, then to a rotating drum for continuous mixing and drying at approximately 300°F. 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 #2 fuel oil to heat air to dry the aggregate. The air is drawn into the system via an exhaust fan. After passing through the gas burner, the air passes through a 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.

Figure 4-1

ASPHALT BATCH MIX PLANT - AN EXPLODED VIEW



Source: Asphalt Plant Manual, The Asphalt Institute, 1967

(5)

DATA SUMMARY

Plant

1. Manufacturer of plant Mc Carter.
2. Designed maximum operating capacity 350 TPH @ 2 % moisture.
3. Actual operation rate 322 TPH @ 5 % moisture.
4. Startup date Sept. 1988.
5. Type of fuel used in dryer #2 Fuel Oil.
6. Quanity of fuel consumption 510 gal. est.

Aggregate

7. Name/type of mix I5 Top.
8. Percent asphalt in mix 5.3 %.
9. Temperature of asphalt 300°.
10. Sieve/Screening analysis: % Passing;

1"		3/8"	95	#16	40
3/4"		#4	63	#50	18
1/2"	100	#8	48	#200	5.5

Baghouse

11. Manufacturer Mc Carter.
12. No. of bags 864. Type of bags Nomex 14oz.
13. Air to cloth ratio 5.9 : 1. Designed ACFM 72,000 at 350°
14. Square feet of bags 12,220 sq. ft.
15. Type of cleaning; pulse jet ✓, reverse air ____, plenum pulse ____, other ____.
16. Cleaning cycle time 75 Milliseconds.
17. Interval between cleaning cycle 12 sec.
18. Pressure drop across baghouse 3 inches of water.
19. Pulse pressure on cleaning cycle 100 psi.

COMPANY NAME Quality Materials DATE 6/26/89

COMPANY REPRESENTATIVE [illegible]

PLANT DATA

(7)

COMPANY NAME Quality Materials

COMPANY REP. _____ DATE 6/27 PHONE # _____

DATA SOURCE _____

PLANT LOCATION _____

PLANT MFG. _____ PLANT MODEL # _____ PLANT TYPE _____

MIX SPECIFICATION # _____ OIL SPECIFICATION # _____

2nd Run

Time 24 Hour	Fuel Oil ✓ Nat. Gas ___ Propane ___ Coal ___ GPM	Burner Setting	Aggregate TPH	Recycle TPH	Liquid Asphalt TPH	Mix Temp. °F	Venturi ___ Baghouse ___ Pressure Drop Inches Water
7:42	9	60	330			310	3
7:57	9	60	330			"	3
8:12	8	50	325			"	3
8:27	9	60	330			"	3
8:42	9	60	330			"	3
8:57	Plant Shut Down						
9:08	8	50	325			"	3
9:23	8	50	325			"	3
9:31	8	50	325			"	3

(8)

PLANT DATA

COMPANY NAME Quality Materials

COMPANY REP. _____ DATE 6/87 PHONE # _____

DATA SOURCE _____

PLANT LOCATION _____

PLANT MFG. _____ PLANT MODEL # _____ PLANT TYPE _____

MIX SPECIFICATION # _____ OIL SPECIFICATION # _____

4th Run

Time 24 Hour	#2 Fuel Oil ✓ Nat. Gas ___ Propane ___ Coal ___ GPM	Burner Setting %	Aggregate TPH	Recycle TPH	Liquid Asphalt TPH	Mix Temp. °F	Venturi Baghouse Pressure Drop Inches Water
135	8	50	325			310	3
150	9	60	330			"	3
205	8	50	325			"	3
245	9	60	330			"	3
3:00	9	60	330			"	3
315	8	50	325			"	3

PLANT DATA

(9)

COMPANY NAME Quality Materials

COMPANY REP. _____ DATE 6/30/89 PHONE # _____

DATA SOURCE _____

PLANT LOCATION _____

PLANT MFG. _____ PLANT MODEL # _____ PLANT TYPE _____

MIX SPECIFICATION # _____ OIL SPECIFICATION # _____

6 th.

Time 24 Hour	* Fuel Oil 2 / Nat. Gas / Propane / Coal — GPM	Burner Setting %	Aggregate TPH	Recycle TPH	Liquid Asphalt TPH	Mix Temp. °F	Venturi / Baghouse Pressure Drop Inches Water
8:31	8	50	325			310	3
8:45	8	50	325			310	3
9:00	9	60	330			310	3
9:15	9	60	330			310	3
9:30	9	60	330			310	3
9:40	9	60	330			310	3

V. EQUIPMENT USED

V. EQUIPMENT USED

Equipment used on conducting the particulate emissions test was:

A. The Lear Siegler PM-100 stack sampler with appropriate auxillary equipment and glassware. The train was set up according to the schematic on the nex page.

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

C. Weston dial thermometers are used to check meter temperatures. An Analogic Model 2572 Digital Thermocouple is used for stack temperatures.

D. A Hays 621 Analyzer was used to measure the oxygen, carbon dioxide and carbon monoxide content of the stack gases. For non-combustion sources, A Bacharach Instrument Company Fyrite is used for the gas analysis.

E. Filters are mady by Schleicher and Schuell and are type 1-HV with a porosity of .03 microns.

F. The acetone is reagent grade or ACS grade with a residue of $\leq$ .001.

VI. LABORATORY PROCEDURES & RESULTS

LABORATORY PROCEDURES FOR PARTICULATE SAMPLING

I. Field Preparation

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

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

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

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

II. Post - Testing Lab Analysis

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

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

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

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

E. ACETONE: A blank analysis of acetone is conducted from the one gallon glass container used in the field preparation. This acetone was used in the field for rinsing the probe, nozzle, and top half of the filter holder. A blank analysis is performed prior to testing on all new containers of acetone received from the manufacturer to insure that the quality of the acetone used will be exceed the .001% residual purity standard.

SPECIAL NOTE

When sampling sources high in moisture content, (such as asphalt plants) the filter paper sometimes sticks to the filter holder. When removing the filter, it may tear. In order to maintain control of any small pieces of filter paper which may be easily lost, they are washed with acetone into the probe washing. This makes the filter weight light (sometimes negative) and the probe wash correspondingly heavier. this laboratory procedure is taught by EPA in the "Quality Assurance for Source Emissions Workshop" at Research Triangle Park and is approved by EPA.

WEIGHING PROCEDURE - SARTORIUS ANALYTICAL BALANCE

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

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

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

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

Form REC#8

SAMPLE ANALYTICAL DATA FORM

(14)

Plant Location QUALITY — Relative humidity in lab 50 %

Sample Location hot mix asphalt plant — Density of Acetone (pa) .7857 mg/ml

Blank volume (V_a) 200 ml

Date/Time wt. blank 7-5-89 — Gross wt. 122.4747 mg

Date/Time wt. blank 7-6-89 — Gross wt. 122.4740 mg

Ave. Gross wt. 122.4744 mg

Tare wt. 122.4741 mg

Weight of blank (m_{ab}) .0003 mg

Acetone blank residue concentration (C_a) — (C_a) = (M_{ab}) / (V_a) (p_a) = (.000001 mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} p_a$ = (.000001)(200)(.7853) = (.0003)

		Run # 2	Run # 4	Run # 6
Acetone rinse volume (V_{aw})	ml	200	200	200
Date/Time of wt 7-5-89; 8:30 AM Gross wt	g	123.8099	137.8211	126.3954
Date/Time of wt 7-6-89; 10:00 AM Gross wt	g	123.8101	137.8215	126.3956
Average Gross wt	g	123.8100	137.8213	126.3955
Tare wt	g	123.8008	137.8072	126.3725
Less acetone blank wt (W_a)	g	.0003	.0003	.0003
Wt of particulate in acetone rinse (m_a)	g	.0089	.0138	.0227

Filter Numbers	#	BS 3325	FK 3327	FK 3329
Date/Time of wt 7-5-89; 8:30 AM Gross wt	g	0.5413	0.5391	0.5357
Date/Time of wt 7-6-89; 10:00 AM Gross wt	g	0.5415	0.5390	0.5358
Average Gross wt	g	0.5414	0.5390	0.5357
Tare wt	g	0.5379	0.5154	0.5121

Weight of particulate on filters(s) (m_f)	g	0.0035	0.0236	0.0236
Weight of particulate in acetone rinse	g	0.0089	0.0138	0.0227
Total weight of particulate (m_n)	g	0.0124	0.0374	0.0463

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 Bruce Shrader — Signature of reviewer [illegible]

Form REC#8

SAMPLE ANALYTICAL DATA FORM

(15)

Plant Location Quality — Relative humidity in lab 50 %

Sample Location hot mix asphalt plant — Density of Acetone (pa) .7857 mg/ml

Blank volume (V_a) 200 ml

Date/Time wt. blank 7-5-89 — Gross wt. 122.4747 mg

Date/Time wt. blank 7-6-89 — Gross wt. 122.4740 mg

Ave. Gross wt. 122.4744 mg

Tare wt. 122.4741 mg

Weight of blank (m_{ab}) .0003 mg

Acetone blank residue concentration (C_a) (C_a) = (M_{ab}) / (V_a) (P_a) = (.000001? mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} P_a$ = (.000001)(200)(.7853) = (.0003)

		Run # 1	Run # 3	Run # 5
Acetone rinse volume (V_{aw})	ml	200	200	200
Date/Time of wt 7-5-89; 8:30AM Gross wt	g	123.7160	162.7737	153.1465
Date/Time of wt 7-6-89; 10:00AM Gross wt	g	123.7164	162.7740	153.1467
Average Gross wt	g	123.7162	162.7738	153.1466
Tare wt	g	123.7004	162.7505	153.1390
Less acetone blank wt (W_a)	g	0.0003	0.0003	0.0003
Wt of particulate in acetone rinse (m_a)	g	0.0155	0.0230	0.0073

Filter Numbers	#	FK3312	FK3328	BS3326
Date/Time of wt 7-5-89; 8:30AM Gross wt	g	0.5277	0.5369	0.5352
Date/Time of wt 7-6-89; 10:00AM Gross wt	g	0.5276	0.5369	0.5350
Average Gross wt	g	0.5276	0.5369	0.5351
Tare wt	g	0.5234	0.5128	0.5341

Weight of particulate on filters(s) (m_f)	g	0.0042	0.0241	0.0010
Weight of particulate in acetone rinse	g	0.0155	0.0230	0.0073
Total weight of particulate (m_n)	g	0.0197	0.0471	0.0083

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 Runs one Void - See problems encountered

Signature of analyst Bruce Shuler — Signature of reviewer [illegible]

 Quality

Run # 1	1		2		3		
Collection Method Continuous/Grab GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	Average Net Volume
CO_2	2.5	2.5	2.5				2.5
O_2 (Net is actual O_2 reading minus actual CO_2 reading)	19.4	16.9	19.4	16.9			16.9
CO (Net is actual CO reading minus actual O_2 reading)	...		...				
N_2 (Net is 100 minus actual CO reading)		83.1		83.1			83.1

Run # 2	1		2		3		
Collection Method Continuous/Grab GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	Average Net Volume
CO_2	2.5	2.5		2.5			2.5
O_2 (Net is actual O_2 reading minus actual CO_2 reading)	19.9	17.4		17.4			17.4
CO (Net is actual CO reading minus actual O_2 reading)	...						
N_2 (Net is 100 minus actual CO reading)		80.1		80.1			80.1

Run # 3	1		2		3		
Collection Method Continuous/Grab GAS	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	Average Net Volume
CO_2	3	3		3			3
O_2 (Net is actual O_2 reading minus actual CO_2 reading)	19.1	16.1		16.1			16.1
CO (Net is actual CO reading minus actual O_2 reading)	...						
N_2 (Net is 100 minus actual CO reading)		80.9		80.9			80.9

EDISON, NEW JERSEY

SUMMARY OF TEST DATA

		6-27-89 RUN #2	6-27-89 RUN #4	6-30-89 RUN #6
SAMPLING TRAIN DATA				
	start	07:42	13:35	08:31
	finish	09:31	15:15	09:40
1. Sampling time, minutes	θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.2650	.2650	.2700
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000383	.000383	.000398
4. Isokinetic variation	I	91.1	101.1	100.9
5. Sample gas volume - meter cond., cf.	V_m	39.700	45.400	50.120
6. Average meter temperature, ^oR	T_m	562	562	550
7. Avg. oriface pressure drop, in. H_2O	dH	1.53	1.77	1.90
8. Total particulate collected, mg.	M_n	12.40	37.40	46.30 ?
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2	A	15.90	15.90	15.90
10. Absolute stack gas pressure, in. Hg.	P_s	30.72	30.72	31.10
11. Barometric pressure, in. Hg.	P_{bar}	30.72	30.72	31.10
12. Avg. absolute stack temperature, R^o	T_s	686	688	661
13. Average $-\sqrt{\text{vel. head}}$, (C_p= .80)	$-\sqrt{dP}$	0.91	0.91	0.90
14. Average stack gas velocity, ft./sec.	V_s	58.31	58.05	55.04
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	405.00	410.20	325.00
16. Moisture in stack gas, %	B_{ws}	32.99	30.30	23.17
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1767	1824	2009
18. Stack gas flow rate, cfm	acfm	55628	55380	52508
19. Particulate concentration, gr/dscf	C_s	0.0049	0.0130	0.0141
20. Particulate concentration, lb/hr	E	1.24	3.39	4.05 ?
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	2.50	2.60	3.00
23. Percent O_2 by volume	O_2	17.40	17.00	17.20
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	80.10	80.40	79.80

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 2:

$$V_{m(std)} = (17.64)(1.010)(39.700)\left[\frac{(30.72) + \frac{1.53}{13.6}}{562}\right] = 38.805 \text{ dscf}$$

RUN 4:

$$V_{m(std)} = (17.64)(1.010)(45.400)\left[\frac{(30.72) + \frac{1.77}{13.6}}{562}\right] = 44.401 \text{ dscf}$$

RUN 6:

$$V_{m(std)} = (17.64)(1.010)(50.120)\left[\frac{(31.10) + \frac{1.90}{13.6}}{550}\right] = 50.720 \text{ dscf}$$

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 2:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{12.40}{38.805} \right] = 0.0049 \text{ gr./dscf.}$$

Run 4:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{37.40}{44.401} \right] = 0.0130 \text{ gr./dscf.}$$

Run 6:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{46.30}{50.720} \right] = 0.0141 \text{ gr./dscf.}$$

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 2:

$$M_d = 0.44(\ \ 2.50\%) + 0.32(17.40\%) + 0.28(\ \ .00\% + 80.10\%) = 29.10\ \frac{lb}{lb\text{-}mole}$$

Run 4:

$$M_d = 0.44(\ \ 2.60\%) + 0.32(17.00\%) + 0.28(\ \ .00\% + 80.40\%) = 29.10\ \frac{lb}{lb\text{-}mole}$$

Run 6:

$$M_d = 0.44(\ \ 3.00\%) + 0.32(17.20\%) + 0.28(\ \ .00\% + 79.80\%) = 29.17\ \frac{lb}{lb\text{-}mole}$$

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

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

Where:

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

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

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

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

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

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

p_w = Density of water, 0.002201 lb/ml.

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

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

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

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

Run 2:

$V_{wc(std)}$ = (0.04707) (395.0) = 18.6 cu.ft
$V_{wsg(std)}$ = (0.04715) (10.0) = 0.5 cu.ft

Run 4:

$V_{wc(std)}$ = (0.04707) (400.0) = 18.8 cu.ft
$V_{wsg(std)}$ = (0.04715) (10.2) = 0.5 cu.ft

Run 6:

$V_{wc(std)}$ = (0.04707) (310.0) = 14.6 cu.ft
$V_{wsg(std)}$ = (0.04715) (15.0) = 0.7 cu.ft

Moisture Content of Stack Gases

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

Where:

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

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

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

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

Run 2:

$$B_{ws} = \frac{18.6 + 0.5}{18.6 + 0.5 + 38.805} \times 100 = 32.99\ \%$$

Run 4:

$$B_{ws} = \frac{18.8 + 0.5}{18.8 + 0.5 + 44.401} \times 100 = 30.30\ \%$$

Run 6:

$$B_{ws} = \frac{14.6 + 0.7}{14.6 + 0.7 + 50.720} \times 100 = 23.17\ \%$$

Molecular Weight of Stack Gases

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

Where:

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

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

Run 2:

M_s = 29.10 (1 - 32.99) + 18 (32.99) = 25.44 (lb./lb.-mole)

Run 4:

M_s = 29.10 (1 - 30.30) + 18 (30.30) = 25.74 (lb./lb.-mole)

Run 6:

M_s = 29.17 (1 - 23.17) + 18 (23.17) = 26.58 (lb./lb.-mole)

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 $\left[(g/g\text{-mole})\text{-}(mm\ Hg)\ /\ (^oK)(\ mm\ H_2O \right]^{1/2}$
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 2:

$$V = (85.49)\ (\ .80)\ (\ 0.91)\ \sqrt{\frac{686}{(30.72)(25.44)}} = 58.31\ ft/sec.$$

Run 4:

$$V = (85.49)\ (\ .80)\ (\ 0.91)\ \sqrt{\frac{688}{(30.72)(25.74)}} = 58.05\ ft/sec.$$

Run 6:

$$V = (85.49)\ (\ .80)\ (\ 0.90)\ \sqrt{\frac{661}{(31.10)(26.58)}} = 55.04\ ft/sec.$$

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

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°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 2:

$$Q_{sd}=3600(1-\ .3299\ )(\ 58.31)(\ 15.90)\left[\frac{528}{686}\right]\left[\frac{30.72}{29.92}\right] = 1767468.6\ \frac{dscf}{hr}$$

Run 4:

$$Q_{sd}=3600(1-\ .3030\ )(\ 58.05)(\ 15.90)\left[\frac{528}{688}\right]\left[\frac{30.72}{29.92}\right] = 1824902.8\ \frac{dscf}{hr}$$

Run 6:

$$Q_{sd}=3600(1-\ .2317\ )(\ 55.04)(\ 15.90)\left[\frac{528}{661}\right]\left[\frac{31.10}{29.92}\right] = 2009741.3\ \frac{dscf}{hr}$$

Emissions Rate from Stack

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

Where:

E = Emissions rate, lb/hr.

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

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

Run 2:

$$E = \frac{(0.0049)\ (1767468.6)}{7000} = 1.24\ lb. / hr.$$

Run 4:

$$E = \frac{(0.0130)\ (1824902.8)}{7000} = 3.39\ lb. / hr.$$

Run 6:

$$E = \frac{(0.0141)\ (2009741.3)}{7000} = 4.05\ lb. / hr.$$

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

Where:

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

Run 2:

$$I = (100)(\ 686\ ) \left[\frac{(0.002669)(405.00) + \frac{39.700}{562} \left[30.72 + \frac{1.53}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 58.31\ )\ (\ 30.72\ )\ (\ .000383\ )} \right] = 91.1\%$$

Run 4:

$$I = (100)(\ 688\ ) \left[\frac{(0.002669)(410.20) + \frac{45.400}{562} \left[30.72 + \frac{1.77}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 58.05\ )\ (\ 30.72\ )\ (\ .000383\ )} \right] = 101.1\%$$

Run 6:

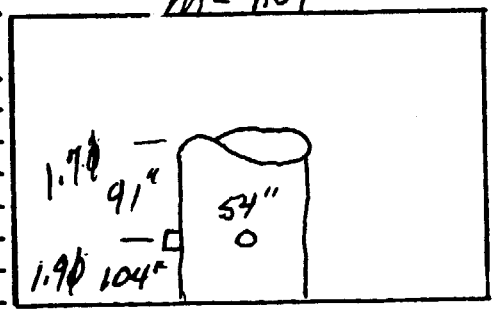
$$I = (100)(\ 661\ ) \left[\frac{(0.002669)(325.00) + \frac{50.120}{550} \left[31.10 + \frac{1.90}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 55.04\ )\ (\ 31.10\ )\ (\ .000398\ )} \right] = 100.9\%$$

VIII. FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant Quality Materials Inc.
Location Edison, N.J.
Operator Dave Armstrong
Date 6-26-89
Run No. 1
Sample Box No. 3
Meter Box No. 646882
Meter H @ 1.55
C Factor 1.01
Pitot Tube Coefficient Cp .802

m = 4.04



Schematic of Stack Cross Section

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature 82°F		
Barometric Pressure FINAL		
Assumed Moisture, % 30% INITIAL	200	
Probe Length, m(ft) 6ft. DIFFERENCE		

Nozzle Identification No. .0005585
Avg. Calibrated Nozzle Dia., (in.) .320/.320/.320
Probe Heater Setting 5
Leak Rate, m³/min. (cfm)
Probe Liner Material Glass
Static Pressure, mm Hg (in. Hg)
Filter No.

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 IN / OUT	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	1:40 / 1:42.30	5	210	.56	2.3	550.146 / 552.32	94	88	160 / 220	65
2	1:45	3	216	.44	1.8	554.27	106	88	156 / 206	65
3	1:47.30	4	220	.48	1.9	556.04	108	88	156 / 204	65
4	1:50	5	223	.58	2.3	558.26	110	88	155 / 220	65
5	1:52.30	4.5	225	.54	2.2	560.16	112	90	156 / 225	65
6	1:55	5	227	.56	2.3	562.26	114	90	156 / 222	60
7	1:57.30	4	230	.44	1.8	564.45	116	92	158 / 200	60
8	2:00	5	230	.54	2.2	566.57	118	92	155 / 206	60
9	2:02.30	5	228	.51	2.1	568.42	120	94	160 / 225	60
10	2:05	4	220	.42	1.7	570.31	120	94	163 / 215	60
11	2:07.30	4.5	221	.47	1.9	572.68	122	94	163 / 198	60
12	2:10	5	228	.53	2.1	574.34	122	94	170 / 220	60
B 1	2:20 / 2:22.30	4	218	.58	2.3	576.70	110	98	190 / 225	60

-29-

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-26-89 LOCATION Eddington, ME. 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) IN / OUT	IMPINGER TEMP (°F)
2	2:25	4	220	.58	2.3	578.62	120	100	166 / 223	60
3	2:27.30	4.5	223	.60	2.4	580.22	122	100	164 / 222	60
4	2:30	4	226	.52	2.1	582.84	124	100	161 / 220	60
5	2:32.30	3.5	230	.46	1.9	584.69	124	100	159 / 214	60
6	2:35	4	230	.52	2.1	586.67	124	100	158 / 200	60
7	2:37.30	3	233	.41	1.7	588.65	124	100	160 / 209	60
8	2:40	3.5	234	.45	1.8	590.17	126	102	163 / 225	60
9	2:42.30	3.5	235	.45	1.8	592.18	126	102	163 / 225	60
10	2:45	3.5	236	.45	1.8	594.05	126	102	158 / 210	60
11	2:47.30	3	238	.42	1.7	595.41	126	102	158 / 196	60
12	2:50	3	238	.38	1.5	597.493	126	102	164 / 200	60

RAMCON ENVIRONMENTAL CORPORATION

Plant Quality Materials

Location Edison, N.J.
Operator Dave Armstrong
Date 6-27-89
Run No. 2
Sample Box No. 3
Meter Box No. 646882
Meter H @ 1.55
C Factor 1.01
Pitot Tube Coefficient Cp .802

m = 1.86

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature 74°F			
Barometric Pressure 30.72	FINAL	595	548.0
Assumed Moisture, % 30	INITIAL	200	538.0
Probe Length, m(ft) 6 ft.	DIFFERENCE	395	10.0

Nozzle Identification No. .00034830
Avg. Calibrated Nozzle Dia., (in.) .265/.265/.265
Probe Heater Setting 5
Leak Rate, m³/min. (cfm) +.003 @ 5"
Probe Liner Material Glass
Static Pressure, mm Hg (in. Hg) +.10
Filter No. B5-3325

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	7:42 / 7:44.30	2.5	224	.88	1.6	605.100 / 606.73	88	86	180 / 225	55
2	7:47	3	226	.86	1.6	608.30	100	86	174 / 233	55
3	7:49.30	3	226	.88	1.6	610.03	104	86	170 / 220	55
4	7:52	2.5	230	.83	1.5	611.64	108	86	174 / 214	55
5	7:54.30	2	232	.83	1.5	613.38	110	86	169 / 212	55
6	7:57	2	232	.77	1.4	614.89	110	86	184 / 192	55
7	7:59.30	2.5	232	.78	1.5	616.48	112	86	184 / 188	55
8	8:02	2.5	232	.80	1.5	617.95	112	86	188 / 198	55
9	8:04.30	2	232	.75	1.4	619.48	114	86	190 / 204	55
10	8:07	2.5	234	.81	1.5	621.17	116	86	200 / 225	55
11	8:09.30	2	234	.88	1.6	623.02	116	86	205 / 225	55
12	8:12	1	232	.72	1.3	624.73	118	90	210 / 225	55
B 1	8:41 / 8:43.30	2	242	.90	1.7	626.71	110	92	175 / 200	55

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-27-89 LOCATION Edison, N.J. TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME Vm (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
2	8:46	1.5	236	.82	1.5	628.82	112	92	159 / 172	55
3	8:48.30	1	226	.77	1.3	629.90	114	94	192 / 191	55
4	9:09 / 9:11.30	2	204	.95	1.8	631.80	102	96	220 / 222	55
5	9:14	2	208	.91	1.7	633.57	112	100	194 / 207	55
6	9:16.30	2	209	.91	1.7	635.10	118	100	189 / 215	55
7	9:19	1	212	.80	1.5	636.78	120	96	183 / 214	55
8	9:21.30	1	214	.80	1.5	638.38	120	96	177 / 209	55
9	9:24	1	220	.85	1.6	640.05	120	96	182 / 210	55
10	9:26.30	1	224	.84	1.6	641.13	122	96	204 / 214	55
11	9:29	1	225	.81	1.5	643.44	122	96	225 / 222	55
12	9:31.30	1	226	.75	1.4	644.796	124	96	222 / 225	55

Plant Down

RAMCON ENVIRONMENTAL CORPORATION

Plant Quality Materials Inc.

Location Edison, N.J.
Operator Dave Armstrong
Date 6-27-89
Run No. 3
Sample Box No. 3
Meter Box No. 646882
Meter H @ 1.55
C Factor 1.01
Pitot Tube Coefficient Cp .842

n = 2.14

Schematic of Stack Cross Section

Ambient Temperature
Barometric Pressure 30.72 FINAL
Assumed Moisture, % 30 INITIAL 200
Probe Length, m(ft) 6.45 DIFFERENCE
Nozzle Identification No. 10003830
Avg. Calibrated Nozzle Dia., (in.) .265/.265/.265
Probe Heater Setting 5
Leak Rate, m³/min. (cfm)
Probe Liner Material Glass
Static Pressure, mm Hg (in. Hg)
Filter No.

IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g

TRAV. PT NO.	SAMPLING TIME (θ) min. (CENTRAL TIME)	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 IN / OUT	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	10:16 / 10:18.30	2	230	.95	2.0	645.285 / 647.28	110	102	225 / 225	60
2	10:21	2	232	.95	2.0	648.84	112	98	223 / 225	60
3	10:23.30	2	234	.89	1.9	650.96	116	98	220 / 225	60
4	10:26	2	234	.91	2.1	652.74	118	98	220 / 225	55
5	10:28.30	2	234	.82	2.0	654.64	118	98	216 / 225	55
6	10:31	2	234	.86	1.8	656.42	120	98	218 / 222	55
7	10:33.30	2	234	.86	1.8	658.35	120	98	210 / 220	55
8	10:36	1.5	234	.76	1.6	660.20	122	98	204 / 216	55
9	10:38.30	1.5	234	.74	1.6	661.62	122	98	196 / 210	55
10	10:41	1.5	234	.72	1.5	663.47	122	98	192 / 220	55
11	10:43.30	2	232	.82	1.8	664.94	122	98	190 / 225	55
12	10:46	1.5	232	.75	1.6	666.66	122	98	186 / 225	55
B 1	10:48 / 10:50.30	2	234	.96	2.1	668.76	114	98	160 / 198	55

-33-

Form ATEC 05

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-27-89 LOCATION Edison, N.J. TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME Vm (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
2	10:53	2	238	.85	1.8	670.75	118	98	168 / 200	55
3	10:55:30	2	240	.85	1.8	672.77	118	98	170 / 202	55
4	10:58	2	240	.87	1.9	674.64	120	98	180 / 216	55
5	11:00:30	1.5	242	.73	1.6	676.17	120	98	186 / 218	55
6	11:03	1.5	242	.70	1.5	678.52	122	98	196 / 220	55
7	11:05:30	1.5	244	.70	1.5	679.94	122	98	200 / 222	55
8	11:08	1.5	244	.71	1.5	681.92	122	98	202 / 225	55
9	11:10:30	1	244	.66	1.4	683.53	122	98	204 / 225	55
10	11:13	1	244	.64	1.4	685.55	124	98	200 / 225	55
11	11:15:30	1.5	242	.72	1.5	686.90	126	100	168 / 217	55
12	11:18	1.5	240	.72	1.5	688.626	126	100	168 / 217	55

RAMCON ENVIRONMENTAL CORPORATION

Plant Quality Materials Inc.

Location Edison, N.J.
Operator Dave Armstrong
Date 6-27-89
Run No. 4
Sample Box No. 3
Meter Box No. 646882
Meter H @ 1.35
C Factor 1.01
Pitot Tube Coefficient Cp .802

m = 2.14

Schematic of Stack Cross Section

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature 78			
Barometric Pressure 30.72	FINAL	600	5352
Assumed Moisture, % 30	INITIAL	200	285.0
Probe Length, m(ft) 6 FT.	DIFFERENCE	400	10.2

Nozzle Identification No. 10003580
Avg. Calibrated Nozzle Dia., (in.) .265/.265/.265
Probe Heater Setting 5
Leak Rate, m^3/min. (cfm) +.013 @ 6"
Probe Liner Material 316 SS
Static Pressure, mm Hg (in. Hg) .05
Filter No. FK 3527

TRAV. PT NO.	SAMPLING TIME (θ) min. (EASTERN TIME)	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	1:35:15 / 1:37:45	3	230	.95	2.0	690.150 / 692.27	100	95	230 / 230	65
2	1:40:15	3	230	.95	2.0	694.37	110	95	225 / 230	65
3	1:42:45	3	230	.90	1.9	696.43	115	95	225 / 230	60
4	1:43:15	2	230	.82	1.8	698.46	115	95	225 / 230	60
5	1:45:45	2	230	.80	1.7	700.34	117	90	117 / 220	55
6	1:48:15	2	230	.80	1.7	702.25	120	90	220 / 220	55
7	1:50:45	2	230	.77	1.6	704.08	120	90	220 / 220	55
8	1:53:15	2	230	.73	1.6	705.81	120	90	215 / 215	55
9	1:55:45	2	235	.73	1.6	707.78	115	90	215 / 210	55
10	1:58:15	2	235	.73	1.6	709.58	115	90	225 / 200	55
11	2:00:45	2	235	.73	1.6	711.47	115	90	225 / 225	55
12	2:03:15	2	235	.73	1.6	713.24	115	90	225 / 230	55
B 1	1:45:45 / 1:48:15	2	210	.93	2.0	715.27	95	90	220 / 210	60

-35-

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-27-89 LOCATION Edison NJ TEST NO. 4

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME Vm ($ft.^3$)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
2	14:50:45	3	220	.98	2.1	717.36	110	90	210/215	55
3	14:53:15	3	220	.93	2.0	719.37	110	90	215/215	55
4	14:55:45	2	220	.88	1.9	721.34	110	90	220/225	55
5	14:58:15	2	220	.85	1.8	723.26	110	90	220/225	55
6	15:00:45	2	225	.83	1.7	725.03	110	90	200/210	55
7	15:03:15	2	225	.80	1.7	726.86	110	90	215/205	55
8	15:05:45	2	225	.83	1.7	728.55	110	90	225/225	55
9	15:08:15	2	225	.80	1.7	730.21	110	90	225/225	55
10	15:10:45	2	230	.80	1.7	732.34	115	90	225/220	55
11	15:13:15	2	230	.85	1.8	733.86	115	90	225/205	55
12	15:15:45	2	230	.80	1.7	735.534	115	90	225/200	55

RAMCON ENVIRONMENTAL CORPORATION

Plant Quality Metals

Location
Operator
Date
Run No. 5
Sample Box No.
Meter Box No.
Meter H @
C Factor
Pitot Tube Coefficient Cp

No production

Ambient Temperature
Barometric Pressure
Assumed Moisture, %
Probe Length, m(ft)
Nozzle Identification No.
Avg. Calibrated Nozzle Dia., (in.)
Probe Heater Setting
Leak Rate, m^3/min. (cfm)
Probe Liner Material
Static Pressure, mm Hg (in. Hg)
Filter No.

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL		
INITIAL		
DIFFERENCE		

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H_2O	PRESSURE DIFF. ORF. MTR in H_2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A) 1	14:49:30 / 14:52	3	215	.83	1.8	736.263 / 738.06	100	90	200 / 190	60
2	14:54:30	3	210	.80	1.7	739.79	110	90	210 / 200	60
3	14:57	4	205	.95	2.0	741.82	110	90	210 / 205	60
4	14:59:30	5	185	1.0	2.1	743.71	110	90	210 / 210	55
5	15:02	5	195	.95	2.0	745.83	110	90	215 / 210	55
6	15:04:30	5	195	.90	1.9	747.79	115	90	220 / 220	55
7	15:07	5	200	.80	1.7	749.73	115	90	220 / 220	55
8	15:09:30	5	200	.82	1.8	751.63	115	90	225 / 225	55
9	15:12	5	200	.73	1.6	753.44	115	90	225 / 225	55
10	15:14:30	2	200	.55	1.2	755.99	115	90	225 / 225	55
11	15:17	2	200	.53	1.1	756.67	115	90	220 / 225	55
12	15:19:30	2	200	.50	1.0	758.23	115	90	220 / 220	55
B) 1	/									

RAMCON ENVIRONMENTAL CORPORATION

Plant Quality Materials Inc.

Location Edison, N.J.
Operator Wayne Armstrong
Date 6-30-89
Run No. 6
Sample Box No. 2
Meter Box No. 646582
Meter H @ 1.55
C Factor 1.01
Pitot Tube Coefficient Cp .802

m = 2.32

Ambient Temperature 60°F
Barometric Pressure 31.10
Assumed Moisture, % 35
Probe Length, m(ft) 6 ft
Nozzle Identification No. .0003976
Avg. Calibrated Nozzle Dia., (in.) .270/.270/.270
Probe Heater Setting 5
Leak Rate, m³/min. (cfm) +.011 @ 5"
Probe Liner Material Glass
Static Pressure, mm Hg (in. Hg) +.05
Filter No. EK 3329

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	510	530.0
INITIAL	200	515.0
DIFFERENCE	310	15.0

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	8:31 / 8:33.30	2.5	180	.80	1.9	945.349 / 949.42	76	70	189 / 225	40
2	8:38	3	180	.97	2.3	949.73	86	70	186 / 224	40
3	8:38.30	3	178	.94	2.2	951.84	92	70	181 / 224	40
4	8:41	3.5	186	1.0	2.3	954.17	96	70	174 / 222	40
5	8:43.30	3	190	.86	2.0	956.35	98	72	168 / 218	40
6	8:46	3	198	.83	1.9	958.30	100	72	170 / 222	40
7	8:48.30	3	200	.83	1.9	960.47	100	74	172 / 221	40
8	8:51	3.5	204	.78	1.8	962.48	102	74	175 / 220	40
9	8:53.30	3	208	.75	1.7	964.45	106	74	175 / 220	40
10	8:56	3.5	210	.78	1.8	966.59	106	76	182 / 220	42
11	8:58.30	3.5	214	.84	1.9	968.63	108	76	184 / 218	42
12	9:01	3.5	216	.85	2.0	970.71	108	76	191 / 220	42
B 1	9:10 / 9:12.30	3	184	.74	1.7	972.88	90	78	188 / 218	42

Form #REC-05

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-30-89 LOCATION Edison, N.J. TEST NO. 6

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	9:15	3	192	.85	2.0	975.02	104	78	188 / 225	42
3	9:17.30	3	202	.85	2.0	977.17	106	80	183 / 224	44
4	9:20	3	204	.83	1.9	~~940~~ 979.26	108	80	186 / 217	44
5	9:22.30	3	208	.88	2.0	981.38	108	80	190 / 223	44
6	9:25	3	210	.80	1.9	983.66	110	80	195 / 225	44
7	9:27.30	3	210	.73	1.7	985.51	110	80	197 / 225	44
8	9:30	2.5	210	.67	1.6	987.43	110	80	191 / 223	44
9	9:32.30	2.5	210	.71	1.6	989.38	110	82	193 / 220	44
10	9:35	3	212	.75	1.7	991.46	110	82	198 / 218	44
11	9:37.30	3	212	.82	1.9	993.45	110	82	200 / 220	44
12	9:40	3	210	.78	1.8	995.471	112	82	198 / 225	44

IX. CALIBRATION

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number _____ Date 7-7-89 Meter box number C-124 Plant _____

Barometric pressure, P_b = 30.89 in. Hg Dry gas meter number 646882 Pretest Y 1.01

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 $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	Data
1.0	10 ~~7~~	156.270 / 163.410	69.8	100 / 102	70 / 72	86	12.22	3	1.007		1.607
1.5	10 10	166.520 / 176.959	69.8	100 / 102	72 / 74	87	14.19	3	1.015		1.620
2.0	10 10	152.640 / 162.650	69.8	92 / 100	68 / 70	82.5	12.23	5	1.017		1.628
									Y =	1.013	1.63

[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 $\pm 0.05Y$.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 6-19-89 Meter box number 646882 C-124

Barometric pressure, P_b = 30.03 in. Hg Calibrated by NA

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	5								
1.0	5	492.20 / 500.457	75.2	106 / 110	86 / 84	96.5	17.00	1.01	1.57
1.5	10	481.40 / 491.633	75.2	106 / 110	84 / 84	96	13.77	1.01	1.55
2.0	10	468.083 / 478.288	75.2	100 / 110	84 / 84	94.5	12.08	1.00	1.59
3.0	10	457.13 / 467.26	75.2	106 / 110	80 / 82	94.5	9.53	1.02	1.49
4.0	10								
							Avg	1.01	1.55

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.

Form #REC-02

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-7-89 Thermocouple number Hot box

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator Turner Reference: mercury-in-glass ✓

other _____

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	Ice Bath	32°F	32	0
B	Boiling water	212	212	0
C	Boiling oil	381	381	0
D	Ambient 6-26-89	80	80	0

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-7-89 Thermocouple number inlet/outlet

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator Henry Reference: mercury-in-glass ✓

other _____

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	Ice Bath	32	32	0
B.	Boiling water	212	212	0
C	Boiling oil	381	381	0
D	Ambient 6-26-89	80	80	0

[a]Type of calibration system used.

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

RAMCON ENVIRONMENTAL CORPORATION

(44)

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. 62 Date 5-8-89

Calibrated by: Sam O'T. Lumen

"A" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp (s) cm H_2O (in. H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(A)$
1	0.98	1.5	.808	<.01
2	0.85	1.30	.809	<.01
3	0.64	.99	.804	<.01
		$\bar{C}_p$ (SIDE A)	.807	

"B" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp(s) cm H_2O in. H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(B)$
1	0.98	1.55	.795	<.01
2	0.85	1.30	.809	<.01
3	0.64	0.99	.804	<.01
		$\bar{C}_p$ (SIDE B)	.803	

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

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

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

Form No. EED-17-1

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-5-89 Thermocouple number 62

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	210	.009
C	oil	381	378	.008
D	Ambient 6-26-89	80	80	0

[a]Type of calibration system used.

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

RAMCON

Lear Siegler Stack Sampler

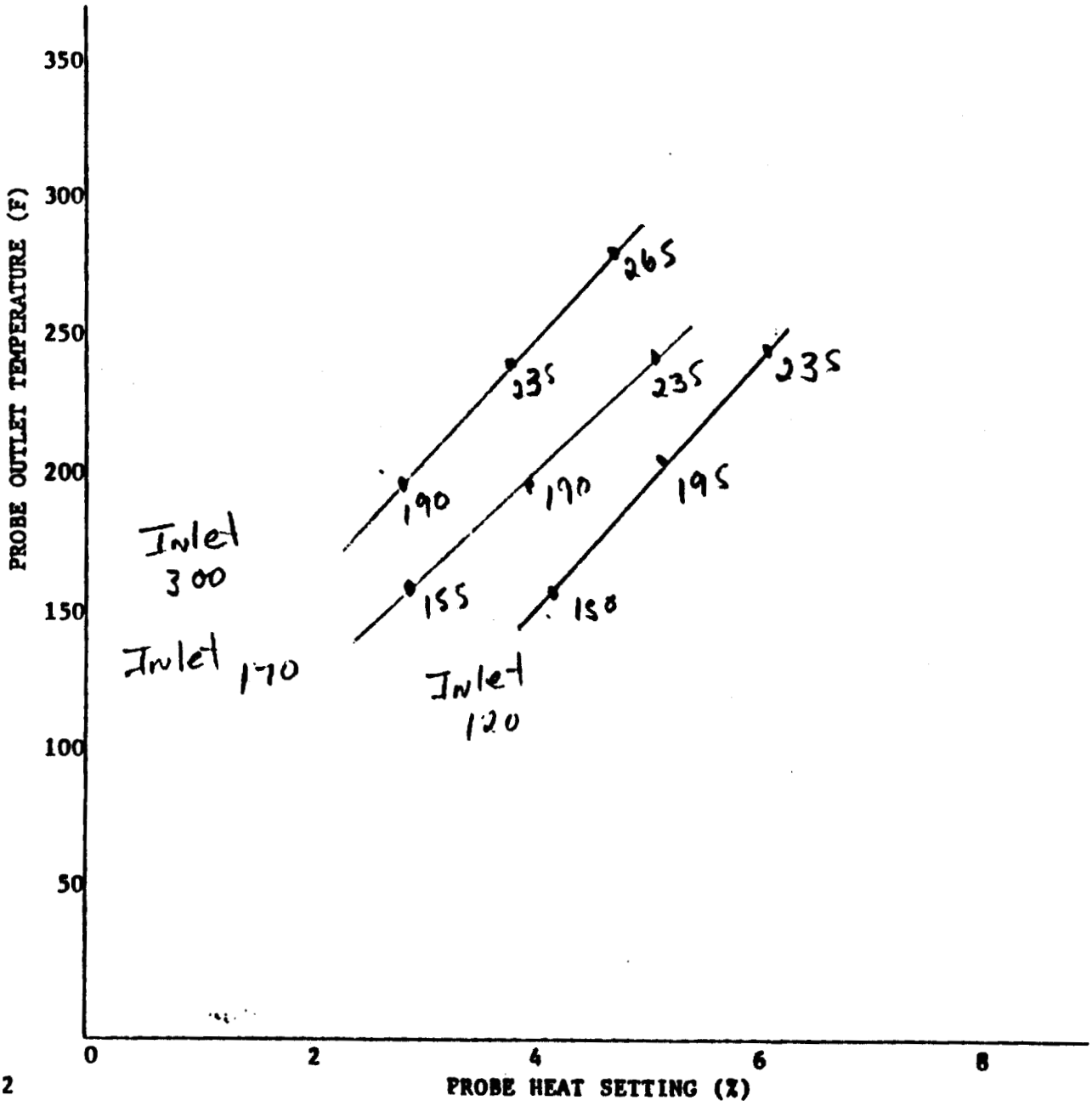
Heating Probe Calibration

Probe No. 62 Probe Length 6'

Date of Calibration 5-7-89 Signature Sam Cumm

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 Stack Test Team

Sumner Buck - President

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

Dave Armstrong - Team Leader

Dave Armstrong has been with RAMCON Environmental for two years. He was promoted to Team Leader in 1988 and altogether has sampled almost 200 stacks of all types. Dave is a current V.E. reader and has extensive training in EPA Methods 1 - 9.