RAMCON
ENVIRONMENTAL CORPORATION

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
T.L. JAMES PAVING COMPANY
MONROE, LOUISIANA
November 12, 1991

Leo LeBourgeois
T.L. James Paving Company

G. Sumner Buck, III
President

Tommy Crook
Team Leader

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

TELEPHONE (504) 467-6000

T.L. JAMES & COMPANY
INCORPORATED

EXECUTIVE OFFICES
RUSTON, LOUISIANA

P. O. DRAWER 10
KENNER, LOUISIANA 70063-0010

November 25, 1991

Mr. Paul Laird
State of Louisiana
Department of Environmental Quality
P. O. Box 8475
Monroe, LA 70211-8475

Re: Permit No. 7777-00088-00
West Monroe, LA
Ouachita Parish

Dear Mr. Laird:

Enclosed please find two copies of the stack emissions test report on the referenced facility. This report states that this plant is in compliance with permit requirements for NSPS.

I trust this report is sufficient for your needs. If you have any questions, please feel free to call me.

Sincerely,

T. L. JAMES & COMPANY, INC.

Leo LeBourgeois
Leo LeBourgeois
Asphalt Paving Manager

Encl.

LLeB/ds

SOURCE TEST REPORT REVIEW FORM

PLANT TL James Paving Co.　　SOURCE ID NO. ____________

DATE REPORT RECEIVED ____________　　RECEIVED FROM ____________

REVIEWER OJ Stallings　　DATE REVIEWED 11/13/92

REPORT CONTENTS

	YES	NO	OK	REMARKS
A. Cover				
1. Plant name and location	X			
2. Source sampled	X			
3. Testing company or agency	X			
B. Certification				
1. Certification by team leader	X			
2. Certification by reviewer (e.g. a P.E.	X			
3. Certification by owner, or facility management	X			
C. Table of Contents	✓			
D. Introduction				
1. Test purpose	✓			
2. Test location, type of process	✓			
3. Test dates	✓			
4. Pollutants tested	✓			
5. Observers' names (industry and DEQ)				
6. Any other important background information				
E. Summary of Results				
1. Emission results	✓			
2. Process data, regarding determination of compliance	✓			
3. Allowable emissions	✓			
4. Visible emission summary	✓			
5. Discussion of errors, both real and apparent	✓			
F. Conclusions and Recommendations				
1. Is the test conclusive?	✓			
2. Were the objectives met?	✓			
3. Status re regulatory requirements	✓			
4. Recommendations for future actions		✓		

Figure 6.1

SOURCE TEST REPORT REVIEW FORM (continued)

REPORT CONTENTS

	YES	NO	OK	REMARKS
G. Source Operation				
1. Description of process and control devices	✓			
2. Flow diagram	✓			
3. Process data and results, with example calculations		✓		?
4. Representativeness of raw materials and products		✓		
5. Any specially required operation demonstrated		✓		
6. Control equipment description	✓			
7. Control equipment operating status	✓			
H. Sampling and Analytical Procedures				
1. Sampling port location and dimensioned cross section	✓			
2. Sampling point description, including labeling system		X		
3. Sampling train description	X			
4. Description of sampling procedures that deviated from standard methods		X	X	
5. Description of analytical procedures that deviated from standard methods		X	X	
I. Documentation Appendix				
1. Complete results with sample calculations	X			
2. Raw field data (original, not computer printouts)	X			
3. Laboratory report, with chain of custody	X			
4. Raw production data, signed by a plant official	X			No sig.
5. Test Log	X			
6. Calibration procedures and results	X			
7. Project participants and titles				
8. Related correspondance				
9. Pretest Agreements	X			

Figure 6.2

SOURCE TEST REPORT REVIEW FORM (continued)

REPORT COMMENTS

Review Comments

Were calculations validated ___X___ yes ________ no

If yes, were any results greater than normal round off errors ___X___ yes ________ no Run #2 5%

Were any sampling or analytical procedures unacceptable

________ yes ___X___ no

Were any procss or control equipment operations unacceptable

________ yes ___X___ no

List any unacceptable items ____________________

____

____

Were any additional items requested from the source or tester after the report was reviewed ________ yes ________ no

List items and reason for request ____________________

____

____

This report is ___X___ acceptable, ________ unacceptable

Give reasons for unacceptability ____________________

____

____

Comments reviewed by ____________________ Date ________

Figure 6.3

RAMCON
ENVIRONMENTAL CORPORATION

November 20, 1991

Mr. Leo LeBourgeois
T.L. James Paving Company
P.O. Box 1876
Kenner, LA 70063

Re: Particulate Emissions Test: Monroe, Louisiana

Dear Mr. LeBourgeois:

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

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

Mr. Paul Laird
State of Louisiana
Department of Environmental Quality
P.O. Box 8475
Monroe, LA 70211-8475

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

Sincerely,

G. Sumner Buck, III
President

GSBIII:djb

Enclosures

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

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I. INTRODUCTION

On November 12, 1991 personnel from RAMCON Environmental Corporation conducted a source emissions test for particulate emissions compliance at T.L. James Paving Company's CMI drum mix asphalt plant (Permit #7777-000-88-00) located in Monroe, Louisiana. RAMCON personnel conducting the test were Tommy Crook, Team Leader, and Charlie Crook. Tim Huey was responsible for the laboratory analysis including taring the beakers and filters and recording final data in the laboratory record books. Custody of the samples was limited to Mr. Crook and Mr. Huey.

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 Louisiana.

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 Louisiana are the same as those set by EPA.

Tommy Crook of RAMCON Environmental conducted the opacity test which were 0% on all three runs and, therefore, meets N.S.P.S. requirements.

SUMMARY OF TEST RESULTS

TABLE I

November 12, 1991

Test Run	Time	Grain Loading gr/DSCF	Isokinetic Variation	Emissions Lbs/Hr
1	08:11 - 09:24	0.0239	106.1%	4.56
2	10:22 - 11:33	0.0114	105.6%	1.99
3	13:04 - 14:16	0.0292	110.2%	5.10
	Average:	0.0215		3.88

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

III. TEST PROCEDURES

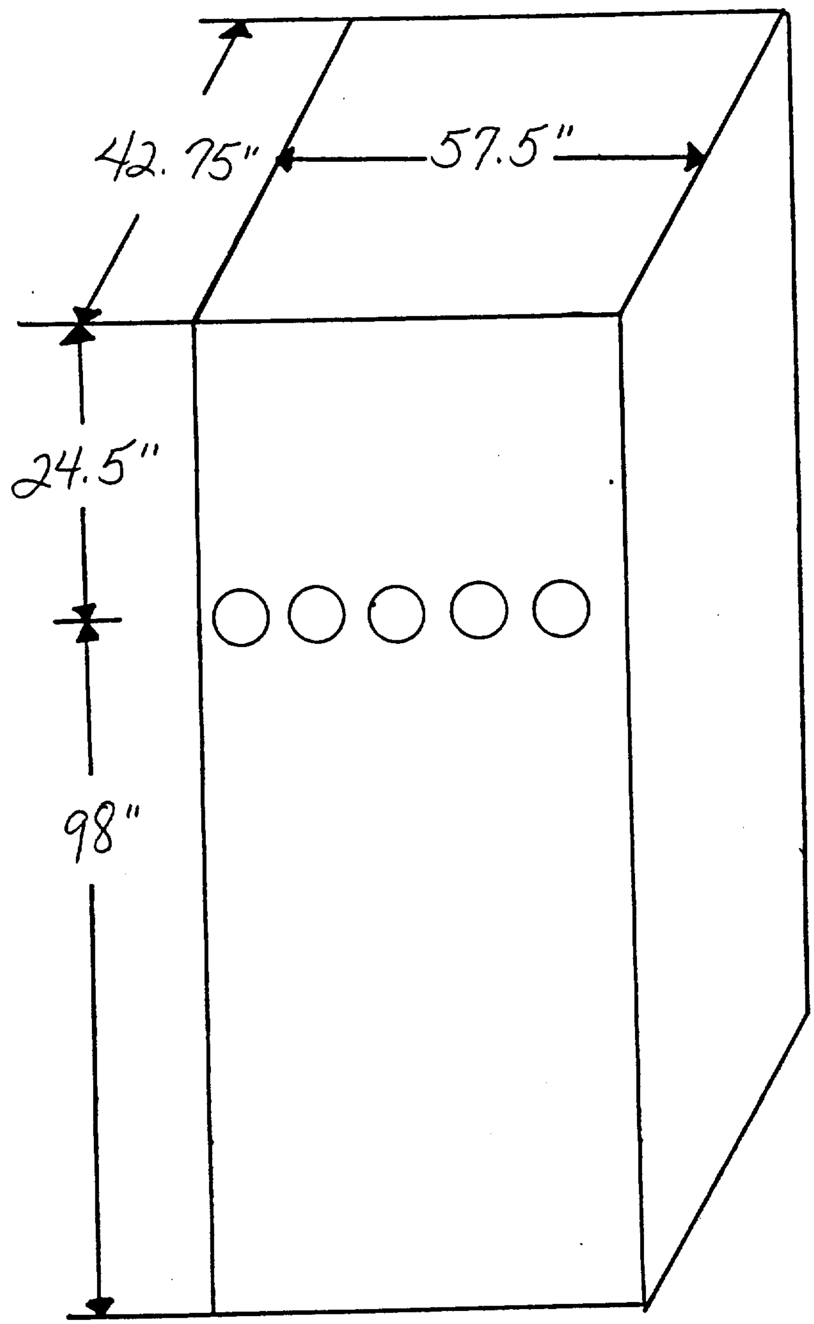
A. Method Used: Method 5 source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

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

C. Sampling Site: The emissions test was conducted after a baghouse on a rectangular stack measuring 42.75" x 57.5" with an equivalent diameter of 49.0". Five sampling ports were placed 24.5" down (0.5 diameters upstream) from the top of the stack and 98.0" up (2.0 diameters downstream) from the last flow disturbance. The ports were evenly spaced on 11.5" centers. The two outside ports are 5.75" from the side walls of the stack. Thirty points were sampled, six through each port for two minutes each.

Points on a Diameter	Probe Mark
1	*8.6"
2	15.7"
3	22.8"
4	30.0"
5	37.1"
6	44.2"

*Measurements include a 5" standoff.



IV. THE SOURCE

IV. THE SOURCE

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

The following is a general description of the plant's manufacturing process: The cold feed materials (aggregate) are dumped into separate bins which in turn feed a common continuous conveyor. The aggregate is dispensed from the bins in accordance with the desired formulation onto the cold feed system conveyor, to an inclined weigh conveyor, then to a rotating drum for continuous mixing and drying at approximately 300°F. When recycled asphalt mix is used, it is added halfway down the drum through a separate conveyor. 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 a conveyor. 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.

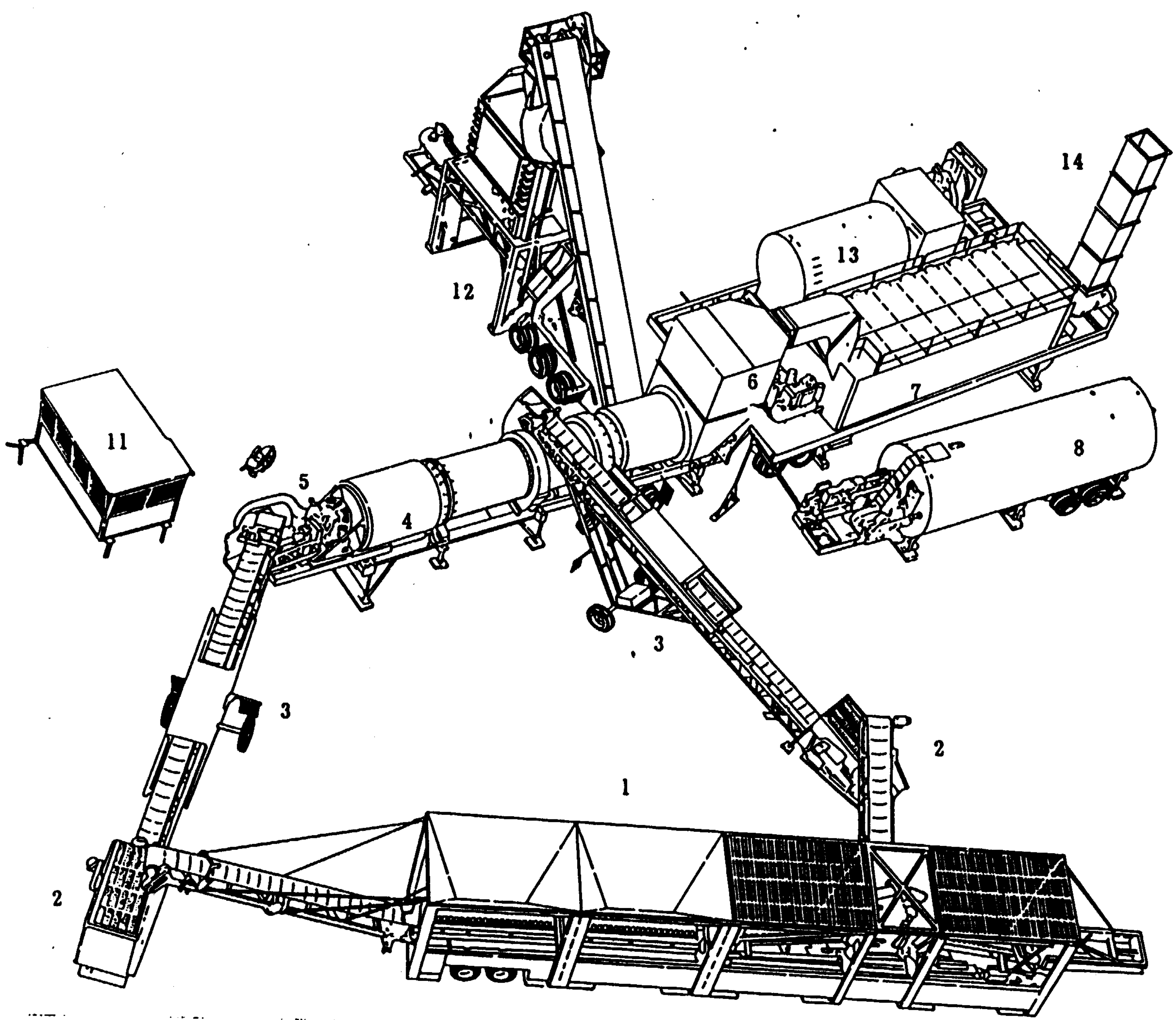
The drum mixer uses a burner fired with #4 Fuel Oil to heat air to dry the aggregate, and the motion of the rotating drum to blend the aggregate. The air is drawn into the system via an exhaust fan. After passing through the gas burner and the mixing drum, the air passes through a baghouse. The baghouse is manufactured by CMI. The exhaust gasses are 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 drum mixer.

DATA ON FACILITY BEING STACK TESTED

COMPANY NAME T.L. James COMPANY REP. ______ PHONE ( ) ______
LOCATION OF FACILITY ______ ORIGINAL START-UP DATE ______ DESIGNED CAPACITY ______
OEM ______ MODEL NO. ______ TYPE ______ AC TYPE ______

1 Time (24 HR) NOTE: check small box in column when moisture sample is taken		2 Fuel Use ✓ #Fuel Oil __ Nat. Gas __ Propane __ Coal __ other __	3 Burner Setting	4 Blower Pressure	5 Production Rate ✓ Mix ✓ Aggregate TPH	5 Production Rate __ RAP TPH	6 Asphalt Cement %	7 Mix Temp. °F	8 Exhaust Gas Temp. °F	9 __ Venturi Scrubber __ Baghouse Pressure Drop In w.g.	9 Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position
8:15			48	.15	275		4.0	310	287	5.2				55
8:30			52	.11	275		4.0	310	290	5.1				55
[illegible]45			54	.17	275		4.0	310	293	4.8	4.56			57
[illegible]00			51	.16	275		4.0	310	293	5.0				57
[illegible]15			54	.14	275		4.0	310	289	5.2				55
[illegible]30			56	.17	300		4.0	310	295	4.5				53
[illegible]45			57	.15	300		4.0	310	290	5.3				58
[illegible]00			55	.16	300		4.0	310	295	5.2	1.99			58
[illegible]15			54	.16	300		4.0	310	297	4.4				56
11:30			49	.14	275		4.0	310	285	5.2				54
[illegible]00			47	.16	275		4.0	310	284	4.7				53
[illegible]15			[illegible]	.14	300		4.0	310	288	5.0				56
[illegible]30			61	.15	325		4.0	310	290	5.5	5.10			62
[illegible]45			75	.18	340		4.0	310	288	4.8				65
2:00			79	.17	340		4.0	310	294	5.1				72
[illegible]:15			82	.16	340		4.0	310	292	5.1				70

(5)



CMI drum mixer plant (baghouse)

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

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

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

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

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

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

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

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

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

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

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

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

13. Fuel storage.

14. Stack

V. EQUIPMENT USED

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.

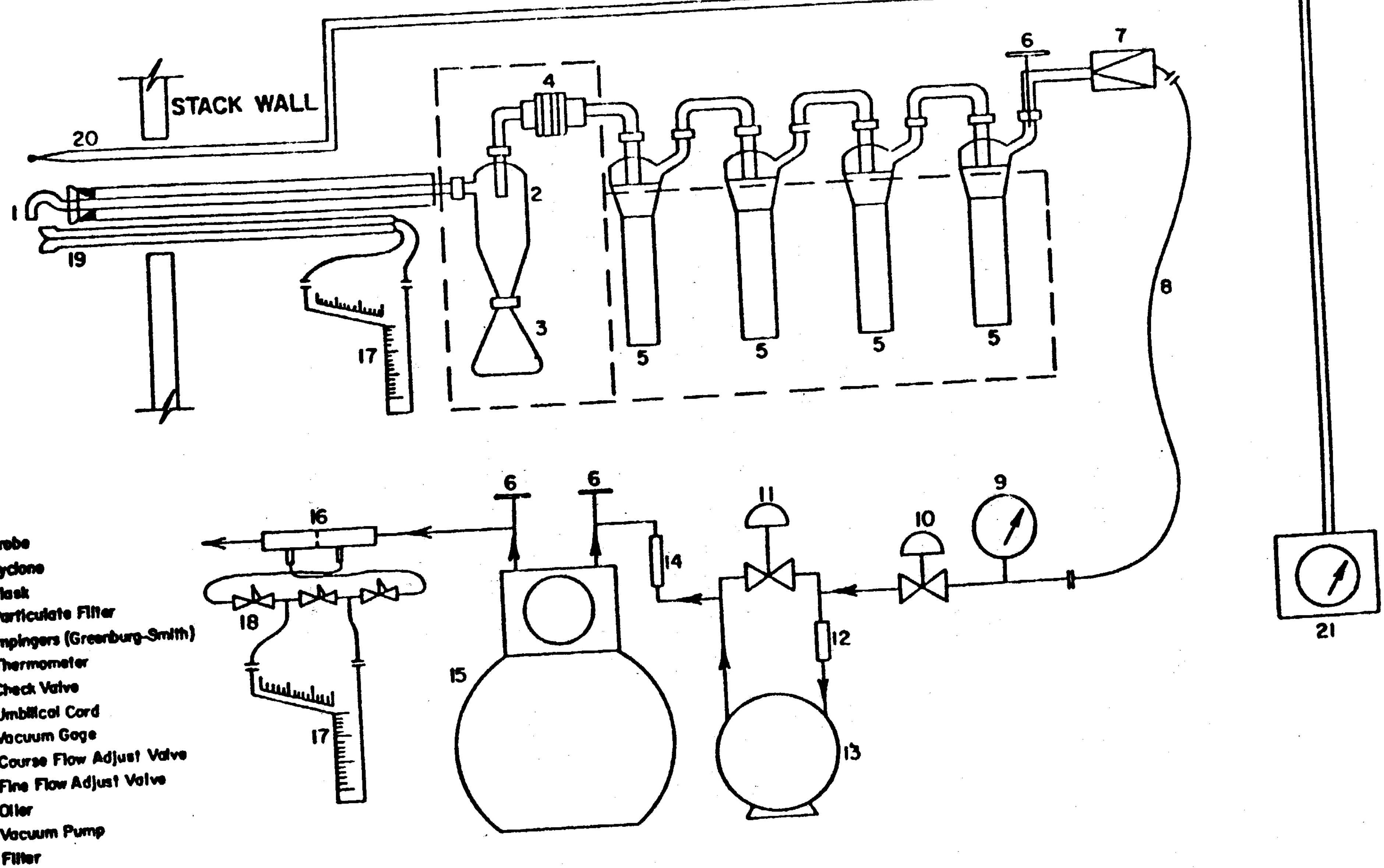
C. Weston dial thermometers are used to check meter temperatures. An Analogic Model 2572 Digital Thermocouple is used for stack temperatures.

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



SAMPLING TRAIN
USED FOR ISOKINETIC SAMPLING

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

(12)

SAMPLE ANALYTICAL DATA FORM

Company Name T.L. JAMES

Sample Location

Blank Volume (V_a) 70 ml

Date/Time wt. blank 11-18/8A

Date/Time wt. blank 11-8/2p

Relative Humidity in Lab 39 %

Density of Acetone (ρ_a) .7857 mg/ml

Gross wt. 165.0917 g

Gross wt. 165.0915 g

Ave. Gross wt. 165.0916 g

Tare wt. 165.0914 g

Weight of blank (m_{ab}) 0.0002 g

Acetone blank residue concentration (C_a) : $(C_a) = (m_{ab}) / (V_a) (\rho_a)$ = (0.000004 mg/g)

Acetone Blank Wt. : $W_a = C_a V_{aw} \rho_a$ = (0.000004) (195) (0.7857) = (0.0006 g)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	195	195	195
Date/Time of wt. 11-19/10A Gross wt.	g	163.6599	170.1872	147.5557
Date/Time of wt. ______ Gross wt.	g	163.6588	170.1860	147.5542
Average Gross wt.	g	163.6594	170.1866	147.5550
Tare wt.	g	163.6212	170.1655	147.4947
Less Acetone blank wt. (W_a)	g	0.0006	0.0006	0.0006
Weight of particulate in acetone rinse (m_a)	g	0.0376	0.0205	0.0597

Filter Numbers	#	TH5625	TH5624	TH5623
Date/Time of wt. 11-18/10A Gross wt.	g	0.5902	0.5830	0.5851
Date/Time of wt. 11-19/ Gross wt.	g	0.5899	0.5825	0.5854
Average Gross wt.	g	0.5901	0.5828	0.5853
Tare wt.	g	0.5688	0.5776	0.5763

Weight of particulate on filter (m_f)	g	0.0213	0.0052	0.0090
Weight of particulate in acetone rinse (m_a)	g	0.0376	0.0205	0.0597
Total weight of particulate (m_n)	g	0.0589	0.0257	0.0687

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

Remarks:

Signature of Analyst K. Hipson Signature of Reviewer [signature]

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

T.C. James — Company Name

11-12-91 — Date

REFERENCE METHOD 3: GAS ANALYSIS BY FYRITE

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

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

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

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

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

RUN 1:	CO_{2x}	5	CO_{2x}	4	CO_{2x}	4	AVG.	4.3
	O_{2x}	14	O_{2x}	15	O_{2x}	15	AVG.	14.7
	N_{2x}		N_{2x}		N_{2x}		AVG.	81.0
RUN 2:	CO_{2x}	5	CO_{2x}	5	CO_{2x}	5	AVG.	5.0
	O_{2x}	14	O_{2x}	14	O_{2x}	14	AVG.	14.0
	N_{2x}		N_{2x}		N_{2x}		AVG.	81.0
RUN 3:	CO_{2x}	4	CO_{2x}	5	CO_{2x}	5	AVG.	5.0
	O_{2x}	15	O_{2x}	14	O_{2x}	14	AVG.	14.3
	N_{2x}		N_{2x}		N_{2x}		AVG.	80.7

VII. CALCULATIONS

T.L. JAMES PAVING COMPANY
MONROE, LOUISIANA

SUMMARY OF TEST DATA

		11-12-91 RUN #1	11-12-91 RUN #2	11-12-91 RUN #3
SAMPLING TRAIN DATA				
	start	08:11	10:22	13:04
	finish	09:24	11:33	14:16
1. Sampling time, minutes	Θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.2900	.2900	.2900
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000459	.000459	.000459
4. Isokinetic variation	I	106.1	105.6	110.2
5. Sample gas volume - meter cond., cf.	V_m	38.006	35.684	37.930
6. Average meter temperature, ^oR	T_m	526	541	550
7. Avg. oriface pressure drop, in. H_2O	dH	1.37	1.28	1.30
8. Total particulate collected, mg.	M_n	58.90	25.70	68.70
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2.	A	17.07	17.07	17.07
10. Absolute stack gas pressure, in. Hg.	P_s	29.91	29.91	29.91
11. Barometric pressure, in. Hg.	P_{bar}	29.91	29.91	29.91
12. Avg. absolute stack temperature, R^o	T_s	725	714	729
13. Average $-\sqrt{vel.\ head}$, (C_p= .80)	$-\sqrt{dP}$	0.63	0.56	0.62
14. Average stack gas velocity, ft./sec.	V_s	41.52	36.44	41.42
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	318.00	262.00	390.00
16. Moisture in stack gas, %	B_{ws}	28.18	26.35	33.67
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1334	1219	1222
18. Stack gas flow rate, cfm	acfm	42525	37322	42422
19. Particulate concentration, gr/dscf	C_s	0.0239	0.0114	0.0292
20. Particulate concentration, lb/hr	E	4.56	1.99	5.10
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	4.30	5.00	5.00
23. Percent O_2 by volume	O_2	14.70	14.00	14.30
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	81.00	81.00	80.70

Format: summryR3

Dry Gas Volume

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

Where:

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

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

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

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

T_m = Absolute temperature at meter ^oR.

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

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

Y = Dry gas meter calibration factor.

13.6 = Inches water per inches Hg.

RUN 1:

$$V_{m(std)} = (17.64)(.993)(38.006)\left[\frac{(29.91) + \frac{1.37}{13.6}}{526}\right] = 37.983 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(.993)(35.684)\left[\frac{(29.91) + \frac{1.28}{13.6}}{541}\right] = 34.666 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(.993)(37.930)\left[\frac{(29.91) + \frac{1.30}{13.6}}{550}\right] = 36.247 \text{ dscf}$$

Total Contaminants by Weight: GRAIN LOADING

Particulate concentration C_s' gr./dscf.

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

Where:

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

M_n = Total amount of particulate matter collected, mg.

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

Run 1:

$$C_s' = \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{58.90}{37.983}\right] = 0.0239 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{25.70}{34.666}\right] = 0.0114 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{68.70}{36.247}\right] = 0.0292 \text{ gr./dscf.}$$

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

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:

$$M_d = 0.44(4.30\%) + 0.32(14.70\%) + 0.28(.00\% + 81.00\%) = 29.28 \frac{lb}{lb\text{-}mole}$$

Run 2:

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

Run 3:

$$M_d = 0.44(5.00\%) + 0.32(14.30\%) + 0.28(.00\% + 80.70\%) = 29.37 \frac{lb}{lb\text{-}mole}$$

Water Vapor Condensed

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

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

Where:

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

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

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

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

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

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

P_w = Density of water, 0.002201 lb/ml.

R = Ideal gas constant, 21.85 in.Hg. (cu.ft./lb.-mole)(^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) (300.0) = 14.1 cu.ft
$V_{wsg(std)}$ = (0.04715) (18.0) = 0.8 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (250.0) = 11.8 cu.ft
$V_{wsg(std)}$ = (0.04715) (12.0) = 0.6 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (376.0) = 17.7 cu.ft
$V_{wsg(std)}$ = (0.04715) (14.0) = 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 1:

$$B_{ws} = \frac{14.1 + 0.8}{14.1 + 0.8 + 37.983} \times 100 = 28.18\ \%$$

Run 2:

$$B_{ws} = \frac{11.8 + 0.6}{11.8 + 0.6 + 34.666} \times 100 = 26.35\ \%$$

Run 3:

$$B_{ws} = \frac{17.7 + 0.7}{17.7 + 0.7 + 36.247} \times 100 = 33.67\ \%$$

Molecular Weight of Stack Gases

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

Where:

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

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

Run 1:

M_s = 29.28 (1 - 28.18) + 18 (28.18) = 26.10 (lb./lb.-mole)

Run 2:

M_s = 29.36 (1 - 26.35) + 18 (26.35) = 26.37 (lb./lb.-mole)

Run 3:

M_s = 29.37 (1 - 33.67) + 18 (33.67) = 25.54 (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:

$$V = (85.49)\ (\ .80)\ (\ 0.63) \sqrt{\frac{725}{(29.91)(26.10)}} = 41.52 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (\ .80)\ (\ 0.56) \sqrt{\frac{714}{(29.91)(26.37)}} = 36.44 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ .80)\ (\ 0.62) \sqrt{\frac{729}{(29.91)(25.54)}} = 41.42 \text{ ft/sec.}$$

Stack Gas Flow Rate

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

Where:

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

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

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

t_s = Stack temperature, (^oF).

T_s = Absolute stack temperature, (^oR).

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

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

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

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

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

Run 1:

$$Q_{sd} = 3600(1- .2818)(41.52)(17.07)\left[\frac{528}{725}\right]\left[\frac{29.91}{29.92}\right] = 1334103.5 \frac{dscf}{hr}$$

Run 2:

$$Q_{sd} = 3600(1- .2635)(36.44)(17.07)\left[\frac{528}{714}\right]\left[\frac{29.91}{29.92}\right] = 1219207.6 \frac{dscf}{hr}$$

Run 3:

$$Q_{sd} = 3600(1- .3367)(41.42)(17.07)\left[\frac{528}{729}\right]\left[\frac{29.91}{29.92}\right] = 1222411.2 \frac{dscf}{hr}$$

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

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:

$$E = \frac{(0.0239)(1334103.5)}{7000} = 4.56 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(0.0114)(1219207.6)}{7000} = 1.99 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0292)(1222411.2)}{7000} = 5.10 \text{ lb. / hr.}$$

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

Where:

I	=	Percent isokinetic sampling.
100	=	Conversion to percent.
T_s	=	Absolute average stack gas temperature, ^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:

$$I = (100)(725) \left[\frac{(0.002669)(318.0) + \frac{38.006}{526}\left[29.91 + \frac{1.37}{13.6}\right]}{60\ (60.0)\ (41.52)\ (29.91)\ (.000459)} \right] = 106.1\%$$

Run 2:

$$I = (100)(714) \left[\frac{(0.002669)(262.0) + \frac{35.684}{541}\left[29.91 + \frac{1.28}{13.6}\right]}{60\ (60.0)\ (36.44)\ (29.91)\ (.000459)} \right] = 105.6\%$$

Run 3:

$$I = (100)(729) \left[\frac{(0.002669)(390.0) + \frac{37.930}{550}\left[29.91 + \frac{1.30}{13.6}\right]}{60\ (60.0)\ (41.42)\ (29.91)\ (.000459)} \right] = 110.2\%$$

VIII. FIELD DATA

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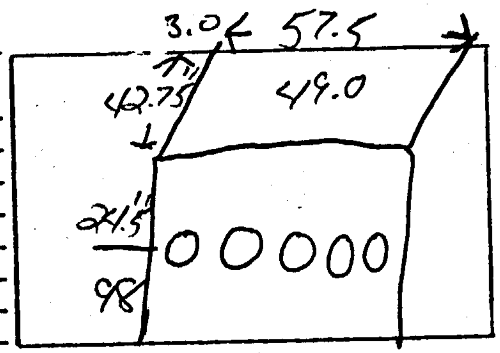
RAMCON ENVIRONMENTAL CORPORATION

Plant T.L. James

Location Milroe La.
Operator C. Cook
Date 11-12-91
Run No. 1
Sample Box No. 1
Meter Box No. C-282
Meter H @ 1.48
C Factor .993
Pitot Tube Coefficient Cp .797



Schematic of Stack Cross Section

Ambient Temperature 50
Barometric Pressure 29.91
Assumed Moisture, % 20
Probe Length, m(ft) 4 FT
Nozzle Identification No. .0005986 .0004587
Avg. Calibrated Nozzle Dia., (in.) .250/.250/.290
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) 0 @ 19"
Probe Liner Material Stainless
Static Pressure, mm Hg (in.Hg) +.01
Filter No. TH5625

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	500	218
INITIAL	200	200
DIFFERENCE	300	18

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 ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
1	8:11 / 8:13	3	250	.45	1.4	190.206 / 191.6	44	50	250	60
2	8:15	5	265	.69	2.1	193.4	62	50	250	60
3	8:17	6	270	.77	2.3	195.2	64	50	250	61
4	8:19	7	270	1.0	3.0	197.5	70	50	250	60
5	8:21	7	270	~~1.05~~ 1.0	~~3.0~~ 3.0	199.5	70	50	250	60
6	8:23	7	265	1.1	3.3	201.2	70	50	250	60
1	8:30 / 8:32	2	260	.21	.63	202.2	62	54	250	60
2	8:34	3	270	.30	.90	203.3	70	54	250	60
3	8:36	4	270	.47	1.4	204.9	76	54	250	60
4	8:38	7	270	.98	2.9	208.9	78	54	250	60
5	8:40	8	265	1.1	3.3	209.3	78	54	250	60
6	8:42	8	265	1.0	3.0	210.9	78	54	250	60

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 11-12-91 LOCATION Monroe L#. 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)
1	9:45 / 9:47	2	265	1.3	.39	211.6	70	56	250	60
2	9:49	3	280	.41	1.2	212.9	76	56	250	60
3	9:51	2	280	.27	.81	214.0	80	56	250	60
4	9:53	2	275	.32	.96	215.3	80	56	250	60
5	9:55	5	260	.67	2.0	216.9	80	56	250	60
6	9:57	6	260	.80	2.4	218.6	82	56	250	60
1	9:58 / 10:00	2	260	.12	.36	219.3	80	58	250	60
2	10:02	2	265	.12	.36	220.0	82	58	250	60
3	10:04	2	265	.10	.30	220.7	82	58	250	60
4	10:06	2	260	.20	.60	221.4	82	58	250	60
5	10:08	2	260	.31	.93	222.6	82	58	250	60
6	10:10	4	260	.42	1.3	223.9	84	58	250	60
1	10:12 / 10:14	2	260	.11	.33	224.6	78	60	250	60
2	10:16	2	260	.10	.30	225.2	80	60	250	60
3	10:18	2	260	.14	.42	225.9	80	60	250	60
4	10:20	2	260	.12	.36	226.6	82	60	250	60
5	10:22	2	260	.16	.48	227.4	82	60	250	60
6	10:24	2	260	.16	.46	228.206	82	60	250	60

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RAMCON ENVIRONMENTAL CORPORATION

Plant T.C. James

Location Monroe LA.
Operator C. Crook
Date 11-12-91
Run No. 2
Sample Box No. 1
Meter Box No. C-282
Meter H @ 1.48
C Factor .993
Pitot Tube Coefficient Cp .797

Schematic of Stack Cross Section

Ambient Temperature 50
Barometric Pressure 29.91
Assumed Moisture, % .20
Probe Length, m(ft) 4 FT
Nozzle Identification No. .0005486 .0004587
Avg. Calibrated Nozzle Dia., (in.) .290/.290/.290
Probe Heater Setting 4
Leak Rate, m³/min. (cfm) .008 at 14"
Probe Liner Material Stainless
Static Pressure, mm Hg (in.Hg) +.01
Filter No. TH5624

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	450	212
INITIAL	200	200
DIFFERENCE	250	12

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 ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
1	10:22 / 10:24	2	230	.10	.30	230.823 / 231.5	80	70	250	60
2	10:26	2	250	.10	.30	232.1	80	70	250	60
3	10:28	2	265	.12	.36	232.8	84	68	250	60
4	10:30	2	260	.12	.36	233.4	86	68	250	60
5	10:32	2	260	.15	.45	234.2	86	68	250	60
6	10:34	2	250	.16	.48	235.0	86	68	250	60
1	10:36 / 10:38	2	260	.10	.30	235.6	84	68	250	60
2	10:40	2	260	.12	.36	236.2	88	68	250	60
3	10:42	2	260	.11	.33	236.9	88	68	250	60
4	10:44	2	260	.24	.72	238.0	88	68	250	60
5	10:46	2	255	.23	.69	238.8	90	70	250	60
6	10:48	2	255	.18	.54	239.6	90	70	250	60

Pol... #RE 6

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RAMCON emissions test log sheet, cont. DATE 11-12-91 LOCATION Monroe LA. 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)
1	10:50 / 10:52	2	250	.10	.30	240.3	88	70	250	60
2	10:54	2	250	.15	.45	241.1	90	70	250	60
3	10:56	2	250	.15	.45	241.9	92	70	250	60
4	10:58	2	255	.23	.69	242.8	92	70	250	60
5	11:00	4	250	.40	1.2	244.3	94	70	250	60
6	11:02	4	250	.45	1.4	245.5	96	70	250	60
1	11:06 / 11:08	2	250	.15	.45	246.4	88	70	250	60
2	11:10	3	250	.23	.69	247.4	92	72	250	60
3	11:12	4	250	.35	1.1	248.7	94	72	250	60
4	11:14	6	250	.63	1.9	250.1	96	72	250	60
5	11:16	8	250	.81	2.4	252.3	96	72	250	60
6	11:18	8	250	.95	2.9	254.1	96	72	250	60
1	12:21 / 12:23	6	266	.47	1.74	255.8	96	76	250	60
2	12:25	6	266	.55	1.7	257.1	98	78	250	60
3	12:27	8	257	.95	2.9	259.2	100	78	250	60
4	12:29	10	250	1.2	3.6	261.4	100	78	250	60
5	12:31	11	256	1.5	4.5	263.9	100	78	250	60
6	12:33	11	254	1.7	5.1	266.609	100	78	250	60

RAMCON ENVIRONMENTAL CORPORATION

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3.0

Plant T.L. James
Location Monroe LA
Operator C. Crooks
Date 11-12-91
Run No. 3
Sample Box No. 1
Meter Box No. C-282
Meter H @ 1.78
C Factor 1.993
Pitot Tube Coefficient Cp .797

Ambient Temperature 60
Barometric Pressure 29.91
Assumed Moisture, % .20
Probe Length, m(ft) 4FT
Nozzle Identification No. ~~.0005486~~ .0004587
Avg. Calibrated Nozzle Dia., (in.) .290/.290/.290
Probe Heater Setting 4
Leak Rate, m^3/min.(cfm) .006 at 10"
Probe Liner Material STAINLESS
Static Pressure, mm Hg(in.Hg) +.01
Filter No. TH 5623

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	576	214
INITIAL	200	200
DIFFERENCE	376	14

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H20	PRESSURE DIFF. ORF. MTR in 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
1	1:04 / 1:06	2	250	.22	.66	267.354 / 268.3	90	84	250	60
2	1:08	5	250	.58	1.7	269.9	96	84	250	60
3	1:10	6	250	.65	2.0	271.6	98	82	250	60
4	1:12	7	250	.86	2.6	273.6	98	82	250	60
5	1:14	8	260	1.0	3.0	275.5	98	82	250	60
6	1:16	8	260	1.0	3.0	277.5	98	80	250	60
1	1:24 / 1:26	2	260	.15	.45	278.3	90	80	250	60
2	1:28	4	260	.38	1.1	279.8	98	80	250	60
3	1:30	6	265	.65	2.0	281.7	98	80	250	60
4	1:32	8	265	.96	2.9	283.2	100	80	250	60
5	1:34	8	270	.90	2.7	285.2	100	80	250	60
6	1:36	8	270	.90	2.7	287.1	100	80	250	60

RAMCON emissions test log sheet, cont. DATE 11-12-91 LOCATION Monroe LA. TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
1	1:37 / 1:39	2	275	.14	.42	288.0	98	80	250	60
2	1:41	2	270	.17	.51	288.7	100	80	250	60
3	1:43	3	270	.21	.63	289.7	102	80	250	60
4	1:45	4	280	.36	1.1	291.1	102	80	250	60
5	1:47	6	270	.60	1.8	292.7	104	80	250	60
6	1:49	6	280	.56	1.7	294.1	104	80	250	60
1	1:50 / 1:52	2	280	.20	.60	295.1	102	80	250	60
2	1:54	2	280	.18	.54	296.0	102	80	250	60
3	1:56	2	280	.28	.84	297.1	102	80	250	60
4	1:58	2	280	.28	.84	298.0	102	80	250	60
5	2:00	2	275	.10	.30	298.5	102	80	250	60
6	2:02	2	265	.12	.36	299.3	102	80	250	60
1	2:04 / 2:06	2	250	.13	.39	299.9	100	80	250	60
2	2:08	2	270	.20	.60	300.8	100	80	250	60
3	2:10	3	280	.26	.78	301.9	102	80	250	60
4	2:12	3	280	.26	.78	302.8	102	80	250	60
5	2:14	4	280	.34	1.0	304.1	102	80	250	60
6	2:16	5	280	.38	1.1	305.284	102	80	250	60

(30)

IX. CALIBRATION

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ________ Date 11-22-91 Meter box number C-282 Plant ________

Barometric pressure, P_b = 30.01 in. Hg Dry gas meter number ________ Pretest Y ________

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1.0	10	565.954 / 576.596	68°	100 / 100	74 / 76	87.5	17:08	1	.971	1.569
2.0	10	555.273 / 565.778	68°	100 / 100	74 / 76	87.5	12:08	3	.982	1.569
3.0	10	544.636 / 555.021	68°	94 / 100	74 / 76	86	9.9	5	.988	1.585
									Y = .98	1.57

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

where

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in. H_2O.

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

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

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Quality Assurance Handbook M4-2.4A

Form #REC-01

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ______ Date 11-8-91 Meter box number C282 Plant ______

Barometric pressure, P_b = 30.41 in. Hg Dry gas meter number ______ Pretest Y ______

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$ 534 535.5 / 535.5 / 518
1	~~10~~ 5	84.244	58	84 / 88	64 / 66	75.5	8.4		.992	1.47
2	10	174.037 / 184.462	58	94 / 88	64 / 66	75.5	11.9		.992	1.48
3	10	163.469 / 173.259	58	80 / 88	62 / 66	74	9.8		.995	1.50
									Y = .993	1.48

[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.

Quality Assurance Handbook M4-2.4A

Form #REC-01

RAMCON

Lear Siegler Stack Sampler

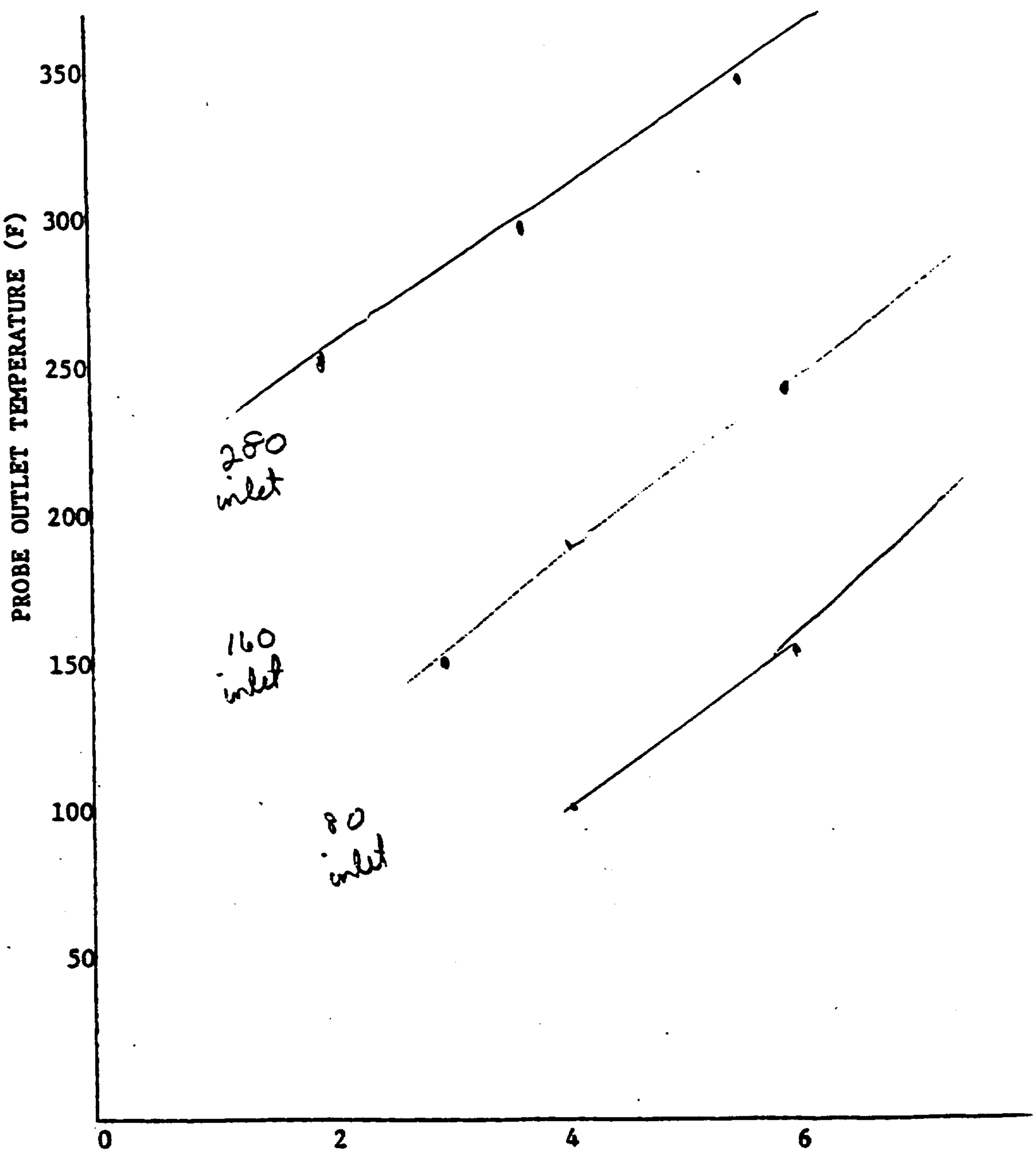
Heating Probe Calibration

Probe No. 42 Probe Length 4'

Date of Calibration 6-10-89 Signature Sam Turner

Name of Company to be tested ______

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



Form No. EED-17-2

RAMCON ENVIRONMENTAL CORPORATION

Date 4-8-91 Thermocouple number 42

Ambient temperature 68 °F Barometric pressure 29.96 in. Hg

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

other ____________

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °C	Thermocouple Potentiometer Temperature, °C	Temperature Difference,[c] %
BOILING H2O		145°F	146°F	-.69
BOILING OIL		435°F	434°F	0.23
ICE WATER		32°F	32°F	0
AMBIENT TEMP		68°F	69°F	0
	11-12-91	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.

Pitot Tube Calibration (S Type)

Pitot Tube Identification No. 42 Date: 4/2/91

Calibrated by: [signature]

"A" SIDE CALIBRATION				
RUN NO.	Δp std cm H_2O (in H_2O)	Δp(s) cm H_2O (in H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(A)$
1	.35	.56	.790	.007
2	.58	.91	.798	.001
3	1.1	1.7	.804	.007
		$\bar{C}_p$ (SIDE A)	.797	

"B" SIDE CALIBRATION				
RUN NO.	Δp std cm H_2O (in H_2O)	Δp(s) cm H_2O (in H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(B)$
1	.35	.56	.790	.007
2	.58	.91	.798	.001
3	1.1	1.7	.804	.007
		$\bar{C}_p$ (SIDE B)	.797	

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

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

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 4-5-91 Thermocouple number Hotbox

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator Turner Reference: mercury-in-glass ✓

other ____________

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	Ice Bath	32	32	0
B	Boiling water	212	212	0
C	Boiling oil	381	381	0
D	Ambient 11-12-91	50°F	50°F	0

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 4-5-91 Thermocouple number Inlet / Outlet

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator Turner Reference: mercury-in-glass ✓

other ____________

Reference point number	Source[a] (specify)	Reference thermometer temperature, °~~C~~ F	Thermocouple potentiometer temperature, °~~C~~ F	Temperature difference,[b] %
A	Ice Bath	32	32	0
B	Boiling oil	381	381	0
C	Boiling water	212	212	0
D	ambient 11-12-91	50°F	50°F	0

[a] Type of calibration system used.

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