Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section: 11.1

Reference Number: 70

Title: Source Sampling For Particulate Emissions, W. Hodgman & Sons, Inc., Northrup, Minnesota, Ramcon Environmental Corporation,

Memphis, TN,

June 11, 1993.

AP-42 Section 11.1
Reference
Report Sect. 4
Reference 70

RAMCON
ENVIRONMENTAL CORPORATION

651A
Stack tests

SOURCE SAMPLING
for
PARTICULATE EMISSIONS

W. HODGMAN & SONS, INC.
NORTHRUP, MINNESOTA
June 11, 1993

Lyle Maschoff
W. Hodgman & Sons, Inc.

William Joseph Sewell, II
Vice President
RAMCON Environmental Corporation

RAMCON

ENVIRONMENTAL CORPORATION

June 23, 1993

Mr. Lyle Maschoff
W. Hodgman & Sons, Inc.
P. O. Box 1100
Fairmont, Minnesota 56031

RE: Particulate Emissions Test: June 11, 1993

Dear Mr. Maschoff:

Enclosed you will find four (4) copies of our report on the particulate emissions test we conducted at your asphalt plant located in Northrup, Minnesota. Based on our test results, the average grain loading of the three test runs do pass the standards set by the State of Minnesota. Therefore, the plant is operating in compliance with State standards.

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

Mr. Tom Kosevisch
Minnesota Pollution Control
Agency, Air Quality Division
520 Lafayette Road
St. Paul, Minnesota 55155

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,

William Joseph Sewell, II
Vice President

WJSii:wpc
Enclosures

RAMCON BUILDING, 6707 FLETCHER CREEK COVE, MEMPHIS, TENNESSEE 38133
TELEPHONE 800/458-4567 IN TENNESSEE 901/387-0500 FAX 901/387-0400

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SECTION A:

1. INTRODUCTION
2. TEST RESULTS
3. TEST PROCEDURES

SECTION A.

1. INTRODUCTION

On June 11, 1993 personnel from RAMCON Environmental Corporation conducted a source emissions test for particulate emissions compliance at W. Hodgman & Sons, Inc.'s Barber-Greene drum-mix asphalt plant located in Northrup, Minnesota. RAMCON personnel conducting the test were Tommy Crook, Team Leader, Mark Graham and Chad Hughes. Tommy 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. Crook and Mr. South.

The purpose of the test was to determine if the rate of particulate emissions from this plant's scrubber is below or equal to the allowable emissions limit set by US EPA and the State of Minnesota.

2. TEST RESULTS

Table I summarizes the test results. The grain loading limitation for EPA is .04 gr/dscf as specified in 39 FR 9314, March 8, 1974, 60.92 Standards for Particulate Matter (1), as amended. The allowable emissions for the State of Minnesota are the same as those set by EPA.

Chad Hughes of RAMCON Environmental conducted the opacity test which ranged from five (5) to twenty-five (25) percent on all three (3) runs.

SUMMARY OF TEST RESULTS

TABLE I

June 11, 1993

Test Run	Time	Actual Emissions gr/dscf	Isokinetic Variation	Emissions lbs/hr
1	10:17 - 11:26	0.0369	102.0%	10.69
2	12:32 - 13:40	0.0371	100.1%	11.54
3	15:54 - 16:58	0.0334	92.6%	10.25
	Average:	0.0358		10.83

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

3. TEST PROCEDURES

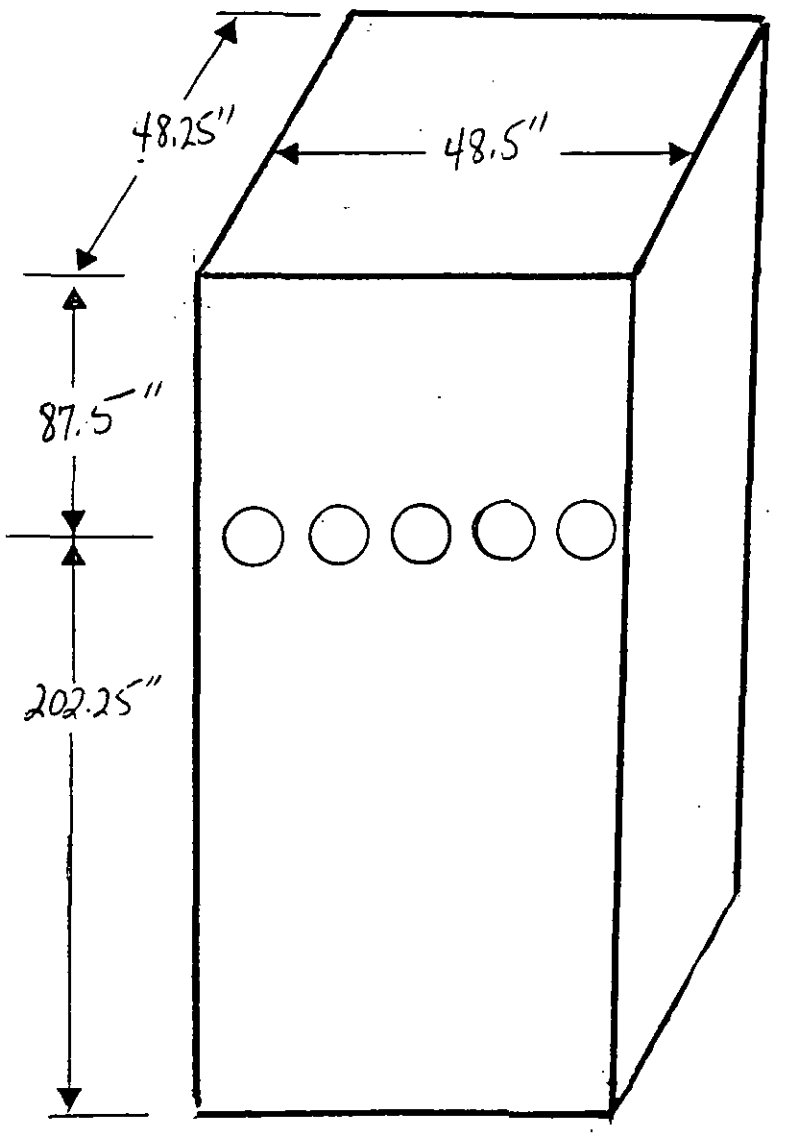
(a) *Method Used:* Method 5 source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

(b) Problems Encountered: No problems were encountered that affected testing.

(c) Sampling Site: The emissions test was conducted after a scrubber on a rectangular stack measuring 48.25" x 48.50" with an equivalent diameter of 48.4". Five (5) sampling ports were placed 87.5" down (1.8 diameters upstream) from the top of the stack and 202.25" up (4.2 diameters downstream) from the last flow disturbance. The ports were evenly spaced on 9.7" centers. The two outside ports are 4.9" from the side walls of the stack. Thirty (30) points were sampled, six (6) through each port for two (2) minutes each for a total testing time of sixty (60) minutes.

Points on a Diameter	Probe Mark*
1	10.5"
2	18.5"
3	26.5"
4	34.5"
5	42.5"
6	50.5"

*Measurements include a 6.5" standoff.



MVTL LABORATORIES, Inc.
P.O. BOX 1873, 1411 S. 12th STREET
BISMARCK, ND 58502
PHONE (701) 258-9720 WATS (800) 279-6885 FAX (701) 258-9724

WE ARE AN EQUAL OPPORTUNITY EMPLOYER

FINAL ANALYSIS REPORT

Sample Number: 93-F77
Client: W. Hodgman & Sons, Inc.
PO Box 1100
Fairmont MN 56031-1100

Attn: Rob Larson

Report Date: 7/21/93
Work Order #: 81-0382
PO #:

Collection Date:
Collection Time:
Date Received: 6/28/93

Petroleum Derived Used Oil
Burner Fuel

Analyte	Result	Units	Comments
Density	0.88	g/ml	
Acidity	7.00	mg/l	Neutral
Lead Waste Oil	27.7	mg/kg	0.00277 wt%
PCB	< 1	ppm	
Ash	0.83	wt. %	
Calorific Value cal/g	10546.	cal/gram	
Calorific Value BTU/lb	18983.	BTU/lb	139,270 BTU/gal
Total Sulfur	0.53	wt. %	
Flash Point	290.	degrees F	
Total Halogens (Chlorine)	928.	ug/g	0.0928 wt%

Approved by: CCarroll

MVTL guarantees the accuracy of the analysis done on the sample submitted for testing. It is not possible for MVTL to guarantee that a test result obtained on a particular sample will be the same on any other sample unless all conditions affecting the sample are the same, including sampling by MVTL. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

W. Hodgman & Sons. Inc
PARTICULATE EMISSIONS TEST: June 11, '93
NORTHROP, MN PLANT #920

Moisture Tests

Run #1

wet wt. 2500 g
dry wt. 2325 g
H_2O 175 g 7.0% Moisture

Run #2

wet wt. 2500 g
dry wt. 2327.5 g
H_2O 172.5 g 6.9% moisture

Run #3

wet wt. 2500 g
dry wt. 2322.5 g
H_2O 177.5 g 7.1% moisture

Tests Run by Kim Laclete 6-11-93

THE SOURCE

W. Hodgman & Sons, Inc. employs a Barber-Greene drum mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt oil to bind the mixture together. After the hot asphalt mix is manufactured at the plant, it is transported to the location where it is to be applied. The hot asphalt mix is spread evenly over the surface with a paver 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 mixer uses a burner fired with waste oil to heat air to dry the aggregate. The air is drawn into the system via an exhaust fan. After passing through the gas burner, the air passes through a high efficiency scrubber. The scrubber is manufactured by Barber-Greene. The exhaust gases are blown through the scrubber and discharged to the atmosphere through the stack. The design pressure drop across the venturi is in excess of 15 inches of water. The particulate matter, which is removed by the scrubber, is fed into a scrubber pond where it drops out of suspension.

DATA ON FACILITY BEING STACK TESTED

COMPANY NAME W. Hodgman & Sons COMPANY REP. Kurt Auhl PHONE (507) 235-[illegible]

LOCATION OF FACILITY North Rup Min. ORIGINAL START-UP DATE _____ DESIGNED CAPACITY _____

OEM [illegible] Speed MODEL NO. DM-75 TYPE Drum AC TYPE [illegible]

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 X Mix Aggregate TPH	5 Production Rate RAP TPH	6 Asphalt Cement %	7 Mix Temp. °F	8 Exhaust Gas Temp. °F	9 X Venturi Scrubber / Baghouse Pressure Drop in w.g.	9 Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position
10:15	1.8 gal/Hour	65%	24oz	260		7.2%	290		12.5	70	79		OPEN
10:30		65%		260			290		12.5	70	79		
10:45		64		255			285		12.5	70	79		
11:00		65		255			290		12.5	70	80		
11:15		64		260			285		12.5	70	81		
12:30	1.8 gal	64	24oz	260		7.2%	286		12.5	70	83		OPEN
12:45	1.8	65		255			290		12.5	65	83		
1:00	1.78	64		260			285		12.0	65	84		
1:15	1.78	64		260			287		12.0	65	84		
1:30	1.78	64		260			287		12.0	65	86		
4:00	1.68	62	24oz.	250		7.2%	285		12.0	65	86		OPEN
4:15	1.68	62		245			284		12.0	65	86		
4:30	1.68	61		245			280		12.0	65	87		
4:45	1.68	62		250			283		12.0	65	87		
5:00	1.68	61		245			287		12.0	65	87		

DATA SUMMARY ON STACK BEING TESTED

AGGREGATE

1. Name/type of mix 2331
2. Name/type of 2nd mix (if used) _____
3. Type/temperature of Liquid Asphalt 85-100 / 300 °F
4. Sieve/Screening analysis: _____ % Passing;

	1st mix / 2nd mix		1st mix / 2nd mix		1st mix / 2nd mix
1"	/	3/8"	86 /	#4	76 /
3/4"	100 /	#200	6 /	#10	63 /
1/2"	92 /	#5/8	98 /	#40	27 /

CONTROL SYSTEM

Manufacturer Contractor built

A. Baghouse:

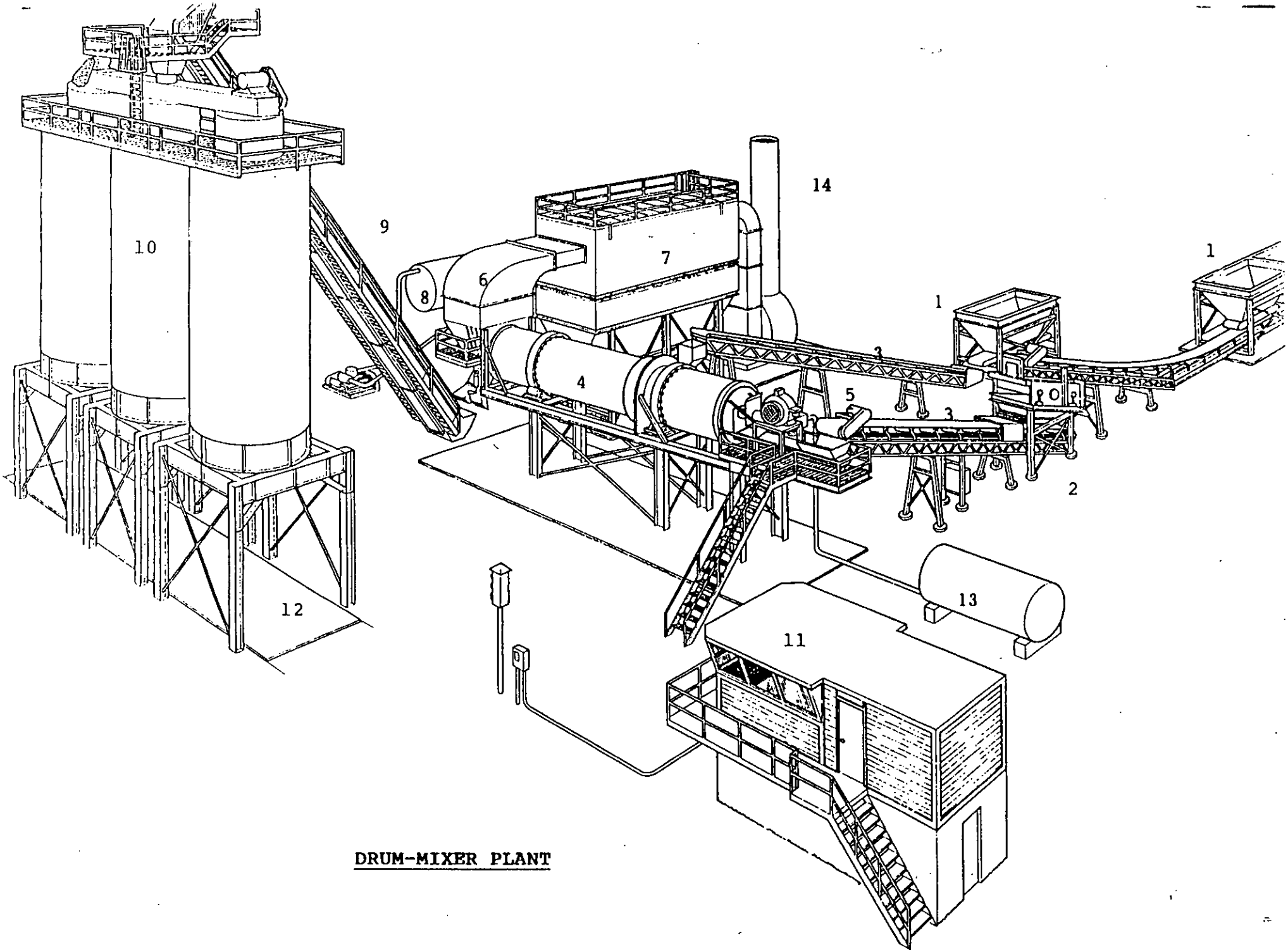
1. Type of bags _____ # of bags _____ Sq. ft. of bags _____
2. Air to cloth ratio _____ Designed ACFM _____
3. Type of cleaning - pulse jet _____ reverse air _____ plenum pulse _____ other _____
4. Cleaning cycle time _____ Interval between cleaning cycle _____
5. Pulse pressure on cleaning cycle _____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

B. Scrubber:

1. Type - Venturi X Wet Washer _____
   Spray Booth _____ Other _____
2. Gallons per minute through system 350
3. Water source storage tank (i.e., pond, lagoon, etc.)
4. Number of spray nozzles 36

Company Name [illegible] Date 6-11-93

Company Representative Kent Ahl



DRUM-MIXER PLANT

1. Aggregate bins: Virgin and/or recycled 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 and sand in the rotating drum as well as reheat recycled asphalt when it is a part of the mix.

6. Wet scrubbing system: A system of cyclonic action, spray nozzles and a venturi removes 99% of particulates in the gas stream.

7. 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.

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

9. 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.

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

11. 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.

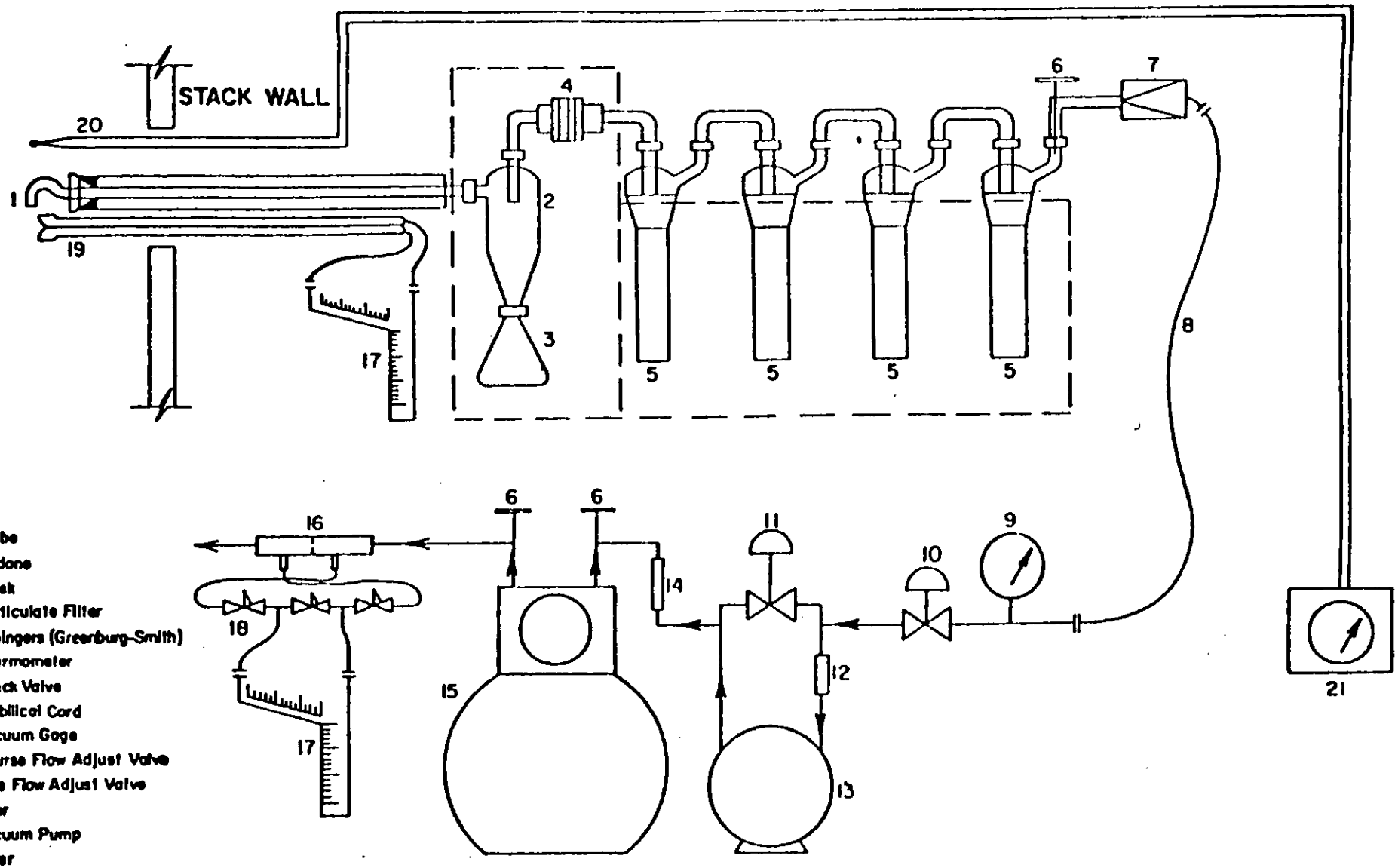
12. Mineral filler system (when used).

13. Burner fuel storage (when used).

14. Stack

SECTION C:

EQUIPMENT USED



1) Probe
2) Cyclone
3) Flask
4) Particulate Filter
5) Impingers (Greenburg-Smith)
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Gage
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

EQUIPMENT USED

Equipment used to conduct the particulate emissions test was:

A. A Lear Siegler PM-100 stack sampler with appropriate auxiliary equipment and glassware (with train set up according to the schematic on the next page).

B. An Airguide Instruments Model 211-B (uncorrected) aneroid barometer for checking the barometric pressure.

C. Weston dial thermometers to check meter temperatures or an Analogic Model 2572 Digital Thermocouple to check stack temperatures.

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

E. Schleicher and Schuell Type 1-HV filters with a porosity of .03 microns.

F. Reagent- or ACS-grade acetone with a residue of ≤ .001.

SOURCE NAME: Hedgeman

ADDRESS:

CITY: Fairmont | STATE: MN | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Batch Plant | OPERATING MODE: 100%

CONTROL EQUIPMENT: Scrubber | OPERATING MODE: 100%

DESCRIBE EMISSION POINT:

HEIGHT ABOVE GROUND LEVEL: 30 ft | HEIGHT RELATIVE TO OBSERVER: 20 ft

DISTANCE FROM OBSERVER: 90 ft | DIRECTION FROM OBSERVER: N-E

DESCRIBE EMISSIONS: Light brown

EMISSION COLOR: White/Brown | PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☐ YES ☐ | IS WATER DROPLET PLUME ATTACHED ☒ DETACHED ☐

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED: at stack exit

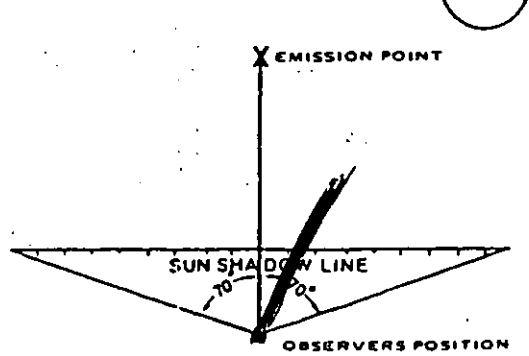
DESCRIBE BACKGROUND: SKY

BACKGROUND COLOR: Blue | SKY CONDITIONS: Partly Cloudy

WIND SPEED: 15-20/25-30 | WIND DIRECTION: Variable

AMBIENT TEMPERATURE: 84°F | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



OBSERVATION DATE: ~~6/10/93~~ 6/11/93 | START TIME: 1554 | STOP TIME: 1654

M \ SEC	0	15	30	45	M \ SEC	0	15	30	45
1	10	10	10	10	31	10	10	5	10
2	10	15	15	10	32	10	10	5	10
3	15	15	15	15	33	10	10	10	10
4	15	15	15	15	34	5	10	10	10
5	15	15	15	20	35	10	5	10	10
6	15	15	10	10	36	10	10	10	10
7	10	10	10	10	37	10	10	10	10
8	10	10	10	10	38	10	10	10	10
9	10	10	5	10	39	10	10	5	10
10	10	5	5	5	40	10	5	5	10
11	5	5	5	5	41	10	10	5	5
12	5	10	5	10	42	10	5	5	10
13	10	10	10	10	43	10	5	5	10
14	10	10	10	5	44	10	10	5	10
15	10	10	10	10	45	10	10	10	10
16	5	10	5	5	46	10	5	10	5
17	5	5	10	5	47	10	5	5	10
18	10	10	5	10	48	5	10	5	10
19	5	5	5	5	49	5	10	5	10
20	5	5	5	5	50	5	10	5	10
21	10	10	5	5	51	5	5	10	5
22	5	5	10	10	52	5	10	10	10
23	5	10	5	10	53	5	5	5	5
24	5	5	5	5	54	5	5	10	5
25	5	5	10	10	55	5	10	5	5
26	10	10	10	10	56	5	10	5	5
27	10	10	10	10	57	5	10	10	10
28	10	5	10	10	58	5	5	5	5
29	5	5	10	10	59	10	10	10	5
30	10	10	15	10	60	5	10	5	5

AVERAGE OPACITY FOR HIGHEST PERIOD:

NUMBER OF READINGS ABOVE % WERE:

COMMENTS:

RANGE OF OPACITY READINGS: MINIMUM 5 MAXIMUM 20

OBSERVER'S NAME (PRINT): Chad Hughes

OBSERVER'S SIGNATURE: Chad Hughes | DATE: 6/10/93

ORGANIZATION: Barncon

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE:

TITLE: | DATE:

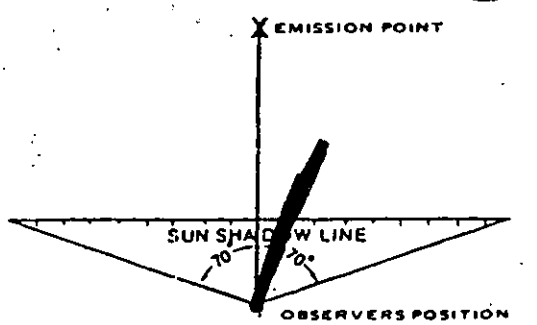
CERTIFIED BY: State of Tennessee | DATE:

VERIFIED BY: Karl Koontz | DATE:

REC#14

SOURCE NAME: Hodgeman	OBSERVATION DATE: ~~6/10/93~~ 6/11/93
ADDRESS:	START TIME: 1235
CITY: Fairmont	STATE: TN
ZIP:	STOP TIME: 1335
PHONE:	SOURCE ID NUMBER:
PROCESS EQUIPMENT: Batch Plant	OPERATING MODE: 100%
CONTROL EQUIPMENT: Scrubber	OPERATING MODE: 100%
DESCRIBE EMISSION POINT: Stack/Square	
HEIGHT ABOVE GROUND LEVEL: 30	HEIGHT RELATIVE TO OBSERVER: 20FT
DISTANCE FROM OBSERVER: 90	DIRECTION FROM OBSERVER: SW
DESCRIBE EMISSIONS: Light White Brown	
EMISSION COLOR: White Brown	PLUME TYPE: CONTINUOUS X FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☐ YES X	IS WATER DROPLET PLUME ATTACHED X DETACHED ☐
AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED: at steam plume	
DESCRIBE BACKGROUND: Blue sky	
BACKGROUND COLOR: Blue	SKY CONDITIONS: Clear/Partly Cloudy
WIND SPEED: 15-20	WIND DIRECTION: S-SE
AMBIENT TEMPERATURE: 80	RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



M \ SEC	0	15	30	45	M \ SEC	0	15	30	45
1	10	10	15	10	31	15	15	15	15
2	10	15	10	10	32	20	15	20	15
3	10	10	10	5	33	15	15	15	15
4	10	15	15	10	34	15	10	15	15
5	10	15	10	10	35	10	15	10	15
6	15	10	10	10	36	15	20	15	15
7	10	5	10	10	37	15	15	5	15
8	10	5	10	10	38	15	15	10	15
9	10	5	5	5	39	15	10	15	15
10	10	10	10	10	40	15	10	10	10
11	10	10	5	10	41	10	15	15	15
12	10	10	10	10	42	15	15	20	15
13	10	15	15	10	43	15	10	15	20
14	15	10	10	10	44	15	15	15	15
15	10	10	15	10	45	10	15	15	15
16	15	15	15	15	46	15	10	10	10
17	15	15	10	10	47	10	10	15	15
18	10	10	15	10	48	15	15	15	15
19	15	15	10	10	49	15	15	15	10
20	15	15	15	15	50	15	15	10	15
21	15	15	15	10	51	15	15	15	10
22	15	15	15	15	52	15	15	10	10
23	15	15	10	15	53	15	10	15	5
24	20	15	15	10	54	10	10	10	15
25	15	15	15	15	55	15	10	10	15
26	15	10	15	15	56	10	15	15	10
27	15	10	15	15	57	10	10	15	10
28	10	15	20	15	58	10	15	20	15
29	15	15	20	15	59	15	15	15	15
30	15	15	15	20	60	15	10	15	10

AVERAGE OPACITY FOR HIGHEST PERIOD:

NUMBER OF READINGS ABOVE ___ % WERE:

COMMENTS:

RANGE OF OPACITY READINGS — MINIMUM: 5 MAXIMUM: 20

OBSERVER'S NAME (PRINT): Chad Hughes

OBSERVER'S SIGNATURE: Chad Hughes — DATE: 6/10/93

ORGANIZATION: Rumson

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE:

TITLE: — DATE:

CERTIFIED BY: State of Tennessee — DATE:

VERIFIED BY: Karl Koontz — DATE:

REC#14

SOURCE NAME: Hodgeman

ADDRESS:

CITY: Fairmont | STATE: MN | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Batch Plant | OPERATING MODE: 100%

CONTROL EQUIPMENT: | OPERATING MODE: 100%

DESCRIBE EMISSION POINT: ~~Continuous~~ Continuous plume came after steam

HEIGHT ABOVE GROUND LEVEL: 30 ft | HEIGHT RELATIVE TO OBSERVER: 20

DISTANCE FROM OBSERVER: 90 ft | DIRECTION FROM OBSERVER:

DESCRIBE EMISSIONS:

EMISSION COLOR: White/Brown | PLUME TYPE: CONTINUOUS X FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☐ YES ☐ | IS WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED: at steam plume dissipation point

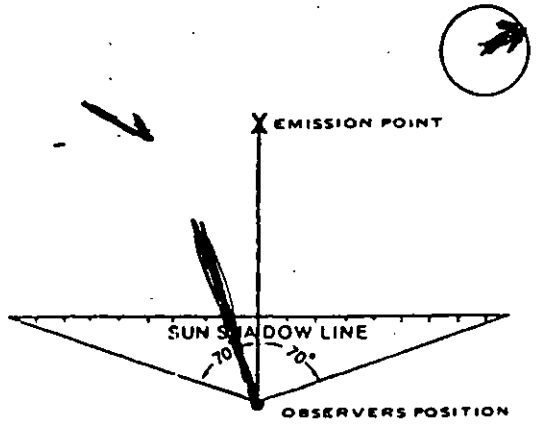
DESCRIBE BACKGROUND: SKY

BACKGROUND COLOR: Blue | SKY CONDITIONS: Clear

WIND SPEED: 15-20 | WIND DIRECTION: SW

AMBIENT TEMPERATURE: 75°F | RELATIVE HUMIDITY:

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



OBSERVATION DATE: ~~6/10/93~~ 6/14/93 | START TIME: 1017 | STOP TIME: 1117

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	10	10	15	15	31	15	20	15	20
2	10	15	20	15	32	20	15	20	20
3	10	10	15	15	33	20	20	20	25
4	10	10	15	15	34	25	20	20	20
5	15	10	10	15	35	20	20	15	20
6	15	20	20	15	36	15	20	20	15
7	15	15	15	15	37	20	20	15	20
8	10	15	10	15	38	15	15	20	15
9	10	15	15	15	39	15	15	15	15
10	15	15	15	15	40	15	15	15	20
11	10	15	20	20	41	15	15	15	15
12	15	15	15	15	42	15	15	20	15
13	10	20	15	15	43	15	15	15	20
14	15	15	20	15	44	15	15	20	20
15	15	10	15	20	45	15	20	25	15
16	15	15	15	20	46	20	20	20	15
17	15	15	25	15	47	15	20	20	15
18	15	20	20	15	48	20	15	20	15
19	20	20	15	20	49	15	15	20	20
20	15	20	15	20	50	15	20	15	25
21	15	20	15	15	51	15	20	20	20
22	20	25	20	15	52	15	25	15	20
23	25	20	15	10	53	20	15	20	20
24	15	20	15	20	54	15	20	20	20
25	25	20	15	15	55	20	25	20	20
26	15	20	20	20	56	20	15	20	15
27	15	20	15	15	57	20	20	15	15
28	15	15	20	20	58	15	20	20	15
29	20	15	15	15	59	15	20	15	20
30	15	20	15	20	60	15	15	20	20

AVERAGE OPACITY FOR HIGHEST PERIOD: | NUMBER OF READINGS ABOVE % WERE:

COMMENTS:

RANGE OF OPACITY READINGS: MINIMUM 10 MAXIMUM 25

OBSERVER'S NAME (PRINT): Chad Hughes

OBSERVER'S SIGNATURE: Chad Hughes | DATE: 6/10/93

ORGANIZATION: Ramcon

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE:

TITLE: | DATE:

CERTIFIED BY: State of Tennessee | DATE:

VERIFIED BY: Karl Koontz | DATE:

REC#14

SECTION I:

VISIBLE EMISSIONS

Name: Mr. Tommy Crook
Title: Team Leader

Qualifications: Mr. Crook has been employed by RAMCON Environmental Corporation for three years. He has completed Team Leader training in isokinetic and proportional test methods. He currently is certified in conducting US EPA Reference Method 9 for opacity. He has been involved in conducting tests on process stacks, incinerators, boilers, etc. He has served as a Field Technician for over two years.

Project Duties: Mr. Crook is responsible for conducting isokinetic sampling procedures at the facility(s). He is responsible for preparation, calibration and cleaning of the necessary equipment for this testing. His duties on-site include assembling the sample train, leak checking the system, operation of the train and recording the test data on the field data forms.

RAMCON Environmental Corporation field supervisors and managers involved in the testing project.

Name: Mr. Ray Jenkins
Title: Source Sampling Director

Qualifications: 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 obtaining 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.

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

Name: Mr. Tommy South
Title: Laboratory Technician

Qualifications: 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.

Project Duties: 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.

Name: Mr. Sumner Buck
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 Method 9.

Project Duties: Mr. Buck is responsible for the overall supervision of each testing project. This includes the correspondence to the State Regulatory Agency and the plant personnel regarding scheduling, testing requirements, etc. He will assist in supervision of the project preparation for each team involved and the overall organization between the testing crew(s) 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 serves 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

SECTION H:

RAMCON PERSONNEL

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number _____ Date 6-4-93 Meter box number Anderson Plant _____

Barometric pressure, P_b = 29.65 in. Hg Dry gas meter number 26940 Pretest Y _____

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1.0	10	867.182 / 877.434	82	110 / 126	96 / 100	108	18.85	8"	1.019	1.964
2.0	~~10~~ 13	853.618 / 866.866	82	96 / 126	94 / 98	103.5	16:68	6"	1.015	1.835
3.0	~~10~~ 21	832.182 / 853.443	82	90 / 126	90 / 95	100.25	22:66	5"	1.013	1.958
									Y = 1.015	1.919

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

where

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in. H_2O.

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

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

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Quality Assurance Handbook M4-2.4A

Form #REC-01

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number _____ Date 6-14-93 Meter box number Anderson Plant _____

Barometric pressure, P_b = 29.95 in. Hg Dry gas meter number 26940 Pretest Y _____

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
3.0	10	~~259.7~~ ~~278.283~~	79	~~129~~ ~~140~~	~~107~~ ~~109~~	121.5	11.19		1.012	1.986
2.0	10	~~282.0~~ ~~292.572~~	79	~~120~~ ~~140~~	~~108~~ ~~109~~	119.25	13.37		1.02	1.897
1.0	10	~~271.2~~ ~~281.692~~	79	~~118~~ ~~132~~	~~107~~ ~~108~~	116.25	18.57		1.017	1.84
									Y = 1.016	1.908

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

where

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in. H_2O.

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

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

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Quality Assurance Handbook M4-2.4A

Form #REC-01

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-13-90 Thermocouple number 54

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator S Turner Reference: mercury-in-glass ✓

other _____

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	ice water	32 °F	32 °F	0 %
B	Boiling	212 °F	212 °F	0 %
C	Boiling oil	381 °F	379 °F	.00?
D	Ambient			

[a]Type of calibration system used.

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

RAMCON

Lear Siegler Stack Sampler

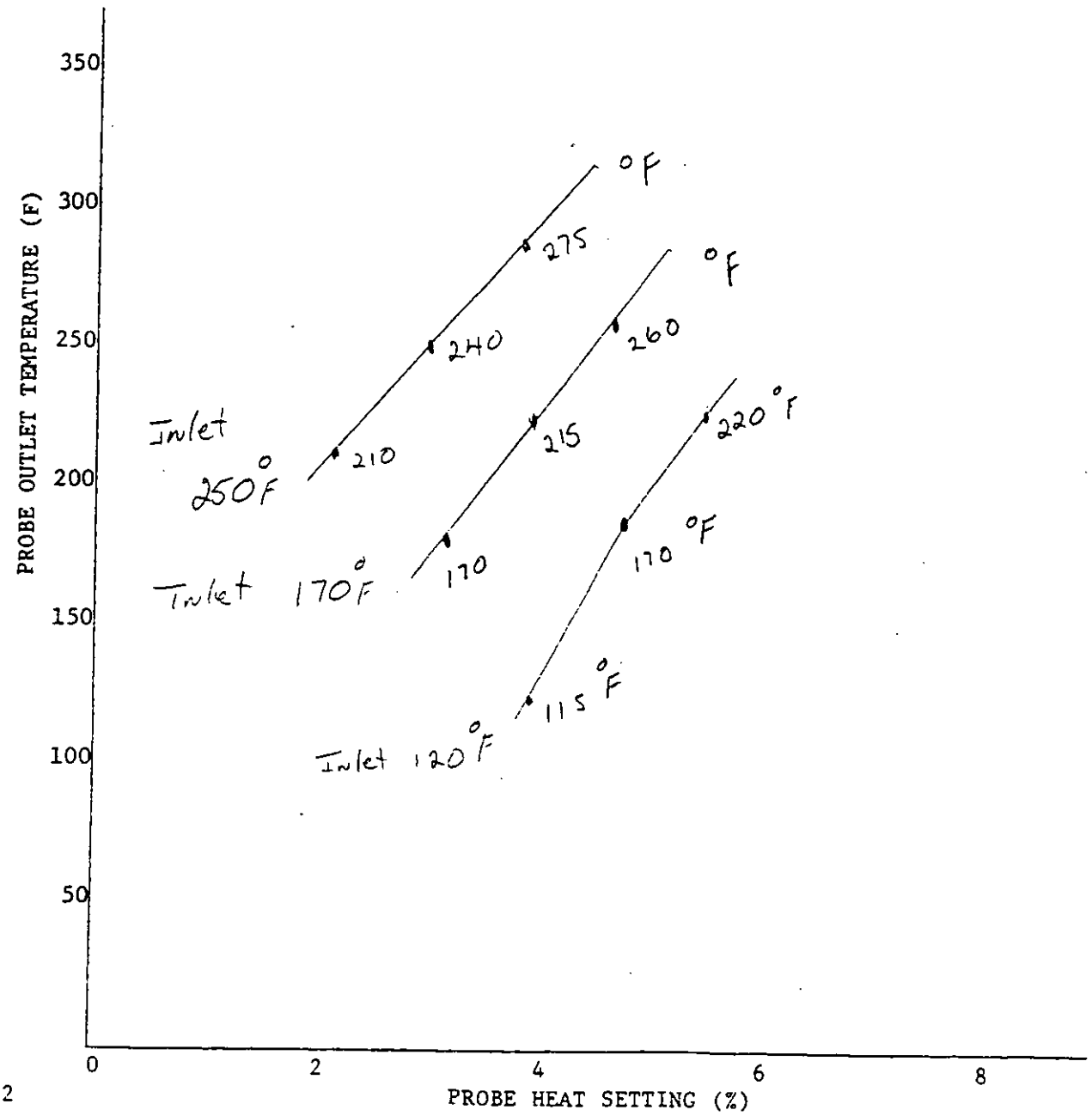
Heating Probe Calibration

Probe No. 54 Probe Length 5'

Date of Calibration 5-7-89 Signature SAM TURNER

Name of Company to be tested _____

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



Form No. EED-17-2

RAMCON ENVIRONMENTAL CORPORATION

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. 54 Date 6-9-91

Calibrated by: S Tuck

"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	2.2	3.1	.842	.006
2	1.8	2.5	.848	.000
3	1.1	1.5	.856	.008
		$\bar{C}_p$ (SIDE A)	.848	

"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	2.2	3.1	.842	.006
2	1.8	2.5	.848	.000
3	1.1	1.5	.856	.008
		$\bar{C}_p$ (SIDE B)	.848	

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

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

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

Form No. EED-17-1

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-5-89 Thermocouple number Inlet/Outlet

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 °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
A	Ice Bath	32	32	0
B	oven	200	200	0
C	oven	350°F	350	0
D	Ambient			

[a]Type of calibration system used.

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

4B

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 = .5 ° (<10°), β_1 = 1.8 ° (<5°),
β_2 = 1.8 ° (<5°)

γ = 3.2 °, θ = 1.0 °, A = .98 cm (in.)

z = A sin γ = .05 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = .02 cm (in.); <.08 cm (<1/32 in.)

P_A .49 cm (in.) P_b .49 cm (in.)

D_t = .38 cm (in.)

Comments: _____

Calibration required? _____ yes ✓ no

4A

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? ✓ yes _____ no

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

α_1 = 1.3 ° (<10°), α_2 = 0.8 ° (<10°), β_1 = 0.5 ° (<5°),
β_2 = 1.8 ° (<5°)

γ = 2.9 °, θ = 1.7 °, A = .97 cm (in.)

z = A sin γ = .05 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = .03 cm (in.); <.08 cm (<1/32 in.)

P_A .48 cm (in.) P_b .49 cm (in.)

D_t = .38 cm (in.)

Comments: _____

Calibration required? _____ yes ✓ no

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-11-93 LOCATION Hormel FAIRMONT, MN TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME Vm (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
1	~~16:20~~ 16:22	3	132	.75	1.3	169.9	121	96	238	64
2	16:24	3	132	.65	1.1	171.1	124	97	240	63
3	16:26	3	132	.65	1.1	172.2	125	97	244	63
4	16:28	3	132	.55	.97	173.4	126	98	247	63
5	16:30	3	133	.65	1.1	174.5	127	99	249	64
6	16:32	3	133	.65	1.1	175.7	129	100	256	65
1	~~16:33~~ 16:35	1	132	.25	.44	176.5	118	102	248	68
2	16:37	1	133	.30	.53	177.3	120	102	242	66
3	16:39	1	132	.30	.53	178.1	122	102	235	65
4	16:41	2	132	.35	.61	179.0	124	102	234	65
5	16:43	2	132	.40	.70	180.0	126	103	237	64
6	16:45	2	133	.40	.70	180.9	128	103	232	64
1	~~16:46~~ 16:48	1	130	.25	.44	181.7	121	104	233	68
2	16:50	1	132	.11	.19	182.2	120	105	229	65
3	16:52	1	133	.15	.26	182.8	119	105	229	63
4	16:54	2	134	.20	.35	183.6	121	105	226	63
5	16:56	2	134	.22	.38	184.3	124	105	229	63
6	16:58	2	133	.22	.38	185.030	125	106	231	63

RAMCON ENVIRONMENTAL CORPORATION

Plant HODGEMAN

Location FAIRMONT, MN

Operator T. BOYS

Date 6-11-93

Run No. 3

Sample Box No. 1

Meter Box No. ANDERSON #26940

Meter H @ 1.919

C Factor 1.015

Pitot Tube Coefficient Cp .84

			IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature	87			
Barometric Pressure	29.91	FINAL	325	418.9
Assumed Moisture, %	20	INITIAL	200	411.7
Probe Length, m(ft)	5 FT	DIFFERENCE	125	7.2

Nozzle Identification No. -000276 1

Avg. Calibrated Nozzle Dia., (in.) .225/.225/.225

Probe Heater Setting 4

Leak Rate, m^3/min. (cfm) .005 @ 7"

Probe Liner Material STAINLESS

Static Pressure, mm Hg (in. Hg) .40

Filter No. T.S. 6521

Schematic of Stack Cross Section

2 MIN POINT

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H_2O	PRESSURE DIFF. ORF. MTR in H_2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
1	15:54 / 15:54	4	135	1.3	2.3	149.373 / 151.0	88	85	249	68
2	15:58	4	131	1.3	2.3	152.8	92	85	248	65
3	16:00	4	132	1.4	2.4	154.4	99	85	246	62
4	16:02	4	132	1.2	2.1	156.0	105	85	250	62
5	16:04	4	130	1.2	2.1	157.7	110	86	242	63
6	16:06	4	130	1.1	1.9	159.2	115	87	243	64
1	16:07 / 16:09	4	130	1.3	2.3	160.8	112	88	240	66
2	16:11	4	130	1.2	2.1	162.5	116	89	239	65
3	16:13	4	132	1.3	2.3	164.1	121	90	238	64
4	16:15	4	133	1.1	1.9	165.7	124	91	237	62
5	16:17	4	132	1.0	1.8	167.1	125	93	249	62
6	16:19	4	131	1.0	1.8	168.6	124	94	252	62

Form "REC-25"

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 6-11-93 LOCATION Hoosemen FARMONT, MN TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME Vm (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
1	13:00 / 13:02	3	143	.90	1.6	120.4	108	91	257	67
2	13:04	3	142	.95	1.7	121.9	117	91	256	65
3	13:06	3	143	.75	1.4	123.2	124	93	258	60
4	13:08	3	143	.80	1.5	124.6	127	95	267	60
5	13:10	3	142	.80	1.5	126.0	130	97	271	60
6	13:12	3	143	.55	1.0	127.1	130	98	267	61
1	13:14 / 13:16	5	142	1.6	2.9	128.9	124	101	260	61
2	13:18	5	144	1.6	2.9	130.8	131	101	252	60
3	13:20	5	144	1.5	2.8	132.7	133	101	253	61
4	13:22	5	143	1.6	2.9	134.6	134	102	248	60
5	13:24	5	144	1.3	2.4	136.3	134	103	242	60
6	13:26	5	143	1.3	2.4	138.0	133	103	243	61
1	13:28 / 13:30	6	143	1.7	3.1	140.0	122	103	235	65
2	13:32	6	144	1.6	2.9	141.8	129	103	226	64
3	13:34	6	143	1.6	2.9	143.8	129	103	227	64
4	13:36	6	144	1.7	3.1	145.6	131	103	232	64
5	13:38	6	144	1.4	2.6	147.4	131	103	248	66
6	13:40	5	144	1.1	2.0	148.988	130	103	239	68

RAMCON ENVIRONMENTAL CORPORATION

Plant HODGEMAN

Location FAIRMONT, MN.
Operator T. CRAIG
Date 6-11-93
Run No. 2
Sample Box No. 1
Meter Box No. ANDERSEN #26940
Meter H @ 1.919
C Factor 1.015
Pitot Tube Coefficient Cp .84

Ambient Temperature 83
Barometric Pressure 29.91
Assumed Moisture, % .20
Probe Length, m(ft) 5 FT

	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	395	332.1
INITIAL	200	326.7
DIFFERENCE	195	5.4

Nozzle Identification No. .0002761
Avg. Calibrated Nozzle Dia., (in.) .225/.225/.2
Probe Heater Setting 4
Leak Rate, m³/min. (cfm) .005 AT 10"
Probe Liner Material STAINLESS
Static Pressure, mm Hg (in. Hg) .40
Filter No. T.S. 6520

2 MIN POINT

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H_2O	PRESSURE DIFF. ORF. MTR in H_2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
1	12:32 / 12:34	1	141	.10	.18	110.067 / 110.5	81	81	223	68
2	12:36	1	142	.10	.18	111.0	83	81	227	66
3	12:38	1	143	.12	.22	111.6	87	81	243	66
4	12:40	1	142	.15	.27	112.2	92	81	250	66
5	12:42	2	143	.18	.33	112.9	95	81	253	65
6	12:44	2	143	.18	.33	113.5	98	82	250	65
1	12:45 / 12:47	2	141	.35	.64	114.4	99	82	248	68
2	12:49	2	141	.35	.64	115.3	105	83	243	67
3	12:51	2	142	.25	.46	116.1	108	84	248	67
4	12:53	2	143	.30	.55	116.9	111	85	245	66
5	12:55	2	142	.45	.83	117.9	115	86	253	66
6	12:57	2	142	.45	.83	119.0	119	88	253	66

Form #REC-05

Form #REC-06

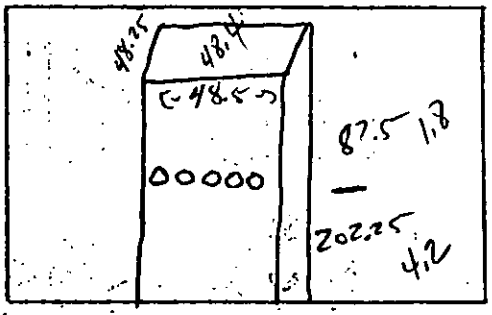
RAMCON emissions test log sheet, cont. DATE 6-11-93 LOCATION Hodgeman FAIRMONT, MN TEST NO. 1

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME Vm (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
1	10:45 / 10:47	4	140	.85	1.6	093.1	113	91	237	64
2	10:49	4	140	.85	1.6	094.5	119	92	230	60
3	10:51	3	140	.80	1.5	095.9	121	92	235	61
4	10:53	3	141	.75	1.4	097.2	123	93	238	61
5	10:55	3	141	.80	1.5	098.6	124	94	248	60
6	10:57	4	141	.85	1.6	100.0	126	95	244	59
1	10:59 / 11:01	2	141	.25	.49	100.8	111	97	247	67
2	11:03	2	141	.37	.73	101.8	116	97	254	64
3	11:05	2	141	.30	.59	102.6	118	97	253	64
4	11:07	2	142	.32	.63	103.6	117	97	263	64
5	11:09	3	141	.45	.88	104.6	120	97	254	64
6	11:11	3	142	.45	.88	105.7	121	98	257	64
1	11:14 / 11:16	2	142	.06	.11	106.0	100	97	264	68
2	11:18	2	143	.15	.29	106.7	103	96	264	64
3	11:20	2	143	.30	.59	107.6	109	95	264	64
4	11:22	2	142	.15	.29	108.2	109	95	261	64
5	11:24	2	142	.20	.39	108.9	110	94	271	66
6	11:26	2	142	.25	.49	109.617	111	94	268	66

RAMCON ENVIRONMENTAL CORPORATION

Plant HODGEMAN

Location FAIRMONT, MN.
Operator T. CROOK
Date 6-11-93
Run No. 1
Sample Box No. 1
Meter Box No. ANDERSEN # 26940
Meter H @ 1.919
C Factor 1.015
Pitot Tube Coefficient Cp .84



Schematic of Stack Cross Section

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature 75			
Barometric Pressure 29.91	FINAL	386	371.5
Assumed Moisture, % .18	INITIAL	200	364.8
Probe Length, m(ft) 5 FT	DIFFERENCE	186	6.7

Nozzle Identification No. .0002761
Avg. Calibrated Nozzle Dia., (in.) .225/.224/.22
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) .006 AT 8"
Probe Liner Material STAINLESS
Static Pressure, mm Hg (in. Hg) .25
Filter No. T.S. 00239

2 MIN POINT

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H_2O	PRESSURE DIFF. ORF. MTR in H_2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
1	10:17 / 10:19	2	139	.55	1.1	072.452 / 074.1	81	77	242	68
2	10:21	3	139	.75	1.4	075.4	87	77	245	66
3	10:23	3	139	.80	1.5	076.8	96	77	254	64
4	10:25	3	139	.75	1.4	078.1	100	78	252	62
5	10:27	3	139	.65	1.3	079.4	105	79	258	62
6	10:29	3	138	.65	1.3	080.6	108	80	271	62
1	10:31 / 10:33	5	139	1.5	2.9	082.3	106	83	245	63
2	10:35	5	139	1.7	3.3	084.2	110	83	243	60
3	10:37	5	140	1.6	3.1	086.1	117	84	243	59
4	10:39	5	140	1.5	2.9	088.0	119	86	242	59
5	10:41	5	139	1.5	2.9	089.9	122	87	239	58
6	10:43	5	140	1.3	2.5	091.6	123	89	235	58

Form #REC-05

SECTION F:

FIELD DATA

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

ISOKINETIC VARIATION

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

Where:

I	=	Percent isokinetic sampling.
100	=	Conversion to percent.
T_s	=	Absolute average stack gas temperature, °R.
0.002669	=	Conversion factor, Hg - ft³/ml - °R.
V_{ic}	=	Total volume 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.
ΔH	=	Average pressure differential across the orifice 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, ft².
Y_i	=	Calibration factor.

Run #1:

$$I = (100)\ (601) \left[\frac{(0.002669)\ (192.70) + \frac{(1.015)\ (36.665)}{561}\left[29.91 + \frac{1.37}{13.6}\right]}{60\quad (60.00)\quad (49.69)\quad (29.91)\quad (0.000276)} \right] = 102.0\%$$

Run #2:

$$I = (100)\ (603) \left[\frac{(0.002669)\ (200.40) + \frac{(1.015)\ (38.921)}{565}\left[29.91 + \frac{1.57}{13.6}\right]}{60\quad (60.00)\quad (53.39)\quad (29.91)\quad (0.000276)} \right] = 100.1\%$$

Run #3:

$$I = (100)\ (603) \left[\frac{(0.002669)\ (132.20) + \frac{(1.015)\ (35.657)}{567}\left[29.91 + \frac{1.25}{13.6}\right]}{60\quad (60.00)\quad (48.74)\quad (29.91)\quad (0.000276)} \right] = 92.6\%$$

Format: iR3/09-001

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

EMISSIONS RATE FROM STACK

$$E = \left[\frac{(C_s)\ (Q_{sd})}{7{,}000\ gr/lb} \right]$$

Where:

E = Emissions rate, lbs/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:

$$E = \frac{(0.0369)\ (2{,}027{,}538.1)}{7000} = 10.69\ lb/hr$$

Run #2:

$$E = \frac{(0.0371)\ (2{,}175{,}660.6)}{7000} = 11.54\ lb/hr$$

Run #3:

$$E = \frac{(0.0334)\ (2{,}147{,}898.4)}{7000} = 10.25\ lb/hr$$

Format: eR3/05-005

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

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_{stk} = Absolute stack temperature (°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 #1: Q_{sd} =

$$3600 \; (1 - 0.2058) \; (49.69) \; (16.25) \left[\frac{528}{601} \right] \left[\frac{29.91}{29.92} \right] = 2{,}027{,}538.1 \; \frac{dscf}{hr}$$

Run #2: Q_{sd} =

$$3600 \; (1 - 0.2042) \; (53.39) \; (16.25) \left[\frac{528}{603} \right] \left[\frac{29.91}{29.92} \right] = 2{,}175{,}660.6 \; \frac{dscf}{hr}$$

Run #3: Q_{sd} =

$$3600 \; (1 - 0.1551) \; (48.74) \; (16.25) \left[\frac{528}{592} \right] \left[\frac{29.91}{29.92} \right] = 2{,}147{,}898.4 \; \frac{dscf}{hr}$$

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

STACK GAS VELOCITY

$$V_s = K_p \quad C_p \quad [\sqrt{\Delta P}] \text{ avg} \quad \sqrt{\frac{T_s(\text{avg})}{P_s \quad M_s}}$$

Where:

V_s	=	Average velocity of gas stream in stack, ft/sec.
K_p	=	85.49 ft/sec [(g/g-mole) — (mm Hg)/(°K)(mm H_2O]$^{1/2}$
C_p	=	Pitot tube coefficient, dimensionless.
ΔP	=	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, °F.
T_s	=	Absolute stack temperature, °R. = 460 + t_s.
M_s	=	Molecular weight of stack gas, wet basis, lb/lb-mole.

Run #1:

$$V = (85.49)\ (0.84)\ (0.80)\ \sqrt{\frac{601}{(29.91)\ (26.86)}} = 49.69 \text{ ft/sec}$$

Run #2:

$$V = (85.49)\ (0.84)\ (0.86)\ \sqrt{\frac{603}{(29.91)\ (26.98)}} = 53.39 \text{ ft/sec}$$

Run #3:

$$V = (85.49)\ (0.84)\ (0.80)\ \sqrt{\frac{592}{(29.91)\ (27.50)}} = 48.74 \text{ ft/sec}$$

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

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:

$$M_s = 29.16 (1 - 0.2058) + 18 (0.2058) = 26.86 \frac{lb}{lb\text{-}mole}$$

Run #2:

$$M_s = 29.28 (1 - 0.2042) + 18 (0.2042) = 26.98 \frac{lb}{lb\text{-}mole}$$

Run #3:

$$M_s = 29.24 (1 - 0.1551) + 18 (0.1551) = 27.50 \frac{lb}{lb\text{-}mole}$$

Format: msR3/13-002

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

MOISTURE CONTENT OF STACK GASES

$$B_{ws} = \left[\frac{V_{wc_{std}} + V_{wsg_{std}}}{V_{wc_{std}} + V_{wsg_{std}} + V_{mstd}} \right] \times 100$$

Where:

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

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

Vwc_{std} = Volume of water vapor condensed, corrected to standard conditions, scf.

$Vwsg_{std}$ = Volume of water vapor collected in silica gel corrected to std. cond., scf.

Run 1:

$$B_{ws} = \frac{8.8 + 0.3}{8.8 + 0.3 + 35.118} \times 100 = 20.58\ \%$$

Run 2:

$$B_{ws} = \frac{9.2 + 0.3}{9.2 + 0.3 + 37.033} \times 100 = 20.42\ \%$$

Run 3:

$$B_{ws} = \frac{5.9 + 0.3}{5.9 + 0.3 + 33.781} \times 100 = 15.51\ \%$$

Format: bwsR3/19-001

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

WATER VAPOR CONDENSED

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

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

Where:

0.04707	=	Conversion factor, ft^3/ml.
0.04715	=	Conversion factor, ft^3/g.
Vwc_{std}	=	Volume of water vapor condensed (std. cond.), ml.
$Vwsg_{std}$	=	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)(°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) (186.00) = 8.8 cu. ft**

$V_{wsg(std)}$ = **(0.04715) (6.70) = 0.3 cu. ft**

Run 2:

$V_{wc(std)}$ = **(0.04707) (195.00) = 9.2 cu. ft**

$V_{wsg(std)}$ = **(0.04715) (5.40) = 0.3 cu. ft**

Run 3:

$V_{wc(std)}$ = **(0.04707) (125.00) = 5.9 cu. ft**

$V_{wsg(std)}$ = **(0.04715) (7.20) = 0.3 cu. ft**

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

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:

$$M_d = 0.44\ (3.0\%) + 0.32\ (17.0\%) + 0.28\ (.00\% + 80.0\%) = 29.16\ \frac{lb}{lb\text{-}mole}$$

Run #2:

$$M_d = 0.44\ (4.0\%) + 0.32\ (16.0\%) + 0.28\ (.00\% + 80.0\%) = 29.28\ \frac{lb}{lb\text{-}mole}$$

Run #3:

$$M_d = 0.44\ (3.7\%) + 0.32\ (16.3\%) + 0.28\ (.00\% + 80.0\%) = 29.24\ \frac{lb}{lb\text{-}mole}$$

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

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:

$$C_s^{`} = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{84.20}{35.118} \right] = 0.0369 \text{ gr/dscf}$$

Run #2:

$$C_s^{`} = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{89.30}{37.033} \right] = 0.0371 \text{ gr/dscf}$$

Run #3:

$$C_s^{`} = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{73.30}{33.781} \right] = 0.0334 \text{ gr/dscf}$$

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993
SOURCE: SCRUBBER

DRY GAS VOLUME

$$V_{m(std)} =$$

$$V_m \left[\frac{T_{(std)}}{T_m}\right] \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right] = 17.64 \frac{°R}{\in. Hg} \; Y \; V_m \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right]$$

Where:

$V_{m(std)}$	=	Dry gas volume through meter at standard conditions, ft^3.
V_m	=	Dry gas volume measured by meter, ft^3.
P_{bar}	=	Barometric pressure at orifice meter, in. Hg.
P_{std}	=	Standard absolute pressure, (29.92 in. Hg.).
T_m	=	Absolute temperature at meter, °R.
T_{std}	=	Standard absolute temperature, (528°R).
ΔH	=	Avg. pressure drop across orifice meter, in. H_2O.
Y	=	Dry gas meter calibration factor.
13.6	=	Inches of water per Hg.

Run #1:

$$V_{m(std)} = (17.64)\ (1.015)\ (36.665) \left[\frac{(29.91) + \frac{1.37}{13.6}}{561}\right] = 35.118 \quad \text{dscf}$$

Run #2:

$$V_{m(std)} = (17.64)\ (1.015)\ (38.921) \left[\frac{(29.91) + \frac{1.57}{13.6}}{565}\right] = 37.033 \quad \text{dscf}$$

Run #3:

$$V_{m(std)} = (17.64)\ (1.015)\ (35.657) \left[\frac{(29.91) + \frac{1.25}{13.6}}{567}\right] = 33.781 \quad \text{dscf}$$

Format: dgmR3/13-001

NAME: W. HODGMAN & SONS, INC.
LOCATION: FAIRMONT, MINNESOTA

DATE: JUNE 11, 1993

SUMMARY OF TEST DATA

			06-11-93 Run #1	06-11-93 Run #2	06-11-93 Run #3
		start	10:17	12:32	15:54
		finish	11:26	13:40	16:58
	SAMPLING TRAIN DATA				
1.	Sampling time, minutes	Θ	60.00	60.00	60.00
2.	Sampling nozzle diameter, inches	D_n	0.225	0.225	0.225
3.	Sampling nozzle cross-section area, ft²	A_n	0.000276	0.000276	0.000276
4.	Isokinetic variation	I	102.0	100.1	92.6
5.	Sample gas volume — meter condition, cf	V_m	36.665	38.921	35.657
6.	Average meter temperature, °R	T_m	561	565	567
7.	Average orifice pressure drop, inches H_2O	dH	1.37	1.57	1.25
8.	Total particulate collected, mg.	M_n	84.20	89.30	73.30
	VELOCITY TRAVERSE DATA				
9.	Stack area, ft²	A	16.25	16.25	16.25
10.	Absolute stack gas pressure, inches Hg.	P_s	29.91	29.91	29.91
11.	Barometric pressure, inches Hg.	P_{bar}	29.91	29.91	29.91
12.	Average absolute stack temperature, R°	T_s	601	603	592
13.	Average $\sqrt{}$vel. head, (C_p = .84)	$\sqrt{dP}$	0.80	0.86	0.80
14.	Average stack gas velocity, ft/second	V_s	49.69	53.39	48.74
	STACK MOISTURE CONTENT				
15.	Total water collected by train, ml	V_{ic}	192.70	200.40	132.20
16.	Moisture in stack gas, percent (%)	B_{ws}	20.58	20.42	15.51
	EMISSIONS DATA				
17.	Stack gas flow rate, dscf/hr	Q_{sd}	2,027,538.1	2,175,660.6	2,147,898.4
18.	Stack gas flow rate, cfm	acfm	48,448	52,055	47,522
19.	Particulate concentration, gr/dscf	C_s	0.0369	0.0371	0.0334
20.	Particulate concentration, lb/hr	E	10.69	11.54	10.25
	ORSAT DATA				
21.	Percent CO_2 by volume	CO_2	3.0	4.0	3.7
22.	Percent O_2 by volume	O_2	17.0	16.0	16.3
23.	Percent CO by volume	CO	0.0	0.0	0.0
24.	Percent N_2 by volume	N_2	80.0	80.0	80.0

SECTION E:

CALCULATIONS

HODGEMAN FAIRMONT, MN
Company Name

6-11-93
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:	$CO_2\%$	3	$CO_2\%$	3	$CO_2\%$	3	AVG.	3
	$O_2\%$	17	$O_2\%$	17	$O_2\%$	17	AVG.	17
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	
RUN 2:	$CO_2\%$	4	$CO_2\%$	4	$CO_2\%$	4	AVG.	
	$O_2\%$	16	$O_2\%$	16	$O_2\%$	16	AVG.	16
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	
RUN 3:	$CO_2\%$	4	$CO_2\%$	3	$CO_2\%$	4	AVG.	
	$O_2\%$	16	$O_2\%$	17	$O_2\%$	16	AVG.	
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	

MINNESOTA BACK-HALF ANALYSIS

CHLOROFORM-ETHER EXTRACTION

Plant Location Hodgeman, Fairmont, Mn. Date 6/15/93

Sample Location _____ Relative Humidity in lab 55 %

Blank Volume (V_a) 150 ml

Date/Time wt. blank 6/16 2:00p Gross wt. 125.6496 g

Date/Time wt. blank 6/17 8:00A Gross wt. 125.6492 g

Ave. Gross wt. 125.6494 g

Tare wt. 125.6490 g

Weight of blank Extract .0004 g

		Run # 1	Run # 2	Run # 3
Impinger rinse volume	ml	390	500	650
Date/Time of wt 6/16 2:00p Gross wt	g	164.6637	159.0869	163.6276
Date/Time of wt 6/17 8:00A Gross wt	g	164.6635	159.0865	163.6272
Average Gross wt	g	164.6636	159.0867	163.6274
Tare wt	g	164.6621	159.0847	163.6142
Less Extract blank wt	g	.0004	.0004	.0004
Wt of particulate in impinger rinse (m_a)	g	.0011	.0016	.0128

Remarks: _____

Signature of Analyst Thomas Smith Signature of Reviewer _____

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Form REC#8

SAMPLE ANALYTICAL DATA FORM

Company Name Hodgeman

Sample Location Fairmont MN.

Blank Volume (V_a) 100 ml

Date/Time wt. blank 6/16 8:00A

Date/Time wt. blank 6/16 3:00P

Relative Humidity in Lab 50 %

Density of Acetone (ρ_a) .7857 mg/ml

Gross wt. 101.6043 g

Gross wt. 101.6042 g

Ave. Gross wt. 101.6043 g

Tare wt. 101.6042 g

Weight of blank (m_{ab}) .0001 g

Acetone blank residue concentration (C_a) : (C_a) = (m_{ab}) / (V_a) (ρ_a) = (.000001 mg/g)

Acetone Blank Wt. : $W_a = C_a V_{aw} \rho_a$ = (.000001)(450)(.7857) = (.0004 g)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	450	450	450
Date/Time of wt. 6/16 8:00A Gross wt.	g	161.7862	169.8387	155.9405
Date/Time of wt. 6/16 3:00P Gross wt.	g	161.7859	169.8388	155.9400
Average Gross wt.	g	161.7861	169.8388	155.9403
Tare wt.	g	161.7574	169.8167	155.9305
Less Acetone blank wt. (W_a)	g	.0004	.0004	.0004
Weight of particulate in acetone rinse (m_a)	g	.0283	.0217	.0094

Filter Numbers	#	TS00234	TS6520	TS6521
Date/Time of wt. 6/16 8:00A Gross wt.	g	.6300	.6236	.6091
Date/Time of wt. 6/16 3:00P Gross wt.	g	.6301	.6231	.6087
Average Gross wt.	g	.6301	.6234	.6089
Tare wt.	g	.5753	.5574	.5578

Weight of particulate on filter (m_f)	g	.0548	.0660	.0511
Weight of particulate in acetone rinse (m_a)	g	.0283	.0217	.0094
Total weight of particulate (m_n)	g	.0831	.0877	.0605

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 [illegible]

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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.

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.

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.

SECTION D:

LABORATORY PROCEDURES AND RESULTS

VISIBLE EMISSIONS EVALUATION

This is to certify that

Chad Hughes

did complete a course in the opacity method of determining visible emissions from sources as specified by Federal Reference Method "9" conducted by Carl Koontz & Associates of Nashville, Tennessee.

Carl Koontz
Course Moderator

Memphis, TN
Location

May 24, 1993
Date

CARL KOONTZ & ASSOCIATES

of Nashville, Tennessee

This is to acknowledge that

CHAS HUGHES

successfully participated in Visible Emissions training on May 24, 1993

and is qualified to evaluate Visible Emissions for a period of six (6) months from the date of certification.

Carl Koontz

Instructor