RAMCON
ENVIRONMENTAL CORPORATION

SOURCE SAMPLING
for
PARTICULATE EMISSIONS
AJAX PAVING INDUSTRIES
~~DETROIT~~, MICHIGAN

Inkster Rd
Romulus

August 10, 1992

Mark E Bod
Mark Boden
Ajax Paving Industries

G. Sumner Buck, III
President

Mike Winkler
Mike Winkler
Team Leader

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

RAMCON
ENVIRONMENTAL CORPORATION

August 21, 1992

Mr. Mark Boden
Ajax Paving Industries
8744 S. Inkster Road
Romlus, MI 48174

Re: Particulate Emissions Test: Detroit, Michigan

Dear Mr. Boden:

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 Michigan. 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. Mike Maillard
Michigan DNR
2211 E. Jefferson Avenue
Detroit, Michigan 48207

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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2. TEST RESULTS
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SECTION A.

1. INTRODUCTION

On July 7, 1992 and on August 10, 1992 personnel from RAMCON Environmental Corporation conducted a source emissions test for particulate emissions compliance (one run done on 7/7/92; three runs on 8/10/92) at Ajax Paving Industries' Boeing drum mix asphalt plant located in Detroit, Michigan. RAMCON personnel conducting the test were Mike Winkler, Team Leader, and Chuck Hughes. Thomas South 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. Winkler and Mr. South.

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 Michigan.

2. TEST RESULTS

Permit(?)

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 Michigan are the same as those set by EPA.

Youn Tak Kwon of Wayne County Department of Public Health observed the testing conducted by RAMCON Environmental.

SUMMARY OF TEST RESULTS

TABLE I

July 7, 1992 and August 10, 1992

Test Run	Time	Grain Loading gr/DSCF	Isokinetic Variation	Emissions Lbs/Hr
1	02:46 - 03:53	0.0074	111.1%	2.34
2	06:18 - 07:37	0.0137	138.2%	4.11
3	08:09 - 09:23	0.0118	128.7%	3.69
4	17:42 - 18:42	0.0095	109.8%	32.94
	Average:	0.0106	121.95%	10.77

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

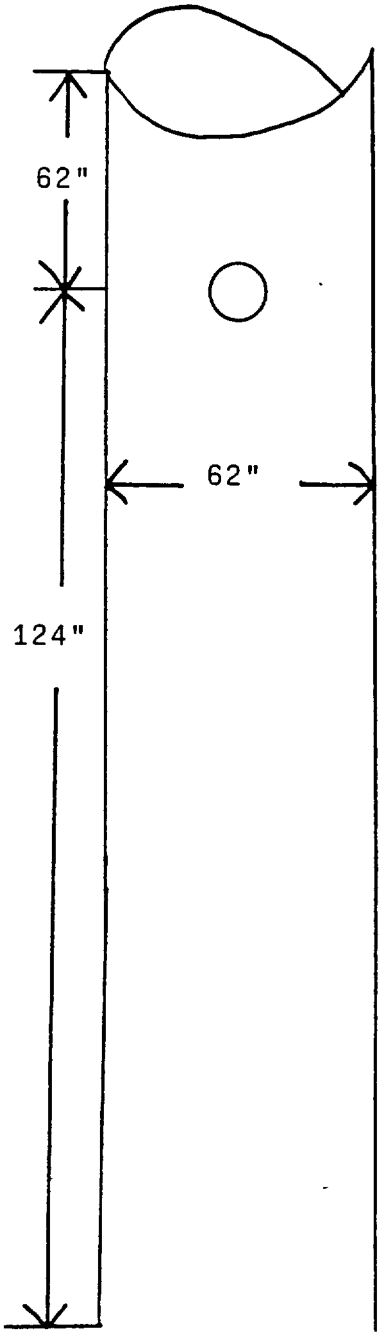
3. TEST PROCEDURES

(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 round stack with a diameter of 62". The sampling ports were placed 90° apart, 62" down (1.0 diameters upstream) from the top of the stack and 124" up (2.0 diameters downstream) from the last flow disturbance. Twenty four points were sampled, twelve through each traverse for 2.5 minutes each for a total testing time of 60 minutes.

Points on a Diameter	Probe Mark
1	1.3"
2	4.2"
3	7.3"
4	11.0"
5	15.5"
6	22.0"
7	40.0"
8	46.5"
9	51.0"
10	54.7"
11	57.8"
12	60.7"



SECTION B:

THE SOURCE

B. THE SOURCE

Ajax Paving Industries employs a Boeing 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 Natural Gas 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 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.

Form REC#03

DATA ON FACILITY BEING STACK TESTED

COMPANY NAME AJAX MATERIALS COMPANY REP. MARK BODEN PHONE (313) 398-2300
LOCATION OF FACILITY #8744 S.INKSTER RD ORIGINAL START-UP DATE ____ DESIGNED CAPACITY ____
OEM ____ MODEL NO. ____ TYPE ____ AC TYPE 120/150

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
20:15		95		375	102	4.6	290°	355°	3		90°		60
20:30		95		375	103	4.6	295°	363°	3		90°		60
20:45		95		375	102	4.6	290°	354°	3		90°		60
21:00		95		375	102	4.6	295°	357°	3		90°		48
21:15		95		375	103	4.6	290°	355°	3		90°		48

DATA SUMMARY ON STACK BEING TESTED

AGGREGATE

1. Name/type of mix BASE MIX CODE 505
2. Name/type of 2nd mix (if used) ________
3. Type/temperature of Liquid Asphalt 120/150 / 333 °F
4. Sieve/Screening analysis: ________ % Passing;

	1st mix / 2nd mix		1st mix / 2nd mix		1st mix / 2nd mix
1"	/	3/8"	/	#	/
3/4"	/	#200	/	#	/
1/2"	/	#	/	#	/

CONTROL SYSTEM

Manufacturer ________

A. Baghouse:

1. Type of bags ________ # of bags ________ Sq. ft. of bags ________
2. Air to cloth ratio ________ Designed ACFM ________
3. Type of cleaning - pulse jet ✓ reverse air ____ plenum pulse ____ other ________
4. Cleaning cycle time ________ Interval between cleaning cycle ________
5. Pulse pressure on cleaning cycle 120 psi

B. Scrubber:

1. Type - Venturi ________ Wet Washer ________
   Spray Booth ________ Other ________
2. Gallons per minute through system ________
3. Water source ________ (i.e., pond, lagoon, etc.)
4. Number of spray nozzles ________

Company Name AJAX MATERIALS Date 8-10-97

Company Representative MARK BODEN

Form REC#03

DATA ON FACILITY BEING STACK TESTED

TODAY'S DATE: 7-7-92

COMPANY NAME Ajax MATERIALS COMPANY REP.___ PHONE (313) 946 8080
LOCATION OF FACILITY Romulus MI ORIGINAL START-UP DATE___ DESIGNED CAPACITY___
OEM___ MODEL NO.___ TYPE___ AC TYPE AC 5

1	2	3	4	5		6	7	8	9		10	11	12
Time (24 HR) NOTE: check small box in column when moisture sample is taken	Fuel Use __#Fuel Oil__ Nat. Gas ✓ Propane __ Coal __ __ other	Burner Setting	Blower Pressure	Production Rate __Mix ✓Aggregate TPH	✓RAP TPH	Asphalt Cement %	Mix Temp. °F	Exhaust Gas Temp. °F	__Venturi Scrubber ▲Baghouse Pressure Drop in w.g.	Water Pressure psi	Ambient Temp. ___ °F	Relative Humidity ___ %	Exhaust Damper Position
17:30		75		280	120	3.2	280	310	1.8		80		38.6
17:45		74		270	122	3.2	285	328	2.2		80		44.7
18:00		70		275	124	3.2	280	320	2.2		80		44.7
18:15		78		278	124	3.2	278	320	2.1		80		44.7
18:30		73		277	120	3.2	280	323	2.1		78		44.7
18:45		71		283	120	3.2	290	335	2.1		78		44.7
19:00		71		285	124	3.2	289	332	2.2		78		44.7
19:15		71		284	121	3.2	285	327	2.2		78		44.7
19:30		76		295	125	3.2	278	318	2.2		76		44.7
19:45													
20:00													

DATA SUMMARY ON STACK BEING TESTED

AGGREGATE

1. Name/type of mix ______
2. Name/type of 2nd mix (if used) ______
3. Type/temperature of Liquid Asphalt ______ / ____ °F
4. Sieve/Screening analysis: ______ % Passing; ______ Moisture on Aggregate

	1st mix / 2nd mix		1st mix / 2nd mix		1st mix / 2nd mix
1"	____ / ____	3/8"	____ / ____	#___	____ / ____
3/4"	____ / ____	#200	____ / ____	#___	____ / ____
1/2"	____ / ____	#___	____ / ____	#___	____ / ____

CONTROL SYSTEM

Manufacturer: ______

A. Baghouse:
1. Type of bags: 14oz Virgin Nomex # of bags 705 Sq. ft. of bags ~~16,908~~ 17293
2. Air to cloth ratio: 5.03/1 ~~Designed~~ ACTUAL ACFM 87,000
3. Type of cleaning - pulse jet ✓ reverse air ____ plenum pulse ____ other ____
4. Cleaning cycle time: ______ Interval between cleaning cycle: 10 sec
5. Pulse pressure on cleaning cycle: 110 psi

B. Scrubber:
1. Type - Venturi: ______ Wet Washer: ______
   Spray Booth: ______ Other: ______
2. Gallons per minute through system: ______
3. Water source: ______ (i.e., pond, lagoon, etc.)
4. Number of spray nozzles: ______

Company Name: Ajax Materials Corporation Date: 07/07/92

Company Representative: Mark E. Boden

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Form REC#03

DATA ON FACILITY BEING STACK TESTED

TODAY'S DATE: 7-7-92

COMPANY NAME Ajax Materials COMPANY REP.

LOCATION OF FACILITY Romulus MI PHONE (313) 946 8080

OEM ORIGINAL START-UP DATE DESIGNED CAPACITY

MODEL NO. TYPE AC TYPE AC 5

1	2	3	4	5		6	7	8	9		10	11	12
Time (24 HR) NOTE: check small box in column when moisture sample is taken	Fuel Use #Fuel Oil ✓ Nat. Gas Propane Coal other	Burner Setting	Blower Pressure	Production Rate		Asphalt Cement	Mix Temp.	Exhaust Gas Temp.	Venturi Scrubber ✓ Baghouse		Ambient Temp.	Relative Humidity	Exhaust Damper Position
				Mix ✓ Aggregate TPH	✓ RAP TPH	%	°F	°F	Pressure Drop in w.g.	Water Pressure psi	°F	%	
17:30		75		280	120	3.2	280	310	1.8		80		38.6
17:45		74		270	122	3.2	285	328	2.2		80		44.7
18:00		70		275	124	3.2	280	320	2.2		80		44.7
18:15		78		278	124	3.2	278	320	2.1		80		44.7
18:30		73		277	120	3.2	280	323	2.1		78		44.7
18:45		71		283	120	3.2	290	335	2.1		78		44.7
19:00		71		285	124	3.2	289	332	2.2		78		44.7
19:15		71		284	121	3.2	285	327	2.2		78		44.7
19:30		76		295	125	3.2	278	318	2.2		76		44.7
19:45													
20:00													

DATA SUMMARY ON STACK BEING TESTED

AGGREGATE

1. Name/type of mix ______
2. Name/type of 2nd mix (if used) ______
3. Type/temperature of Liquid Asphalt ______/ ____°F
4. Sieve/Screening analysis: ____ % Passing; ______Moisture on Aggregate

	1st mix / 2nd mix		1st mix / 2nd mix		1st mix / 2nd mix
1"	___/___	3/8"	___/___	#___	___/___
3/4"	___/___	#200	___/___	#___	___/___
1/2"	___/___	#___	___/___	#___	___/___

CONTROL SYSTEM

Manufacturer: ______

A. Baghouse:

1. Type of bags: 14oz Virgin Nomex # of bags 705 Sq. ft. of bags ~~16,908~~ 17293
2. Air to cloth ratio: 5.03/1 ~~Designed~~ ACTUAL ACFM 87,000
3. Type of cleaning - pulse jet ✓ reverse air____ plenum pulse____ other____
4. Cleaning cycle time:______ Interval between cleaning cycle: 10 sec
5. Pulse pressure on cleaning cycle: 110 psi

B. Scrubber:

1. Type - Venturi:______ Wet Washer:______
   Spray Booth:______ Other:______
2. Gallons per minute through system:______
3. Water source:______ (i.e., pond, lagoon, etc.)
4. Number of spray nozzles:______

Company Name: Ajax Materials Corporation Date: 07/07/92

Company Representative: Mark E. Boden

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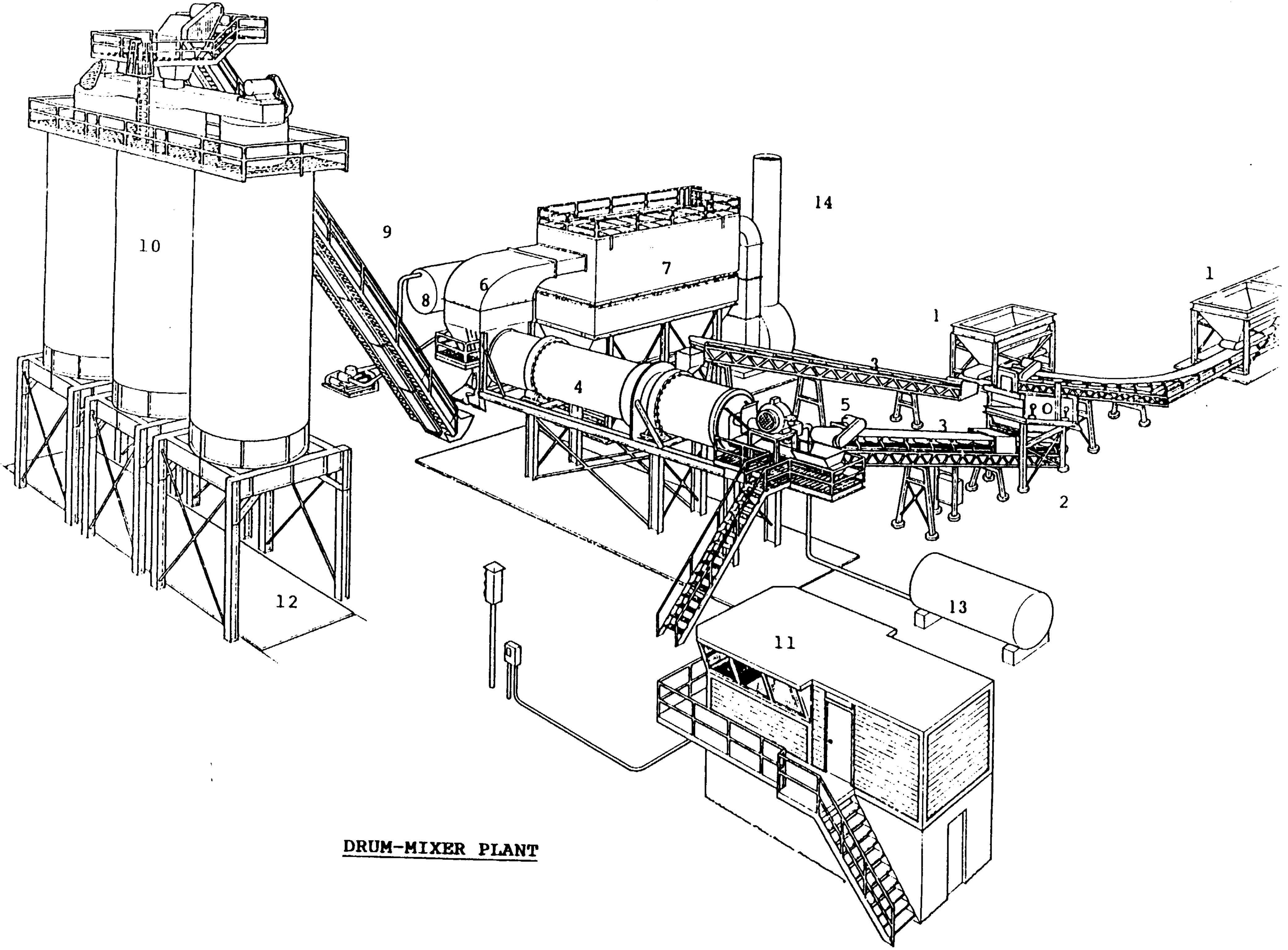


DRUM-MIXER PLANT

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

SECTION C:

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.

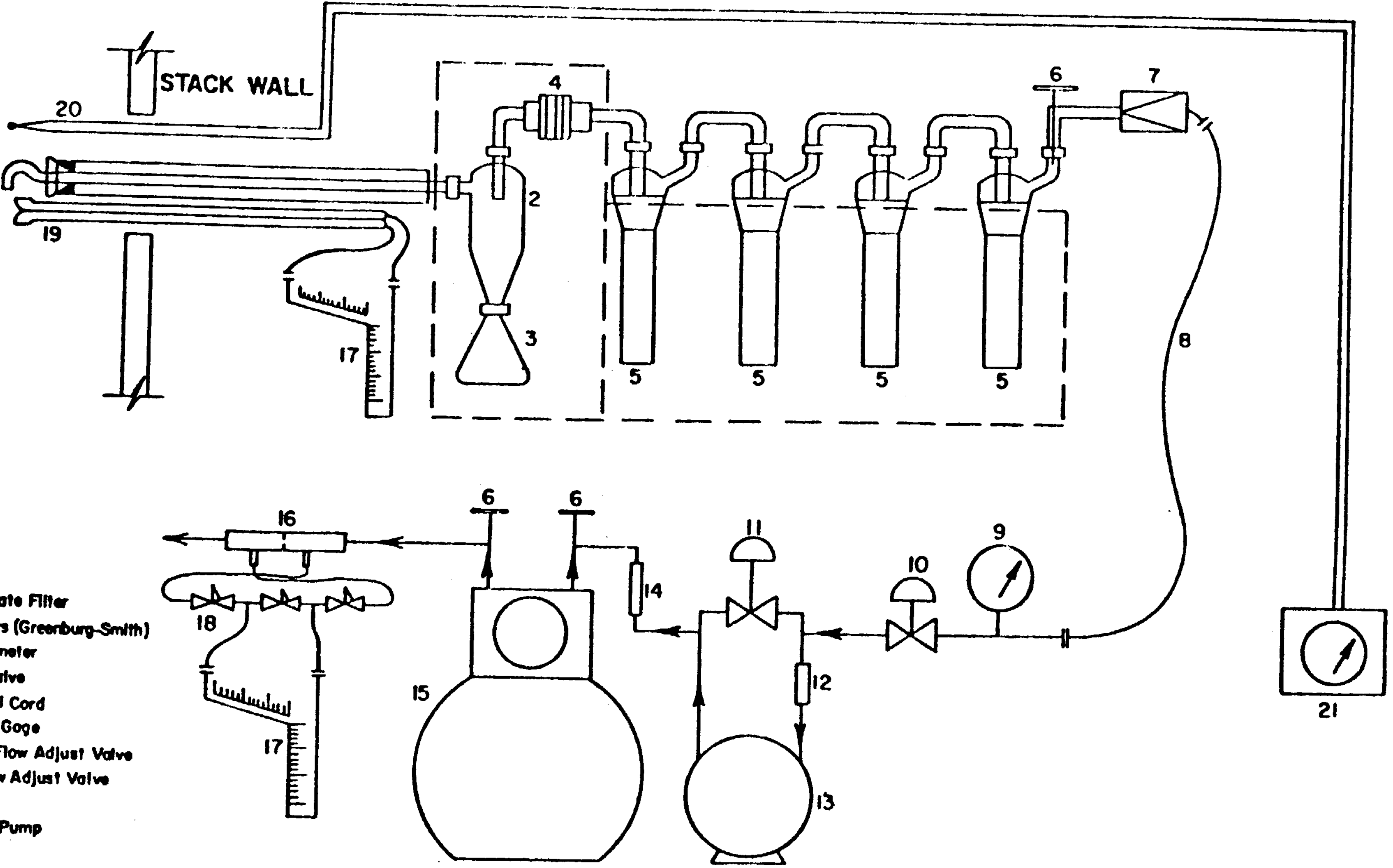
B. An Airguide Instruments Model 211-B (uncorrected) aneroid barometer was used to check the barometric pressure.

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.



1) Probe
2) Cyclone
3) Flask
4) Particulate Filter
5) Impingers (Greenburg-Smith)
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Goge
10) Course Flow Adjust Valve
11) Fine Flow Adjust Valve
12) Oiler
13) Vacuum Pump
14) Filter
15) Dry Gas Meter
16) Orifice Tube
17) Incline Manometer
18) Solenoid Valves
19) Pitot
20) Thermocouple
21) Pyrometer

SAMPLING TRAIN
USED FOR ISOKINETIC SAMPLING

SECTION D:

LABORATORY PROCEDURES AND RESULTS

LABORATORY PROCEDURES FOR PARTICULATE SAMPLING

I. Field Preparation

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

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

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

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

II. Post - Testing Lab Analysis

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

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

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

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

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

SPECIAL NOTE

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

WEIGHING PROCEDURE - SARTORIUS ANALYTICAL BALANCE

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

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

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

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

Form REC#8

SAMPLE ANALYTICAL DATA FORM

Company Name AJAX
Sample Location Romius, MI
Blank Volume (V_a) 100 ml
Date/Time wt. blank 8/15 11:00A
Date/Time wt. blank 8/17 3:00A

Relative Humidity in Lab 49 %
Density of Acetone (ρ_a) .7857 mg/ml
Gross wt. 101.3842 g
Gross wt. 101.3842 g
Ave. Gross wt. 101.3842 g
Tare wt. 101.3840 g
Weight of blank (m_{ab}) .0002 g

Acetone blank residue concentration (C_a) : (C_a) = (m_{ab}) / (V_a) (ρ_a) = (.000003 mg/g)

Acetone Blank Wt. : $W_a = C_a V_{aw} \rho_a$ = (.000003)(200)(7857) = (.0005 g)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	200	200	200
Date/Time of wt. 8/15 11:00A Gross wt.	g	101.1356	101.4372	101.6872
Date/Time of wt. 8/17 8:00A Gross wt.	g	101.1355	101.4369	101.6870
Average Gross wt.	g	101.1356	101.4371	101.6871
Tare wt.	g	101.1176	101.3992	101.6562
Less Acetone blank wt. (W_a)	g	.0005	.0005	.0005
Weight of particulate in acetone rinse (m_a)	g	.0175	.0374	.0304

Filter Numbers	#	JS 6175	JS 6176	JS 6171
Date/Time of wt. 8/15 11:00A Gross wt.	g	5836	5895	.5838
Date/Time of wt. 8/17 8:00A Gross wt.	g	5836	5895	.5837
Average Gross wt.	g	.5836	5895	5838
Tare wt.	g	5778	5764	5717

Weight of particulate on filter (m_f)	g	.0058	.0131	.0121
Weight of particulate in acetone rinse (m_a)	g	.0175	.0374	.0304
Total weight of particulate (m_n)	g	.0233	.0505	.0425

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 Thomas South

Signature of Reviewer

Form REC#8

SAMPLE ANALYTICAL DATA FORM

Company Name AJAX
Sample Location Romulus, MI
Blank Volume (V_a) 100 ml
Date/Time wt. blank 7/13 8:00A
Date/Time wt. blank 7/13 2:00P

Relative Humidity in Lab 48 %
Density of Acetone (ρ_a) .7857 mg/ml
Gross wt. 169.4030 g
Gross wt. 169.4025 g
Ave. Gross wt. 169.4028 g
Tare wt. 169.4026 g
Weight of blank (m_{ab}) .0002 g

Acetone blank residue concentration (C_a) : (C_a) = (m_{ab}) / (V_a) (ρ_a) = (.000003 mg/g)

Acetone Blank Wt. : $W_a = C_a V_{aw} \rho_a$ = (.000003)(200)(.7857) = (.0005 g)

		Run # 1	Run #	Run #
Acetone rinse volume (V_{aw})	ml	200		
Date/Time of wt. 7/13 8:00A Gross wt.	g	98.2795		
Date/Time of wt. 7/13 2:00P Gross wt.	g	98.2793		
Average Gross wt.	g	98.2794		
Tare wt.	g	98.2550		
Less Acetone blank wt. (W_a)	g	.0005		
Weight of particulate in acetone rinse (m_a)	g	.0239		

Filter Numbers	#	TS6274		
Date/Time of wt. 7/13 8:00A Gross wt.	g	.5678		
Date/Time of wt. 7/13 2:00P Gross wt.	g	.5673		
Average Gross wt.	g	.5676		
Tare wt.	g	.5631		

Weight of particulate on filter (m_f)	g	.0045		
Weight of particulate in acetone rinse (m_a)	g	.0239		
Total weight of particulate (m_n)	g	.0284		

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 Thomas Smith
Signature of Reviewer

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

Ajax
Company Name

8-10-92
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:	$CO_{2\%}$	5.8	$CO_{2\%}$	5.8	$CO_{2\%}$	5.8	AVG.	5.8
	$O_{2\%}$	14.0	$O_{2\%}$	14.0	$O_{2\%}$	14.0	AVG.	14.0
	$N_{2\%}$		$N_{2\%}$		$N_{2\%}$		AVG.	
RUN 2:	$CO_{2\%}$	5.4	$CO_{2\%}$	5.0	$CO_{2\%}$	5.0	AVG.	5.0
	$O_{2\%}$	14.5	$O_{2\%}$	14.5	$O_{2\%}$	14.5	AVG.	14.5
	$N_{2\%}$		$N_{2\%}$		$N_{2\%}$		AVG.	
RUN 3:	$CO_{2\%}$	5.0	$CO_{2\%}$	5.0	$CO_{2\%}$	5.0	AVG.	5.0
	$O_{2\%}$	14.0	$O_{2\%}$	140	$O_{2\%}$	14.0	AVG.	14.0
	$N_{2\%}$		$N_{2\%}$		$N_{2\%}$		AVG.	

Ajax Paving
Company Name

7/7
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:	$CO_2\%$		$CO_2\%$		$CO_2\%$		AVG.	
	$O_2\%$		$O_2\%$		$O_2\%$		AVG.	
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	
RUN 2:	$CO_2\%$		$CO_2\%$		$CO_2\%$		AVG.	
	$O_2\%$		$O_2\%$		$O_2\%$		AVG.	
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	
RUN 3:	$CO_2\%$		$CO_2\%$		$CO_2\%$		AVG.	
	$O_2\%$		$O_2\%$		$O_2\%$		AVG.	
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	

SECTION E:

CALCULATIONS

AJAX PAVING INDUSTRIES
DETROIT, MI

SUMMARY OF TEST DATA

		8-10-92 RUN #1	8-10-92 RUN #2	8-10-92 RUN #3
SAMPLING TRAIN DATA				
	start	02:46	06:18	08:09
	finish	03:53	07:37	09:23
1. Sampling time, minutes	Θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.2750	.2750	.2750
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000412	.000412	.000412
4. Isokinetic variation	I	111.1	138.2	128.7
5. Sample gas volume - meter cond., cf.	V_m	51.027	60.800	58.924
6. Average meter temperature, ^{o}R	T_m	562	567	566
7. Avg. oriface pressure drop, in. H_2O	dH	1.96	2.05	2.07
8. Total particulate collected, mg.	M_n	23.30	50.50	42.50
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2	A	21.00	21.00	21.00
10. Absolute stack gas pressure, in. Hg.	P_s	30.00	30.00	30.00
11. Barometric pressure, in. Hg.	P_{bar}	30.00	30.00	30.00
12. Avg. absolute stack temperature, R^{o}	T_s	739	754	756
13. Average $-\sqrt{\text{vel. head}}$, (C_p= .84)	$-\sqrt{dP}$	0.78	0.77	0.81
14. Average stack gas velocity, ft./sec.	V_s	53.78	54.01	57.00
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	325.00	441.00	444.00
16. Moisture in stack gas, %	B_{ws}	24.10	26.67	27.44
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	2210	2102	2189
18. Stack gas flow rate, cfm	acfm	67763	68053	71820
19. Particulate concentration, gr/dscf	C_s	0.0074	0.0137	0.0118
20. Particulate concentration, lb/hr	E	2.34	4.11	3.69
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	5.80	5.00	5.00
23. Percent O_2 by volume	O_2	14.00	14.50	14.00
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	80.20	80.50	81.00

Format: summryR3

Dry Gas Volume

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

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 ^{o}R.

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

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:

$$V_{m(std)} = (17.64)(\ .998)(\ 51.027)\left[\frac{(30.00) + \frac{1.96}{13.6}}{562}\right] = 48.183 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(\ .998)(\ 60.800)\left[\frac{(30.00) + \frac{2.05}{13.6}}{567}\right] = 56.918 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(\ .998)(\ 58.924)\left[\frac{(30.00) + \frac{2.07}{13.6}}{566}\right] = 55.262 \text{ dscf}$$

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:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{23.30}{48.183} \right] = 0.0074 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{50.50}{56.918} \right] = 0.0137 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{42.50}{55.262} \right] = 0.0118 \text{ gr./dscf.}$$

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:

$$M_d = 0.44(\ 5.80\%) + 0.32(14.00\%) + 0.28(\ .00\% + 80.20\%) = 29.49 \ \frac{lb}{lb\text{-}mole}$$

Run 2:

$$M_d = 0.44(\ 5.00\%) + 0.32(14.50\%) + 0.28(\ .00\% + 80.50\%) = 29.38 \ \frac{lb}{lb\text{-}mole}$$

Run 3:

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

Water Vapor Condensed

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

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

Where:

0.04707 = Conversion factor, ft.^{3}/ml.

0.04715 = Conversion factor, ft.^{3}/g.

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

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

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

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

p_w = Density of water, 0.002201 lb/ml.

R = Ideal gas constant, 21.85 in.Hg. (cu.ft./lb.-mole)($^{\circ}$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) (313.0) = 14.7 cu.ft
$V_{wsg(std)}$ = (0.04715) (12.0) = 0.6 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (430.0) = 20.2 cu.ft
$V_{wsg(std)}$ = (0.04715) (11.0) = 0.5 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (435.0) = 20.5 cu.ft
$V_{wsg(std)}$ = (0.04715) (9.0) = 0.4 cu.ft

AJAX PAVING INDUSTRIES
DETROIT, MI

Moisture Content of Stack Gases

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

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:

$$B_{ws} = \frac{14.7 + 0.6}{14.7 + 0.6 + 48.183} \quad X \quad 100 = 24.10\ \%$$

Run 2:

$$B_{ws} = \frac{20.2 + 0.5}{20.2 + 0.5 + 56.918} \quad X \quad 100 = 26.67\ \%$$

Run 3:

$$B_{ws} = \frac{20.5 + 0.4}{20.5 + 0.4 + 55.262} \quad X \quad 100 = 27.44\ \%$$

AJAX PAVING INDUSTRIES
DETROIT, MI

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:

$$M_s = 29.49 (1 - 24.10) + 18 (24.10) = 26.72 \text{ (lb./lb.-mole)}$$

Run 2:

$$M_s = 29.38 (1 - 26.67) + 18 (26.67) = 26.34 \text{ (lb./lb.-mole)}$$

Run 3:

$$M_s = 29.36 (1 - 27.44) + 18 (27.44) = 26.24 \text{ (lb./lb.-mole)}$$

Stack Gas Velocity

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

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:

$$V = (85.49)\ (\ \ .84)\ (\ 0.78)\ \sqrt{\frac{739}{(30.00)(26.72)}} \quad = \quad 53.78 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (\ \ .84)\ (\ 0.77)\ \sqrt{\frac{754}{(30.00)(26.34)}} \quad = \quad 54.01 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ \ .84)\ (\ 0.81)\ \sqrt{\frac{756}{(30.00)(26.24)}} \quad = \quad 57.00 \text{ ft/sec.}$$

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, (^{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:

$$Q_{sd}=3600(1- .2410)(53.78)(21.00)\left[\frac{528}{739}\right]\left[\frac{30.00}{29.92}\right] = 2210718.9 \; \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1- .2667)(54.01)(21.00)\left[\frac{528}{754}\right]\left[\frac{30.00}{29.92}\right] = 2102325.2 \; \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1- .2744)(57.00)(21.00)\left[\frac{528}{756}\right]\left[\frac{30.00}{29.92}\right] = 2189604.7 \; \frac{dscf}{hr}$$

Emissions Rate from Stack

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

Where:

E = Emissions rate, lb/hr.

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

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

Run 1:

$$E = \frac{(0.0074)(2210718.9)}{7000} = 2.34 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(0.0137)(2102325.2)}{7000} = 4.11 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0118)(2189604.7)}{7000} = 3.69 \text{ lb. / hr.}$$

Isokinetic Variation

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

Where:

I = Percent isokinetic sampling.

100 = Conversion to percent.

T_s = Absolute average stack gas temperature, ^{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:

$$I = (100)(\ 739\ ) \left[\frac{(0.002669)(325.0\ ) + \frac{51.027}{562} \left[30.00 + \frac{1.96}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 53.78\ )\ (\ 30.00\ )\ (\ .000412\ )} \right] = 111.1\%$$

Run 2:

$$I = (100)(\ 754\ ) \left[\frac{(0.002669)(\ 441.0\ ) + \frac{60.800}{567} \left[30.00 + \frac{2.05}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 54.01\ )\ (\ 30.00\ )\ (\ .000412\ )} \right] = 138.2\%$$

Run 3:

$$I = (100)(\ 756\ ) \left[\frac{(0.002669)(\ 444.0\ ) + \frac{58.924}{566} \left[30.00 + \frac{2.07}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 57.00\ )\ (\ 30.00\ )\ (\ .000412\ )} \right] = 128.7\%$$

AJAX PAVING INDUSTRIES
DETROIT, MI

SUMMARY OF TEST DATA

7-7-92

RUN # 4

SAMPLING TRAIN DATA

	start	17:42
	finish	18:42
1. Sampling time, minutes	θ	60.0
2. Sampling nozzle diameter, in.	D_n	.2740
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000409
4. Isokinetic variation	I	109.8
5. Sample gas volume - meter cond., cf.	V_m	48.974
6. Average meter temperature, ^oR	T_m	560
7. Avg. oriface pressure drop, in. H_2O	dH	1.85
8. Total particulate collected, mg.	M_n	28.40

VELOCITY TRAVERSE DATA

9. Stack area, ft^2.	A	21.00
10. Absolute stack gas pressure, in. Hg.	P_s	30.07
11. Barometric pressure, in. Hg.	P_{bar}	30.07
12. Avg. absolute stack temperature, R^o	T_s	747
13. Average -\/$\overline{vel.\ head}$, (C_p= .84)	-\/$\overline{dP}$	0.85
14. Average stack gas velocity, ft./sec.	V_s	60.59

STACK MOISTURE CONTENT

15. Total water collected by train, ml.	V_{ic}	495.00
16. Moisture in stack gas, %	B_{ws}	33.49

EMISSIONS DATA

17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	2164
18. Stack gas flow rate, cfm	acfm	76343
19. Particulate concentration, gr/dscf	C_s	0.0095
20. Particulate concentration, lb/hr	E	2.94
21. Particulate concentration, lb/mBtu	E'	0.00000

ORSAT DATA

22. Percent CO_2 by volume	CO_2	.00
23. Percent O_2 by volume	O_2	21.00
24. Percent CO by volume	CO	.00
25. Percent N_2 by volume	N_2	79.00

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 4 :

$$V_{m(std)} = (17.64)(.993)(48.974) \left[\frac{(30.07) + \frac{1.85}{13.6}}{560} \right] = 46.272 \text{ dscf}$$

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 4 :

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{28.40}{46.272} \right] = 0.0095 \text{ gr./dscf.}$$

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 4:

$$M_d = 0.44(\ .00\%) + 0.32(21.00\%) + 0.28(\ .00\% + 79.00\%) = 28.84\ \frac{lb}{lb\text{-}mole}$$

Water Vapor Condensed

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

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

Where:

0.04707 = Conversion factor, ft.^{3}/ml.

0.04715 = Conversion factor, ft.^{3}/g.

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

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

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

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

p_w = Density of water, 0.002201 lb/ml.

R = Ideal gas constant, 21.85 in.Hg. (cu.ft./lb.-mole)($^\circ$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 4 :

$V_{wc(std)}$ = (0.04707) (475.0) = 22.4 cu.ft

$V_{wsg(std)}$ = (0.04715) (20.0) = 0.9 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 4 :

$$B_{ws} = \frac{22.4 + 0.9}{22.4 + 0.9 + 46.272} \times 100 = 33.49\ \%$$

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 4 :

M_s = 28.84 (1 - 33.49) + 18 (33.49) = 25.21 (lb./lb.-mole)

Stack Gas Velocity

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

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 4 :

$$V = (85.49)\ (\ .84)\ (\ 0.85)\ \sqrt{\frac{747}{(30.07)(25.21)}} = 60.59 \text{ ft/sec.}$$

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, $(^{\circ}\text{f})$.

T_s = Absolute stack temperature, $(^{\circ}\text{R})$.

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

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

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

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

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

Run 4 :

$$Q_{sd} = 3600(1- \quad .3349 \quad)(\; 60.59)(\; 21.00) \left[\frac{528}{747} \right] \left[\frac{30.07}{29.92} \right] = 2164187.4 \; \frac{\text{dscf}}{\text{hr}}$$

Emissions Rate from Stack

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

Where:

E = Emissions rate, lb/hr.

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

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

Run 4 :

$$E = \frac{(0.0095)(2164187.4)}{7000} = 2.94 \text{ lb. / hr.}$$

Isokinetic Variation

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

Where:

I = Percent isokinetic sampling.
100 = Conversion to percent.
T_s = Absolute average stack gas temperature, °R.
0.002669 = Conversion factor, Hg - ft^3/ml - °R.
V_{ic} = Ttl vol of liquid collected in impingers and silica gel, ml.
T_m = Absolute average dry gas meter temperature, °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 4 :

$$I = (100)(\ 747\ ) \left[\frac{(0.002669)(\ 495.0\ ) + \frac{48.974}{560} \boxed{30.07 + \frac{1.85}{13.6}}}{60\ (\ 60.0\ )\ (\ 60.59\ )\ (\ 30.07\ )\ (\ .000409\ )} \right] = 109.8\%$$

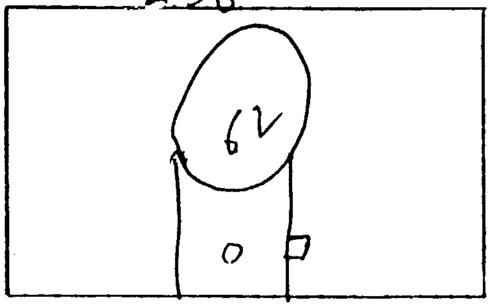
SECTION F:

FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant Ojay
Location Detroit mi
Operator [illegible]
Date 8-10-92
Run No. 1 (2)
Sample Box No. 1
Meter Box No. C-282
Meter H @ 1.58
C Factor .998
Pitot Tube Coefficient Cp .84

256



Schematic of Stack Cross Section

Ambient Temperature 90
Barometric Pressure 30.00
Assumed Moisture, % 25
Probe Length, m(ft) 6
Nozzle Identification No. 0004124
Avg. Calibrated Nozzle Dia., (in.) .275/.275/.275
Probe Heater Setting 4
Leak Rate, m³/min.(cfm) .005 at 6 in Hg
Probe Liner Material [illegible]
Static Pressure, mm Hg(in.Hg)
Filter No. JS-6175

	IMPINGER VOLUME ml	SILICA GEL WEIGHT, g
FINAL	513	524
INITIAL	200	512
DIFFERENCE	313	12

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	2:46 2:48:30	3	290	.52	1.3	254.1 256.0	102	80	260	58
A 2	2:51	3	293	.80	2.0	257.4	108	80	265	58
A 3	2:53-30	3	285	.85	2.2	259.7	112	84	265	60
A 4	2:56	3	289	.85	2.2	262.4	112	84	260	60
A 5	2:58-30	3	290	.85	2.2	263.9	120	88	260	59
A 6	3:01	3	298	.80	2.0	266.2	120	88	260	59
A 7	3:03-30	3	292	.75	1.9	268.2	120	88	260	60
A 8	3:06	3	290	.90	2.0	270.2	122	88	260	60
A 9	3:08-30	3	290	.90	2.3	272.4	122	88	255	60
A 10	3:11	3	293	.95	2.4	274.8	130	88	255	60
A 11	3:13-30	4	292	.93	2.4	277.5	130	90	260	60
A 12	3:16	4	290	.93	2.4	279.5	130	90	260	60
B 1	3:23 3:25:30	4	290	.95	2.4	281.4	130	90	260	60

4 TAV

Fo... REC .6

RAMCON emissions test log sheet, cont. DATE 8-10-92 LOCATION Detroit MI TEST NO. 1 (2)

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
B 2	3:28	5	290	1.0	2.6	283.9	126	90	225	60
B 3	3:30-30	5	290	1.1	2.8	286.7	126	90	225	60
B 4	3:33	5	290	1.1	2.8	289.6	128	90	225	60
B 5	3:35-30	5	290	1.0	2.6	291.1	128	90	255	60
B 6	3:38	5	290	1.0	2.6	293.5	128	90	255	60
B 7	3:40-30	5	290	.80	2.0	295.7	128	90	255	60
B 8	3:43	5	290	.73	1.9	297.7	128	94	255	60
B 9	3:45-30	5	290	.70	1.8	299.7	130	94	255	60
B 10	3:48	5	290	.65	1.7	301.5	130	94	255	60
B 11	3:50-30	5	290	.50	1.3	303.4	130	94	255	60
B 12	3:53	5	290	.42	1.1	305.127	130	94	255	60

RAMCON ENVIRONMENTAL CORPORATION

2.56

Plant Ajax
Location Detroit
Operator Al Ostrow
Date 8-10-92
Run No. 2
Sample Box No.
Meter Box No. C-282
Meter H @ 1.58
C Factor .998
Pitot Tube Coefficient Cp .94

Ambient Temperature 70
Barometric Pressure 30.0
Assumed Moisture, % 7.5
Probe Length, m(ft) 6'
Nozzle Identification No. .0004124
Avg. Calibrated Nozzle Dia., (in.) 275/225/.275
Probe Heater Setting 4
Leak Rate, m³/min. (cfm) .005
Probe Liner Material stainless steel
Static Pressure, mm Hg (in. Hg)
Filter No. JS-6126

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	630	531
INITIAL	200	520
DIFFERENCE	430	11

Schematic of Stack Cross Section

72 Min test

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F		FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
							Inlet	Outlet		
A 1	6:18 / 6:21	2	294	.88	2.2	313.4 / 315.9	110	85	250	60
A 2	6:24	2	295	.90	2.3	318.6	112	85	250	60
A 3	6:27	2	295	.84	2.2	321.0	114	85	250	60
A 4	6:30	2	295	1.1	2.8	324.1	120	85	250	60
A 5	6:33	2	298	.90	2.3	326.7	120	90	254	60
A 6	6:36	2	298	.85	2.2	329.2	120	90	255	60
A 7	6:39	2	287	.68	1.7	331.5	122	90	249	60
A 8	6:42	3	288	.70	1.8	334.2	122	90	249	58
A 9	6:45	3	289	.67	1.7	337.3	122	90	250	58
A 10	6:48	2	289	.60	1.5	338.5	126	90	260	62
A 11	6:51	2	291	.45	1.2	341.0	126	90	260	62
A 12	6:54	2	291	.45	1.2	342.8	126	90	260	62
B 1	7:01 / 7:04	2	291	.80	2.0	344.2	126	90	260	62

orm EC

RAMCON emissions test log sheet, cont. DATE 8-10-92 LOCATION Detroit Mi TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
B2	7:07	3	298	.90	2.3	347.6	126	90	255	58
B3	7:10	4	290	1.1	2.8	350.5	130	90	250	60
B4	7:13	4	291	1.1	2.8	353.6	130	90	250	60
B5	7:16	4	291	1.0	2.6	356.8	130	90	250	60
B6	7:19	4	291	.95	2.4	359.2	130	90	250	60
B7	7:22	4	296	.80	2.0	362.3	130	90	250	60
B8	7:25	4	296	.80	2.0	365.6	130	90	250	54
B9	7:28	4	299	.70	1.8	367.8	130	90	250	55
B10	7:31	4	301	.70	1.8	369.3	130	90	250	55
B11	7:34	4	301	.70	1.8	371.4	130	90	250	55
B12	7:37	4	301	.70	1.8	374.20 ✓	130	90	250	55

RAMCON ENVIRONMENTAL CORPORATION

256

Plant Ajax
Location Detroit MI
Operator [illegible]
Date 8-10-92
Run No. 3
Sample Box No. 1
Meter Box No. C-292
Meter H @ 1.58
C Factor .998
Pitot Tube Coefficient Cp .84

Ambient Temperature 70
Barometric Pressure 30.0
Assumed Moisture, % 25
Probe Length, m(ft) [illegible]
Nozzle Identification No. 0004124
Avg. Calibrated Nozzle Dia., (in.) .275/.275/.275
Probe Heater Setting 4
Leak Rate, m³/min.(cfm) .009 @ 7 [illegible]
Probe Liner Material [illegible]
Static Pressure, mm Hg(in.Hg)
Filter No. 25-6177

	IMPINGER VOLUME ml	SILICA GEL WEIGHT g
FINAL	635	507
INITIAL	200	498
DIFFERENCE	435	9

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	8:09 8:12	3	298	.55	1.4	374.8 376.9	102	90	250	60
A 2	8:15	3	299	.55	1.4	380.3	110	90	250	60
A 3	8:18	3	300	.65	1.7	381.0	112	90	250	60
A 4	8:21	3	300	.68	1.7	383.0	112	90	250	60
A 5	8:24	3	294	.55	1.4	385.2	120	90	250	60
A 6	8:27	3	290	.75	1.9	387.5	120	90	250	60
A 7	8:30	3	290	.85	2.2	390.6	120	90	250	60
A 8	8:33	3	291	.95	2.4	393.9	125	90	250	60
A 9	8:36	3	293	1.1	2.8	395.6	125	90	250	60
A 10	8:39	3	294	1.1	2.8	398.4	125	90	250	60
A 11	8:42	3	294	.80	2.0	402.6	125	90	250	60
A 12	8:45	3	294	.80	2.0	405.3	125	90	247	60
B 1	8:47 8:50	3	294	.85	2.2	406.8	125	90	247	60

RAMCON emissions test log sheet, cont. DATE 8-10-92 LOCATION Detroit MI TEST NO. 3

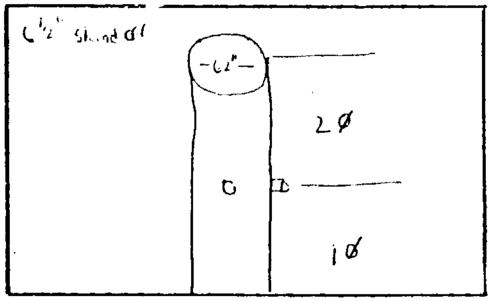
TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
B2	8:53	3	295	1.1	2.8	409.8	125	90	249	60
B3	8:56	3	294	1.3	3.3	413.0	125	90	251	60
B4	8:59	3	293	1.4	3.6	416.2	125	90	254	60
B5	9:02	3	291	1.0	2.56	419.2	125	90	248	60
B6	9:05	3	292	0.91	2.33	422.0	126	90	242	60
B7	9:08	3	292	.86	2.20	424.7	126	90	245	60
B8	9:11	3	298	.75	1.92	427.6	126	90	240	60
B9	9:14	3	300	.66	1.69	428.4	126	90	245	60
B10	9:17	3	301	.50	1.3	430.0	126	90	247	60
B11	9:20	3	300	.50	1.3	431.8	127	90	251	60
B12	9:23	3	300	.50	1.3	433.224	127	90	253	60

RAMCON ENVIRONMENTAL CORPORATION

Run 1 / PM

Plant Ajax Paving

Location Romulus, MI
Operator M Walda
Date 1/7/92
Run No. 1
Sample Box No.
Meter Box No. C-282
Meter H @ 1.51
C Factor .993
Pitot Tube Coefficient Cp .84



Schematic of Stack Cross Section

Ambient Temperature 84
Barometric Pressure 30.07
Assumed Moisture, % 22
Probe Length, m(ft) 6'
Nozzle Identification No. .0004098
Avg. Calibrated Nozzle Dia., (in.) .274 / .274 / .274
Probe Heater Setting 5
Leak Rate, m3/min. (cfm) .011 @ 10"
Probe Liner Material Stainless
Static Pressure, mm Hg (in.Hg)
Filter No. TS 6274

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	[illegible] 615	536
INITIAL	200	516
DIFFERENCE	415 ml	20

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMP. AT DRY GAS METER °F		FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
							Inlet	Outlet		
A-1	17:42 / 17:44.5	4	281	.51	1.28	58.671 / 60.38	100	78	230	67
2	17:47	5	282	.60	1.5	62.2	104	78	236	67
3	17:49.5	5	282	.55	1.38	64.0	110	80	246	67
4	17:52	5	284	.61	1.53	65.8	112	80	263	66
5	17:54.5	5	288	.67	1.68	67.8	114	80	263	66
6	17:57	6	290	.72	1.81	69.8	116	80	250	69
7	17:59.5	8	290	1.0	2.5	72.1	118	80	241	67
8	17:52	8	289	1.0	2.5	74.5	118	80	244	67
9	17:54.5	7	290	.80	2.01	76.7	119	82	255	66
10	17:57	6	290	.78	1.96	78.8	120	82	267	65
11	17:59.5	6	286	.65	1.63	80.7	122	83	266	65
12	18:02	5	287	.55	1.38	82.465	122	83	250	64

ATA-X1

Form #REC-03

RAMCON emissions test log sheet, cont. DATE 7/7 LOCATION Ajax 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)
B-1	18 22 18 24.5	5	285	.93	2.34	84.5	110	86	270	65
2	18 27	7	286	1.0	2.51	86.8	118	84	268	58
3	18 29.5	8	290	1.0	2.51	89.2	120	84	252	56
4	18 32	8	290	1.0	2.51	91.7	121	85	236	60
5	18 34.5	9	291	1.1	2.76	94.2	122	85	238	65
6	18 37	9	289	1.1	2.76	96.8	121	85	251	67
7	18:39.5	6	288	.70	1.75	98.8	122	85	265	67
8	18:42	6	285	.62	1.55	100.7	123	85	270	64
9	18:44.5	5	274	.57	1.43	102.5	123	85	270	62
10	18:48	5	288	.55	1.38	104.3	123	85	261	60
11	18:50.5	5	291	.45	1.13	106.0	123	86	248	60
12	18:53	5	293	.46	1.00	107.645	123	85	247	61

SECTION G:

CALIBRATION

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 2-13-92 Meter box number C-272

Barometric pressure, P_b = 29 98 in. Hg Calibrated by

	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								
10.47	1.0	10 ~~8~~	77.953 88.423	68	92 102	62 62	79.5	1201	.974	1.58
	1.5	10								
10.369	2.0	10	67.120 77.489	68	92 106	62 64	81	1250	.983	1.70
10.285	3.0	10	51.541 26.826	68	96 108	62 64	82.5	9.92	.991	1.62
	4.0	10								
								Avg	.983	1.63

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

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

Quality Assurance Handbook M4-2.3A (front side)

Form #REC-02

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ________ Date 8-7-92 Meter box number C-282 Plant ________

Barometric pressure, P_b = 30.00 in. Hg Dry gas meter number ________ Pretest Y ________

	Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i
		Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), °F	Dry gas meter						$\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
					Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average (t_d),[a] °F				
5.277	1.0	10	238.092 / 243.364	74	102 / 118	80 / 80	95	8.56		.984	ΔH@ 1.59
10.372	2.0	10	243.60 / 253.972	74	104 / 124	80 / 82	92.5	12.15		1.00	1.60
10.2	3.0	10	222318 / 227.781	74	104 / 120	78 / 90	95.5	9.78		1.01	1.56
										Y = .998	Avg 1.58

[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.

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ________ Date 2-24-92 Meter box number C-282 Plant ________

Barometric pressure, P_b = 30.17 in. Hg Dry gas meter number ________ Pretest Y ________

Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), °F	Dry gas meter						$\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
				Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average (t_d),[a] °F				
30	10	710.726 / 720.882	74	98 / 108	82 / 90	94.5	9.92	5	1.01	1.60
2.0	13	721.191 / 734.326	74	100 / 116	78 / 78	93	15.85	5	1.02	1.61
1.0	10	734.684 / 739.782	74	104 / 112	78 / 78	93	9.57	5	1.00	1.59
									Y = 1.01	Avg 1.60

[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.

RAMCON

Lear Siegler Stack Sampler

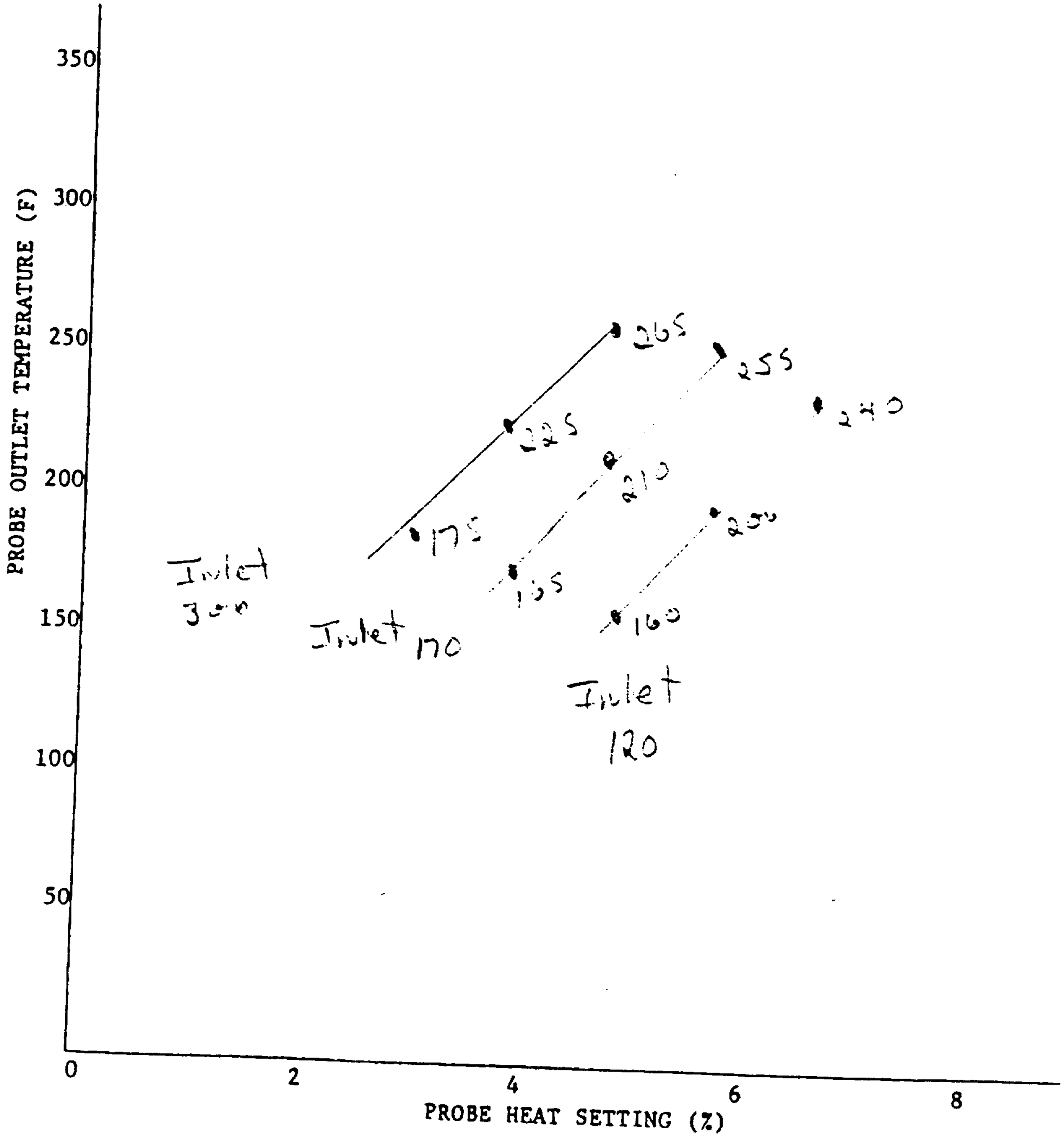
Heating Probe Calibration

Probe No. 62 Probe Length 6'

Date of Calibration 4-6-89 Signature

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 6 FT

Ambient temperature 81 °~~C~~F Barometric pressure 29.96 in. Hg

Calibrator Tommy 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 A	Boiling H2O	212 °F	212 °F	0
Boiling OIL B	Boiling oil	417 °F	417 °F	0
Ice H2O C	Ice water	32 °F	32 °F	0
Ambient Temp D	Ambient Temp.			

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

[b] Type of calibration system used.

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

Figure 2.5 stack temperature sensor calibration data form.

RAMCON ENVIRONMENTAL CORPORATION

Date 4-8-91 Thermocouple number 6 FT NEW

Ambient temperature 68 °C F Barometric pressure 29.96 in. Hg

Calibrator S Lum Reference: mercury-in-glass ✓

other ______

Reference point number[a]	Source[b] (specify)	Reference Thermometer Temperature, °C	Thermocouple Potentiometer Temperature, °C	Temperature Difference,[c] %
Hot H2O		115°F	116°F	-.69
Boiling Oil		428°F	428°F	0
Ice Water		32°F	32°F	0
Ambient Temp		68°F	68°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.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 4-5-91 Thermocouple number 69

Ambient temperature 20 °C Barometric pressure 29 88 in. Hg

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

other ______

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	oil	381	381°	0
B	water boiling	212	212°	0
C	Ice water	32	32°	0
D	Ambient			

[a] Type of calibration system used.

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

Quality Assurance Handbook M5-2.5

A

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? [✓ yes] no

Pitot tube openings damaged? yes (explain below) [✓ no]

α_1 = 1.6 ° (<10°), α_2 = 12 ° (<10°), β_1 = 02 ° (<5°),
β_2 = 3.2 ° (<5°)

γ = 3.1 °, θ = 0.5 °, A = .98 cm (in.)

z = A sin γ = 05 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = .01 cm (in.); <.08 cm (<1/32 in.)

P_A .48 cm (in.) P_b .50 cm (in.)

D_t = .38 cm (in.)

Comments:

Calibration required? yes [✓ no]

6

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? [✓ yes] ____ no

Pitot tube openings damaged? ____ yes (explain below) [✓ no]

α_1 = 2.3 ° (<10°), α_2 = 3.1 ° (<10°), β_1 = 1.6 ° (<5°),
β_2 = 2.1 ° (<5°)

γ = 2.1 °, θ = 1.0 °, A = .91 cm (in.)

$z = A \sin \gamma$ = .03 cm (in.); <0.32 cm (<1/8 in.),
$w = A \sin \theta$ = 02 cm (in.); <.08 cm (<1/32 in.)

P_A .45 cm (in.) P_b .46 cm (in.)

D_t = .38 cm (in.)

Comments:

Calibration required? ____ yes [✓ no]

SECTION H:

RAMCON PERSONNEL

Name: **Mr. G. Sumner Buck, III**
Title: **President**

Qualifications: Mr. Buck is a graduate of the University of Mississippi with graduate studies at Memphis State University and State Technical Institute of Memphis. He is a graduate of the EPA 450 "Source Sampling for Particulate Pollutant's" course and the 474 "Continuous Emissions Monitoring" courses outlined by EPA at Research Triangle Park, N.C. He has been directly involved in conducting and supervising air emission testing for over 15 years. He has personally conducted over 400 air emission tests. He currently sponsors and directs visual emission certification schools for US EPA Reference Method 9.

Project Duties: Mr. Buck will be responsible for the overall supervision of the project. He provided supervision for the project preparation, testing schedules for each team on-site, and overall organization between the testing crews and facility.

Name: **Mr. Joe Sewell**
Title: **Vice President**

Qualifications: Mr. Sewell is currently serving as the Vice President of RAMCON Environmental Corporation. Mr. Sewell is a graduate of Christian Brothers University in Memphis, Tennessee where he obtained a Bachelor of Science degree in Chemical Engineering. He has conducted and supervised air emissions testing projects ranging a broad spectrum of facility process categories. His accomplishments include the development of the instrumental branch of emissions testing utilizing continuous emission monitors and gas chromatography. Mr. Sewell performs a major role in the upgrading of testing capabilities and professional quality that RAMCON Environmental Corporation offers.

Project Duties: Mr. Sewell provides staff engineering and project administration to ensure the integrity of the requested services. He served as the primary contact person for RAMCON Environmental Corporation handling all correspondence between the facility personnel involved in the project and respective state agency representative(s). He provides project leadership to RAMCON Environmental Corporation field supervisors and managers involved in the test project.

<u>Name</u>: **Mr. Ray Jenkins**
<u>Title</u>: **Source Sampling Director**

<u>Qualifications</u>: Mr. Jenkins is serving as the Source Sampling Director for RAMCON Environmental Corporation. He was promoted to this leadership position after gaining a significant amount of experience in conducting and providing field supervision of a variety of air testing projects. Mr. Jenkins has personally conducted and/or supervised all of the prevalent EPA approved procedures with expertise in the instrumental analyzer procedures. He graduated from Memphis State University where he obtained a Bachelor of Science degree in Biology. He is also currently certified to conduct US EPA Reference Method 9 for the visual determination of emission opacity.

<u>Project Duties</u>: Mr. Jenkins provided project leadership to the Team Leader Field Technicians. He ensured that the test crew(s) involved in the test project were properly informed to his respective duties and responsibilities during the testing process. Mr. Jenkins also serves as the Quality Assurance/Quality Control Coordinator and provided guidance in QA/QC to each Team Leader with regard to sample integrity.

<u>Name</u>: **Mr. Thomas South**
<u>Title</u>: **Laboratory Technician**

<u>Qualifications</u>: Mr. South is currently serving as Laboratory Technician. He is proficient in conducting many analysis procedures such as front and back-half particulate analysis, titrations, extractions, etc. He received an Associate degree in Chemical Engineering from State Technical Institute in Memphis, Tennessee.

<u>Project Duties</u>: Mr. South conducts the laboratory analysis on the particulate samples. He is also responsible for accepting the remaining field samples from the Field Sample Bank Manager and performing inspection as to integrity. He documents the transfer on the chain of custody forms and distributed the subcontracted samples to the respective laboratories.