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: 321

Title: Source Sampling For Particulate Emissions, Walls Bros. Asphalt Corp., Ansonia, OH,

Ramcon Environmental Corp., Memphis, TN,

October 29, 1992.

AP-42 Section 11.1
Reference
Report Sect. 4
Reference ~~320~~ 321

APPENDIX K

OEPA STACK TEST REVIEW SUMMARY FORM

APPLICATION NUMBER 0819010076 P001
FACILITY NAME Walls Bros Asphalt Co
SOURCE DESCRIPTION (OR SCC CODE) Asphaltic Concrete Batch Plant
CONTROL EQUIPMENT Baghouse

DATE(S) OF TEST 10-29-92
FINAL TEST REPORT RECEIVED ON 11-16-92
POLLUTANT(S) TESTED PM
TEST METHOD Method 5
TEST FIRM RAMCON
EMISSION RATES*:
ACTUAL (lb(s)/hr) .0108 gr/DSCF ALLOWABLE** .04 gr/DSCF
OPERATING RATES*:
DURING TEST** 218 Tn/hr MAXIMUM** 220 Tn/hr
EMISSION FACTOR***
COMMENTS:

I HEREBY VERIFY THAT THE INFORMATION CONTAINED WITHIN THE STACK TEST REPORT HAS BEEN REVIEWED AND IT HAS BEEN DETERMINED THAT THE TEST PROCEDURES, ANALYSES AND CALCULATIONS ARE:

[X] AN ACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

[ ] AN UNACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

12-2-92
DATE OF REVIEW

Jon Hilty
REVIEWED BY

* BASED ON 3 RUN AVERAGE
** SPECIFY APPLICABLE UNITS
***SPECIFY IN UNITS OF MASS/INPUT

==========

PARTICULATE EMISSION TEST DATA

FACILITY :walls bros asphalt
PROCESS/RUN NUMBER :
SOURCE/RUN :1
TEST DATE :10-29-92

****

VOLUME METERED AT STD. CONDITIONS	= 41.45567745431394 DSCF
VOLUME WATER COLLECTED AT STP.	= 10.317744 SCF
PERCENT MOISTURE BY VOLUME	= 19.92865008758329 %
MOLECULAR WEIGHT OF STACK GAS	= 27.05382767729678 LB/LB-MOL
PERCENT EXCESS AIR	= 121.6160338579038 %
AVERAGE STACK GAS VELOCITY	= 34.30248721348716 FT/SEC
ABSOLUTE STACK PRESSURE	= 29.2 IN. HG
STACK FLOW RATE AT ACTUAL COND.	= 40405.5857385108 ACFM
STACK FLOW RATE AT STD. COND.	= 24047.32399675862 DSCFM
STACK EMISSIONS	= 1.456205849404543E-002 GR/DSCF
	= 2.080918158799092E-006 LB/DSCF
STACK EMISSION RATE	= 3.002430790522811 LB/HR
ISOKINETIC VARIATION	= 97.91682710849935 %

****

TIME OF TEST	= 60 MIN
VOLUME METERED	= 44.474 CU.FT
DRY GAS METER CALB. FACT.	= .994
TEST BAR. PRESSURE	= 29.2 IN HG
AVERAGE DELTA H	= 1.97
AVG. METER TEMP.	= 92 DEG. F
VOL. H2O (IMPINGERS)	= 212 ML
WEIGHT GAIN OF SILICA GEL	= 7.2 GM
%CO2	= 5.17 %
%CO	= 0 %
%O2	= 12 %
%N2	= 82.83 %
STATIC P OF STACK	= 0 IN. H2O
STACK TEMP.	= 233 DEG. F
PITOT COEFFICIENT	= .84
AVG. ROOT DELTA P	= .51
STACK DIAMETER	= 60 IN.
MASS PARTICULATE	= 39.2 MG
NOZZLE DIAMETER	= .325 IN

****

PARTICULATE EMISSION TEST DATA

FACILITY :walls bros asphalt
PROCESS/RUN NUMBER :
SOURCE/RUN :2
TEST DATE :10-29-92

****

VOLUME METERED AT STD. CONDITIONS	= 47.05668165348172 DSCF
VOLUME WATER COLLECTED AT STP.	= 11.541564 SCF
PERCENT MOISTURE BY VOLUME	= 19.69609136125091 %
MOLECULAR WEIGHT OF STACK GAS	= 26.98343765159958 LB/LB-MOL
PERCENT EXCESS AIR	= 111.5559328255483 %
AVERAGE STACK GAS VELOCITY	= 38.77866769908602 FT/SEC
ABSOLUTE STACK PRESSURE	= 29.2 IN. HG
STACK FLOW RATE AT ACTUAL COND.	= 45678.1682561074 ACFM
STACK FLOW RATE AT STD. COND.	= 27663.43415648498 DSCFM
STACK EMISSIONS	= 8.312528343593011E-003 GR/DSCF
	= 1.187860300299441E-006 LB/DSCF
STACK EMISSION RATE	= 1.971617712266164 LB/HR
ISOKINETIC VARIATION	= 96.61733107057513 %

****

TIME OF TEST	= 60 MIN
VOLUME METERED	= 50.7 CU.FT
DRY GAS METER CALB. FACT.	= .994
TEST BAR. PRESSURE	= 29.2 IN HG
AVERAGE DELTA H	= 2.42
AVG. METER TEMP.	= 95 DEG. F
VOL. H2O (IMPINGERS)	= 240 ML
WEIGHT GAIN OF SILICA GEL	= 5.2 GM
%CO2	= 4.5 %
%CO	= 0 %
%O2	= 11.67 %
%N2	= 83.83 %
STATIC P OF STACK	= 0 IN. H2O
STACK TEMP.	= 223 DEG. F
PITOT COEFFICIENT	= .84
AVG. ROOT DELTA P	= .58
STACK DIAMETER	= 60 IN.
MASS PARTICULATE	= 25.4 MG
NOZZLE DIAMETER	= .325 IN

****

==========

PARTICULATE EMISSION TEST DATA

FACILITY :walls bros asphalt
PROCESS/RUN NUMBER :
SOURCE/RUN :3
TEST DATE :10-29-92

****

VOLUME METERED AT STD. CONDITIONS	= 48.53471680002135 DSCF
VOLUME WATER COLLECTED AT STP.	= 12.148767 SCF
PERCENT MOISTURE BY VOLUME	= 20.01989048624088 %
MOLECULAR WEIGHT OF STACK GAS	= 26.83940170346066 LB/LB-MOL
PERCENT EXCESS AIR	= 56.38280528232161 %
AVERAGE STACK GAS VELOCITY	= 39.61084066610239 FT/SEC
ABSOLUTE STACK PRESSURE	= 29.2 IN. HG
STACK FLOW RATE AT ACTUAL COND.	= 46658.40143741533 ACFM
STACK FLOW RATE AT STD. COND.	= 28060.97200990099 DSCFM
STACK EMISSIONS	= 9.645878885602029E-003 GR/DSCF
	= 1.37839609275253E-006 LB/DSCF
STACK EMISSION RATE	= 2.320748050637138 LB/HR
ISOKINETIC VARIATION	= 98.24036188133071 %

****

TIME OF TEST	= 60 MIN
VOLUME METERED	= 51.9 CU.FT
DRY GAS METER CALB. FACT.	= .994
TEST BAR. PRESSURE	= 29.2 IN HG
AVERAGE DELTA H	= 2.54
AVG. METER TEMP.	= 91 DEG. F
VOL. H2O (IMPINGERS)	= 258.1 ML
WEIGHT GAIN OF SILICA GEL	= 0 GM
%CO2	= 4.5 %
%CO	= 0 %
%O2	= 8.300000000000001 %
%N2	= 87.2 %
STATIC P OF STACK	= 0 IN. H2O
STACK TEMP.	= 225 DEG. F
PITOT COEFFICIENT	= .84
AVG. ROOT DELTA P	= .59
STACK DIAMETER	= 60 IN.
MASS PARTICULATE	= 30.4 MG
NOZZLE DIAMETER	= .325 IN

****

PARTICULATE EMISSION TEST REVIEW SHEET

1. Facility Name: Walls Bros.
2. Run Number: 1
3. Test Date: 10-29-91
4. Time of Test: 60 ~~50.7~~ ~~54.9~~ (min)
5. Volume Metered: 44.474 50.7 51.9 (ft^3)
6. Dry Gas Meter Calb. Factor: .994
7. Test Barometric Pressure: 29.2 (in. Hg)
8. Avg. Delta H: 1.97 2.42 2.54 (in. H_2O)
9. Avg. Meter Temp: 92 15 91 (Deg. F)
10. Volume H_2O (Impingers): 2 2 240 258.1 (ML)
11. Weight Gain of Silica Gel: 7.2 5.2 — (GM)
12. % CO_2: 5.17 4.5 4.5
13. % CO: — —
14. % O_2: 12 11.67 8.3
15. % N_2: 82.53 83.83 87.2
16. Static Pressure of Stack: 0 (in. H_2O)
17. Stack Temp: 233 223 225 (Deg. F)
18. Pitot Coefficient: .84
19. Avg. Root Delta P: .51 .58 .59
20. Stack Diameter: 60 (in.)
21. Mass Particulate: 39.2 25.4 30.4 (mg)
22. Nozzle Diameter: .325 (in.)

Coal Data

1. % Hydrogen: _____
2. % Carbon: _____
3. % Sulfur _____
4. % Nitrogen: _____
5. % Oxygen: _____
6. F Factor: _____
7. Gross Calorific Value: _____

SOURCE SAMPLING
for
PARTICULATE EMISSIONS

WALLS BROS. ASPHALT CORP.
ANSONIA, OHIO
October 29, 1992

Perry Walls
Walls Bros. Asphalt Corp.

William Joseph Sewell, II
Vice President

RAMCON

ENVIRONMENTAL CORPORATION

November 6, 1992

Mr. Perry Walls
Walls Bros. Asphalt Corp.
10920 Coletown-Lightville
Ansonia, Ohio 45303

RE: Particulate Emissions Test: October 29, 1992

Dear Mr. Walls:

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

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

Mr. Chris Hocket
Ohio EPA — Air Quality
451 W. Third Street
Dayton, Ohio 45422

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 38134
TELEPHONE 800/458-4567 IN TENNESSEE 901/387-0500 FAX 901/387-0400

RAMCON

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SECTION A.

1. INTRODUCTION

On October 29, 1992 personnel from RAMCON Environmental Corporation conducted a source emissions test for particulate emissions compliance at Walls Bros. Asphalt Corp.'s Gentec batch-mix asphalt plant located in Ansonia, Ohio. RAMCON personnel conducting the test were Mike Winkler and Shane Byrum. 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. 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 Ohio.

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 Ohio are the same as those set by EPA.

Mr. Jerry Adams of Ohio's Environmental Protection Agency observed the testing conducted by RAMCON Environmental.

SUMMARY OF TEST RESULTS

TABLE I

October 29, 1992

Test Run	Time	Actual ~~Allowable~~ Emissions gr/dscf	Isokinetic Variation	Emissions lbs/hr
1	11:25 - 12:30	.0146	97.9%	3.01
2	14:00 - 15:05	.0083	96.7%	1.97
3	15:55 - 17:00	.0096	98.2%	2.30
	Average:	.0108		2.43

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 Ohio. Therefore, the plant is operating in compliance with State and Federal Standards.

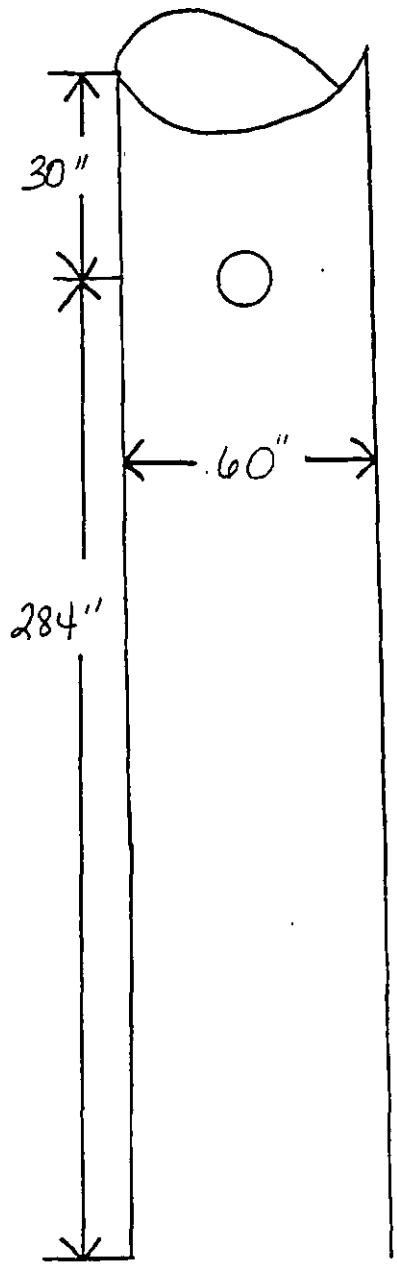
3. TEST PROCEDURES

(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 60". The sampling ports were placed 90° apart, 30" down (.5 diameters upstream) from the top of the stack and 284" up (4.7 diameters downstream) from the last flow disturbance. Twenty-four (24) points were sampled, twelve (12) through each traverse for 2.5 minutes each for a total testing time of 60 minutes.

Points on a Diameter	Probe Mark
1.3	10.3"
4.0	13.0"
7.1	16.1"
10.6	19.6"
15.0	24.0"
21.3	30.3"
38.7	47.7"
45.0	54.0"
49.4	58.4"
52.9	61.9"
55.9	64.9"
58.7	67.9"



B. THE SOURCE

Walls Bros. Asphalt Corp. employs a ~~Gentee~~ Madsen/H+B batch-mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt oil to bind the mixture together. After the hot asphalt mix is manufactured at the plant, it is transported to the location where it is to be applied. The hot asphalt mix is spread evenly over the surface with a paver 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 directly into the pugmill. The dried aggregate is pulled by a bucket elevator to the top of a gradation control unit which separates and stores the aggregate by size. The required amount of each aggregate is dispensed into a weigh-hopper and from there into a pugmill where the hot liquid asphalt pavement is mixed thoroughly with the aggregate. The hot asphalt mix is then discharged from the storage silo through a slide gate into waiting dump trucks which 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 ~~No. 4~~ JB specification 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 baghouse. The exhaust gas is drawn through the baghouse and discharged to the atmosphere through the stack. The design pressure drop across the tube sheet is 2 - 6 inches of water. The particulate matter, which is removed by the baghouse, is reinjected into the pugmill.

Form ...#0...

DATA ON FACILITY BEING STACK TESTED

TODAY'S DATE: 10-29-92

COMPANY NAME Wallo Asphalt COMPANY REP. _____ PHONE ( ) _____

LOCATION OF FACILITY _____ ORIGINAL START-UP DATE _____ DESIGNED CAPACITY _____

OEM _____ MODEL NO. _____ TYPE _____ AC TYPE _____

1 Time (24 HR) NOTE: check small box in column when moisture sample is taken	2 Fuel Use #Fuel Oil Nat. Gas Propane Coal ~~Fuel~~ waste oil other off specification	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 Venturi Scrubber / Baghouse Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position
		96%		215		5.7	360	284	4.2				65
		96%		220		5.69	350	285	5.1				64
		96%		215		5.71	345	293	4.0				65
		96%		220		5.7	350	290	5.7				70
		96%		220		5.69	350	292	5.3				69
		96%		215		5.7	340	269	5.3				61
		96%		220		5.68	320	284	5.5				66
		96%		220		5.7	324	282	4.8				62
		96%		220		5.68	360	280	5.8				66
		96%		220		5.7	366	278	5.0				65
		96%		220		5.72	358	275	5.0				58
		96%		220		5.70	350	285	4.5				60
		96%		220		5.69	340	289	4.8				65
		96%		220		5.7	335	288	5.2				69
		96%		220		5.68	343	289	5.8				68

DATA SUMMARY ON STACK BEING TESTED

AGGREGATE

1. Name/type of mix 402 Surface
2. Name/type of 2nd mix (if used) _____
3. Type/temperature of Liquid Asphalt AC-20 / 300 °F
4. Sieve/Screening analysis: 100 % Passing; _____ Moisture on Aggregate

	1st mix / 2nd mix		1st mix / 2nd mix		1st mix / 2nd mix
1"	100 / ___	3/8"	61 / ___	#	___ / ___
3/4"	98 / ___	#200	5.0 / ___	#	___ / ___
1/2"	76 / ___	#	___ / ___	#	___ / ___

CONTROL SYSTEM

Manufacturer: Gentec

A. Baghouse:

1. Type of bags: Nomex # of bags 685 Sq. ft. of bags 11,343
2. Air to cloth ratio: _____ Designed ACFM 66,000
3. Type of cleaning - pulse jet ✓ reverse air ___ plenum pulse ___ other ___
4. Cleaning cycle time: 3 Interval between cleaning cycle: 15
5. Pulse pressure on cleaning cycle: 80 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: _____

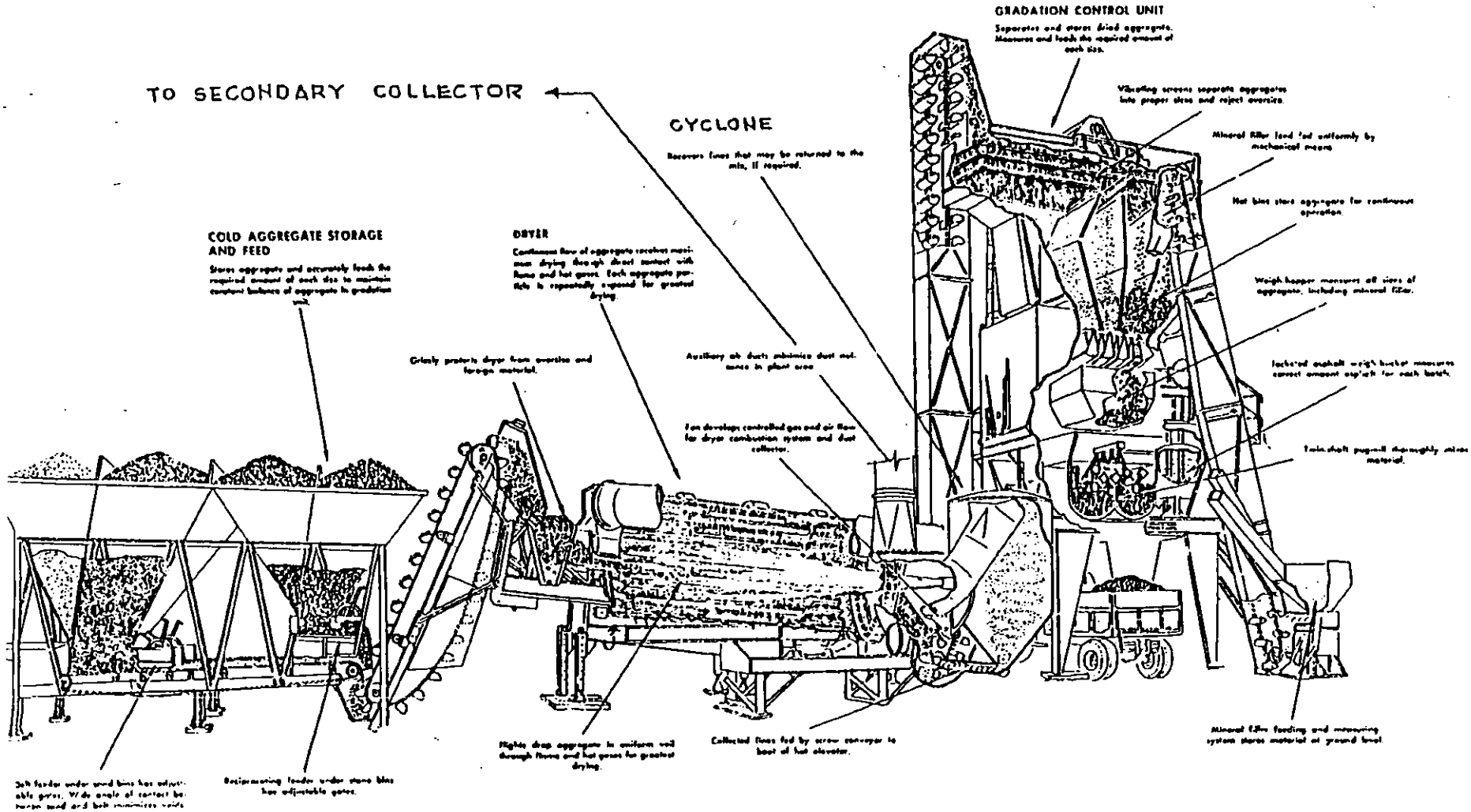
Company Name: _____ Date: _____

Company Representative: _____

D:\DONNA\FORMS\REC04.FRM

Figure 4-1

ASPHALT BATCH MIX PLANT - AN EXPLODED VIEW



Source: Asphalt Plant Manual, The Asphalt Institute, 1967

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

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).

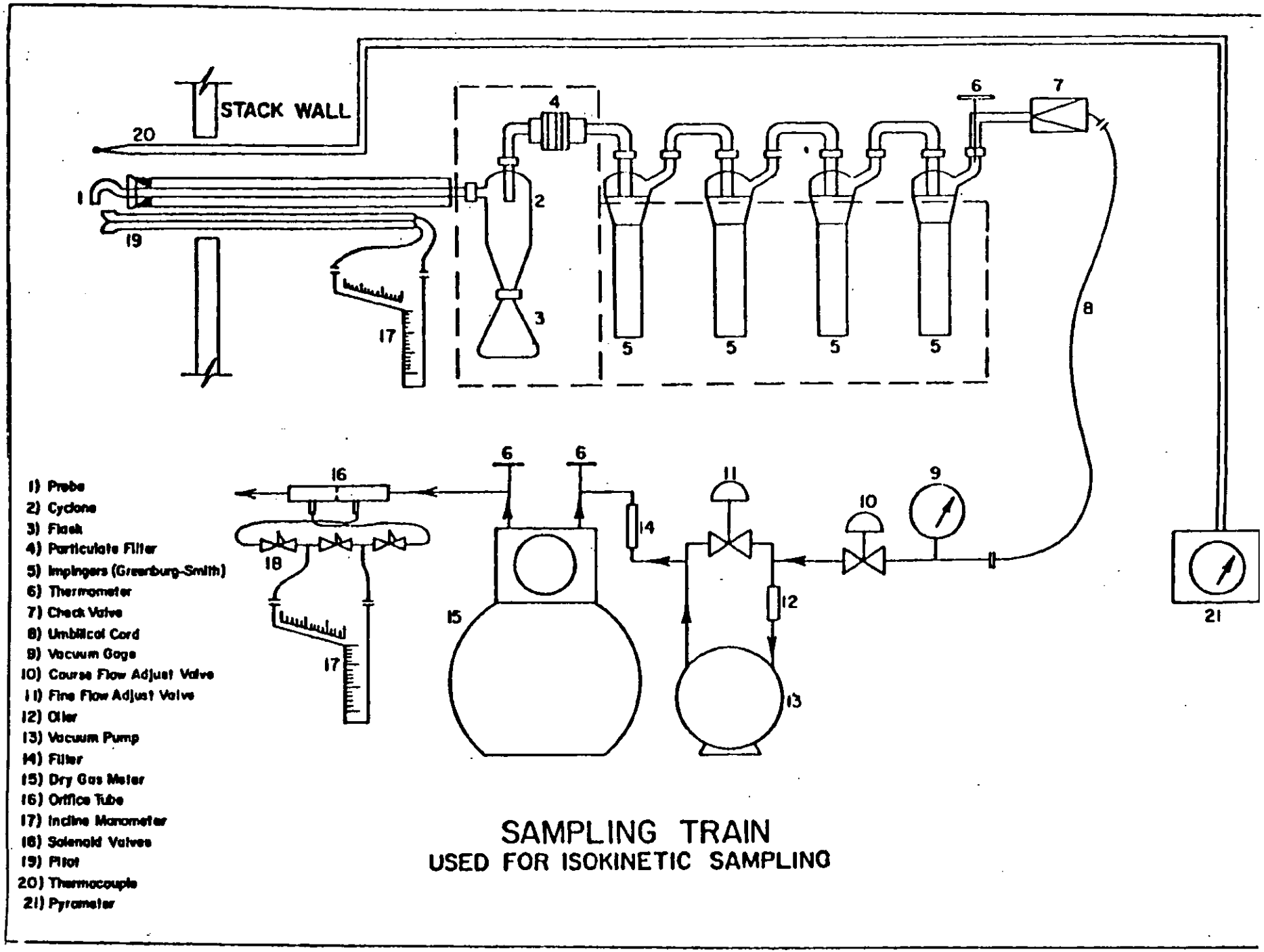
B. An Airguide Instruments Model 211-B (uncorrected) aneroid barometer for checking the barometric pressure.

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.



SAMPLING TRAIN
USED FOR ISOKINETIC SAMPLING

LABORATORY PROCEDURES FOR PARTICULATE SAMPLING

I. Field Preparation

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

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

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

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

II. Post - Testing Lab Analysis

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

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

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

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

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

SPECIAL NOTE

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

WEIGHING PROCEDURE - SARTORIUS ANALYTICAL BALANCE

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

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

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

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

Form REC#8

SAMPLE ANALYTICAL DATA FORM

Company Name WALLS BROS.

Sample Location

Relative Humidity in Lab 55 %

Blank Volume (V_a) 100 ml

Density of Acetone (ρ_a) .7857 mg/ml

Date/Time wt. blank 11/2 8:00A

Date/Time wt. blank 11/3 9:00A

Gross wt. 99.2861 g

Gross wt. 99.2861 g

Ave. Gross wt. 99.2861 g

Tare wt. 99.2860 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)(400)(.7857) = (.0003 g)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	400	400	400
Date/Time of wt. 11/2 8:00A Gross wt.	g	98.3531	98.7470	104.6518
Date/Time of wt. 11/3 9:00A Gross wt.	g	98.3530	98.7470	104.6515
Average Gross wt.	g	98.3531	98.7470	104.6517
Tare wt.	g	98.3195	98.7250	104.6295
Less Acetone blank wt. (W_a)	g	.0003	.0003	.0003
Weight of particulate in acetone rinse (m_a)	g	0.0333	0.0217	0.0219

Filter Numbers	#	TS6438	TS6437	TS6436
Date/Time of wt. 11/2 8:00A Gross wt.	g	.6865	.7203	.7214
Date/Time of wt. 11/3 9:00A Gross wt.	g	.6860	.7202	.7212
Average Gross wt.	g	.6863	.7203	.7213
Tare wt.	g	.6804	.7166	.7128

Weight of particulate on filter (m_f)	g	0.0059	0.0037	0.0085
Weight of particulate in acetone rinse (m_a)	g	0.0333	0.0217	0.0219
Total weight of particulate (m_n)	g	0.0392	0.0254	0.0304

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 WJB

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

Wells Bros
Company Name

10/29
Date

REFERENCE METHOD 3: GAS ANALYSIS BY PYRITE

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%	$CO_2\%$	5%	$CO_2\%$	5.5%	AVG.	5.167%
	$O_2\%$	12%	$O_2\%$	12%	$O_2\%$	12%	AVG.	12%
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	
RUN 2:	$CO_2\%$	4%	$CO_2\%$	5%	$CO_2\%$	4.5%	AVG.	4.5%
	$O_2\%$	11.5%	$O_2\%$	12%	$O_2\%$	11.5%	AVG.	11.67%
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	
RUN 3:	$CO_2\%$	4.5%	$CO_2\%$	5%	$CO_2\%$	4%	AVG.	4.5
	$O_2\%$	11.5%	$O_2\%$	12%	$O_2\%$	11.5%	AVG.	8.3
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	

WALLS BROS.
GREENVILLE, OHIO

SUMMARY OF TEST DATA

		10-29-92 RUN #1	10-29-92 RUN #2	10-29-92 RUN #3
SAMPLING TRAIN DATA				
	start	11:25	14:00	15:55
	finish	12:30	15:05	17:00
1. Sampling time, minutes	θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.3250	.3250	.3250
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000576	.000576	.000576
4. Isokinetic variation	I	97.9	96.7	98.2
5. Sample gas volume - meter cond., cf.	V_m	44.474	50.700	51.900
6. Average meter temperature, ^oR	T_m	552	555	551
7. Avg. oriface pressure drop, in. H_2O	dH	1.97	2.42	2.54
8. Total particulate collected, mg.	M_n	39.20	25.40	30.40
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2	A	19.60	19.60	19.60
10. Absolute stack gas pressure, in. Hg.	P_s	29.20	29.25	29.20
11. Barometric pressure, in. Hg.	P_{bar}	29.20	29.25	29.20
12. Avg. absolute stack temperature, R^o	T_s	693	683	685
13. Average $-\sqrt{vel.\ head}$, (C_p= .84)	$-\sqrt{dP}$	0.51	0.58	0.59
14. Average stack gas velocity, ft./sec.	V_s	34.30	38.73	39.62
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	219.20	245.20	258.10
16. Moisture in stack gas, %	B_{ws}	19.90	19.61	20.09
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1441	1660	1680
18. Stack gas flow rate, cfm	acfm	40337	45546	46593
19. Particulate concentration, gr/dscf	C_s	0.0146	0.0083	0.0096
20. Particulate concentration, lb/hr	E	3.01	1.97	2.30
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	5.17	4.50	4.50
23. Percent O_2 by volume	O_2	12.00	11.67	8.30
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	82.83	83.83	87.20

Format: summryR3

WALLS BROS.
GREENVILLE, OHIO

Dry Gas Volume

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

Where:

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

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

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

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

T_m = Absolute temperature at meter ^oR.

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

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

Y = Dry gas meter calibration factor.

13.6 = Inches water per inches Hg.

RUN 1:

$$V_{m(std)} = (17.64)(\ .994)(\ 44.474)\left[\frac{(29.20) + \frac{1.97}{13.6}}{552}\right] = 41.456 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(\ .994)(\ 50.700)\left[\frac{(29.25) + \frac{2.42}{13.6}}{555}\right] = 47.137 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(\ .994)(\ 51.900)\left[\frac{(29.20) + \frac{2.54}{13.6}}{551}\right] = 48.535 \text{ dscf}$$

Format: dgmR3

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GREENVILLE, OHIO

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:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{39.20}{41.456} \right] = 0.0146 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{25.40}{47.137} \right] = 0.0083 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{30.40}{48.535} \right] = 0.0096 \text{ gr./dscf.}$$

Format: csR3

WALLS BROS.
GREENVILLE, OHIO

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:

$$M_d = 0.44(5.17\%) + 0.32(12.00\%) + 0.28(.00\% + 82.83\%) = 29.31 \frac{lb}{lb\text{-}mole}$$

Run 2:

$$M_d = 0.44(4.50\%) + 0.32(11.67\%) + 0.28(.00\% + 83.83\%) = 29.19 \frac{lb}{lb\text{-}mole}$$

Run 3:

$$M_d = 0.44(4.50\%) + 0.32(8.30\%) + 0.28(.00\% + 87.20\%) = 29.05 \frac{lb}{lb\text{-}mole}$$

Format: mdR3

WALLS BROS.
GREENVILLE, OHIO

Water Vapor Condensed

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

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

Where:

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

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

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

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

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

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

p_w = Density of water, 0.002201 lb/ml.

R = Ideal gas constant, 21.85 in.Hg. (cu.ft./lb.-mole)(^oR).

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

T_{std} = Absolute temperature at standard conditions, 528^oR.

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

Run 1:

$V_{wc(std)}$ = (0.04707) (212.0) = 10.0 cu.ft
$V_{wsg(std)}$ = (0.04715) (7.2) = 0.3 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (240.0) = 11.3 cu.ft
$V_{wsg(std)}$ = (0.04715) (5.2) = 0.2 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (250.0) = 11.8 cu.ft
$V_{wsg(std)}$ = (0.04715) (8.1) = 0.4 cu.ft

Format: vaporR3

WALLS BROS.
GREENVILLE, OHIO

Moisture Content of Stack Gases

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

Where:

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

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

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

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

Run 1:

$$B_{ws} = \frac{10.0 + 0.3}{10.0 + 0.3 + 41.456} \times 100 = 19.90\ \%$$

Run 2:

$$B_{ws} = \frac{11.3 + 0.2}{11.3 + 0.2 + 47.137} \times 100 = 19.61\ \%$$

Run 3:

$$B_{ws} = \frac{11.8 + 0.4}{11.8 + 0.4 + 48.535} \times 100 = 20.09\ \%$$

Format: bwsR3

WALLS BROS.
GREENVILLE, OHIO

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 = 29.31 (1 - 19.90) + 18 (19.90) = 27.06 (lb./lb.-mole)

Run 2:

M_s = 29.19 (1 - 19.61) + 18 (19.61) = 27.00 (lb./lb.-mole)

Run 3:

M_s = 29.05 (1 - 20.09) + 18 (20.09) = 26.83 (lb./lb.-mole)

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GREENVILLE, OHIO

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 $\boxed{(g/g\text{-mole})\text{-}(mm\ Hg)}$ / $(^oK)(\ mm\ \boxed{H_2O})^{1/2}$
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, (^of).
T_s	=	Absolute stack temperature, (^oR). = 460 + t_s.
M_s	=	Molecular weight of stack gas, wet basis, (lb/lb-mole).

Run 1:

$$V = (85.49)\ (\ .84)\ (\ 0.51) \sqrt{\frac{693}{(29.20)(27.06)}} = 34.30 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (\ .84)\ (\ 0.58) \sqrt{\frac{683}{(29.25)(27.00)}} = 38.73 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ .84)\ (\ 0.59) \sqrt{\frac{685}{(29.20)(26.83)}} = 39.62 \text{ ft/sec.}$$

Format: vsR3

WALLS BROS.
GREENVILLE, OHIO

Stack Gas Flow Rate

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

Where:

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

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

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

t_s = Stack temperature, (^of).

T_s = Absolute stack temperature, (^oR).

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

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

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

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

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

Run 1:

$$Q_{sd}=3600(1-\ .1990\ )(\ 34.30)(\ 19.60)\left[\frac{528}{693}\right]\left[\frac{29.20}{29.92}\right] = 1441475.2\ \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1-\ .1961\ )(\ 38.73)(\ 19.60)\left[\frac{528}{683}\right]\left[\frac{29.25}{29.92}\right] = 1660296.3\ \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1-\ .2009\ )(\ 39.62)(\ 19.60)\left[\frac{528}{685}\right]\left[\frac{29.20}{29.92}\right] = 1680501.1\ \frac{dscf}{hr}$$

Format: qR3

WALLS BROS.
GREENVILLE, OHIO

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:

$$E = \frac{(0.0146)(1441475.2)}{7000} = 3.01 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(0.0083)(1660296.3)}{7000} = 1.97 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0096)(1680501.1)}{7000} = 2.30 \text{ lb. / hr.}$$

WALLS BROS.
GREENVILLE, OHIO

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

Run 1:

$$I = (100)(\ 693\ ) \left[\frac{(0.002669)(219.20) + \frac{44.474}{552} \left[29.20 + \frac{1.97}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 34.30\ )\ (\ 29.20\ )\ (\ .000576\ )} \right] = 97.9\%$$

Run 2:

$$I = (100)(\ 683\ ) \left[\frac{(0.002669)(245.20) + \frac{50.700}{555} \left[29.25 + \frac{2.42}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 38.73\ )\ (\ 29.25\ )\ (\ .000576\ )} \right] = 96.7\%$$

Run 3:

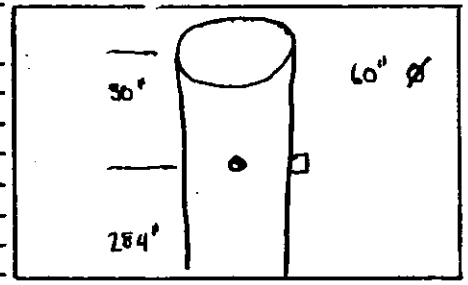
$$I = (100)(\ 685\ ) \left[\frac{(0.002669)(258.10) + \frac{51.900}{551} \left[29.20 + \frac{2.54}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 39.62\ )\ (\ 29.20\ )\ (\ .000576\ )} \right] = 98.2\%$$

Format: iR3

RAMCON ENVIRONMENTAL CORPORATION

Plant Walls Bros

Location Greenville, OH
Operator mw
Date 10/29
Run No. 1
Sample Box No.
Meter Box No. Andersen
Meter H @ 1.901
C Factor .994
Pitot Tube Coefficient Cp .84



Schematic of Stack Cross Section

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature 53			
Barometric Pressure 29.2	FINAL	912	329.6
Assumed Moisture, % 21	INITIAL	200	322.4
Probe Length, m(ft) 6	DIFFERENCE	212	7.2

Nozzle Identification No. .000576
Avg. Calibrated Nozzle Dia., (in.) .325/.325/.325
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) .02 @ 9"
Probe Liner Material Stainless
Static Pressure, mm Hg (in. Hg)
Filter No. TS 6438

.703

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts)	VELOCITY HEAD (Ps)	PRESSURE DIFF. ORF. MTR	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F		FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1-1	11:25 / 11:27.30	2	222°	.10	.703	959.100 / 961.9	71°	69°	240°	60°
2	11:30	3	230°	.13	.91	962.32	78°	69°	252°	54
3	11:32.30	3	231°	.22	1.55	964.01	87°	69°	264°	51°
4	11:35	3	230°	.22	1.55	965.18	91°	69°	267°	49°
5	11:37.30	4	230°	.28	1.96	967.6	95°	69°	261°	48°
6	11:40	4	233	.31	2.17	969.63	103°	71°	256°	48°
7	11:42.30	5	232°	.42	2.95	971.96	109°	73°	249°	48°
8	11:45	5	231°	.40	2.81	974.32	112°	74°	250°	50°
9	11:47.30	5	232°	.34	2.4	976.38	112°	76°	249°	50°
10	11:50	5	234°	.43	3.02	978.7	114°	78°	248°	49°
11	11:52.30	4	232°	.31	2.17	980.8	115°	79°	250°	50
12	11:55	4	233°	.31	2.17	982.692	115°	81°	250°	51°

.699

Form #REC-05

WALLS1

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 10/29 LOCATION Wells TEST NO. 1

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP [redacted]	VELOCITY HEAD [redacted]	ORFICE DIFF. PRESSURE [redacted]	GAS VOLUME Vm (ft.^{3})	GAS SAMPLE TEMP. (°F) [redacted]	GAS SAMPLE TEMP. (°F) [redacted]	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
B 2-1	12:00 / 12:023	5	230°	.32	2.20	984.72	91°	83°	257°	51°
2	12:05	5	231°	.41	2.85	987.03	107°	82°	256°	47°
3	12:07.30	5	231°	.41	2.88	989.35	111°	83°	256°	46°
4	12:10	6	235°	.46	3.23	991.77	113°	83°	253°	49°
5B	12:12.30	6	236°	.43	3.02	994.06	114°	85°	249°	46°
6B	12:15	5	235°	.37	2.60	996.3	115°	85°	246°	47°
7B	12:17.30	4	236°	.23	1.61	998.0	114°	86°	247°	47°
8B	12:20	3	238°	.16	1.12	999.67	112°	87°	248°	48°
9B	12:22.30	3	237°	.15	1.05	1.08	111B	87°	249°	48°
10	12:25	2	235°	.10	.70	2.26	110°	88°	249°	48°
12	12:27.30 12:30	2	233°	.10	.70	3.374	108°	87°	251°	49°
12	12:30	2	234°	.08	.56	4.274	107°	88	251°	49
			232.54	.5127	1.9547	44.474		79.17		

RAMCON ENVIRONMENTAL CORPORATION

Plant Walls

Location Greenville
Operator mw
Date 10/29
Run No. 2
Sample Box No.
Meter Box No. Anderson
Meter H @ 1.901
C Factor .994
Pitot Tube Coefficient Cp .84

Ambient Temperature 53
Barometric Pressure 29.25
Assumed Moisture, % 19
Probe Length, m(ft) 6
Nozzle Identification No. .000576
Avg. Calibrated Nozzle Dia., (in.) .325/.325/.325
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) .01 @ 12"
Probe Liner Material Stainless
Static Pressure, mm Hg (in. Hg)
Filter No. 76 6437

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
	FINAL	940	331.1
	INITIAL	700	325.9
	DIFFERENCE	240	5.2

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts)	VELOCITY HEAD (ΔP)	PRESSURE DIFF. ORF. MTR.	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F		FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A1-1	2:00 / 2:02.30	3	220°	.30	2.12	5.243 / 7.27	70°	69°	259°	99°
2	2:05	4	221°	.36	2.55	9.49	81°	68°	259°	46°
3	2:07.30	4	222°	.47	3.32	11.9	90°	68°	299°	44°
4	2:10	4	220°	.36	2.55	14.29	96°	69°	246°	45°
5	2:12.30	5	221°	.50	3.54	16.7	101°	71°	250°	46°
6	2:15	4	220°	.41	2.90	19.02	105°	72°	250°	48°
7	2:17.5	4	219°	.45	3.18	21.4	107°	74°	247°	48°
8	2:20	4	218°	.35	2.48	23.5	109°	76°	245°	48°
9	2:22.30	3	218°	.23	1.63	25.34	110°	78°	242°	48°
10	2:25	2	220°	.21	1.49	27.04	110°	79°	247°	48°
11	2:27.30	2	221°	.25	1.77	28.99	112°	81°	251°	47°
12	2:30	2	222°	.24	1.69	30.722	114°	82°	251°	47°

Form #REC-05

WALLS1

Form #REC-00

RAMCON emissions test log sheet, cont. DATE 10/15 LOCATION 10/29 TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP [redacted]	VELOCITY HEAD [redacted]	ORFICE DIFF. PRESSURE [redacted]	GAS VOLUME Vm (ft.^{3})	GAS SAMPLE TEMP. (°F) [redacted]	GAS SAMPLE TEMP. (°F) [redacted]	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
B2-1	2:35 / 2:37.3	2	219°	.18	1.27	32.33	98°	85°	298°	90°
2	2:40	2	224°	.16	1.13	33.82	106°	85°	235°	47°
3	2:42.3	3	225	.25	1.76	35.66	112	86	233	47
4	2:45	3	224	.20	1.41	37.34	115	87	226	46
5	2:47.30	3	225	.20	1.41	39.20	116	88	233	47
6	2:50	3.0	227	.28	1.98	41.00	119	89	231	46
7	2:52.30	4	227	.35	2.48	43.1	120	90	230	46
8	2:55	5	227	.52	3.68	45.7	123	92	231	46
9	2:57.30	5	226	.49	3.47	48.3	124	93	228	46
10	3:00	5	226	.51	3.61	50.9	125	94	230	47
11	3:02.30	6	226	.48	3.40	53.44	126	95	224	47
12	3:05	6	226	.46	3.25	55.945	126	96	230	48

11

RAMCON ENVIRONMENTAL CORPORATION

Plant Walls

Location Greenville

Operator MJ

Date 10/29

Run No. 3

Sample Box No.

Meter Box No. Anderson

Meter H @ 1.901

C Factor .997

Pitot Tube Coefficient Cp .84

Schematic of Stack Cross Section

		IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
Ambient Temperature 53			
Barometric Pressure 29.2	FINAL		384.3
Assumed Moisture, % 19	INITIAL	200	376.4
Probe Length, m(ft) 6	DIFFERENCE		8.1

Nozzle Identification No. .000576

Avg. Calibrated Nozzle Dia., (in.) .325/.325/.325

Probe Heater Setting 4

Leak Rate, m^3/min. (cfm)

Probe Liner Material Stainless

Static Pressure, mm Hg (in. Hg)

Filter No. 75 6434

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP °F	VELOCITY HEAD (ΔP_s)	PRESSURE DIFF. ORF. MTR.	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F		FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1-1	3:55 / 3:57.30	3	187	.15	1.06	56.250 / 57.7	73	72	243	48
2	4:00	4	195	.19	1.34	59.3	80	72	230	45
3	4:02.30	4	201	.20	1.41	61.0	88	72	219	44
4	4:05	4	208	.20	1.41	62.6	92	72	218	45
5	4:07.30	5	213	.23	1.63	64.4	96	72	217	46
6	4:10	4	214	.21	1.49	66.2	99	73	218	47
7	4:12.30	5	230	.30	2.12	68.2	102	74	232	47
8	4:15	9	230	.63	4.45	70.1	107	75	235	48
9	4:17.30	6	231	.51	3.53	73.6	110	77	244	49
10	4:20	6	230	.47	3.32	76.1	111	78	237	51
11	4:22.30	6	232	.41	2.90	78.4	111	79	231	51
12	4:25	5	231°	.32	2.26	80.551	111°	80°	232°	52°

WALLS 1

Form #REC-05

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 10/29 LOCATION [illegible] TEST NO. 10/29

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP [redacted]	VELOCITY HEAD [redacted]	ORFICE DIFF. PRESSURE [redacted]	GAS VOLUME Vm (ft.^{3})	GAS SAMPLE TEMP. (°F) [redacted]		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
R - 1	4:30 / 4:32.3	4	230°	.30	2.12	82.5	91°	80°	248°	51°
2	4:35	5	231°	.38	2.69	84.8	101°	80°	250°	46°
3	4:37.3	5	232°	.40	2.82	87.1	105°	80°	250°	48
4	4:40	5	231	.44	3.11	89.2	108	81	250	46
5	4:42.3	9	233	.47	3.32	91.9	110	82	249	47
6	4:45	6	235°	.50	3.53	94.5	113°	83°	253°	48°
7	4:47.3	6	235°	.51	3.60	96.9	113°	88°	253°	48°
8	4:50	6	234°	.48	3.39	99.6	113°	84°	247°	48°
9	4:52.3	5	237°	.37	2.61	101.9	113°	85°	253°	49°
10	4:55	5	235°	.35	2.47	104.0	112°	85°	253°	49°
11	4:57.3	4	232°	.32	2.26	106.1	112°	86°	259°	49
12	5:00	4	230°	.30	2.12	108.150	112°	86°	263°	49°

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

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

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. 6-4 Date 6-9-91

Calibrated by: S Buck

"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	3.2	.829	.001
2	1.8	2.6	.832	.002
3	1.1	1.6	.829	.001
		$\bar{C}_p$ (SIDE A)	.830	

"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	3.2	.829	.001
2	1.8	2.6	.832	.002
3	1.1	1.6	.829	.001
		$\bar{C}_p$ (SIDE B)	.830	

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

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

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

Form No. EED-17-1

RAMCON

Lear Siegler Stack Sampler

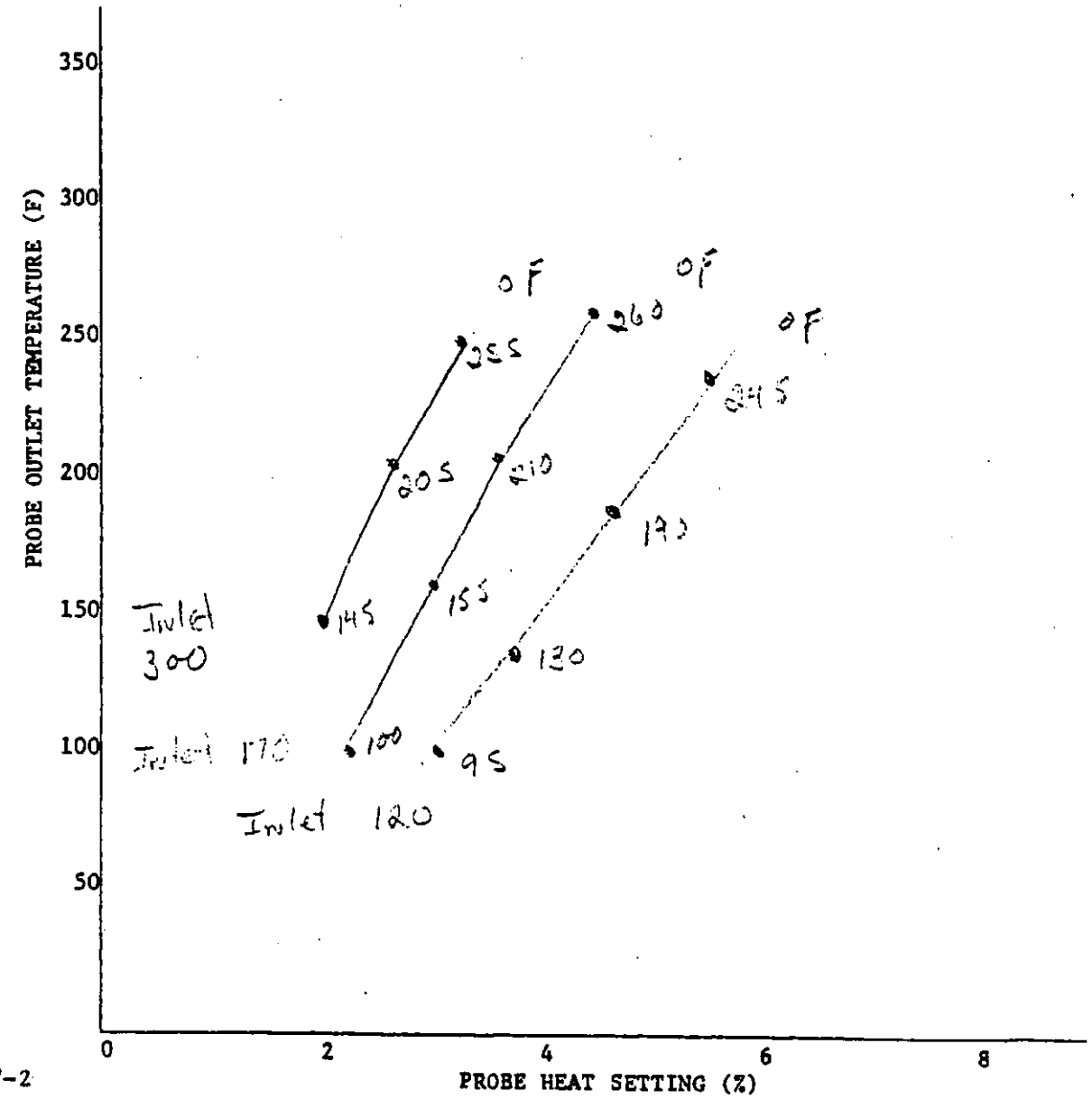
Heating Probe Calibration

Probe No. 64 Probe Length 6'

Date of Calibration 5-7-90 Signature Sam Tuney

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-5-90 Thermocouple number 64

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

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

other _____

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	Ice Bath	32	32	0
B	Boiling water	212	211	.005
C	Boiling oil	381	378	.008
D	Ambient			

[a]Type of calibration system used.

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

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 4-15-92 Meter box number NE

Barometric pressure, P_b = 29.99 in. Hg Calibrated by [illegible]

	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
5.054	0.5	5	841.215 / 846.313	74	102 / 110	82 / 85	94.75	12.35	1.01	1.645
	1.0	5		68						
10.771	1.5	10	776.410 / 787.381	68	96 / 121	90 / 92	99.75	13.41	.981	1.88
10.77	2.0	10	765.5 / 776.429	68	96 / 125	90 / 93	101	13.43	.982	1.89
10.849	3.0	10	754.245 / 765.094	68	106 / 130	94 / 96	105.5	11.10	.982	1.92
10.904	4.0	10	742.935 / 753.839	69	110 / 137	95 / 98	110	9.47	.980	1.95
								Avg	.997	1.8325

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b\ (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110	559.75	
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 11-2-92 Meter box number Andersen Plant _____

Barometric pressure, P_b = 30.0 in. Hg Dry gas meter number _____ Pretest Y _____

	Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
5.299	1	~~10~~ 5	136.382 / 141.681	68	95 / 107	83 / 84	92	9.32	1	.984	1.854
10.621	2	10	142.123 / 152.744	68	94 / 115	85 / 86	96	13.27	1	.986	1.852
10.523	3	10	125.234 / 135.757	68	98 / 114	75 / 82	92	10.95	1	.986	1.919
										Y_i = .915	1.875

[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

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number 1 Date 10-23-92 Meter box number Anderson Plant _____

Barometric pressure, P_b = 30.0 in. Hg Dry gas meter number _____ Pretest Y _____

	Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average (t_d),[a] °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
10.614	1	10 [redacted]	937.619 / 948.233	75	103 / 121	93 / 97	103.5	18.75	1	.990	1.887
10.564	2	10	948.927 / 959.491	75	104 / 126	97 / 100	106.8	13.32	1	.998	1.893
10.468	3	10	926.0856 / 936.524	75	103 / 124	85 / 92	101	10.90	1	.994	1.922
										Y = .994	1.901

[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.

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 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. Michael Winkler
Title: Team Leader

Qualifications: Mr. Winkler is a Team Leader and has completed training in isokinetic and proportional test methods. He received an Associate degree in Mechanical Engineering from State Technical Institute at Memphis, Tennessee.

Project Duties: Mr. Winkler is responsible for conducting isokinetic sampling procedures at the facility(s). He is also 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.