Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF ENVIRONMENTAL QUALITY

CN 027, TRENTON, N.J. 08625

JORGE H. BERKOWITZ, Ph.D.
DIRECTOR

(609) 292-5383

June 21, 1988

MEMORANDUM

TO: Don Paterson

FROM: Edward Choromanski

SUBJECT: Weldon Asphalt Company
Linden, New Jersey
APC ID No. 40015
NJ Stack No. 001

Emission tests were conducted on April 25, 1988 at Weldon Asphalt Division, located in Linden, New Jersey, on the Asphalt Mix Dryer (NJ Stack No. 001). The purpose of the tests was to determine the particulate, total hydrocarbon and carbon monoxide omissions from the source in comparison to the standard stated on Permit No. P-37866 and the new source Performance Standards (NSPS) - Subpart I - Standards or Performance for Asphalt Concrete Plants. The results as reported are as follows:

PARTICULATE EMISSIONS

Run No.	Actual Emission Rate (lb/hr)	Allowable Emission Rate (lb/hr)	% Isokinetic
1	2.0	7.99	98.6
2	2.1	7.99	95.7
3	1.1	7.99	97.4

Run No.	Actual Emission Concentration (GR/DSCF)	Allowable Emission Concentration (GR/DCSF)
1	0.009	0.04
2	0.010	0.04
3	0.005	0.04

<u>NOTE</u>: Allowable emission concentration specifided by NSPS - Subpart I.

<u>CARBON MONOXIDE EMISSIONS</u>

Run No.	Actual Emission Rate (lb/hr)	Actual Concentration (ppmv)	Concentration Adjusted to 7% O_2
1	47.8	417	758
2	---	---	---
3	---	---	---

<u>NOTE</u>: Results for Runs No. 2 and 3 were not reported.

TOTAL HYDROCARBONS EMISSIONS

Run No.	Actual Emission Rate (lb/hr)	Actual Concentration (ppmv)	Concentration Adjusted to 7% O_2
1	6.7	101.9	185.3
2	---	---	---
3	---	---	---

NOTE: Results for Runs No. 2 and 3 were not reported.

Technical Services calculations using the raw data supplied, produced substantially the same results. The test results indicate that the particulate emissions from the Asphalt Mix Dryer were within the standards stated on Permit No. P-37866 and prescribed by N.S.P.S. Subpart I, for all tests runs.

The test results also indicate that emissions of Carbon Monoxide and total hydrocarbons are being emitted from the source which are not listed as air contaminants on Permit No. P-37866.

The following process information was supplied in the final emission test report.

Run No.	1	2	3
Aggregate produced (tons/hr)	249.7	272	263.6
Liquid Asphalt injected (tons/hr)	13.6	15.6	15.4
Avg. Burner Setting (%)	62.3	74.7	68
Mix Temperature (^oF)	300	301	302
Baghouse Pressure Drop (inches H_2O)	3.0	4.4	5.4

Permit No. P-37866 indicates the throughput as 107.5 tons per hour of material. The source was producing 2.5 times higher the amount listed on Permit No. 37866.

Based on the results of the stack tests the following action is recommended.

1. Accept the particulate test results as demonstrating compliance with Permit No. P-37866 and N.S.P.S. - Subpart I.

2. Require the company to submit new permit applications indicating the higher throughput, and carbon monoxide and total hydrocarbon emissions as air contaminants.

c Milt Polakovic
Harold Christiff
Rich Craig
Byron Sullivan

RAMCON
ENVIRONMENTAL CORPORATION

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
WELDON ASPHALT
LINDEN, NEW JERSEY
April 25, 1988

Pete Smith
Weldon Asphalt

G. Sumner Buck, III
President

Sam Turner
Field Supervisor

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

RAMCON
ENVIRONMENTAL CORPORATION

May 3, 1988

Mr. Pete Smith
Weldon Asphalt, Inc.
141 Central Avenue
Westfield, NJ 07090

Re: Particulate Emissions Test - Linden, New Jersey

Dear Mr. Smith:

Enclosed you will find four copies of our report on the particulate emissions test we conducted at your plant. Based on our test results, your plant does pass both EPA New Source Performance Standards and those set by the State of New Jersey. The average grain loading of the three test runs is in compliance with State and Federal Standards.

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

Mr. Dipak B. Ghayal
Bureau of Technical Services
Department of Environmental Protection
380 Scotch Road
W. Trenton, NJ 08628

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: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

On April 25, 1988, personnel from RAMCON Environmental Corporation (REC) conducted a source emissions test for particulate emissions compliance at Weldon Asphalt's Barber-Greene drum mix asphalt plant located in Linden, New Jersey. RAMCON personnel conducting the test were Sam Turner, Field Supervisor and Allen Turner. Shawn Greenwood was responsible for the laboratory analysis including taring the beakers and filters and recording final data in the laboratory record books. Custody of the samples was limited to Mr. Turner and Mr. Greenwood.

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

II. TEST RESULTS

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

Mr. Dipak B. Ghayal, Mr. Daniel Burgoyne and Mr. Michael Pratt of New Jersey's Department of Environmental Protection and Ms. Ann Zownir of US EPA Region II observed the testing conducted by RAMCON.

TABLE I

SUMMARY OF TEST RESULTS
April 25, 1988

Test Run	Time	Grain Loading	Isokinetic Variation	Actual Emissions
1	07:47 to 09:12	0.0088 gr/DSCF	98.6%	2.0 lbs/hr
2	10:23 to 11:35	0.0095 gr/DSCF	95.7%	2.1 lbs/hr
3	13:07 to 14:21	0.0050 gr/DSCF	97.4%	1.1 lbs/hr
	Average:	0.0078 gr/DSCF		1.7 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 New Jersey. Therefore, the plant is operating in compliance with State and Federal Standards.

III. TEST PROCEDURES

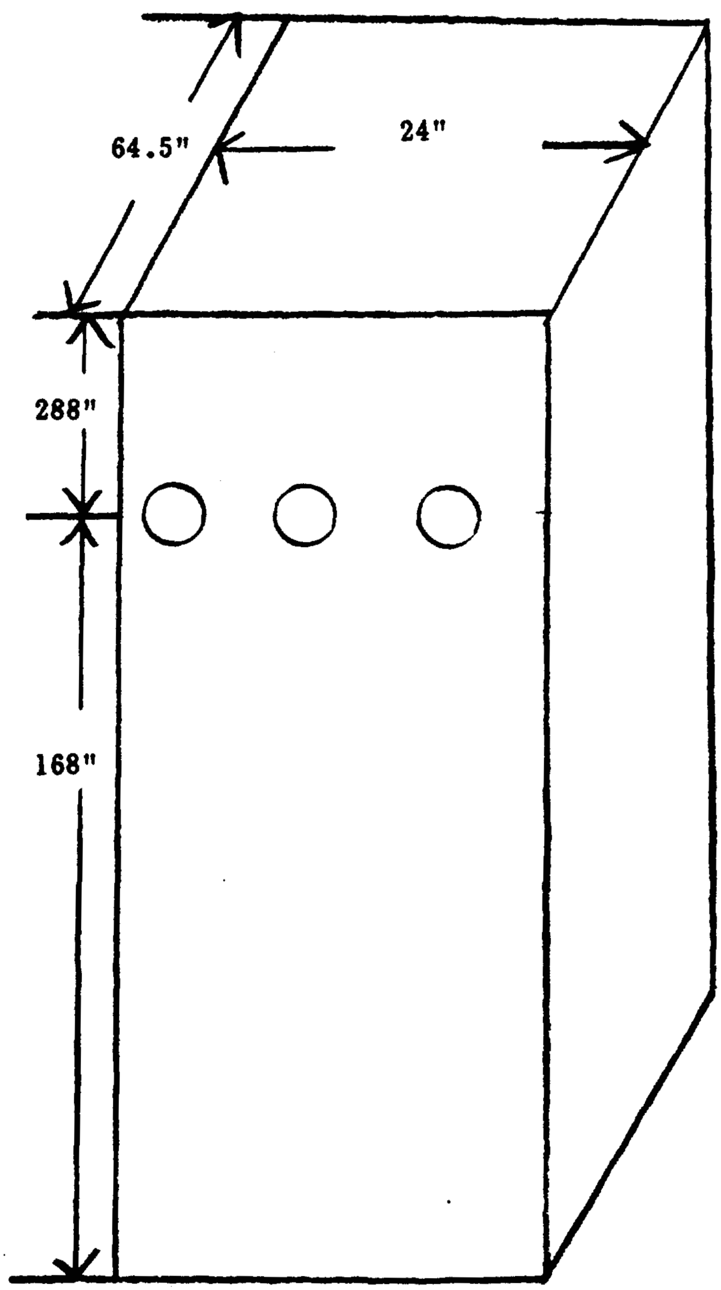
A. Method Used: The source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

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

C. Sampling Site: The emissions test was conducted after a baghouse on a rectangular stack measuring 24" x 64.5" with an equivalent diameter of 35.0". Three sampling ports were placed 288" down (8.2 diameters upstream) from the top of the stack and 168" up (4.8 diameters downstream) from the last flow disturbance. Twenty seven points were sampled, nine through each port for 2.5 minutes each for a total test time of 67.5 minutes per test run.

Points on a Diameter	Probe Mark
1	*8.6"
2	15.8"
3	22.9"
4	30.1"
5	37.3"
6	44.4"
7	51.6"
8	58.8"
9	65.9"

*Measurements include a 5" standoff.



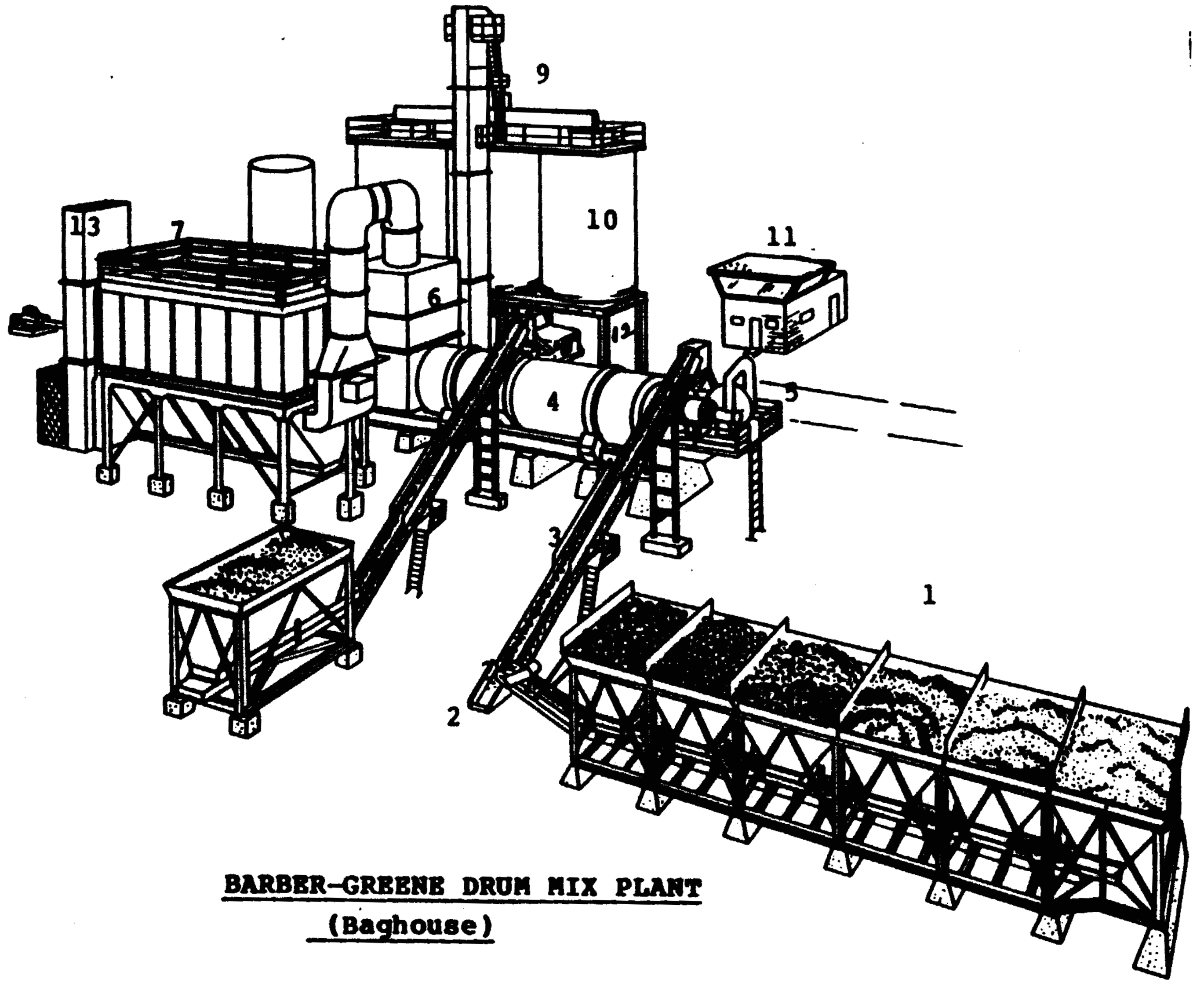
IV. THE SOURCE

IV. THE SOURCE

Weldon Asphalt Paving employs a Barber-Greene drum mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt oil to bind the mixture together. After the hot asphalt mix is manufactured at the plant, it is transported to the location where it is to be applied. The hot asphalt mix is spread evenly over the surface with a paver 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 #2 fuel oil 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 Barber-Greene. 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.



BARBER-GREENE DRUM MIX 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 baffleing: A baffeling plate is inserted in the "dirty" side plenum as a knock out for heavy particles in the air stream. These particles fall to the bottom of the baghouse.

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

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

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

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

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

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

13. Fuel Storage

14. Stack

DATA SUMMARY

Plant

1. Manufacturer of plant Barber - Greene.
2. Designed maximum operating capacity 300 TPH @ 5 % moisture.
3. Actual operation rate 250 TPH @ 5 % moisture.
4. Startup date 4-3-88.
5. Type of fuel used in dryer #2 Fuel Oil.
6. Quanity of fuel consumption ______.

Aggregate

7. Name/type of mix I-2 Stab Base I-5 Fabc Top.
8. Percent asphalt in mix 4.6 5.8 %.
9. Temperature of asphalt 300°.
10. Sieve/Screening analysis: % Passing;

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

Baghouse

11. Manufacturer Barber - Greene.
12. No. of bags 800. Type of bags Nomex.
13. Air to cloth ratio ______. Designed ACFM ______.
14. Square feet of bags ______.
15. Type of cleaning; pulse jet ✓, reverse air ______, plenum pulse ______, other ______.
16. Cleaning cycle time ______.
17. Interval between cleaning cycle ______.
18. Pressure drop across baghouse 4 psi.
19. Pulse pressure on cleaning cycle 110 psi.

COMPANY NAME Weldon Asphalt DATE 4-25-88

COMPANY REPRESENTATIVE [signature]

Form #REC-03

PLANT DATA

COMPANY NAME WELDON Asphalt

COMPANY REP. ______ DATE 4-25-88 PHONE # 862-0646

DATA SOURCE ______

PLANT LOCATION MARSHES Dock RD

PLANT MFG. Barber Greene PLANT MODEL # DM 65x204 PLANT TYPE Drum Mix

MIX SPECIFICATION # ______ OIL SPECIFICATION # 2

	Time 24 Hour	Fuel Oil 2 / Nat. Gas __ / Propane __ / Coal __	Burner Setting %	Aggregate TPH	Recycle TPH	Liquid Asphalt TPH	Mix Temp. °F	Venturi / Baghouse Pressure Drop Inches Water
3Axe	7:50 AM		56	248		11.4	300	3
	8:00		54	247		11.2	300	3
Top 1	8:15		67	252		14.6	300	3
	8:30		67	247		14.4	300	3
	8:45		61	252		14.7	300	3
	9:00		64	250		14.5	300	3
	9:15		67	252		14.7	300	3
	9:15-10:15	Plant	Shut	- Down				
Top	10:15		54	222		12.7	300	3
	10:30		70	257		14.8	300	3.5
2	10:45		74	283		16.5	301	4.5
	11:00		85	290		16.7	300	5.0
	11:15		80	292		16.6	302	5.0
	11:30		85	288		16.5	301	5.5
	~~12:15~~		~~5~~					
	1:00 PM		65	266		15.2	300	5.0
	1:15		72	266		15.5	302	5.5
3	1:30		66	260		15.3	301	5.5
	1:45		74	263		15.3	303	5.5
	2:00		64	264		154	302	5.5
	2:15		67	263		15.4	301	5.5

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 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^{o}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^{o}F for two to three hours, weigh the sample, and use this weight as a final weight.

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

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

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

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

SPECIAL NOTE

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

WEIGHING PROCEDURE - SARTORIUS ANALYTICAL BALANCE

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

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

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

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

Form REC#8

SAMPLE ANALYTICAL DATA FORM

Plant Location Weldon Asphalt   Relative humidity in lab 51 %

Sample Location hot mix asphalt plant   Density of Acetone (p_a) .7855 mg/ml

Blank volume (V_a) 200 ml

Date/Time wt. blank 4/27/88   Gross wt. 101.0398 mg

Date/Time wt. blank 4/28/88   Gross wt. 101.0398 mg

Ave. Gross wt. 101.0398 mg

Tare wt. 101.0395 mg

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

Acetone blank residue concentration (C_a) $(C_a) = (M_{ab}) / (V_a)(p_a)$ = (.0000019 mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} p_a$ = (.0000019)(200)(.7853) = (.0003)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	200	200	200
Date/Time of wt 4/27/88 1:30pm Gross wt	g	156.2110	157.4337	159.7124
Date/Time of wt 4/28/88 9:00AM Gross wt	g	156.2105	157.4336	159.7123
Average Gross wt	g	156.2108	157.4337	159.7124
Tare wt	g	156.1856	157.4084	159.6990
Less acetone blank wt (W_a)	g	.0003	.0003	.0003
Wt of particulate in acetone rinse (m_a)	g	.0249	.0250	.0131

Filter Numbers	#	SG-2547	SG-2546	SG-2548
Date/Time of wt 4/27/88 11am Gross wt	g	0.5308	0.5319	0.5322
Date/Time of wt 4/28/88 9:00AM Gross wt	g	.5306	.5315	.5325
Average Gross wt	g	.5307	.5317	.5324
Tare wt	g	0.5263	0.5269	0.5294

Weight of particulate on filters(s) (m_f)	g	.0044	.0048	.0030
Weight of particulate in acetone rinse	g	.0249	.0250	.0131
Total weight of particulate (m_n)	g	.0293	.0298	.0161

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 [signature]   Signature of reviewer [signature]

ENVIRONMENTAL TESTING & CONSULTING INC.
2924 WALNUT GROVE RD. • MEMPHIS, TENN. 38111 • PHONE (901) 327-2750

May 7, 1988

Mr. Sumner Buck
Ramcon
223 Scott Street
Memphis, TN 38122

REF: Analytical Testing
Weldon Run #1 PW #1 BH #1 - Total Hydrocarbons as Methane

Dear Mr. Buck:

The above referenced samples have been analyzed per your instructions. The tests were performed in our laboratory (#00210) using the following procedure:

Total Hydrocarbons as Methane

GC	: Varian 3700 equipped with Flame Ionization Detector
Column	: Empty glass
Temperature	: 45 C Isothermal
Injection	: 6 port Valco valve with 10 cc sample loop

The results of these tests are found on the attached pages along with copies of all pertinent information accumulated during the procedure. If you have any questions, please feel free to contact me.

Very truly yours,

Nathan A. Pera
Laboratory Manager

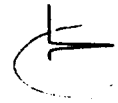
Attachment

WELDON RUN #1
PW #1 BH #1

TOTAL HYDROCARBONS as METHANE	101.9 ppm

Methane 100ppm

CH. 1 C.S 5.00 ATT 6 OFFS 5 05/02/88 13:22



AREA
30211 value interpulated manually.

NO PEAKS

Methane 200ppm

CH. 1 C.S 5.00 ATT 6 OFFS 5 05/02/88 13:15


1.08

D-2000 05/02/88 13:15

SAMPLE: TAG: 538 CH: 1

FILE: 1 CALC-METHOD: AREA% TABLE: 0 CONC: AREA

NO.	RT	AREA	HEIGHT	BC
1	1.08	64422	14444	BB
TOTAL				
		64422	14444	

PEAK REJ : 0

Methane 300ppm

CH. 1 C.S 5.00 ATT 6 OFFS 5 05/02/88 13:18

D-2000 05/02/88 13:18

SAMPLE: TAG: 539 CH: 1

FILE: 1 CALC-METHOD: AREA% TABLE: 0 CONC: AREA

NO.	RT	AREA	HEIGHT	BC
1	1.07	243146	43142	BB
TOTAL				
		243146	43142	

PEAK REJ : 0

Ramcon

CH. 1 C.S 5.00 ATT 6 OFFS 5 05/02/88 13:20

D-2000 05/02/88 13:20

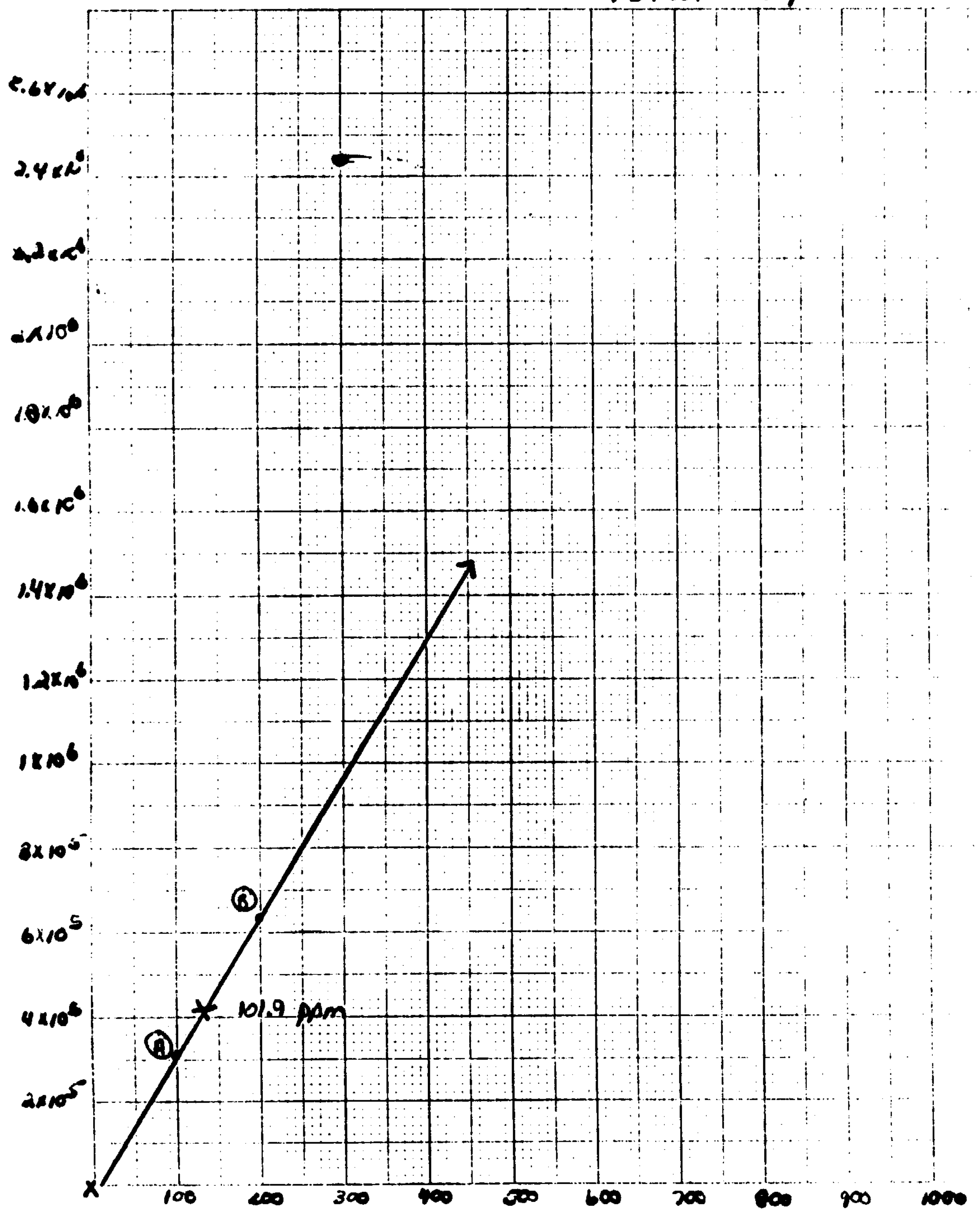
SAMPLE: TAG: 540 CH: 1

FILE: 1 CALC-METHOD: AREA% TABLE: 0 CONC: AREA

NO.	RT	AREA	HEIGHT	BC	
1	1.07	47761	10108	BB	101.9 ppm
TOTAL					
		47761	10108		

PEAK REJ : 0

Total Hydrocarbons AS METHANE



Std Curve

CONC.	AREA
100 ppm	30211
200 ppm	64422
300 ppm	243146

corr. 0.9042
Y INT -30102.6
SLOPE 763.6

46 1320

METHOD 10 - DETERMINATION OF CARBON MONOXIDE EMISSIONS BY N.D.I.R.

A. Procedure: Carbon monoxide gas sampling and analysis was performed by U.S. EPA Reference Method 10. An integrated gas sample was drawn into a Tedlar bag through a probe and condensor system. The Tedlar bags were filled according to section 7.1.2 of the RM and analyzed according to section 7.2.

B. Instrumentation: FUJI 730 NDIR, single gas analyzer

C. Specifications:

1. Measuring principle: NDIR single beam method

2. Measurable gas components and measuring range:

   CO: 0 - 500 ppm......0 - 20%
   CO_2: 0 - 500 ppm......0 - 20%
   CH_4: 0 - 1000 ppm.....0 - 20%

3. Repeatability: L-range; ± 0.5% of full scale
   H-range; ± 1.0% of full scale

4. Stability: Zero drift; ± 1.0% of full scale/24H
   Zero drift; ± 1.0% of full scale/24H

5. Noise: 0.5% of full scale

6. Ambient temperature: -5 to 45°C

7. Ambient humidity: Less than 90% RH

8. Response time: (90% of final reading) Electrical system; 2sec, 3sec, 5sec (Selectable with connector)

   Response of actual gas; Within 15 sec (depending on cell length)

9. Indicator: 100 linear divisions

10. Output signal: OUTPUT 1: DC 0- 1V
    OUTPUT 2: DC 0 - 10 mV or
    DC 0 - 100 mV or
    DC 0 - 1V or DC 4 - 20 mA
    (Allowable load resistance - 550 ohms maximum)

    OUTPUT 1 & OUTPUT 2 available simultaneously.

    RANGE ID SIGNAL: la contact
    [contact close at L-range]
    [contact close at H-range]
    Contact capacity DC 30V, 0.2A
    (resistance road)

11. Linearity: Better than $\pm$ 2% of full scale (when linearizer is used)

12. Power supply: AC 115V $\pm$ 10%, 60 Hz

13. Power consumption: Approx. 30 VA

14. Materials of gas-contacting parts: Measuring cell; SUS304
Window; CaF_2
Piping; Polyethylene

15. Sample gas flow rate: 1 l/min $\pm$ 0.5 l/min

16. Sample gas temperature: 0 to 50°C

17. Purging gas flow rate: 1 l/min (to be flowed as occasion demands)

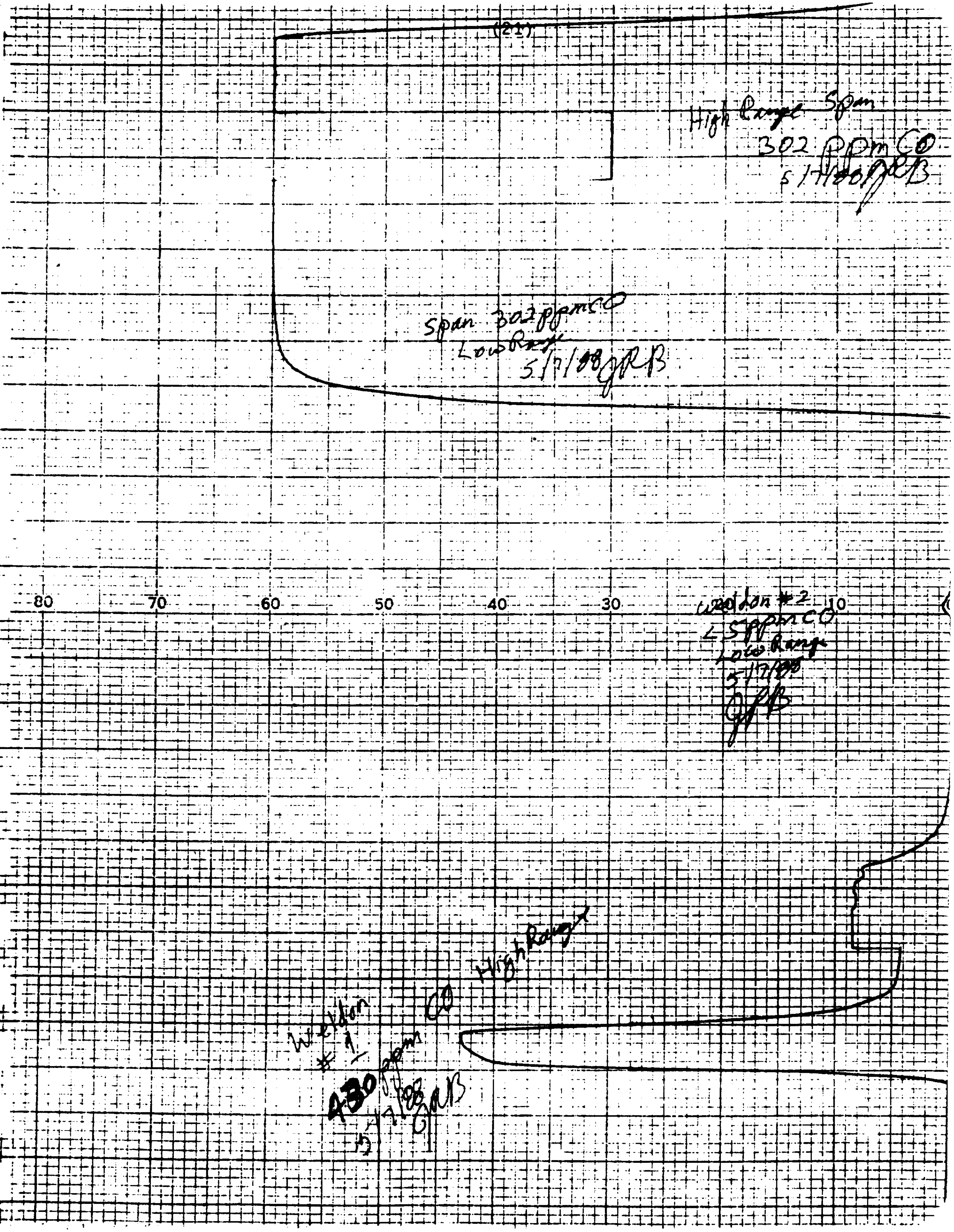
18. Warmup time: Approx. 2 hours

19. External dimensions: 200 x 250 x 541 mm (H x W x D)

20. Weight: Approx. 11 kg

21. Finish color: MUNSELL N1.5

Remarks: For combinations of measuring ranges for the dual-component analyzer, inquiry should be made to the manufacturer.


(21)
High Range Span
302 ppm CO
5/17/88 GRB
Span 302 ppm CO
Low Range
5/17/88 GRB
80
70
60
50
40
30
10
Weldon #2
<5 ppm CO
Low Range
5/17/88
GRB
High Range
Weldon
#1
430 ppm CO
5/17/88 GRB

FIELD SAMPLING DATA FORM FOR CO

Plant name Weldon Asphalt Date 4-25-84

Sample location hot mix plant stack

Barometric pressure, ~~mm~~ (in.) Hg 29.82

Ambient temperature, °C (°F) 50°F Stack temperature, °C (°F) 246°F

Initial leak check ok Final leak check ok

Operator S. Turner

Sampling time, min	Clock time, 24 h	Traverse point	Velocity head (ΔP_s), ~~mm~~ (in.) H_2O	Rotameter setting, ℓ/min (ft^3/min)	CO conc, ppm (dry basis)	CO_2, %
60	07:57	5	1.14	1.0 ℓ/min	417.1	3.0

CARBON MONOXIDE CALCULATION FORM

Plant Weldon Asphalt Date 4-25-88

Sample location hotmix plant stack

Test number 1

Bag number 1

Operator S Turner

CO Concentration

$C_{CO_{NDIR}}$ = 430 ppm (dry basis).

F_{CO_2} = 3.0 % ÷ 100 = 0.03.

$C_{CO_{stack}} = C_{CO_{NDIR}} (1 - F_{CO_2})$.

= 430 (1 - 0.030) = 417 ppm (dry basis).

Errors:

(24)

CALIBRATION VERIFICATION RECORD CHART

Location Ramcon Environmental Corp. Operator J. Biggs
Analyzer Fuji 730 Date 5-7-88

Time	Test number	Zero unadjusted	Zero adjusted	Span unadjusted	Span adjusted	Percent dif-ference
14:00	1	0.1%	0	98%	100%	2%

Run # 1 Collection Method Continuous/Grab Fyrite GAS	1		2		3		
	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)		13.5		13.0			13.25
CO (Net is actual CO reading minus actual O_2 reading)							
N_2 (Net is 100 minus actual CO reading)							83.75

Run # 2 Collection Method Continuous/Grab GAS	1		2		3		
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	Average Net Volume
CO_2		4.5		4.0			4.25
O_2 (Net is actual O_2 reading minus actual CO_2 reading)		13		13			13
CO (Net is actual CO reading minus actual O_2 reading)							
N_2 (Net is 100 minus actual CO reading)							82.75

Run # 3 Collection Method Continuous/Grab GAS	1		2		3		
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	Average Net Volume
CO_2		5.5		6		6	5.8
O_2 (Net is actual O_2 reading minus actual CO_2 reading)		13.5		13.5		14	13.7
CO (Net is actual CO reading minus actual O_2 reading)							
N_2 (Net is 100 minus actual CO reading)							80.5

VII. CALCULATIONS

NAME: WELDON ASPHALT
LOCATION: LINDEN, NEW JERSEY
TEST DATE: 4/25/88

SUMMARY OF TEST DATA

			RUN #1	RUN #2	RUN #3
SAMPLING TRAIN DATA					
1.	Start time		07:57	10:23	13:07
2.	Finish time		09:12	11:35	14:21
3.	Sampling time, minutes	θ	67.5	67.5	67.5
4.	Sampling nozzle diameter, in.	D_n	.2400	.2400	.2400
5.	Sampling nozzle cross-sect. area, ft^2	A_n	.000314	.000314	.000314
6.	Isokinetic variation	I	98.6	95.7	97.4
7.	Sample gas volume - meter cond., cf.	V_m	50.030	47.700	50.345
8.	Average meter temperature, ^oR	T_m	518	525	539
9.	Avg. oriface pressure drop, in. H_2O	dH	2.03	1.97	2.04
10.	Total particulate collected, mg.	M_n	29.30	29.80	16.10
VELOCITY TRAVERSE DATA					
11.	Stack area, ft^2	A	10.75	10.75	10.75
12.	Absolute stack gas pressure, in. Hg.	P_s	29.82	29.82	29.82
13.	Barometric pressure, in. Hg.	P_{bar}	29.82	29.82	29.82
14.	Avg. absolute stack temperature, R^o	T_s	706	706	710
15.	Average $-\sqrt{\text{vel. head}}$, (C_p = .80)	$-\sqrt{dP}$	1.07	1.07	1.09
16.	Average stack gas velocity, ft./sec.	V_s	68.81	69.00	70.19
STACK MOISTURE CONTENT					
17.	Total water collected by train, ml.	V_{ic}	276.00	304.00	314.00
18.	Moisture in stack gas, %	B_{ws}	20.21	22.98	22.97
EMISSIONS DATA					
19.	Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1583	1532	1550
20.	Stack gas flow rate, cfm	acfm	44382	44505	45273
21.	Particulate concentration, gr/dscf	C_s	0.0088	0.0095	0.0050
22.	Particulate concentration, lb/hr	E	1.99	2.08	1.11
23.	Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA					
24.	Percent CO_2 by volume	CO_2	3.00	4.30	6.00
25.	Percent O_2 by volume	O_2	13.30	13.00	13.50
26.	Percent CO by volume	CO	.00	.00	.00
27.	Percent N_2 by volume	N_2	83.70	82.70	80.50

Format: summryR3

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

Where:

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

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

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

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

T_m = Absolute temperature at meter ^oR.

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

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

Y = Dry gas meter calibration factor.

13.6 = Inches water per inches Hg.

RUN 1:

$$V_{m(std)} = (17.64)(1.005)(\ 50.030) \left[\frac{(29.82) + \frac{2.03}{13.6}}{518} \right] = 51.315 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(1.005)(\ 47.700) \left[\frac{(29.82) + \frac{1.97}{13.6}}{525} \right] = 48.265 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(1.005)(\ 50.345) \left[\frac{(29.82) + \frac{2.04}{13.6}}{539} \right] = 49.627 \text{ dscf}$$

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:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{29.30}{51.315}\right] = 0.0088 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{29.80}{48.265}\right] = 0.0095 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{16.10}{49.627}\right] = 0.0050 \text{ gr./dscf.}$$

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

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

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 1:

$V_{wc(std)}$ = (0.04707) (266.0) = 12.5 cu.ft
$V_{wsg(std)}$ = (0.04715) (10.0) = 0.5 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (290.0) = 13.7 cu.ft
$V_{wsg(std)}$ = (0.04715) (14.0) = 0.7 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (302.0) = 14.2 cu.ft
$V_{wsg(std)}$ = (0.04715) (12.0) = 0.6 cu.ft

Moisture Content of Stack Gases

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

Where:

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

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

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

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

Run 1:

$$B_{ws} = \frac{12.5 + 0.5}{12.5 + 0.5 + 51.315} \times 100 = 20.21\ \%$$

Run 2:

$$B_{ws} = \frac{13.7 + 0.7}{13.7 + 0.7 + 48.265} \times 100 = 22.98\ \%$$

Run 3:

$$B_{ws} = \frac{14.2 + 0.6}{14.2 + 0.6 + 49.627} \times 100 = 22.97\ \%$$

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

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:

$$M_d = 0.44(3.00\%) + 0.32(13.30\%) + 0.28(.00\% + 83.70\%) = 29.01 \frac{\text{lb}}{\text{lb-mole}}$$

Run 2:

$$M_d = 0.44(4.30\%) + 0.32(13.00\%) + 0.28(.00\% + 82.70\%) = 29.21 \frac{\text{lb}}{\text{lb-mole}}$$

Run 3:

$$M_d = 0.44(6.00\%) + 0.32(13.50\%) + 0.28(.00\% + 80.50\%) = 29.50 \frac{\text{lb}}{\text{lb-mole}}$$

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

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 = 29.01 (1 - 20.21) + 18 (20.21) = 26.78 (lb./lb.-mole)

Run 2:

M_s = 29.21 (1 - 22.98) + 18 (22.98) = 26.63 (lb./lb.-mole)

Run 3:

M_s = 29.50 (1 - 22.97) + 18 (22.97) = 26.86 (lb./lb.-mole)

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

Where:

V_s	=	Average velocity of gas stream in stack, ft./sec.
K_p	=	85.49 ft/sec $\left[(g/g\text{-mole})\text{-}(mm\ Hg)\ /\ (^{o}K)(\ mm\ H_2O\right]^{1/2}$
C_p	=	Pitot tube coefficient, (dimensionless).
dP	=	Velocity head of stack gas, in. H_2O.
P_{bar}	=	Barometric pressure at measurement site, (in. Hg).
P_g	=	Stack static pressure, (in. Hg).
P_s	=	Absolute stack gas pressure, (in. Hg) = $P_{bar} + P_g$
P_{std}	=	Standard absolute pressure, (29.92 in. Hg).
t_s	=	Stack temperature, (^{o}f).
T_s	=	Absolute stack temperature, (^{o}R). = 460 + t_s.
M_s	=	Molecular weight of stack gas, wet basis, (lb/lb-mole).

Run 1:

$$V = (85.49)\ (\ .80)\ (\ 1.07) \sqrt{\frac{706}{(29.82)(26.78)}} = 68.81 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (\ .80)\ (\ 1.07) \sqrt{\frac{706}{(29.82)(26.63)}} = 69.00 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ .80)\ (\ 1.09) \sqrt{\frac{710}{(29.82)(26.86)}} = 70.19 \text{ ft/sec.}$$

NAME: WELDON ASPHALT
LOCATION: LINDEN, NEW JERSEY
TEST DATE: 4/25/88

Stack Gas Flow Rate

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

Where:

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

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

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

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

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

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

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

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

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

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

Run 1:

$$Q_{sd}=3600(1- .2021)(68.81)(10.75)\left[\frac{528}{706}\right]\left[\frac{29.82}{29.92}\right] = 1583748.7 \; \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1- .2298)(69.00)(10.75)\left[\frac{528}{706}\right]\left[\frac{29.82}{29.92}\right] = 1532988.3 \; \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1- .2297)(70.19)(10.75)\left[\frac{528}{710}\right]\left[\frac{29.82}{29.92}\right] = 1550842.6 \; \frac{dscf}{hr}$$

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

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:

$$E = \frac{(\ 0.0088)\ (\ 1583748.7)}{7000} = 1.99 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(\ 0.0095)\ (\ 1532988.3)}{7000} = 2.08 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(\ 0.0050)\ (\ 1550842.6)}{7000} = 1.11 \text{ lb. / hr.}$$

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

Where:

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

Run 1:

$$I = (100)(\;706\;) \left[\frac{(0.002669)(276.00) + \frac{50.030}{518} \left[29.82 + \frac{2.03}{13.6} \right]}{60\;(\;67.5\;)\;(\;68.81\;)\;(\;29.82\;)\;(\;.000314\;)} \right] = 98.6\%$$

Run 2:

$$I = (100)(\;706\;) \left[\frac{(0.002669)(304.00) + \frac{47.700}{525} \left[29.82 + \frac{1.97}{13.6} \right]}{60\;(\;67.5\;)\;(\;69.00\;)\;(\;29.82\;)\;(\;.000314\;)} \right] = 95.7\%$$

Run 3:

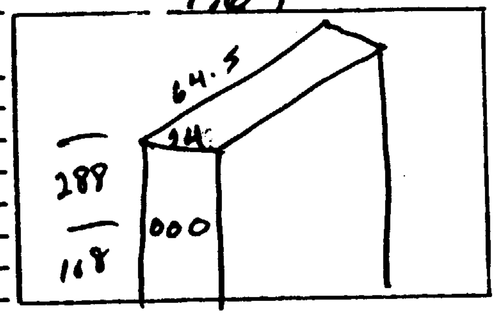
$$I = (100)(\;710\;) \left[\frac{(0.002669)(314.00) + \frac{50.345}{539} \left[29.82 + \frac{2.04}{13.6} \right]}{60\;(\;67.5\;)\;(\;70.19\;)\;(\;29.82\;)\;(\;.000314\;)} \right] = 97.4\%$$

VIII. FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant Walden Asphalt
Location Linden N.J.
Operator [illegible]
Date 4-25-88
Run No. 1
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.85
C Factor 1.005
Pitot Tube Coefficient Cp .80

1.67



Schematic of Stack Cross Section

Ambient Temperature 48 50 (51)
Barometric Pressure 29.82
Assumed Moisture, % 20
Probe Length, m(ft) 6
Nozzle Identification No. .000 3142
Avg. Calibrated Nozzle Dia., (in.) .240/.240/.240/.5
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) .004 at [illegible]
Probe Liner Material Nrex
Static Pressure, mm Hg (in. Hg) .70/13.6
Filter No. SC 2547

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	466	210
INITIAL	200	200
DIFFERENCE	266	10

Pitot Tube leak ck OK

Leak ck at 18" Start

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
1	7:52 / 7:59-30	4	237	1.6	3.0	957.97 / 959.2	42	42	200 / 225	40
9 ~~2~~	8:04 / 8:05-30	2	244	.70	.67	960.7	54	42	200 / 225	40
8 ~~3~~	8:09	2	244	.50	.84	962.1	60	42	200 / 225	40
7 ~~4~~	8:11-30	2	245	.20	1.2	963.3	62	42	200 / 225	35
6 ~~5~~	8:14	3	245	1.4	2.3	965.2	64	44	200 / 225	35
5 ~~6~~	8:16-30	4	244	1.5	2.5	967.2	68	44	200 / 255	32
4 ~~7~~	8:19	4	245	1.5	2.5	969.3	68	44	190 / 230	32
3 ~~8~~	8:21-30	4	246	1.5	2.5	971.5	70	44	190 / 230	32
2 ~~9~~	8:24	4	245	1.5	2.5	973.4	70	44	185 ~~190~~ / 225 ~~230~~	~~38~~ 36
9 ~~1~~	8:26 / 8:28-30	1.	244	.62	1.0	924.7	64	48	180 / 225	40
8 ~~2~~	8:31	1	246	.70	1.2	976.1	70	48	180 / 225	40
7 ~~3~~	8:33-30	1	245	.20	1.2	977.4	70	48	180 / 225	40
6 ~~4~~	8:36	3	247	1.2	2.0	979.2	70	48	180 / 220	35

CO_2 = 3.0% O_2 = 13.5%

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 4-25-~~98~~ LOCATION [illegible] NJ TEST NO. 1

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM ~~mm Hg~~ (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)		IMPINGER TEMP (°F)
5 ~~8~~	8:38-30	5	247	1.6	2.7	981.5	72	48	180	225	35
4 ~~6~~	8:41	5	250	1.6	2.2	983.3	72	48	180	225	35
3 ~~7~~	8:43-30	5	250	1.6	2.2	985.5	72	48	180	216	40
2 ~~8~~	8:46	5	249	1.6	2.7	987.6	72	50	185	222	40
1 ~~8~~	8:48-30	5	247	1.6	2.7	989.9	74	50	185	222	40
9 ~~8~~	8:50 8:52-30	2	245	.85	1.4	993.0	68	50	180	220	40
8 ~~7~~	8:55	2	245	.95	1.6	994.8	68	50	142	222	40
7 ~~8~~	8:57-30	4	245	1.0	1.7	996.0	68	50	142	222	40
6 ~~8~~	9:00	3	246	1.6	1.7	997.5	72	50	142	220	40
5 ~~8~~	9:02-30	5	248	1.2	2.0	999.5	74	50	165	212	40
4 ~~6~~	9:04-30	4	248	1.2	2.0	001.3	74	50	165	212	40
3 ~~7~~	9:07	4	247	1.3	2.2	003.2	74	50	175 ~~170~~	208 ~~220~~	40
2 ~~8~~	9:09-30	5	246	1.6	2.7	005.2	76	52	175	208	40
1 ~~8~~	9:12	5	244	1.6	2.7	007.5 [illegible]	76	52	151	209	42

RAMCON ENVIRONMENTAL CORPORATION

Plant Weldon Asphalt
Location Linden N.J.
Operator [illegible] Jones
Date 4-25-88
Run No. 2
Sample Box No. 2
Meter Box No. C-185
Meter H @ 1.85
C Factor 1.005
Pitot Tube Coefficient Cp .80

Pitot Tube leak ck OK

Schematic of Stack Cross Section

Ambient Temperature 45
Barometric Pressure 29.82
Assumed Moisture, % 20
Probe Length, m(ft) 6
Nozzle Identification No. .0003142
Avg. Calibrated Nozzle Dia., (in.) .240/.240/.240
Probe Heater Setting 4
Leak Rate, m^3/min.(cfm) .004 at 6" Vac
Probe Liner Material [illegible]
Static Pressure, mm Hg(in.Hg) .90/13.6
Filter No. SC-2546

	IMPINGER VOLUME ml	SILICA GEL WEIGHT, g
FINAL	490	214
INITIAL	200	200
DIFFERENCE	290	14

Leak CK at 16" Stack

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (T_S) °F	VELOCITY HEAD (P_S) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F		GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
9	10:23 / 10:25-30	1	237	.50	.84	007.2 / 009.1	60	52	190	220	50
8	10:28	1	241	.50	.84	.10 010.2	68	52	190	220	50
7	10:30-30	1	244	.73	1.2	11.6	72	54	190	220	50
6	10:33	4	247	1.3	2.2	13.2	72	54	180	221	45
5	10:35-30	5	248	1.5	2.5	15.3	74	54	160	284	45
4	10:38	5	247	1.4	2.3	17.1	76	54	160	224	48
3	10:40-30	5	247	1.3	2.2	19.0	76	54	165	222	50
2	10:43	5	246	1.6	2.7	21.4	76	54	165	222	50
1	10:45-30	5	245	1.6	2.7	23.5	78	54	160	222	55
9	10:48 / 10:50-30	2	243	.55	.92	24.7	72	54	160	222	55
8	10:53	2	248	.72	1.2	26.1	76	54	170	220	50
7	10:55-30	2	250	.98	1.6	27.5	76	54	170	220	50
6	10:58	5	250	1.2	2.0	29.3	76	54	170	220	50

O_2 = 13.0% CO_2 = 4.5%

Form #REC-06

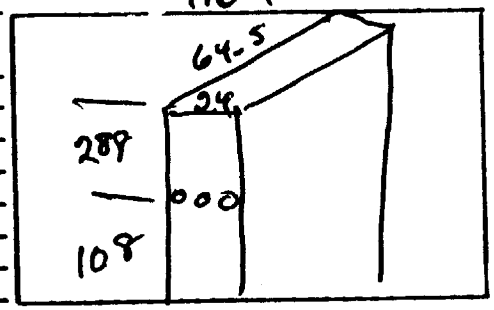
RAMCON emissions test log sheet, cont. DATE 4-25-98 LOCATION Linden N.J. TEST NO. 2

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)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							in	out		
5	11:00-30	6	249	1.3	2.2	31.1	76	54	150/225	50
4	11:03	6	249	1.3	2.2	33.0	76	54	150 225	50
3	11:05-30	6	248	1.3	2.2	35.2	76	54	150 225	50
2	11:08	5 ~~8~~ 6	249	1.6	2.7	37.2	76	56	165 222	50
1	11:10-30	5 ~~8~~ 6	246	1.6	2.7	39.2	76	56	165 225	50
9	11:12-30 11:15	5	240	1.0	1.7	40.7	70	58	165 225	50
8	11:17-30	6	248	.90	1.5	42.4	76	58	180 225	50
7	11:20	5 ~~8~~ 6	249	1.0	1.7	43.8	76	58	165 225	50
6	11:22-30	5 ~~8~~ 6	250	1.0	1.7	45.4	76	58	155 225	50
5	11:25	5 ~~8~~ 6	250	1.0	1.7	47.1	78	58	155 225	50
4	11:27-30	6	250	1.2	2.0	49.1	78	58	155 225	50
3	11:30	6	249	1.3	2.2	51.1	80	58	155 225	50
2	11:32-30	4	249	1.6	2.7	53.1	80	60	155 225	50
1	11:35	4	236	1.6	2.7	55.408	80	60	150 225	60

RAMCON ENVIRONMENTAL CORPORATION

Plant Weldon Asphalt
Location Linden N.J.
Operator [illegible]
Date 4-25-88
Run No. 3
Sample Box No. 2
Meter Box No. C-185
Meter H @ 1.85
C Factor 1.005
Pitot Tube Coefficient Cp .80

1.67



Schematic of Stack Cross Section

Ambient Temperature (ST) 75.53
Barometric Pressure 29.92
Assumed Moisture, % 20
Probe Length, m(ft) 6
Nozzle Identification No. 0003142
Avg. Calibrated Nozzle Dia., (in.) .240/.240/.241
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) .004 at 6" Vac.
Probe Liner Material [illegible]
Static Pressure, mm Hg (in. Hg) .070/13.6
Filter No. SG-2548

	IMPINGER VOLUME ml	SILICA GEL WEIGHT g
FINAL	502	212
INITIAL	200	200
DIFFERENCE	302	12

Pitot Tube leak ck OK

leak ck at 18" Start

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F in	out	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
9	13:07 / 13:09:30	0	247	.35	.58	56.845 / 57.90	72	68	166	222	55
8	13:12	1	251	.66	1.1	59.40	80	67	166	222	55
7	13 14:30	2	251	.95	1.6	60.99	84	67	169	220	55
6	1317	3	251	1.3	2.17	62.80	86	67	160	223	34
5	13:19:30	3	251	1.5	2.5	65.00	87	67	160	223	34
4	13:22	3.5	250	1.7	2.8	67.10	87	66	160	220	30
3	13:24:30	3.0	248	1.3	2.17	69.10	88	66	160	224	30
2	13:27	3.5	249	1.6	2.67	71.20	88	66	160	222	32
1	13:29:30	3.5	250	1.7	2.8	73.40	90	66	160	222	32
9	13:32:30 / 13:35	1.0	250	.50	.84	74.60	82	66	163	224	35
8	13:37:30	2.0	251	.70	1.17	76.10	88	68	167	222	40
7	13:40	2.0	252	1.0	1.67	77.50	90	68	167	222	40
6	13:42:30	3.0	253	1.4	2.3	79.40	90	68	165	220	40

CO_2 = 5.5 CO_2 = 6.0 % O_2 = 13.5 % / = 13.5 O_2 = 14.0

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 4-25-88 LOCATION Weldox TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F) in	SAMPLE BOX TEMP. (°F) out	IMPINGER TEMP (°F)
5	13:45	3.5	253	1.5	2.5	81.70	92	68	168	225	40
4	13:47:30	3.5	251	1.5	2.5	83.80	92	68	168	225	40
3	13:50	3.0	249	1.3	2.17	85.70	93	68	165	221	40
2	13:52:30	3.5	250	1.7	2.8	87.90	92	68	165	221	40
1	13:55	4.0	245	1.8	3.0	90.30	93	68	165	216	40
9	~~13:58:30~~ 14:01	2.0	246	.65	1.09	91.80	82	69	163	218	40
8	14:03:30	2.0	250	.90	1.5	93.40	88	70	160	226	40
7	14:06	2.0	250	1.0	1.67	95.20	92	70	160	224	45
6	14:08:30	3.0	250	1.2	2.0	96.90	92	70	162	225	45
5	14:11	3.0	250	1.2	2.0	98.50	94	70	162	225	45
4	14:13:30	3.0	250	1.2	2.0	100.60	94	70	165	216	45
3	14:16	3.0	254	1.2	2.0	102.50	94	70	165	220	45
2	14:18:30	4.0	252	1.7	2.8	105.00	95	70	164	220	45
1	14:21	4.0	250	1.9	3.17	107.22	96	70	166	210	45

IX. CALIBRATIONS

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 5-4-88 Meter box number C-185

Barometric pressure, P_b = 29.88 in. Hg Calibrated by Sam Turner

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	5								
1.0	6	452.30 / 458.465	74	80 / 98	68 / 68	78.5	10.95	.979	1.87
1.5	10								
2.0	10	458.465 / 468.716	74	95 / 101	68 / 68	83	13.00	.987	1.88
3.0	10	468.716 / 471.952	74	90 / 102	68 / 69	82.25	10.69	.985	1.91
4.0	10								
							Avg	.984	1.89

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 4-11-88 Meter box number C-185

Barometric pressure, P_b = 29.68 in. Hg Calibrated by Sam Turner

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Avg[a] (t_d), °F	Time (Θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	5								
1.0	5	670.90 / 675.977	72	87 / 93	68 / 68	79	895	0.995	1.80
1.5	10								
2.0	10	650.38 / 660.46	72	82 / 93	64 / 66	76.25	12.92	1.007	1.88
3.0	10	660.10 / 670.64	72	90 / 96	66 / 67	79.75	10:57	1.013	1.88
4.0	10								
							Avg	1.005	1.85

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 2-10-88 Thermocouple number Outlet

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

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

other ______

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °C	Thermocouple Potentiometer Temperature, °C	Temperature Difference,[c] %
A	ICE BATH	33° F	32° F	.03%
B	OVEN	152° F	150° F	.01%
C	OVEN	175° F	175° F	0%
D	Ambient	55° F	55° F	0%
	4-25-88	50°F	50°F	0%

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

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON ENVIRONMENTAL CORPORATION

Date 2-10-88 Thermocouple number Inlet

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

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

other ______

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, ~~°C~~	Thermocouple Potentiometer Temperature, ~~°C~~	Temperature Difference,[c] %
A	ICE BATH	33°F	33°F	0%
B	OVEN	150°F	151°F	.007%
C	OVEN	175°F	173°F	.01%
D	AMBIENT	55°F	54°F	.02%
	4-25-86	50°F	50°F	0%

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

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON ENVIRONMENTAL CORPORATION

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. 61 Date 2-3-88

Calibrated by: Sam T. Turner

"A" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp (s) cm H_2O (in. H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(A)$
1	0.90	1.4	.802	
2	0.60	.93	.803	
3	0.41	.64	.800	
		$\bar{C}_p$ (SIDE A)	.802	

"B" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp(s) cm H_2O in. H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(B)$
1	0.90	1.39	.805	
2	0.60	.94	.799	
3	0.41	.63	.807	
		$\bar{C}_p$ (SIDE B)	.804	

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

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

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

Form No. EED-17-1

RAMCON

Lear Siegler Stack Sampler

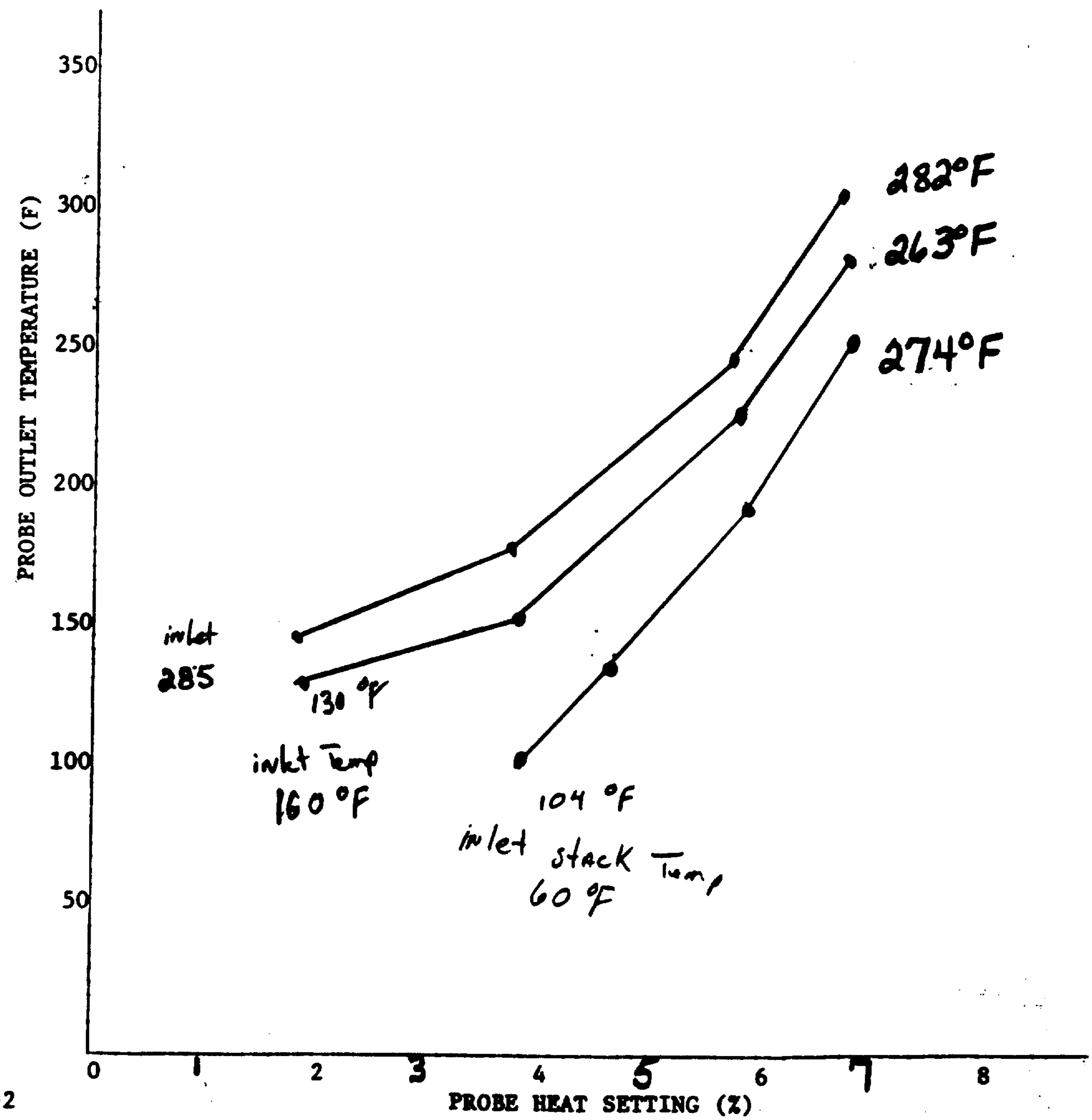
Heating Probe Calibration

Probe No. 61 Probe Length 6'

Date of Calibration 2-9-88 Signature Sam T Turner

Name of Company to be tested ______

Note: 3 ft. probe - 5 min. warmup
6 ft. probe - 15 min. warmup
10 ft. probe - 30 min. warmup
Calibration flow rate = .75 CFM



RAMCON ENVIRONMENTAL CORPORATION

Date 2/9/88 Thermocouple number 61

Ambient temperature 53° F Barometric pressure 29.95 in. Hg

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

other ______

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °C	Thermocouple Potentiometer Temperature, °C	Temperature Difference,[c] %
A	ICE WATER	32°F	32°F	0%
B	Boiling Water	213°F	211°F	.9%
C	Oil	380°F	379°F	.2%
D	Ambient	53°F	53°F	0%
	4-25-88	50°F	50°F	0%

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

[b]Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

X. RAMCON PERSONNEL

RAMCON Environmental Stack Test Team

Sumner Buck - President

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

Sam Turner - Field Supervisor

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