RAMCON
ENVIRONMENTAL CORPORATION

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
JACKSON ASPHALT & CONCRETE COMPANY
JACKSON, NEW JERSEY
September 1, 1988

Bill Harris
Jackson Asphalt & Concrete

G. Sumner Buck, III
President

Ken Allmendinger
Team Leader

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

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
401 East State Street
CN 027
Trenton, N.J. 08625
(609) 984-6721

Jorge H. Berkowitz, Ph.D.
Director

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

January 13, 1989

MEMORANDUM

TO: Don Patterson

THROUGH: Edward Choromanski

FROM: Michael Pratt

SUBJECT: Jackson Asphalt Company
APC Plant ID# 78011; NJ Stack# 006
BNSR Log# 87-4224; Permit/Certificate to Operate (P/Ct)# 081487

ATTACHMENT: T. Micai (BNSR) December 29, 1988 memo to this writer.

Emission tests were conducted at the above referenced facility on the asphalt plant controlled by "Standard Havens" baghouse. The purpose of the stack test was to determine the Particulate, CO and THC emissions and compare them to those stated on P/Ct# 081487. Particulate emissions are limited to 10.65 lb/hr as specified in subject P/Ct condition 1(refer to the attached memo).

Leonard Sobolewski reviewed the submitted test report. His review indicates that baghouse particulates control efficiency was 99.9%.

1. THC (as methane) and CO emissions exceeded P/Ct# 081487 allowables.

2. Particulate emissions were within P/Ct# 081487 condition 1 allowables.

Conclusions:

Item 1. Subject facility equipment requires corrective action (as per magnitude of THC and CO emission over their P/Ct# 081487 allowables).

Item 2. Particulate emission rates were in compliance with P/Ct attachment conditions 1 but differed from VEM-004 form. As suggested by T. Micai, CRO should amend subject P/Ct particulate emissions (refer to T.M 12-29-89 memo's third paragraph).

c Milton Polakovic
Harold Christiff
Lou Mikolajczyk
Joe DePierro
Leonard Sobolewski

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
Bureau of New Source Review
CN 027, 401 E. State St.
Trenton, N.J. 08625-0027
1-800-441-0065

Jorge H. Berkowitz, Ph.D.
Director

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

TO: **Mike Pratt**
Bureau of Technical Services

FROM: **T. Micai**
Bureau of New Source Review

DATE: **December 29, 1988**

SUBJECT: **Jackson Asphalt Co. Permit**
BNSR Log No. 87-4224 (ID)

The maximum allowable particulate emission rate in the Jackson Asphalt Co. permit is 10.65 pound per hour (1 hour block average) as specified in Condition I of the permit. The conditioned limit takes precedence over the lower limit of 7.65 pounds per hour as shown in the permit application. This has been an established policy in permit writing. There should be no problem since 10.65 pounds per hour is in compliance with NJAC 7:27-6.2.

The originally proposed TSP emission rate was 10.65 pounds per hour, but this rate was later revised to 7.65 pounds per hour to make the emissions consistent with AP-42 emission factors which was the "how determined" selection in Section "G." Unfortunately the permit conditions were not similarly revised before the permit was issued.

This permit should be revised to eliminate this inconsistency. We would suggest that the final number be consistent with the stack test report. Jackson Asphalt should be asked to agree to this approach.

Since Jackson Asphalt has demonstrated 99% efficiency of the baghouse, they are not subject to the 0.02 grain per SCF limit specified in NJAC 7:27 - 6.2. They were given the option of demonstrating > 99% baghouse efficiency or an exhaust particulate loading < 0.02 grain per SCF. This was

agreed upon in a meeting with the permittee on July 27, 1988. See attached copy.

c: L. Mikolajczyk
E. Choromanski
CRO
Stack File
W. Kuehne

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
401 East State Street
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Jorge H. Berkowitz, Ph.D.
Director

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

November 30, 1988

MEMORANDUM

TO: Michael Pratt

FROM: Len Sobolewski

SUBJECT: Jackson Asphalt Company
Stack Test Report
APC Plant ID. 78011

Emission tests were conducted at the Jackson Asphalt Company located in Jackson Township New Jersey on September 1, 1988.

The purpose of the tests was to determine if the particulate, total hydrocarbons and carbon monoxide emission rate from the Baghouse (N.J Stack No. 006) was within the standards stated on Permit/Certificate Number 081487 as filed under N.J.A.C. 7:27-8.

The results of the tests using the data supplied by Ramco Environmental Corporation is as follows.

PARTICULATE

RUN	DATE	ALLOWABLE	EMISSION RATE(LBS/HR) ACTUAL
1	09-01-88	6.7505 ✓	8.5678
2	09-01-88	6.7505	7.8647
3	09-01-88	6.7505	8.9112

The above particulate allowable emission rate is based upon the standards stated on Permit/Certificate Number 081487 as filed under N.J.A.C. 7:27-8.

BAGHOUSE EFFICIENCY

RUN	DATE	DROPOUT COLLECTIONS	EFFICIENCY
1	09-01-88	7,361	99.9%
2	09-01-88	6,156	99.9%
3	09-01-88	6,759*	99.9%

*Due to the problems with collecting and weighting the baghouse dropout, JACKSON ASPHALT COMPANY consented to accept the test results of the dropout collected for test run numbers 1 and 2 to average the test run number 3.

TOTAL HYDROCARBONS (AS METHANE)

RUN	DATE	ALLOWABLE* LBS/HR	ACTUAL LBS/HR	ACTUAL PPM
1	09-01-88	1.27	968.41	12800
2	09-01-88	1.27	1677.20	24000
3	09-01-88	1.27	1271.14	17100

The above total hydrocarbon allowable emission rate is based upon the standards stated on Permit/Certificate Number 081487 as filed under N.J.A.C 7:27-8.

TOTAL HYDROCARBONS

RUN	DATE	ACTUAL(PPM)	7% OXYGEN CORRECTION (PPM)
1	09-01-88	12800	23893
2	09-01-88	24000	48000
3	09-01-88	17100	31920

CARBON MONOXIDE

RUN	DATE	ALLOWABLE (LBS/HR)	ACTUAL (LBS/HR)	ACTUAL (PPM)
1	09-01-88	3.90	62.85	476
2	09-01-88	3.90	43.54	357
3	09-01 88	3.90	59.29	457

The above carbon monoxide allowable emission rate is based upon the standards stated on Permit/Certificate Number 081487 as filed under N.J.A.C. 7:27-8.

RUN	DATE	ACTUAL(PPM)	7%OXYGEN CORRECTION
1	09-01-88	476	889
2	09-01-88	357	714
3	09-01-88	457	853

The pressure drop across the Baghouse remained between 2 and 3 inches of H_2O during the test period.

For all test runs observed the asphalt plant was producing approximately 300,000 LBS/HR of N.J.D.O.T I-5 asphalt mix. The type fuel used in the dryer was Number 2 diesel fired at a rate of approximately 120 gallons per hour. This production rate coincides with the manufacturing and materials handling processed as stated on Permit/Certificate Number 081487.

Technical Services calculations using the submitting field test data produced essentially the same particulate results as reported by Ramcon Environmental Corporation. Although tests were conducted for total hydrocarbons and carbon monoxide the results of these tests were not calculated or mentioned in this report.

The test results indicated that the particulate, total hydrocarbon and carbon monoxide emission rates exceeded the standards stated on Permit/Certificate Number 081487 during all test runs.

The test results also indicated that the particulate emission rate was within the standards prescribed by the Code of Federal Regulations parts 53 to 60 revised as of July 1, 1987 subpart I-Standards of Performance for Hot mix Asphalt Facilities during all test runs.

RAMCON
ENVIRONMENTAL CORPORATION

September 13, 1988

Mr. Bill Harris
Jackson Asphalt & Concrete Company
1817 Old Mill Road
Belmar, NJ 07719

Re: Particulate Emissions Tests - Jackson, New Jersey

Dear Mr. Harris:

Enclosed you will find four copies of our report on the particulate emissions tests we conducted at Jackson Asphalt & Concrete Company in Jackson, New Jersey. 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 was below the allowable emissions standard set by EPA and the State of New Jersey. Therefore, your plant is operating in compliance with State and Federal Standards.

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

Mr. Thomas W. Morris
New Jersey DEP
Twin Rivers Professional Bldg.
E. Windsor, New Jersey 08520

You will need to keep one copy of the report at the plant.

We certainly have enjoyed working with you and we look forward to serving you again in the future.

Sincerely,

G. Sumner Buck, III
President

GSBIII:mew

Enclosures

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

TABLE OF CONTENTS

I. INTRODUCTION

On September 1, 1988, personnel from RAMCON Environmental Corporation (REC) conducted a source emissions test for particulate emissions compliance at Jackson Asphalt & Concrete Company's Cedarapids batch mix asphalt plant located in Jackson, New Jersey. RAMCON personnel conducting the test were Ken Allmendinger, Team Leader, and Bill Turner. John Biggs was responsible for the particulate laboratory analysis including taring the beakers and filters and recording final data in the laboratory record books. Custody of the samples was limited to Mr. Turner and Mr. Biggs.

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 the State of New Jersey.

II. TEST RESULTS

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

Mr. Thomas W. Morris of the New Jersey Department of Environmental Protection observed the testing conducted by RAMCON.

TABLE I
SUMMARY OF TEST RESULTS
September 1, 1988

Test Run	Time	Grain Loading	Isokinetic Variation	Actual Emissions
1	10:12 to 11:10	0.0329 gr/DSCF	97.2%	8.6 lbs/hr ✓
2	12:28 to 13:30	0.0328 gr/DSCF	109.4%	7.9 lbs/hr ✓
3	14:20 to 15:24	0.0349 gr/DSCF	104.1%	8.9 lbs/hr ✓
	Average:	0.0335 gr/DSCF		8.5 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. Therefore, the plant is operating in compliance with State and Federal Standards.

TABLE II
BAGHOUSE EFFICIENCY

Test Run	Actual Emissions	Hopper Collections	Efficiency
1	8.6 lbs/hr	7,361 lbs.	99.9%
2	7.9 lbs/hr	6,156 lbs.	99.9%
3	8.9 lbs/hr	6,759 lbs.*	99.9%

*Average of Run 1 and 2.

III. TEST PROCEDURES

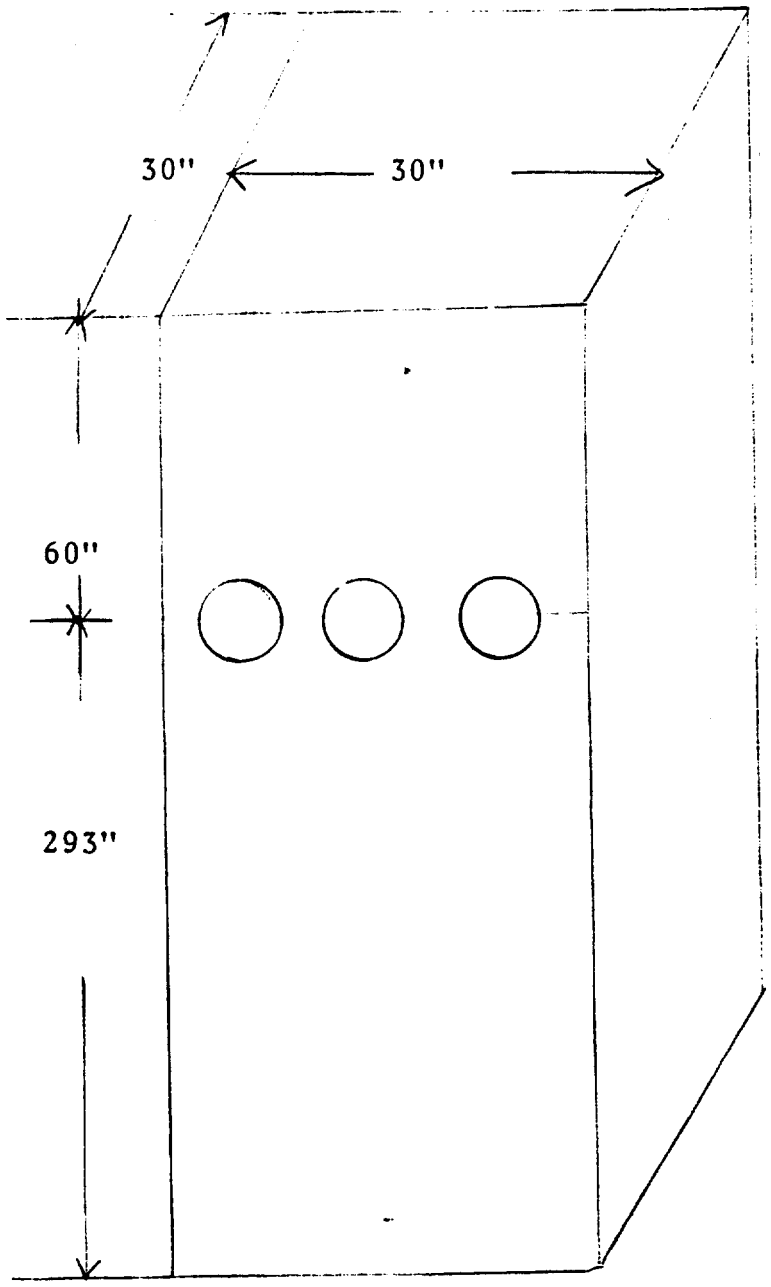
A. Method Used: The source sampling was conducted in accordance with requirements of the U. S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

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 30" x 30" with an equivalent diameter of 30". Three sampling ports were placed 60" down (2.0 diameters upstream) from the top of the stack and 293" up (9.8 diameters downstream) from the last flow disturbance. Twelve points were sampled, four through each port for 5 minutes each for a total test time of 60 minutes per test run.

Points on a Diameter	Probe Mark
1	* 7.8"
2	15.3"
3	22.8"
4	30.3"

*Measurements include a 4" standoff.



IV. THE SOURCE

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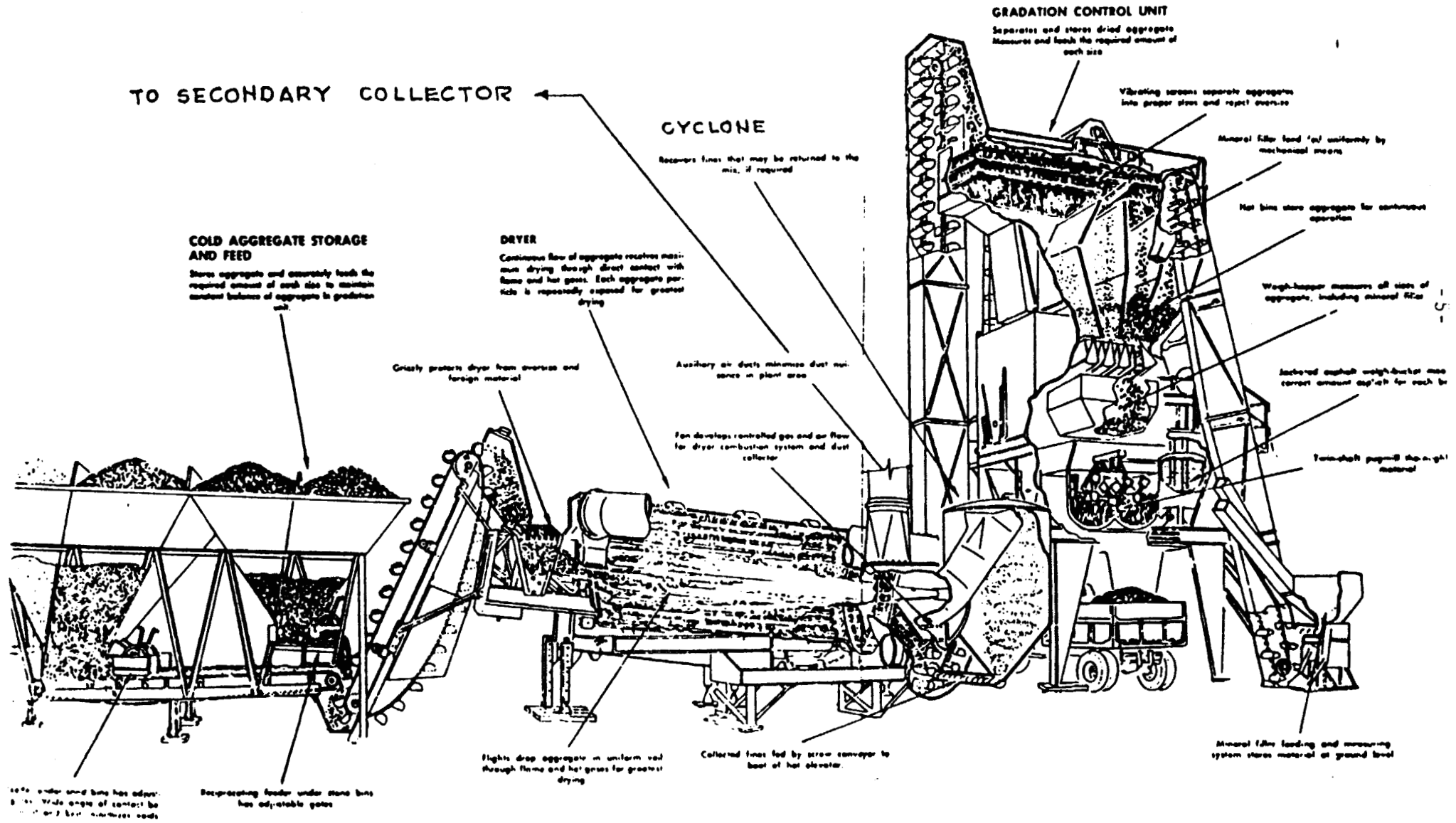
Jackson Asphalt & Concrete Company employs a Cedarapids batch mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt oil to bind the mixture together. After the hot asphalt mix is manufactured at the plant, it is transported to the location where it is to be applied. The hot asphalt mix is spread evenly over the surface with a paver 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 separate bins which in turn feed a common continuous conveyor. The aggregate is dispensed from the bins in accordance with the desired formulation onto the cold feed system conveyor to an inclined weigh conveyor then to a rotating drum for continuous mixing and drying at approximately 300°F. The dried aggregate is pulled by a bucket elevator to the top of a gradation control unit which separates and stores the aggregate by size. The required amount of each aggregate is dispensed into a weigh-hopper and from there, into a pugmill where the hot liquid asphalt is mixed thoroughly with the aggregate. The hot asphalt mix is then discharged from the storage silo through a slide gate into waiting dump trucks, which 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 dryer uses a burner fired with #2 diesel to heat air to dry the aggregate. The air is drawn into the system via an exhaust fan. After passing through the burner and the mixing drum, the air passes through a baghouse. The baghouse is manufactured by Standard Haven. The exhaust gas is drawn through the baghouse and discharged to the atmosphere through the stack. The design pressure drop across the tube sheet is 1 - 6 inches of water. The particulate matter, which is removed by the baghouse is reinjected into the pugmill. The following sketch shows a typical batch mix asphalt plant.

Figure 4-1

ASPHALT BATCH MIX PLANT - AN EXPLODED VIEW



DATA SUMMARY

Plant

1. Manufacturer of plant CEDAR RAPIDS.
2. Designed maximum operating capacity 200 TPH @ ___ % moisture.
3. Actual operation rate 150 TPH @ ___ % moisture.
4. Startup date APPROX JULY 1ST
5. Type of fuel used in dryer #2 DIESEL.
6. Quanity of fuel consumption APPROX 120 GAL/P/H (VARIES WITH MOISTURE CONTENT)

Aggregate

7. Name/type of mix N.J. D.O.T. I-5.
8. Percent asphalt in mix 5.5% %.
9. Temperature of asphalt 325°F.
10. Sieve/Screening analysis: % Passing;

1"	100%	3/8"	95.8%	# 8	50.1%
3/4"	100%	#		#50	18.4%
1/2"	100%	# 4	63.3%	#200	6.0%

Baghouse

11. Manufacturer STANDARD HAVEN SER# 13752.
12. No. of bags 288. Type of bags NOMEX TYPE 450
13. Air to cloth ratio ___. Designed ACFM 41602.
14. Square feet of bags 7704 SF.
15. Type of cleaning; pulse jet ✓, reverse air ___, plenum pulse ___, other ___.
16. Cleaning cycle time 240 SECONDS.
17. Interval between cleaning cycle 12 SECONDS.
18. Pressure drop across baghouse ___ psi.
19. Pulse pressure on cleaning cycle ___ psi.

COMPANY NAME JACKSON ASPHALT & CONC. CO DATE 9/1/88

COMPANY REPRESENTATIVE WILLIAM HARRIS

elf asphalt

Elf Asphalt, Inc. JACKSON
Petty's Island, N.J. Office ASPHALT
609-428-8808
215-925-7736

Terminals
Baltimore, MD. 301-355-6262
Chesapeake, VA. 804-487-9136
Kearny, N.J. 201-998-2340
Perth Amboy, N.J. 201-826-1144

3.1	12:30	2.1 1:35
2.0	12.35	
2.1	12.40	
2.1	12.45	
2.1	12 50	PRESSURE DROP ACROSS BAGHOUSE RUN NUMBER 2.
2.2.	12 55	
2.1	1 00	
2.1	1:05	
2.0	1:10	
2.0	1:15	
2.1	1:20	
2.0	1:25	
2.1	1:30	

09-01-88

EDWARD M. CHROMANSKI
CHIEF
BUREAU OF TECHNICAL SERVICES
STATE OF NEW JERSEY

9/1/88

RE: BAGHOUSE EMISSION TESTS
DEAR ED;

IN LIEU OF THE LARGE AMOUNT OF BAGHOUSE DROPOUT PER HOUR AND THE PROBLEMS IN COLLECTING SAME, WE ARE COLLECTING FOR TWO TEST RUNS AND USING THAT RESULT FOR A REPRESENTATIVE AMOUNT FOR TEST RUN # THREE

MEANING SIMPLY THAT NO DROPOUT WILL BE COLLECTED FOR TEST RUN # THREE.

WE WILL ACCEPT THE TEST RESULTS OF TEST RUN # THREE BASED ON THE DROPOUT DATA FOR DROPOUT RUN NUMBERS ONE and TWO

THANKYOU FOR YOUR CO-OPERATION

A Paul Patz
CONSTR. MGR
HARRIS BROS CONSTR CO

CC JOHN HARRIS
RAMCON
FILE

DROPOUT FROM BAGHOUSE RUN # 1

55 GALLON DRUM TARE = ~32 POUNDS

DRUM #	WEIGHT (DRUM PLUS DROPOUT) lbs.	TIME	WEIGHT (DROP lbs.
1	435	1004	403
2	469	1007	437
3	469	1011	437
4	364	1016	332
5	357	1019	325
6	342	1022	310
7	250	1025	218
8	336	1028	304
9	350	1031	318
10	385	1035	353
11	414	1039	382
12	421	1043	389
13	405	1046	373
14	335	1050	303
15	313	1052	281
16	318	1056	286
17	357	1059	325
18	326	1103	294
19	343	1106	311
20	367	1110	335
21	360	1114	328
22	349	1116	317
		TOTAL =	7361

1-1-82

DROPOUT FROM BAGHOUSE RUN # 2

55 GALLON DRUM TARE = ~32 POUNDS

DRUM #	WEIGHT (DRUM PLUS DROPOUT lbs.)	TIME	WEIGHT (DROPOUT lbs.)
1	350	1226	318
2	338	1227	306
3	344	1228	312
4	357	1230	325
5	360	1233	328
6	409	1238	377
7	374	1242	342
8	336	1246	304
9	341	1249	309
10	335	1250	303
11	437	1258	405
12	279	1302	247
13	317	1305	285
14	349	1310	317
15	367	1316	335
16	415	1321	383
17	381	1326	349
18	335	1331	303
19	340	1333	308
		TOTAL =	6156

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.

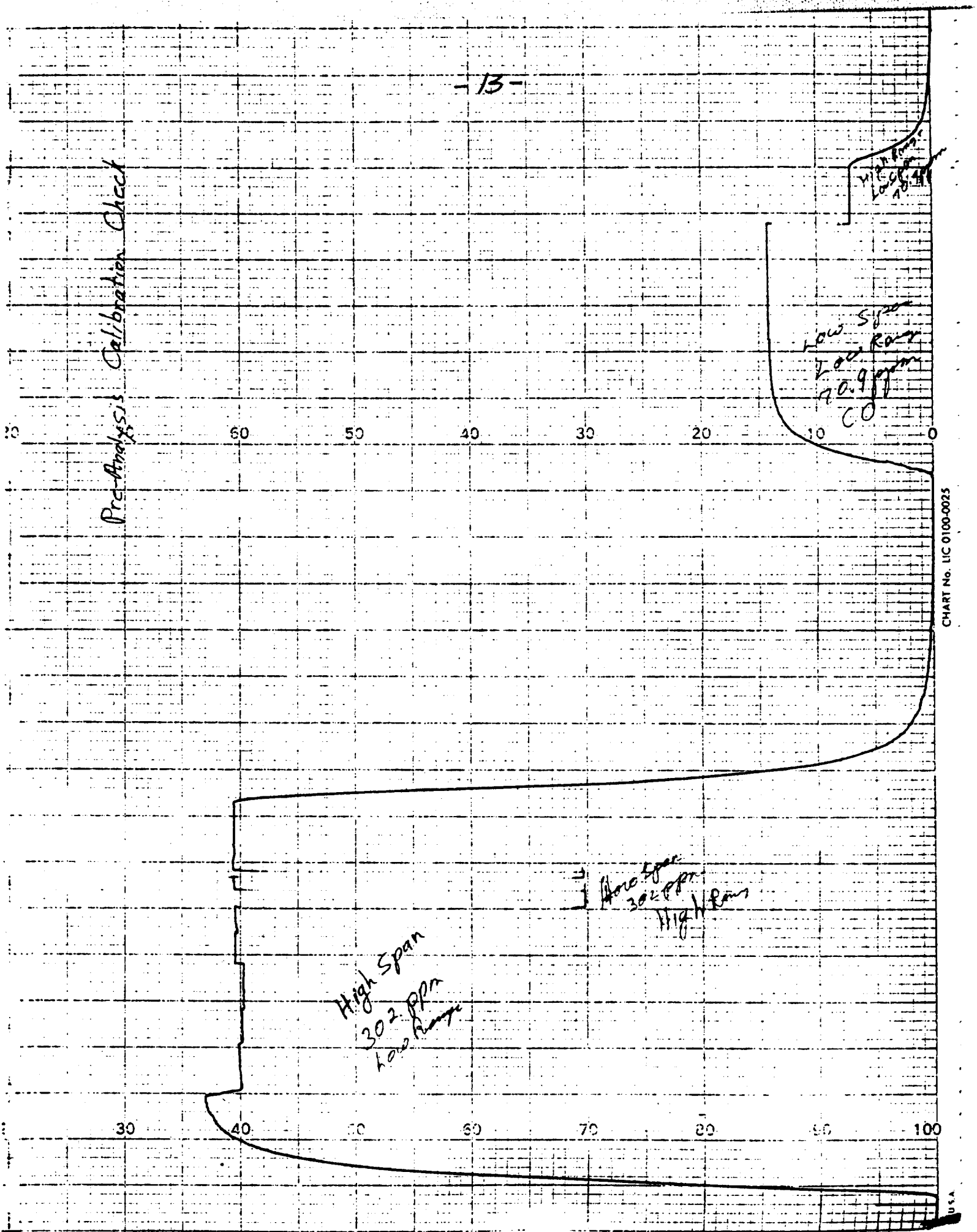
E. Filters are mady by Schleicher and Schuell and are type 1-HV with a porosity of .03 microns.

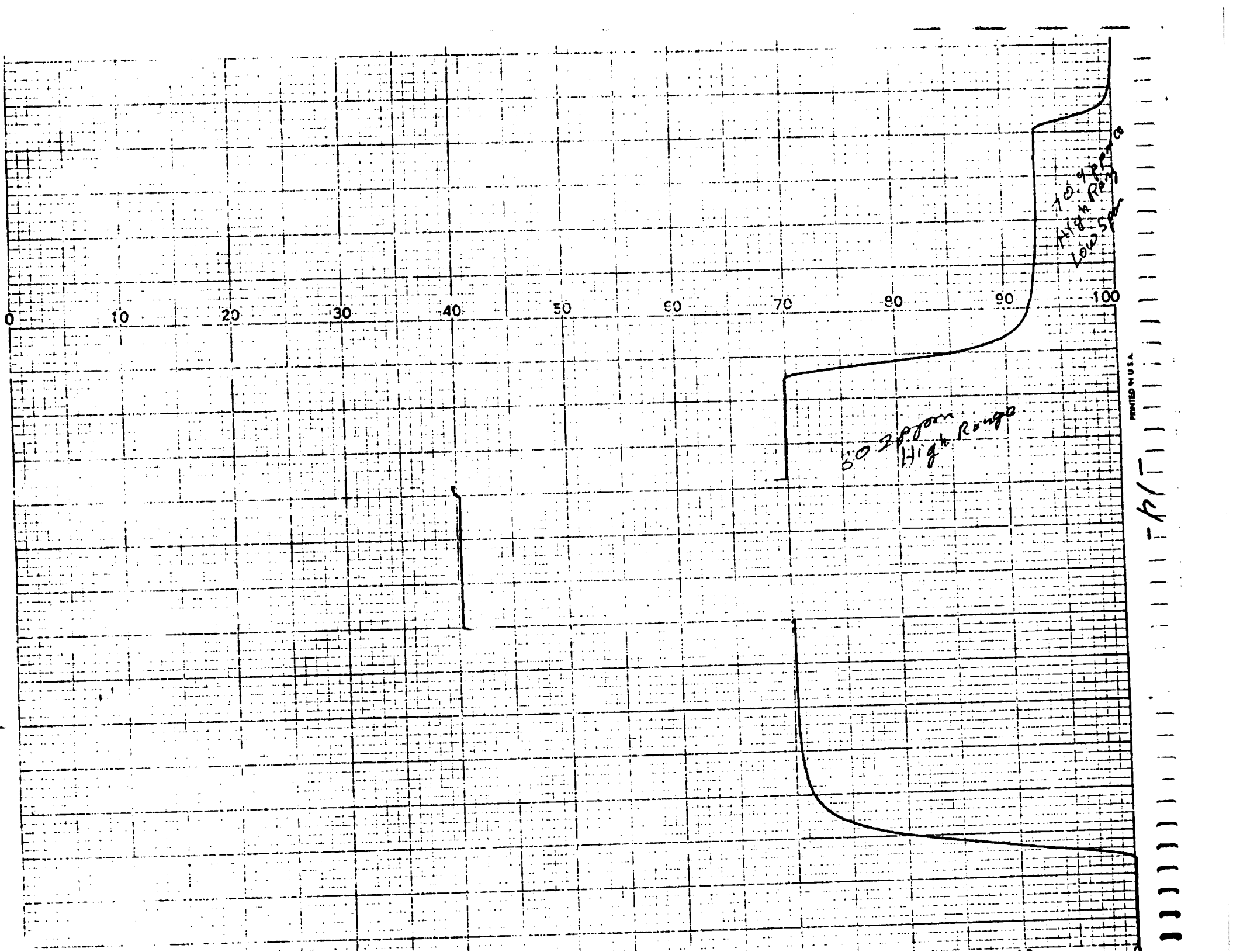
F. The acetone is reagent grade or ACS grade with a residue of $\leq$ .001.

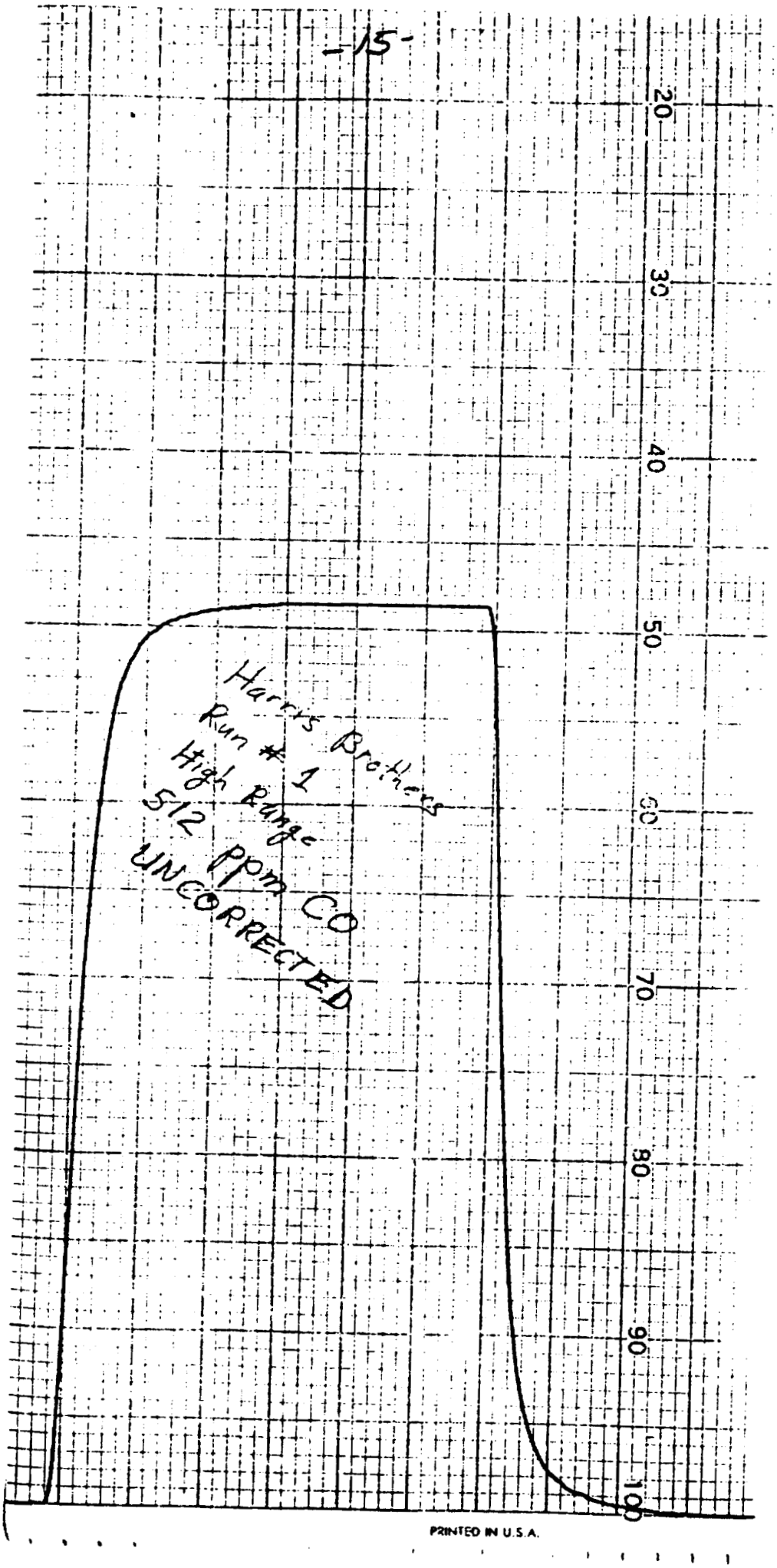
VI. LABORATORY PROCEDURES & RESULTS

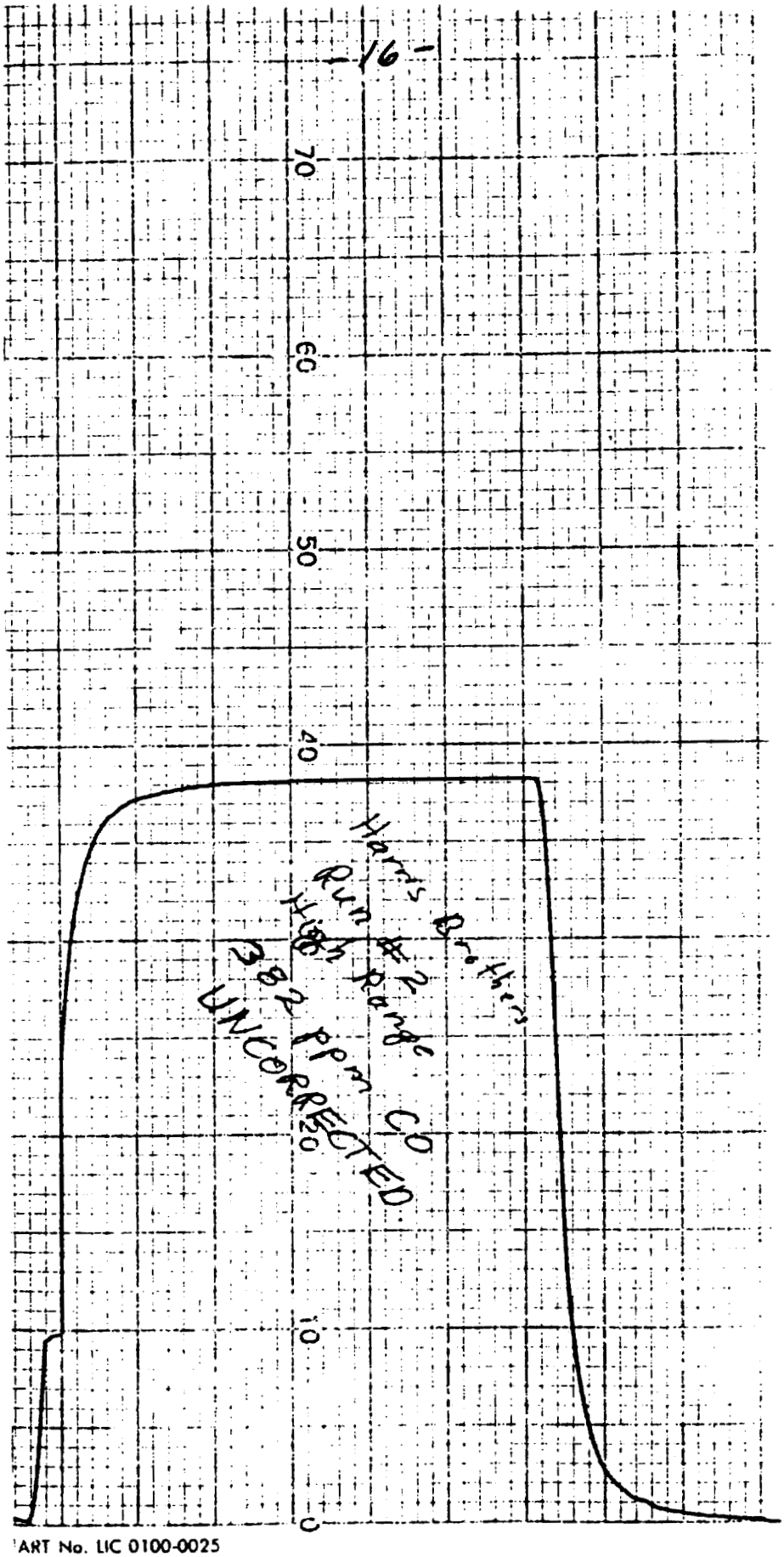
CO Analysis

	ppm Uncorrected	ppm Corrected	% CO_2
Run 1	512	476	7.0
Run 2	382	357	6.5
Run 3	494	457	7.2
Span	302		

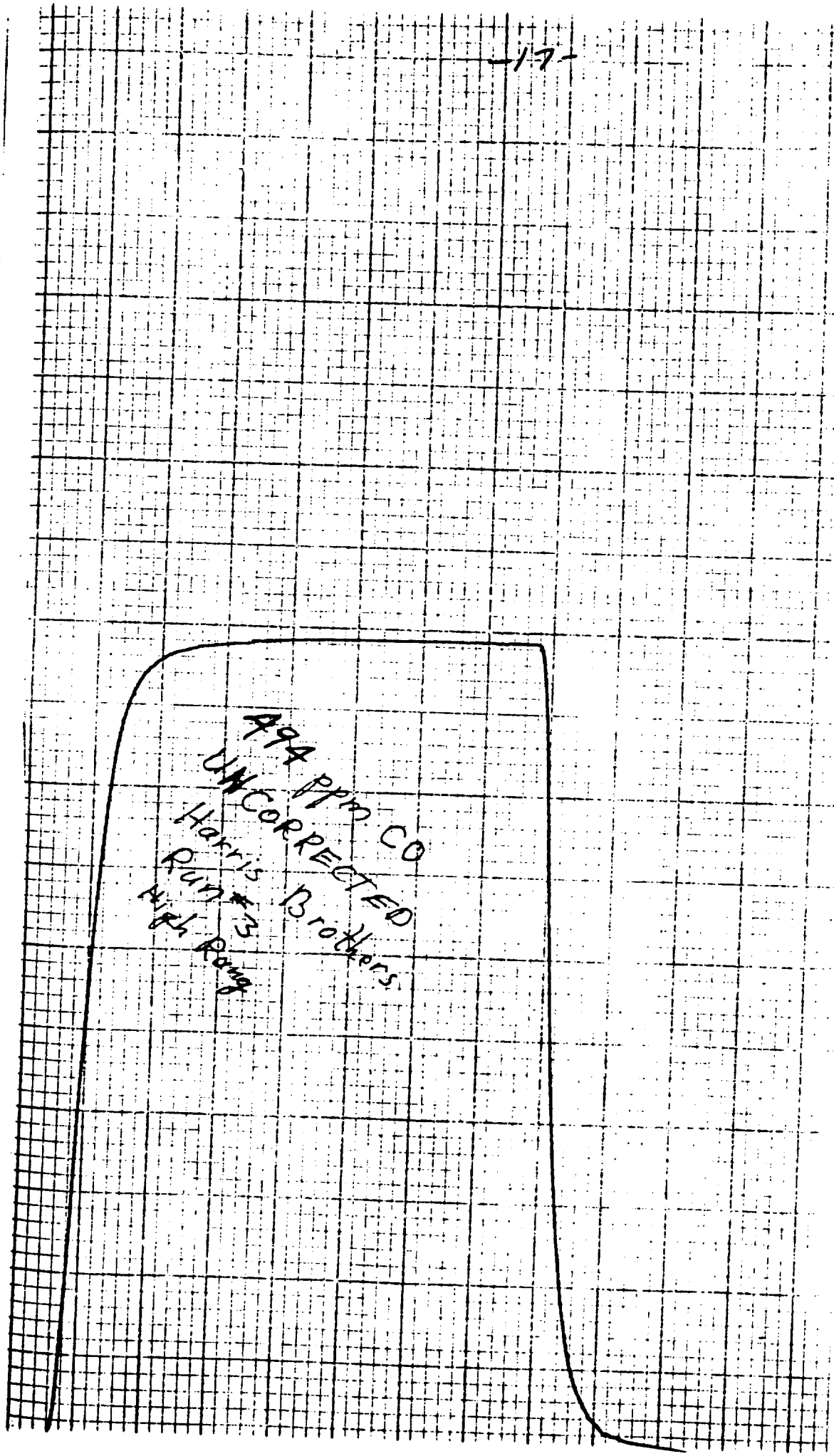

Pre-Analysis Calibration Check
60
50
40
30
20
10
0
Low Span
Zero Range
40.9 ppm
CO
High Span
302 ppm
Low Range
Zero Span
302 ppm
High Range
30
40
70
80
100
CHART No. LIC 0100-0025
U.S.A.

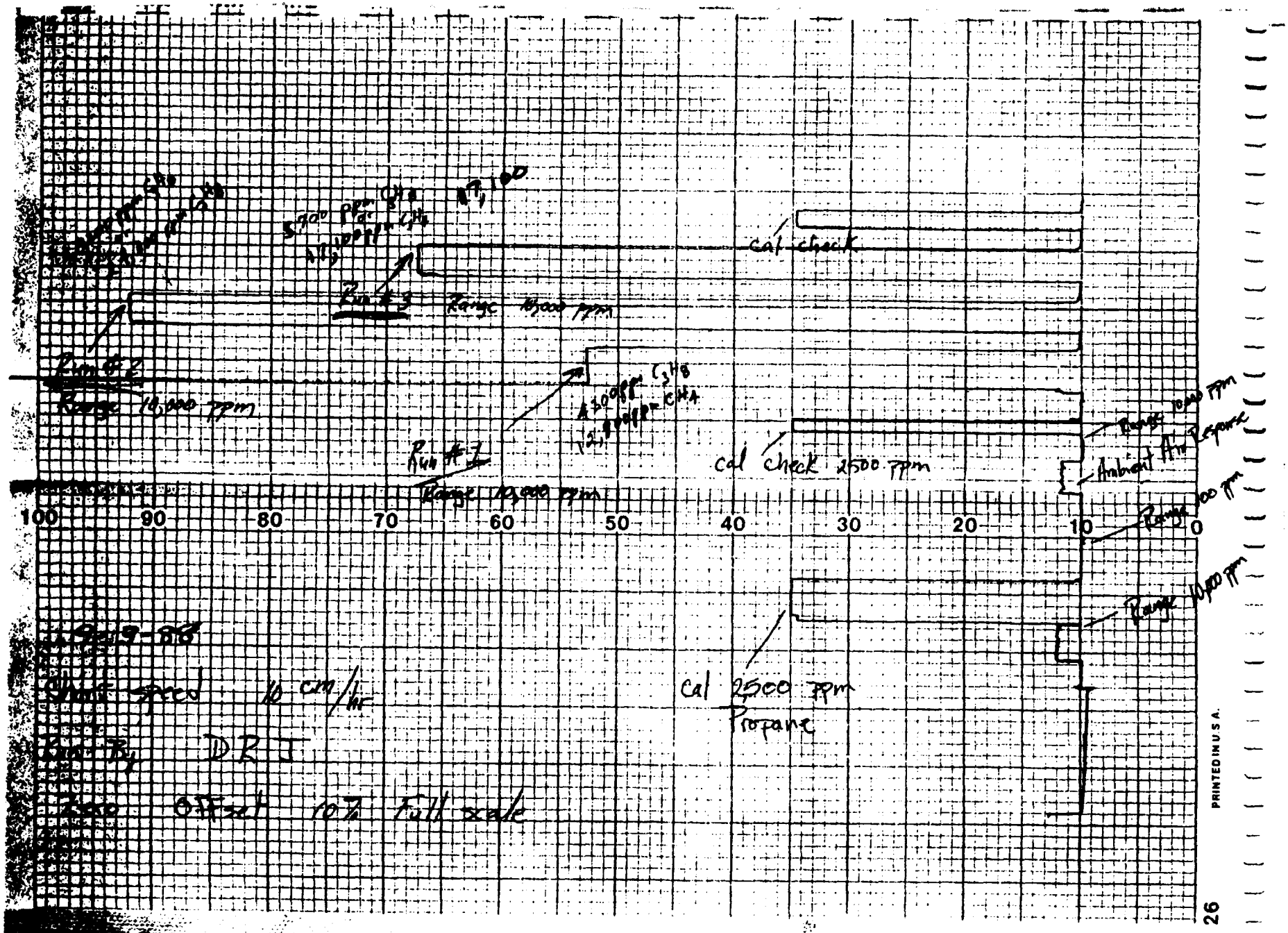

0
10
20
30
40
50
60
70
80
90
100
50 ppm
High Range
PRINTED IN U.S.A.


20
30
40
50
60
70
80
90
100
Harris Brothers
Run # 1
High Range
512 ppm CO
UNCORRECTED
PRINTED IN U.S.A.



ART No. LIC 0100-0025


A9A RPM CO
UNCORRECTED
Harris Brothers
Run #3
High Rang


Run #2
Range 10,000 ppm
Run #3
Range 10,000 ppm
Run #4
Range 10,000 ppm
cal check
cal check 2500 ppm
Ambient Air Response
Range 1000 ppm
Range 100 ppm
cal 2500 ppm
Propane
100
90
80
70
60
50
40
30
20
10
0
PRINTED IN U.S.A.
26

-81-

44.09

LABORATORY PROCEDURES FOR PARTICULATE SAMPLING

I. Field Preparation

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

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

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

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

II. Post-Testing Lab Analysis

A. FILTERS: The filters are returned to the lab in their sealed petri dishes. In the lab, the dishes are opened and placed into a dessicator for at least 24 hours. Then, the filters are weighed continuously every 6 hours until a constant weight is achieved. All data is recorded on the laboratory forms that will be bound in the test report.

Alternately, the test team may opt to oven dry the filters at 220°F for two to three hours, weigh the sample, and use this weight as a final weight.

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

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

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

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

SPECIAL NOTE

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

WEIGHING PROCEDURE - SARTORIUS 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 Harris Brother — Relative humidity in lab 45 %

Sample Location Latania Asphalt Plant — Density of Acetone (pa) .7853 mg/ml

Blank volume (V_a) 200 ml

Date/Time wt. blank 9-6-88 — Gross wt. 111.1327 mg

Date/Time wt. blank 9-7-88 — Gross wt. 111.1323 mg

Ave. Gross wt. 111.1325 mg

Tare wt. 111.1323 mg

Weight of blank (m_{ab}) .0002 mg

Acetone blank residue concentration (C_a) (C_a) = (M_{ab}) / (V_a) (p_a) = (.000003 mg/g)

Weight of residue in acetone wash: $W_a = C_a V_{aw} p_a$ = (.000003)(200)(.7853) = (.0002)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml			
Date/Time of wt 9-6-88 Gross wt	g	137.9177	154.6020	155.3180
Date/Time of wt 9-7-88 Gross wt	g	137.9177	154.6025	155.3175
Average Gross wt	g	137.9177	154.6028	155.3178
Tare wt	g	137.8248	154.5042	155.2100
Less acetone blank wt (W_a)	g	.0002	.0002	.0002
Wt of particulate in acetone rinse (m_a)	g	.0927	.0984	.1076

		KA-2977	KA-2979	BS-2959
Filter Numbers	#			
Date/Time of wt 9-6-88 Gross wt	g	.5313	.5275	.5346
Date/Time of wt 9-7-88 Gross wt	g	.5318	.5271	.5341
Average Gross wt	g	.5316	.5273	.5344
Tare wt	g	.5236	.5220	.5300

Weight of particulate on filters(s) (m_f)	g	.0080	.0053	.0044
Weight of particulate in acetone rinse	g	.0927	.0984	.1076
Total weight of particulate (m_n)	g	.1007	.1037	.1120

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]

VII. CALCULATIONS

JACKSON ASPHALT & CONCRETE COMPANY
JACKSON, NEW JERSEY

SUMMARY OF TEST DATA

		9/1/88 RUN #1	9/1/88 RUN #2	9/1/88 RUN #3
SAMPLING TRAIN DATA				
	start	10:12	12:28	14:20
	finish	11:10	13:30	15:24
1. Sampling time, minutes	Θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.1750	.1750	.1750
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000167	.000167	.000167
4. Isokinetic variation	I	96.7	108.7	103.6
5. Sample gas volume - meter cond., cf.	V_m	49.075	51.699	52.242
6. Average meter temperature, ^oR	T_m	558	568	566
7. Avg. oriface pressure drop, in. H_2O	dH	1.99	2.06	2.09
8. Total particulate collected, mg.	M_n	100.70	103.70	112.00
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2	A	6.30	6.30	6.30
10. Absolute stack gas pressure, in. Hg.	P_s	30.50	30.50	30.50
11. Barometric pressure, in. Hg.	P_{bar}	30.50	30.50	30.50
12. Avg. absolute stack temperature, R^o	T_s	648	650	640
13. Average $-\sqrt{\text{vel. head}}$, (C_p= .84)	$-\sqrt{dP}$	1.77	1.79	1.81
14. Average stack gas velocity, ft./sec.	V_s	110.05	107.30	106.46
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	128.00	198.00	134.00
16. Moisture in stack gas, %	B_{ws}	11.31	16.03	11.31
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1838	1692	1800
18. Stack gas flow rate, cfm	acfm	41599	40559	40242
19. Particulate concentration, gr/dscf	C_s	0.0329	0.0328	0.0349
20. Particulate concentration, lb/hr	E	8.64	7.93	8.98
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	7.00	6.50	7.20
23. Percent O_2 by volume	O_2	13.50	14.00	13.50
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	79.50	79.50	79.30

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:

$$V_{m(std)} = (17.64)(.990)(49.075)\left[\frac{(30.50) + \frac{1.99}{13.6}}{558}\right] = 47.069 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(.990)(51.699)\left[\frac{(30.50) + \frac{2.06}{13.6}}{568}\right] = 48.721 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(.990)(52.242)\left[\frac{(30.50) + \frac{2.09}{13.6}}{566}\right] = 49.411 \text{ dscf}$$

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:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{100.70}{47.069}\right] = 0.0329 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{103.70}{48.721}\right] = 0.0328 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{112.00}{49.411}\right] = 0.0349 \text{ gr./dscf.}$$

Dry Molecular Weight

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

Where:

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

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

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

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

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

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

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

0.32 = Molecular weight of O_2 divided by 100.

0.44 = Molecular weight of CO_2 divided by 100.

Run 1:

$$M_d = 0.44(\ 7.00\%) + 0.32(13.50\%) + 0.28(\ .00\% + 79.50\%) = 29.66 \ \frac{lb}{lb\text{-mole}}$$

Run 2:

$$M_d = 0.44(\ 6.50\%) + 0.32(14.00\%) + 0.28(\ .00\% + 79.50\%) = 29.60 \ \frac{lb}{lb\text{-mole}}$$

Run 3:

$$M_d = 0.44(\ 7.20\%) + 0.32(13.50\%) + 0.28(\ .00\% + 79.30\%) = 29.69 \ \frac{lb}{lb\text{-mole}}$$

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)($^\circ$R).

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

T_{std} = Absolute temperature at standard conditions, 528°R.

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

Run 1:

$V_{wc(std)}$ = (0.04707) (124.0) = 5.8 cu.ft
$V_{wsg(std)}$ = (0.04715) (4.0) = 0.2 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (192.0) = 9.0 cu.ft
$V_{wsg(std)}$ = (0.04715) (6.0) = 0.3 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (125.0) = 5.9 cu.ft
$V_{wsg(std)}$ = (0.04715) (9.0) = 0.4 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:

$$B_{ws} = \frac{5.8 + 0.2}{5.8 + 0.2 + 47.069} \times 100 = 11.31\ \%$$

Run 2:

$$B_{ws} = \frac{9.0 + 0.3}{9.0 + 0.3 + 48.721} \times 100 = 16.03\ \%$$

Run 3:

$$B_{ws} = \frac{5.9 + 0.4}{5.9 + 0.4 + 49.411} \times 100 = 11.31\ \%$$

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:

$M_s = 29.66 (1 - 11.31) + 18 (11.31) = 28.34$ (lb./lb.-mole)

Run 2:

$M_s = 29.60 (1 - 16.03) + 18 (16.03) = 27.74$ (lb./lb.-mole)

Run 3:

$M_s = 29.69 (1 - 11.31) + 18 (11.31) = 28.37$ (lb./lb.-mole)

Stack Gas Velocity

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

Where:

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

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

C_p = Pitot tube coefficient, (dimensionless).

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

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

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

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

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

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

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

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

Run 1:

$$V = (85.49)\ (\ .84)\ (\ 1.77)\ \sqrt{\frac{648}{(30.50)(28.34)}} = 110.05 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (\ .80)\ (\ 1.79)\ \sqrt{\frac{650}{(30.50)(27.74)}} = 107.30 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ .80)\ (\ 1.81)\ \sqrt{\frac{640}{(30.50)(28.37)}} = 106.46 \text{ ft/sec.}$$

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JACKSON, NEW JERSEY

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:

$$Q_{sd}=3600(1-\ .1131\ )(110.05)(\ 6.30)\left[\frac{528}{648}\right]\left[\frac{30.50}{29.92}\right] = 1838674.8\ \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1-\ .1603\ )(107.30)(\ 6.30)\left[\frac{528}{650}\right]\left[\frac{30.50}{29.92}\right] = 1692098.9\ \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1-\ .1131\ )(106.46)(\ 6.30)\left[\frac{528}{640}\right]\left[\frac{30.50}{29.92}\right] = 1800928.1\ \frac{dscf}{hr}$$

Emissions Rate from Stack

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

Where:

E = Emissions rate, lb/hr.

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

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

Run 1:

$$E = \frac{(0.0329)\ (1838674.8)}{7000} = 8.64\ lb. / hr.$$

Run 2:

$$E = \frac{(0.0328)\ (1692098.9)}{7000} = 7.93\ lb. / hr.$$

Run 3:

$$E = \frac{(0.0349)\ (1800928.1)}{7000} = 8.98\ lb. / hr.$$

Isokinetic Variation

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

Where:

I	=	Percent isokinetic sampling.
100	=	Conversion to percent.
T_s	=	Absolute average stack gas temperature, ^{o}R.
0.002669	=	Conversion factor, Hg - ft^3/ml - ^{o}R.
V_{ic}	=	Ttl vol of liquid collected in impingers and silica gel, ml.
T_m	=	Absolute average dry gas meter temperature, ^{o}R.
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:

$$I = (100)(\ 648\ ) \left[\frac{(0.002669)(128.00) + \frac{49.075}{558} \left[30.50 + \frac{1.99}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 110.05\ )\ (\ 30.50\ )\ (\ .000167\ )} \right] = 96.7\%$$

Run 2:

$$I = (100)(\ 650\ ) \left[\frac{(0.002669)(198.00) + \frac{51.699}{568} \left[30.50 + \frac{2.06}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 107.30\ )\ (\ 30.50\ )\ (\ .000167\ )} \right] = 108.7\%$$

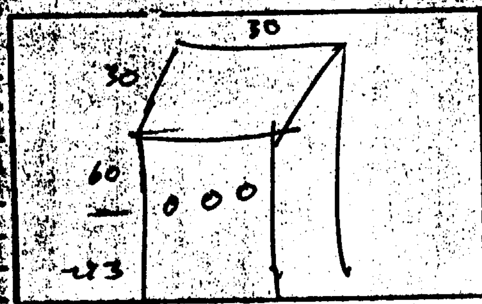
Run 3:

$$I = (100)(\ 640\ ) \left[\frac{(0.002669)(134.00) + \frac{52.242}{566} \left[30.50 + \frac{2.09}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 106.46\ )\ (\ 30.50\ )\ (\ .000167\ )} \right] = 103.6\%$$

VIII. FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant: Heinz Bros [illegible]
Location: Jackson [illegible]
Operator: K. [illegible]
Date: 4-?-88
Run No.: 1
Sample Box No.: 2
Meter Box No.: C-121 [illegible]
Meter H @: 1.66
C Factor: .990
Pitot Tube Coefficient Cp: .8? [illegible]



Schematic of Stack Cross Section

Ambient Temperature: 78
Barometric Pressure: 30.50
Assumed Moisture, %: 10
Probe Length, m(ft): 6
Nozzle Identification No.: [illegible]
Avg. Calibrated Nozzle Dia., (in.): [illegible]
Probe Heater Setting: 1.5
Leak Rate, m^3/min. (cfm): .01 @ 9 [illegible]
Probe Liner Material: [illegible]
Static Pressure, mm Hg (in. Hg): [illegible]
Filter No.: KA 29? [illegible]

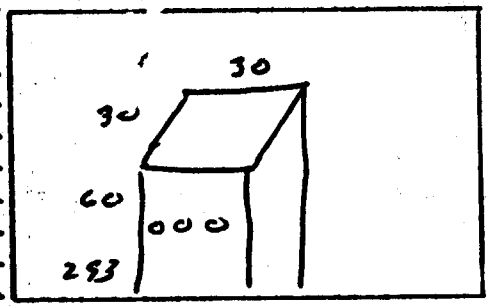
TRAV. PT. NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP. (Ts) °F	VELOCITY HEAD (P_s) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP. °F	GAS TEMP. COND. LAST [illegible]
A) 1	10:1? / 10:17	6	[illegible]	2.0	1.3	287.236 / 290.38	85 82.5	80	210	[illegible]
2	10:18	6	180 [illegible]	3.1	2.0	294.73	90 85	80	228	[illegible]
3	10:23	7	166 [illegible]	3.0	1.9	298.73	109 93	82	228	[illegible]
4	10:28	7	P166 183 [illegible]	3.0	1.9	302.83	110 96	82	(?) 20 197	[illegible]
B) 1	10:3? / 10:34	7	P166 185 [illegible]	3.0	1.9	306.88	108 96	84	(?) 225	60
2	10:39	7 (?)	185 152	3.5	2.2	311.12	112 99	86	(?) 190 185	[illegible]
3	10:44	7 (?)	192 148	3.2	2.0	315.33	116 102	88	(?) 192 180	62
4	10:49	7	205 176	3.0	1.9	319.45	118 104	90	220	[illegible]
C) 1	10:5? / 10:55	7	210 179	3.0 2.7	2.2 1.9	323.68	118 104	90	217	[illegible]
2	11:00	7	198 180	3.5	2.2	328.03	120 106	92	224	[illegible]
3	11:05	7	199 170	3.6	2.3	332.43	120 106	92	198	[illegible]
4	11:10	8	196 180	3.7	2.4	336.311	122 107	92	225	[illegible]
						49.075 / 45.934				

* CO_2 = 7% O_2 = 13.5%

RAMCON ENVIRONMENTAL CORPORATION

Plant Harris Bros.

Location Jackson NJ.
Operator Bill 'W.L.' Turner
Date 9-1-88
Run No. 2
Sample Box No. 3
Meter Box No. C-129 6746802
Meter H@ 1.66
C Factor .990
Pitot Tube Coefficient Cp .8



Schematic of Stack Cross Section

Ambient Temperature 82°
Barometric Pressure 30.50
Assumed Moisture, % 10
Probe Length, m(ft) 6'
Nozzle Identification No. C00167
Avg. Calibrated Nozzle Dia., (in.) .175/.175/.175
Probe Heater Setting 4.5
Leak Rate, m³/min. (cfm) .0025 @ 20"
Probe Liner Material Quartz
Static Pressure, mm Hg (in. Hg) .05
Filter No. KA-377

	FINAL	392	97.6
	INITIAL	200	91.6
	DIFFERENCE	192	6

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft³ ✓	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LEAVING CONDENSER OR LAST IMPINGER °F
A) 1	~~12:28~~ 12:33	4	193 201	3.0	1.9	~~339.293~~ 343.55	102 100	98	222	58
2.02	12:38	4	180 172	3.4	2.2	347.89	118 107	96	212	58
2.03	12:43	4	193 172	3.2	2.0	352.17	120 107	94	219	60
2.19	12:48	4	196 173	3.6 (3.4)	2.23	356.165	120 107	94	209	60
B) 1	~~12:49~~ 12:54	5	192 171	3.0	1.9	360.89	118 106	94	196	60
2.12	12:59	4	192 169	3.7	2.4	365.31	122 108	94	196	60
3	1:04	5	200 178	3.9	2.5	369.99	124 109	94	220	60
2.19	1:09	5	190 185	3.6	2.3	374.65	124 110	96	226	60
C) 1	~~1:10~~ 1:15	4	189 180	2.6	1.7	378.66	124 110	96	210	62
2.12	1:20	4	189 182	3.0	1.9	382.80	124 110	96	218	62
2.03	1:25	4	182 182	3.0	1.9	386.91	124 109	94	224	62
4	1:30	4	188 170	2.7	1.7	390.99 ✓	124 110	96	196	62
						51.699				

CO_2 = 6.5% O_2 = 14%

RAMCON ENVIRONMENTAL CORPORATION

Plant Harris Bros

Location Jackson MS
Operator Bill Cook / Turner
Date 9-1-88
Run No. 3
Sample Box No. 2
Meter Box No. C-124 696882
Meter H @ 1.66
C Factor .990
Pitot Tube Coefficient Cp .8

Ambient Temperature 89
Barometric Pressure 30.50
Assumed Moisture, % 10
Probe Length, m(ft) 6'
Nozzle Identification No. 00167
Avg. Calibrated Nozzle Dia., (in.) .175 .175 .175
Probe Heater Setting 4.5
Leak Rate, m^3/min. (cfm) .005 @ 10"
Probe Liner Material quartz
Static Pressure, mm Hg (in. Hg) .05
Filter No. BS-959

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	325	524
INITIAL	200	516
DIFFERENCE	125	9

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A) 2.1 1	2:20 / 2:25	5	180 178	3.0	1.9	391.056 / 395.61	100 98	96	220	60
2.2 2	2:30	5	179 179	3.3	2.1	399:73	116 104	92	218	60
2.1 3	2:35	5	179 179	3.3	2.1	403:03	118 105	92	217	60
2.1 4	2:40	5	180 175	3.0	1.9	408:29	120 106	92	208	60
B) 2.0 1	2:47 / 2:51	5	179 165	3.0	1.9	412:42	118 105	92	220	62
2.2 2	2:52	6	180 166	3.1	2.2	416:78	120 106	92	220	62
2.1 3	2:57	6	182 172	3.6	2.3	421:16	122 108	94	202	62
2.1 4	3:02	6	182 171	3.1	2.2	425:678	122 108	94	210	62
C) 2.1 1	3:04 / 3:09	6	179 175	3.0	1.9	429:87	120 107	94	218	62
2.0 2	3:14	6	177 170	3.2	2.0	434:17	122 108	94	222	62
2.0 3	3:19	6	179 170	3.7	2.4	438:76	122 108	94	220	62
2.2 4	3:24	6	180 169	3.5	2.2	443:298	122 108	94	214	62
						53.242				

CO_2 = 7.2 % O_2 = 13.5 %

IX. CALIBRATIONS

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 9-6-85 Meter box number C-114 64688²

Barometric pressure, P_b = 30.09 in. Hg Calibrated by MA

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	6	345.13 / 351.299	78.8	108 / 114	85 / 85	98	14:37	1.006	1.63
1.0	6	351.93 / 344.057	78.8	110 / 110	85 / 85	97.5	10:25	1.006	1.65
1.5	10	926.24 / 936.144	78.8	115 / 112	85 / 85	99.25	14:00	1.013	1.63
2.0	10	914.07 / 924.16	78.8	110 / 112	85 / 85	98	12:02	1.021	1.68
3.0	10								
4.0	10								
							Avg	1.012	1.65

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.

Quality Assurance Handbook M4-2.3A (front side)

Form #REC-02

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 5-22-88 Meter box number 646882 C-124

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

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	117.117 / 122.724	75.2	109 / 110	86 / 86	97.75	12:13	0.9868	1.66
1.0	5	710.77 / 716.03	75.2	111 / 112	86 / 86	98.75	8:48	0.9900	1.65
1.5	10	698.63 / 709.098	75.2	110 / 112	85 / 85	98	14:17	0.9923	1.66
2.0	10	686.57 / 697.04	75.2	110 / 113	84 / 85	98	12:22	0.9909	1.64
3.0	10								
4.0	10								
							Avg	0.990	1.66

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.

Quality Assurance Handbook M4-2.3A (front side)

Form #REC-02

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%
	9-1-88	78	78	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.

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%
	9-1-88	73°F	76°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

Lear Siegler Stack Sampler

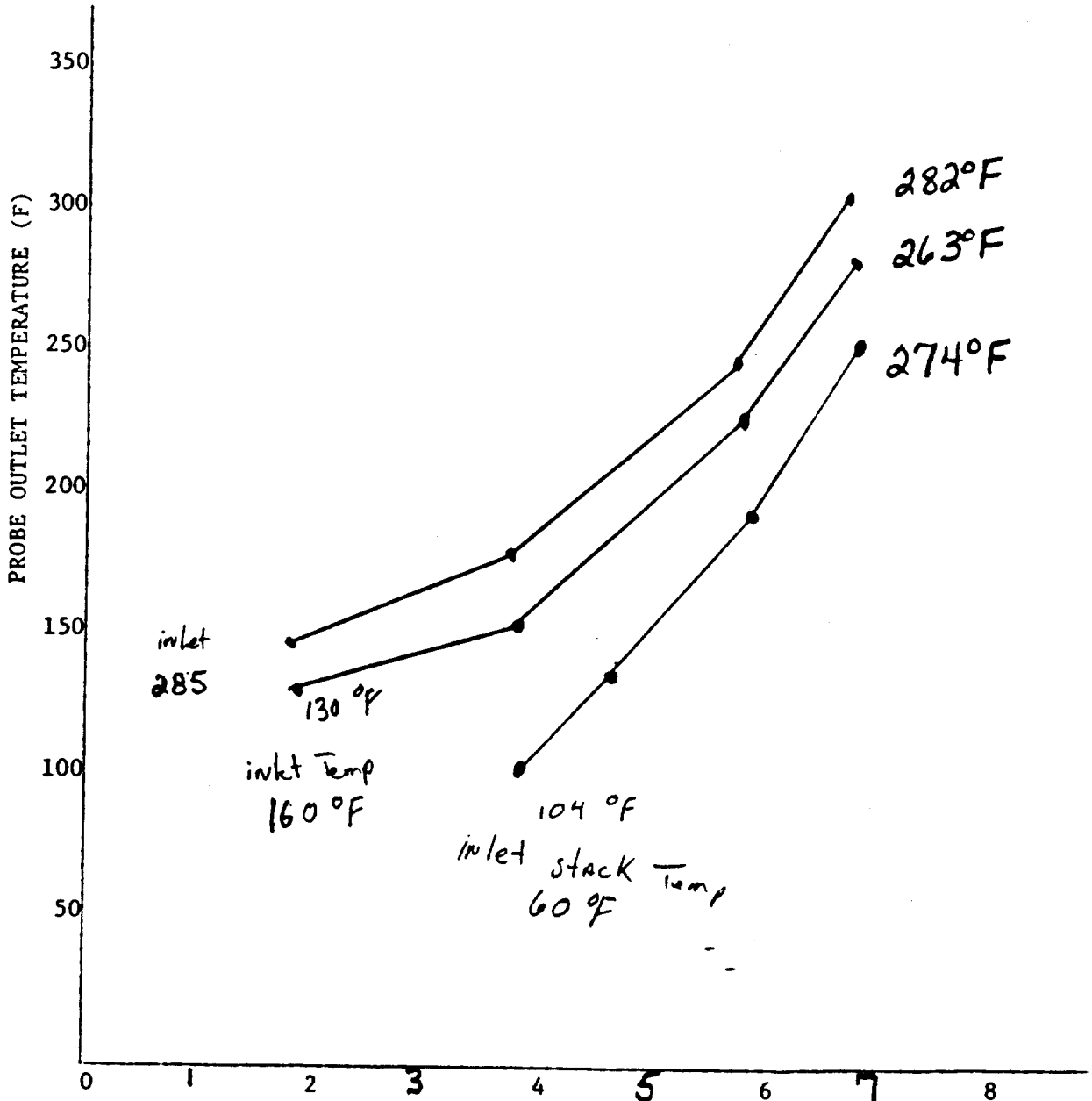
Heating Probe Calibration

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

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 3-8-87

Calibrated by: Sam T Thomas

"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	1.20	1.7	.840	2.01
2	0.80	1.05	.834	2.01
3	0.55	.78	.840	2.01
		$\bar{C}_p$ (SIDE A)	.838	

"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	1.20	1.7	.840	2.01
2	0.80	1.05	.834	2.01
3	0.55	.77	.845	2.01
		$\bar{C}_p$ (SIDE B)	.840	

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

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

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

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%
	9-1-88	76°F	76°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 300 stacks including over 200 asphalt plants. He is 43 years old and a graduate of the University of Mississippi with graduate studies at Memphis State University and State Technical Institute of Memphis.

Ken Allmendinger - Team Leader

Ken Allmendinger has been employed with RAMCON for three years. He has sampled over 100 asphalt plants with extensive training in Methods 1 through 5. He is qualified as a team leader and has current certification as a V.E. reader.