FAX

TRANSMITTAL

LAKESIDE INDUSTRIES
Fax# (206) 869-2249

TO:	Fred Austin (sp?) / Jay Willenberg
COMPANY:	PSAPCA
FAX#	343-7522
FROM:	Forest Lane
DATE:	27 Aug 93
#PAGES:	1
RE:	NOC # 4813

RECEIVED
AUG 27 1993
PUGET SOUND AIR POLLUTION CONTROL AGENCY

Our source test for the new plant in Monroe failed the standard. The manufacturer is working with us. They believe they have corrected the problem (leaking joint in baghouse). We are setting up another test now. Please call. Should I send 1 or 2 copies of test?

1) ONE COPY PLEASE
SAVE THE TREES

Jay Willenberg

NOTE!

If transmittal is incomplete, or you do not receive all pages specified, please call our regular telephone number - listed to the left.

Thank You

• WP51\JOHNLFAX

Mailing Address:
P.O. BOX 1379
BELLEVUE, WA 98009

Gen & Admin Office:
Redmond Science Park, Bldg. B
7735 - 178th. Pl. N.E.
REDMOND, Wa 98052-4954
Tel: (206) 883-1661

AMTEST
AIR QUALITY, INC.

AmTest-Air Quality, Inc.
30545 S.E. 84th St., #5
Preston, WA 98050
Office: (206) 222-7746
FAX: (206) 222-7849

July 16, 1993

Mr. Fred Austin
Puget Sound Air Pollution Control Agency
110 Union Street, #500
Seattle, Washington 98101

Dear Fred:

This letter will serve as the test plan for upcoming emissions tests to be performed by Am Test-Air Quality, Inc. at the baghouse exhaust of an asphalt plant located at Lakeside Industries Inc.'s Monroe, Washington facility. Emissions of particulate matter and carbon monoxide (CO), as well as visible emissions (opacity) will be measured at the baghouse exhaust of the hot dryer mix asphalt plant. The testing is currently scheduled for July 26, 1993. The plant is planning to process approximately 20% recycled asphalt during the emission test.

Testing and analysis procedures to be used for this project are presented in the July 1, 1992 of the Environmental Protection Agency (EPA) document Title 40 Code of Federal Regulations, Parts 53-60 (40 CFR 60), Appendix A, Methods 1, 2, 3A, 4, 5, 9 and 10. This testing is being performed to demonstrate compliance with Puget Sound Air Pollution Control Agency (PSAPCA) requirements. PSAPCA requires particulate matter emissions for this plant to be less than 0.02 grains per dry standard cubic foot (gr/dscf). Methods 1 and 2 will be performed to measure the stack gas velocity and temperature for calculating the volumetric flow rate. Method 3A will be performed to calculate the molecular weight of the stack gas based on measurements of oxygen and carbon dioxide. Method 4 will be performed to measure the moisture content of the stack gas. Method 5 will be performed to quantify particulate and condensible matter emissions. PSAPCA requires that the condensable particulate matter present in the gas stream be quantified by performing an extraction of the back-half portion of the Method 5 sample train in accordance with PSAPCA Regulation 1 procedures. Since this plant is subject to the requirements of 40 CFR 60 Subpart I, Am Test is planning to observe visible emissions using EPA Method 9 during each 60-minute Method 5 test period. Method 10 will also be performed to quantify emissions of carbon monoxide (CO) from integrated samples of the stack gas collected during each run. Three (3) 1-

hour Method 1, 2, 3A, 4 and 5 tests will be performed at the baghouse outlet to quantify particulate matter emissions.

It will be the responsibility of Lakeside Industries Inc. personnel to provide Am Test with the necessary process information during each test period for inclusion in our final report. A copy of the data sheet we will be asking Lakeside Industrie's on-site representative to complete is attached. It is the responsibility of Lakeside Industries Inc. to provide safe access to the sample site, and to install test ports if they do not exist. Am Test will require a 15-20 amp circuit for our exclusive use during the testing.

Within 30 days after the testing is completed, Am Test-Air Quality, Inc. will submit four (4) copies of a final report to Lakeside Industries Inc., which will be a formal, bound document containing information about the source, dates and times of each test, details of sampling and analysis procedures, quality assurance procedures, and a discussion of how the results were calculated, along with example calculations. Results will be presented in concentration units (e.g., grains per dry standard cubic foot (gr/dscf) or parts per million (ppm)) and emission rate units (e.g. pounds per hour (lb/hr)). It will be the responsibility of Lakeside Industries to forward a copy of the report to PSAPCA.

Please call our office at (206) 222-7746 if we may provide additional information or clarification.

Sincerely,
Am Test-Air Quality, Inc.

Kris A. Hansen
President

cc: Mr. Harold Nickel, Lakeside Industries
Mr. Forest Lane, Lakeside Industries

[afb\c:\w\testplan\lakeside]

AMTEST AIR QUALITY, INC.

AmTest-Air Quality, Inc.
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FACSIMILE TRANSMISSION

RECEIVED
AUG 30 1993
PUGET SOUND AIR POLLUTION CONTROL AGENCY

Date: 8-30-93

No. of Pages, including this cover sheet

Attention: Fred Austin
Jay Willenberg

Company: PSAPCA

FAX Number: 206-343-7522

From: Am Test - Air Quality, Inc.
30545 S.E. 84th Street
Suite 5
Preston, Washington 98050
Attn: Kris Hansen

FAX Number: (206) 222-7849

Subject: Lakeside Industries - Monroe

Per my recent conversation w/ Harold Nickel. They are going to be running this plant at a much higher production rates during the evening. They have asked us if we would test at night. I said that we would if you (PSAPCA) approve.

Let me know.

Kris

If you have not received all pages, please call back as soon as possible at (206) 222-7746

We are transmitting from (206) 222-7849

AMTEST AIR QUALITY, INC.

AmTest-Air Quality, Inc.
30545 S.E. 84th St., #5
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SOURCE

EMISSION

EVALUATION

RECEIVED
AUG 31 1993
PUGET SOUND AIR POLLUTION CONTROL AGENCY

AUGUST 26, 1993

Prepared For:

LAKESIDE INDUSTRIES, INC.
COUNTERFLOW DRUM MIX ASPHALT PLANT
BAGHOUSE STACK
METHOD 5 TESTING
MONROE, WASHINGTON
JULY 26, 1993

Submitted by:

Kris A. Hansen
Project Manager

K. Steven Mackey
Sr. Air Quality Specialist

Angela F. Blaisdell
Sr. Technical Writer

Am Test-Air Quality, Inc.
Preston, Washington

We certify that the information contained herein is accurate and complete to the best of our knowledge.

TABLE OF CONTENTS

1.0
INTRODUCTION

The purpose of this source emission evaluation was to quantify particulate matter emissions and visible emissions (opacity) at the baghouse exhaust of a counterflow drum mix asphalt plant located at Lakeside Industries, Inc.'s Monroe, Washington facility. The asphalt plant was manufactured by Gencor and is equipped with a Gencor baghouse to control particulate matter emissions prior to exhausting to the atmosphere. Lakeside Industries, Inc. contracted Am Test-Air Quality, Inc. based in Preston, Washington to conduct these source tests. These tests were performed to demonstrate compliance with Puget Sound Area Pollution Control Agency (PSAPCA) notice of construction No. 4813 requirements.

Testing and analysis procedures used for this project are presented in the July 1, 1992 edition of the Environmental Protection Agency (EPA) document Title 40, Code of Federal Regulations, Parts 53-60 (40 CFR 60), Appendix A, Methods 1, 2, 3, 4, 5, 9 and 10, and the Puget Sound Air Pollution Control Agency (PSAPCA) Regulation I. Methods 1 and 2 were performed to measure the stack gas temperature and velocity for calculating volumetric flow rate. Method 3A was performed to determine the molecular weight of the stack gas based on measurements of the oxygen (O_2) and carbon dioxide (CO_2). Method 4 was performed to measure the moisture content of the stack gas. Method 5 was performed to quantify particulate and condensible matter emissions. PSAPCA requires that the condensible particulate matter present in the gas stream be quantified by performing an extraction of the back-half portion of the Method 5 sample train in accordance with PSAPCA Regulation 1 procedures. Method 9

observations for visible emissions could not be performed due to cloudy skies and a dissipating steam plume. Method 10 was performed to quantify parts per million (ppm) levels of carbon monoxide (CO) using a non-dispersive infrared (NDIR) analyzer. Three (3) 62.5-minute Method 1, 2, 3, 4 and 5 samples were collected at the baghouse exhaust on July 26, 1993.

Mr. K. Steven Mackey, Mr. Victor J. Pedroni and Mr. E. Ray Lawrence of Am Test-Air Quality, Inc. performed the field sampling. Sample recovery and laboratory analysis of the Method 5 samples was performed by Ms. Wendy A. Linn of Am Test. Data reduction, quality assurance review and final report preparation were performed by Mr. Kris A. Hansen, Ms. Angela F. Blaisdell, Ms. Cassie B. Heaton, Ms. Jan W. Alden, Ms. Amy M. Brotherton and Ms. Linn of Am Test. This testing program was coordinated by Mr. Harold Nickel and Mr. Forest Lane of Lakeside Industries.

2.0

SUMMARY OF RESULTS

2.1 Particulate Matter

The results of the three (3) 62.5-minute Method 5 tests for quantifying particulate and condensible matter emissions at the asphalt plant baghouse exhaust are summarized in Table 2.1 below, and on page 4 in a computer printout titled "Summary of Results - Methods 1, 2, 3A, 4 and 5".

Table 2.1. Summary of particulate matter emission test results from samples collected on July 26, 1993 at the baghouse exhaust at Lakeside Industries, Inc.'s facility in Monroe, Washington.

Sample Run #	Front-Half P.M. Emission Conc. (gr/dscf)	Back-Half P.M. Emission Conc. (gr/dscf)	Total P.M. Emission Conc. (gr/dscf)	Total P.M. Emission Rate (lb/hr)
1	0.018	0.006	0.025	6.39
2	0.029	0.003	0.032	8.30
3	0.040	0.012	0.052	13.6
Average	0.029	0.007	0.036	9.43

The front-half, back-half and total particulate matter emission concentrations in Table 2.1 are presented in units of grains per dry standard cubic foot (gr/dscf). The total particulate matter emission rate is presented in units of pounds per hour (lb/hr). An acceptable leak check of less than 0.02 cfm at the highest vacuum rate (or greater) used during the test preceded and followed each run. The average percentage isokinetics for each run were within the acceptable limits of 100 $\pm$ 10%. Computer printouts of the results from the individual Method 5 tests are included in Appendix A of this report. Appendix B of this report contains example calculations of the results, along with copies of original field data sheets.

AMTEST
AIR QUALITY, INC.

SUMMARY OF RESULTS - METHODS 1, 2, 3A, 4 AND 5
AM TEST - AIR QUALITY, INC.

FILE NAME: 201B\LAKM5SUM
CLIENT: LAKESIDE INDUSTRIES, INC.
LOCATION: MONROE, WASHINGTON

	BAGHOUSE EXHAUST STACK			
	RUN #1	RUN #2	RUN #3	AVERAGE
LAB #:	4150	4151	4152	
DATE:	7/26/93	7/26/93	7/26/93	
START TIME:	07:28	09:15	11:18	
STOP TIME:	08:35	10:45	12:28	
SAMPLE LENGTH (minutes):	62.5	62.5	62.5	
VOLUME SAMPLED (cubic feet):	39.115	40.262	38.443	39.273
VOLUME SAMPLED (dry std. cubic feet):	40.188	40.864	38.692	39.915
VOLUME SAMPLED (dry std. cubic meters):	1.138	1.157	1.096	1.130
STACK GAS MOISTURE (percent):	25.33	28.73	28.19	27.42
BAROMETRIC PRESSURE (inches of Hg):	30.30	30.30	30.30	30.30
STATIC PRESSURE (inches of H2O):	-0.75	-0.70	-0.75	-0.73
STACK PRESSURE (inches of Hg):	30.24	30.25	30.24	30.24
STACK TEMPERATURE (degrees F.):	239.5	262.4	264.8	255.6
STACK TEMPERATURE (degrees R.):	699.5	722.4	724.8	715.6
CARBON DIOXIDE (percent):	4.2	5.4	5.3	5.0
OXYGEN (percent):	14.3	13.0	13.7	13.7
CARBON MONOXIDE (ppm):	377	366	379	374
MOLECULAR WEIGHT (dry, g/g-mole):	29.24	29.38	29.40	29.34
MOLECULAR WEIGHT (wet, g/g-mole):	26.40	26.11	26.18	26.23
AVERAGE VELOCITY HEAD (inches of H2O):	0.679	0.764	0.755	0.733
PITOT TUBE Cp:	0.84	0.84	0.84	
STACK GAS VELOCITY (feet per second):	55.4	60.0	59.7	58.4
STACK DIAMETER (inches):	48x48	48x48	48x48	
STACK AREA (square feet):	16.00	16.00	16.00	
STACK GAS AIRFLOW (dry std. cubic feet per min.):	30289.5	30338.1	30306.9	30311.5
STACK GAS AIRFLOW (actual cubic feet per min.):	53164.3	57612.6	57307.2	56028.0
NOZZLE DIAMETER (inches):	0.247	0.247	0.247	
ISOKINETICS (percent):	102	104	98	
FRONT-HALF PARTICULATE EMISSION CONC. (gr/dscf):	0.018	0.029	0.040	0.029
BACK-HALF PARTICULATE EMISSION CONC. (gr/dscf):	0.006	0.003	0.012	0.007
TOTAL PARTICULATE EMISSION CONC. (gr/dscf):	0.025	0.032	0.052	0.036
TOTAL PARTICULATE EMISSION CONC. (mg/dscm):	56.3	73.0	119.5	82.9
TOTAL PARTICULATE MATTER EMISSION RATE (lb/hr):	6.39	8.30	13.6	9.43

2.2 Visible Emissions

EPA Method 9 visible emission (opacity) observations were attempted by Mr. K. Steven Mackey on July 26, 1993 but, due to cloudy skies and a dissipating steam plume, were not possible.

3.0
SOURCE OPERATION

The Gencor Model Ultraplant 300 (I.D. M5300UDS 7390-92-NA) counterflow drum mix asphalt plant located at Lakeside Industries, Inc.'s facility located at 14800 195th Avenue S.E. in Monroe, Washington was constructed and installed in 1993. Emissions from the asphalt plant are controlled by a Gencor baghouse prior to exhausting to the atmosphere. The plant was fired with propane at a rate of 94%. The baghouse contains 420, 16.25-inch by 192-inch, 14 ounce Nomex bags. The pressure drop across the baghouse averaged 4 inches of water column ("H_2O) on the day of testing. According to plant personnel, the plant operated at an average asphalt production rate of 300 tons per hour (ton/hr), with a gravel moisture content of 5.7%, gravel containing 5.0% fines and an asphalt discharge temperature of 300° F. A process information sheet is included in Appendix C of this report.

4.0

METHODOLOGY REFERENCES

Sampling procedures specified in the July 1, 1992 edition of the EPA document Title 40, Code of Federal Regulations, Parts 53-60 (40 CFR 60), Appendix A, Methods 1, 2, 3A, 4, 5, 9 and 10 were used for these tests. Sampling and analysis procedures specified in the Puget Sound Air Pollution Control Agency (PSAPCA) "Particulate Source Test Procedures" adopted by the PSAPCA Board of Directors, August 11, 1983, in accordance with section 9.09 of Regulation I, were utilized in conjunction with the EPA Method 5 procedures for "back-half" analysis for extracting condensible matter. Methodology suggested in the EPA Air Pollution Training Institute "Course 450 - Source Sampling For Particulate Pollutants" and quality assurance procedures outlined in the EPA's reference manual titled Quality Assurance Handbook for Air Pollution Measurement Systems, Volume 3, EPA-600/4-77-027b, along with current updates, were used with respect to quality assurance and testing protocol.

5.0
SAMPLING AND ANALYSIS PROCEDURES

5.1 EPA Methods 1 and 2 - Velocity, Temperature and Airflow

EPA Method 1 procedures were used to assure that representative measurements of volumetric flow rate were obtained by dividing the cross-section of the exhaust stack into a number of equal areas, and then locating a traverse point within each of the equal areas. Method 2 was performed to measure the stack gas velocity using a pitot tube, and the gas temperature using a thermocouple. The S-type pitot tubes were connected with tubing to an oil-filled inclined manometer to obtain velocity measurements. The pitot tube lines were leak-checked and the inclined manometer was leveled and zeroed prior to use. Temperatures were measured using calibrated thermocouple probes connected to a digital thermocouple indicator.

Emissions from the baghouse exhaust to the atmosphere through a 48-inch by 48-inch rectangular stack which has five (5) sample ports located at the same elevation along one side. The sample ports are located 33 feet from the nearest upstream flow disturbance, and 3 feet from the nearest downstream flow disturbance. Five (5) velocity and temperature traverses of five (5) points each were performed during each Method 5 test. Each point was sampled for 2.5 minutes for a total sampling time of 62.5 minutes per run. Figure 1 located in Appendix C of this report is a schematic of the stack and the point locations selected. The sample probe was marked with felt pen and heat resistant tape to indicate the proper point location.

5.2 EPA Method 3A - Gas Composition

The stack gas composition was determined using EPA Method 3A procedures, which allow the use of instrumental analyzers. A Servomex Model 1420B paramagnetic analyzer was used to measure the percent oxygen (O_2). A Servomex Model 1410B non-dispersive infrared (NDIR) analyzer was used to measure the percent carbon dioxide (CO_2). A Thermo Environmental Systems (TECO) Model 48 gas filter correlation NDIR was used to measure carbon monoxide (CO). Gaseous data were recorded at each traverse point during each Method 5 test period. The gas composition measurements made during each test period were used to calculate the molecular weight of the stack gas.

5.3 EPA Method 4 - Moisture

The percent moisture in the gas stream was quantified by weighing the impingers to 0.1 grams before and after each Method 5 run on a digital top-loading balance. The net weight (final minus initial) was used to calculate the amount of moisture condensed from the known volume of stack gas which was collected.

5.4 EPA Method 5 - Particulate Matter

The sample train used for particulate matter sampling was an EPA Method 5 design as illustrated in Figure 2 in Appendix C of this report. The stainless steel button hook nozzles used for these tests were measured on-site with inside calipers. A stainless steel probe sheath with a heated stainless steel liner was used to draw gas from the stack. The probe was equipped with S-type pitot tubes for measuring gas velocity and a thermocouple sensor for measuring stack gas temperature. The thermocouple sensor was connected to a digital thermocouple indicator which was used to measure the stack gas temperature at each sample point. A glass filter assembly containing a 110 millimeter Whatman QM-A ultrapure quartz microfibre

filter was enclosed in a temperature-controlled heated sample box. The average box temperature was maintained at 248° F ± 25° F. The nozzle, probe liner, prefilter connective glassware and filter are often referred to as the "front-half" of the sample train. Following the filter is a condenser section which, by convention, is referred to as the "back-half". The condenser section of the Method 5 sample train consisted of a modified Greenburg-Smith bubbler containing 100 milliliters (mL) of deionized water, an impinger also containing 100 mL of deionized water, an empty bubbler, and a bubbler containing indicating silica gel desiccant. The back-half was maintained at a temperature below 68° F by adding ice to the condenser section during sampling.

The Method 5 sample train was connected to a control box by means of an umbilical cord which contains a vacuum hose, pitot lines, thermocouple wires and a 4-wire electrical cord. The control box (meter box) was used to monitor stack conditions and to facilitate isokinetic sampling. The control box consists of a diaphragm pump which is used to pull the stack gas through the sample train, fine and coarse metering valves to control the sampling rate, a vacuum gauge which measures the pressure drop from the sampling nozzle to the metering valves, and a calibrated dry gas meter readable to 0.001 cubic feet. At the outlet of the dry gas meter is a calibrated orifice which is used to isokinetically control the flow of gas through the metering system. The pitot tubes utilized to measure stack gas velocity are connected to the control box via the umbilical cord. The control box contains an oil-filled inclined manometer which was used for the velocity measurement and for monitoring orifice pressure.

Stack condition measurements were made prior to collecting a sample, including measurements of velocity, temperature and a check for cyclonic flow in the stack. A

sample nozzle was chosen and isokinetic operating parameters were established utilizing a Hewlett-Packard programmable calculator. The sampling nozzle, probe and prefilter connective glassware were all cleaned and rinsed prior to use. The sample train was assembled and determined to be leak free following the procedures outlined in Method 5. Before each test, a final check was made to assure that the process was operating at the desired production rate and the desired operating parameters. A final check was made of the sample box and probe heat temperatures. Crushed ice was added to the condenser section. The sample nozzle was positioned in the stack at the first sample point. The sample pump was then turned on and the gas sampling rate was adjusted for isokinetic sampling. Isokinetic sampling proceeded at each of the traverse points. Upon completion of the test, the sample probe was removed from the stack and a post-test leak check was performed according to Method 5 procedures. Care was taken to assure that the nozzle tip did not touch the port nipple.

Following sample collection, the Method 5 sample was transferred to an area free from air disturbances and airborne particulate matter. The filters were transferred to petri dishes labeled with the sample date, client name and run number. Am Test refers to the front-half filter portion of the particulate catch as the "A" section. Care was taken to assure that any loose particulate matter and filter mat were quantitatively transferred to the petri dish. In the laboratory, the filters were placed in an oven and baked at 105° C for two (2) hours, then they were transferred to a constant humidity desiccator containing silicon dioxide (SiO_2) for at least 24 hours of desiccation prior to obtaining weights. The same weighing procedures were followed to obtain the tare weights for the filters. The tare and final weights were made using an electronic balance set to a time integrating mode with a readability of 0.1 milligrams. The filters containing particulate matter were weighed to a

constant weight of $\pm$0.5 milligrams. The interval between weighings was at least 6 hours. These weights were recorded in a bound laboratory notebook.

The contents of the nozzle, probe liner and prefilter connective glassware were quantitatively transferred to the "B" section storage container labeled with sample date, client name and run number following each run. Several rinses of acetone, with simultaneous loosening of particulate matter using a clean nylon brush, were used for the front-half clean-up. An iodine flask with a female ball joint end was attached to the male ball joint end of the probe to assure that no particulate matter was lost during the rinsing and brushing of the probe. The contents of the iodine flask were quantitatively transferred to the "B" section storage container. The contents of this "B" section acetone rinse were transferred to a tared, graduated 150 milliliter beaker. The volume of acetone was recorded and the beakers were placed in an evaporation chamber at a temperature of approximately 75-80^{o} F. A tared beaker with 150 milliliters of acetone was handled in an identical fashion to the "B" section samples as a control. The tare and final weights of the beakers were obtained following at least 24 hours of desiccation. The samples and acetone blanks were weighed to a constant weight of $\pm$0.5 milligrams at 6 hour or greater intervals.

The bubblers and impingers utilized for the condenser section, or "back-half" of the sample train were weighed with a readability of 0.1 grams before and after sampling using an electronic top loading balance. The difference between the initial and final weights of the condenser section constitute the amount of moisture gain during the run. The contents of the bubblers and impingers were transferred to a 1000 mL graduated cylinder. The bubblers and impingers were rinsed with deionized water into the graduated cylinder and the liquid level was recorded. This liquid was transferred to a separatory funnel and the contents were extracted with three (3) 50

mL portions of dichloromethane (CH_2Cl_2). The organic layer was transferred to a tared 150 mL beaker labeled the "C_x" section and this beaker's contents were allowed to evaporate to dryness in an evaporation chamber at a temperature of 75-80° F. The water layer was transferred to a tared 150 mL beaker with glass boiling beads labeled the "C" section, and this beaker's contents were heated on a hot plate to boiling until approximately 20 milliliters remained in the beaker. The remaining 20 milliliters in the beaker was evaporated to dryness in an evaporation chamber set at 75-80° F. The bubblers, impingers, and graduated cylinder were given a final rinse with acetone into another tared, graduated beaker ("D" section) and it's contents were allowed to evaporate to dryness in an evaporation chamber at 75-80° F. Sample blanks containing deionized water, dichloromethane, and acetone were analyzed in an identical fashion as the representative "section". All beakers were desiccated for at least 24 hours and weighed to constant weights of $\pm$0.5 milligrams at 6 hour or greater intervals after their contents had evaporated. The total particulate matter weight is the sum of the net weights of the particulate matter found on the filter, plus the net weights found in the B, C, Cx and D section beakers, minus the acetone, water, and dichloromethane blank concentrations. The particulate matter weights are included on the Method 5 computer printouts which are included in Appendix A of this report, and on the laboratory analysis data sheets in Appendix B of this report.

5.5 EPA Method 9 - Visible Emissions (Opacity)

EPA Method 9 visible emissions (opacity) observations were attempted by Mr. K. Steven Mackey of Am Test-Air Quality, Inc., who is a certified opacity reader by the Washington State Department of Ecology (WDOE). Procedures outlined in EPA Method 9 were followed. The observer stood at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back. His

line of vision was perpendicular to the plume direction, and did not include more than one (1) plume diameter. There were cloudy skies on July 26, 1993 and the steam plume dissipated too high to read against anything but sky. As a result, no Method 9 readings were possible. A copy of Mr. Mackey's plume evaluation certificate is included in Appendix C of this report.

6.0
QUALITY ASSURANCE PLAN

The purpose of the quality assurance plan is to provide guidelines for achieving quality control in air pollution measurements. The detailed procedures which were utilized are included in the Environmental Protection Agency's (EPA's) reference manual titled Quality Assurance Handbook for Air Pollution Measurement Systems, Volume 3, EPA-600/4-77-027b. Procedures were followed throughout equipment preparation, field sampling, sample recovery, analysis and data reduction. Am Test-Air Quality, Inc.'s quality assurance procedures are discussed below.

6.1 Calibration Procedures and Frequency

Field equipment utilized for on-site measurements is calibrated at a frequency as recommended by the equipment manufacturer or industry practice. Prior to field use, each instrument is calibrated and the calibration value is recorded. If any measuring or test device requiring calibration cannot immediately be removed from service, the Project Manager may extend the calibration cycle providing a review of the equipment's history warrants the issuance of an extension. No equipment will be extended more than twice a calibration cycle, nor will the extension exceed one-half the prescribed calibration cycle. Test equipment consistently found to be out of calibration will be repaired or replaced.

The sample nozzles used to collect isokinetic samples were calibrated on-site before sampling using digital inside calipers readable to 0.001 inch. Three (3) measurements were taken at varying points around the inside of the nozzle tip and averaged. The dry gas meter used to accurately measure sample volumes was

calibrated using a standard laboratory dry gas meter. Calibration data for the dry gas meters used for this project are included in Appendix C of this report. The S-type pitot tubes utilized for velocity determination have been calibrated using Method 2, Section 4.1, and are inspected regularly for wear. The digital thermocouple indicator used for temperature measurement has a readability of 1 degree Fahrenheit and has been re-certified by the manufacturer. Each thermocouple probe used to monitor temperature is checked periodically at three (3) temperature settings. Thermocouples are checked in the field with ambient air and ice water. Additional calibration information for pressure and temperature recording devices is included in Appendix C of this report. A barometer readable to 0.01 inches of mercury was used in the field to obtain barometric pressure readings.

In the laboratory, ACS grade acetone, dichloromethane, deionized water and filter blanks were carried throughout the gravimetric analysis procedures. The samples were weighed to constant weights of ± 0.5 milligrams following desiccation in a cabinet desiccator. This desiccator is an electronic dehumidifier which automatically maintains the humidity inside the desiccator. The dehumidifier automatically recharges the internal desiccant every 5.5 hours. An Airguide humidity indicator accurate to $\pm 1\%$ is used to check the humidity inside the desiccator when obtaining tare and final weights. A small container of indicating silica gel is placed in the desiccators to maintain the desired humidity. The Mettler AE163 electronic balance used to obtain weights was set to a time integrating mode (100,000 readings per minute) with a readability of 0.01 milligrams. The balance was calibrated prior to every weighing session and an audit is performed with class S weights once a week. The calibration of Am Test's Mettler balances is checked by the manufacturer on a yearly basis.

Support equipment is defined as all equipment, not previously discussed that is required for completing an environmental monitoring or measurement task. This equipment may include storage and transportation containers, sample recovery glassware, and communications gear. Support equipment is periodically inspected to maintain the performance standards necessary for proper and efficient execution of all tasks and responsibilities.

During the project, a systems audit was performed, consisting of an on-site qualitative inspection and review of the total measurement system. This inspection was conducted on a daily basis by the Project Leader. During the systems audit, the auditor observed the procedures and techniques of the field team in the following general areas:

- Setting up and leak testing the sampling train
- Isokinetic sampling check of the sampling train
- Final leak check of train
- Sample recovery

Visual inspections of pitot tubes, glassware, and other equipment were also made. The main purpose of a systems audit is to ensure that the measurement system will generate valid data, if operated properly.

6.2 Sample Recovery and Field Documentation

Data relative to samples, collected during each test, were immediately inspected for completeness and placed under the custody of the Project Leader until custody is transferred when the samples are returned to the Air Quality laboratory. Sample recovery was carried out in a suitable area free from particulate matter contamination.

6.3 Data Reduction, Validation and Reporting

Raw data are handled according to strict guidelines when being transposed into computer files or to other logs. The guidelines include document receipt control procedures, file review, and sign-off by a checker. Raw data were entered into the appropriate software package by a "processor", then the entered figures were checked for accuracy by a "checker," different from the "processor". Any mistakes were corrected, and figures were rechecked and signed off by the "checker". In addition, by-hand calculation checks were made to validate the computer output. All data generated by each phase of a laboratory or field sampling program were reviewed by the senior reviewer. The data package was signed off by the senior reviewer prior to releasing the data for report preparation.

7.0
CALCULATION OF RESULTS

The Method 1, 2, 3A, 4 and 5 test results were calculated in accordance with current EPA 40 CFR 60 and Puget Sound Area Pollution Control Agency (PSAPCA) criteria. Copies of the pertinent equations used to derive these results are included in Appendix C of this report. Final result calculations were performed using custom-written spreadsheet programs run on Hewlett-Packard Vectra computer systems. The "by-hand" was performed to check the integrity of the computer programs which were used to reduce the data. A sample "by-hand" calculation was completed for run 3, using a Hewlett Packard 11C calculator, and may be found in Appendix B of this report.

APPENDIX A

Computer Printouts of Results

METHODS 1, 2, 3A, 4, AND 5
AM TEST-AIR QUALITY, INC.

FILE NAME:	2018\LAKE-1	LAB #:	4150
CLIENT:	LAKESIDE INDUSTRIES	START TIME:	07:28 o'clock
LOCATION:	MONROE, WASHINGTON	STOP TIME:	08:35 o'clock
SAMPLE SITE:	BAGHOUSE EXHAUST STACK	SAMPLE LENGTH:	62.5 minutes
SAMPLE DATE:	JULY 26, 1993		
RUN #:	1 - METHOD 5		
OPERATORS:	PEDRONI/MACKEY/LAWRENCE		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
846.3	636.6	209.7
756.7	701.5	55.2
549.7	538.6	11.1
749.7	736.5	13.2
TOTAL H2O GAIN:		289.2
TOTAL VOLUME (SCF):		13.64
PERCENT MOISTURE:		25.33
Bws:		0.2533

PITOT TUBE Cp:	0.84		
NOZZLE DIAMETER:	0.247	inches	
NOZZLE AREA:	0.0003	sq. feet	
STACK DIAMETER:	48x48	inches	
STACK AREA:	16.00	sq. feet	
METER TEMPERATURE:	67.0	degrees F	
BAROMETRIC PRES.:	30.30	inches Hg	
STATIC PRESSURE:	-0.75	inches H2O	
STACK PRESSURE:	30.24	inches Hg	
ORIFICE PRESSURE:	1.486	inches H2O	
METER PRESSURE:	30.41	inches Hg	
INIT. METER VOLUME:	958.862		
FINAL METER VOLUME:	997.977		
VOLUME SAMPLED:	39.115		
STD VOLUME (DSCF):	40.188		
STD VOLUME (DSCM):	1.138		
Y FACTOR:	1.009		
AVERAGE CONC. CO2:	4.2	percent	
AVERAGE CONC. O2:	14.3	percent	
AVERAGE CONC. CO:	377	ppm	
MOLECULAR WEIGHT:	29.24	g/g-mole-dry	
MOLECULAR WEIGHT:	26.40	g/g-mole-wet	

SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F
A 1	0.68	216	4	0.64	247
2	0.77	235	5	0.53	246
3	0.72	241	D 1	0.79	244
4	1.15	234	2	0.89	248
5	1.30	225	3	0.82	242
B 1	0.35	221	4	0.70	250
2	0.68	230	5	0.47	257
3	0.72	236	E 1	0.72	250
4	0.69	241	2	0.71	252
5	0.65	242	3	0.57	247
C 1	0.65	243	4	0.42	232
2	0.78	246	5	0.25	217
3	0.74	245			

PERCENT ISOKINETICS:	102 %		
STACK TEMPERATURE:	239.5	degrees F	699.5 degrees R
AVERAGE VELOCITY HEAD:	0.679	" of H2O	
STACK GAS VELOCITY:			55.4 ft/second
STACK GAS AIR FLOW:	53164.3	acf/min	30289.5 dscf/min
PARTICULATE EMISSION CONCENTRATION (front-half):			0.018 gr/dscf
PARTICULATE EMISSION CONCENTRATION (back-half):			0.006 gr/dscf
TOTAL PARTICULATE EMISSION CONC. (front & back-half):			0.025 gr/dscf
TOTAL PARTICULATE EMISSION CONCENTRATION:			56.3 mg/dscm
TOTAL PARTICULATE MATTER EMISSION RATE:			6.39 lb/hr

FRONTHALF PARTICULATE MATTER MASS LOADING

FILTER NUMBER:	#110-071
TARE WEIGHT OF FILTER (grams):	0.6293
FINAL WEIGHT OF FILTER (grams):	0.6587
NET WEIGHT OF PARTICULATE MATTER (grams):	0.0294
BEAKER NUMBER:	#150-520
TARE WEIGHT OF BEAKER (grams):	65.8299
FINAL WEIGHT OF BEAKER (grams):	65.8481
NET WEIGHT OF PARTICULATE MATTER (grams):	0.0182
VOLUME OF ACETONE (milliliters):	165.0
WT./VOL. OF ACETONE BLANK (milligrams/ml):	0.000
NET WEIGHT OF PARTIC. DUE TO ACETONE (grams):	0.0000
TOTAL FRONTHALF PARTICULATE MATTER (grams):	0.0476

BACKHALF PARTICULATE MATTER MASS LOADING

"C" SECTION - CONDENSER PARTICULATE	#150-543
TARE WEIGHT OF BEAKER (grams):	67.3187
FINAL WEIGHT OF BEAKER (grams):	67.3305
NET WEIGHT OF PARTIC. MATTER (grams):	0.0118
TOTAL VOLUME OF WATER (milliliters):	625.0
VOLUME OF WATER CONDENSED (milliliters):	276.0
NET VOLUME OF WATER FOR BLANK (milliliters):	349.0
WT./VOL. OF WATER BLANK (milligrams/ml):	0.0008
NET WEIGHT OF PARTIC. DUE TO WATER (grams):	0.0003
"Cx" SECTION - HYDROCARBON EXTRACTION	#150-527
TARE WEIGHT OF BEAKER (grams):	64.6931
FINAL WEIGHT OF BEAKER (grams):	64.6961
NET WEIGHT OF PARTIC. MATTER (grams):	0.0030
TOTAL VOLUME OF CH2Cl2 (milliliters):	150.0
WT./VOL. OF CH2Cl2 BLANK (milligrams/ml):	0.000
NET WEIGHT OF PARTIC. DUE TO CH2Cl2 (grams):	0.0000
"D" SECTION - ACETONE RINSE OF CONDENSER	#150-524
TARE WEIGHT OF BEAKER (grams):	79.1025
FINAL WEIGHT OF BEAKER (grams):	79.1045
NET WEIGHT OF PARTIC. MATTER (grams):	0.0020
TOTAL VOLUME OF ACETONE (milliliters):	90.0
WT./VOL. OF ACETONE BLANK (milligrams/ml):	0.000
NET WEIGHT OF PARTIC. DUE TO ACETONE (grams):	0.0000
TOTAL BACKHALF PARTICULATE MATTER (grams):	0.0165
TOTAL WEIGHT OF PARTICULATE MATTER (grams):	0.0641

METHODS 1, 2, 3A, 4, AND 5
AM TEST-AIR QUALITY, INC.

FILE NAME:	2018\LAKE-2	LAB #:	4151
CLIENT:	LAKESIDE INDUSTRIES	START TIME:	09:15 o'clock
LOCATION:	MONROE, WASHINGTON	STOP TIME:	10:45 o'clock
SAMPLE SITE:	BAGHOUSE EXHAUST STACK	SAMPLE LENGTH:	62.5 minutes
SAMPLE DATE:	JULY 26, 1993		
RUN #:	2 - METHOD 5		
OPERATORS:	PEDRONI/MACKEY/LAWRENCE		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
947.9	644.6	303.3
704.5	667.6	36.9
538.7	537.5	1.2
827.5	819.5	8.0

TOTAL H2O GAIN:	349.4	PITOT TUBE Cp:	0.84
TOTAL VOLUME (SCF):	16.47	NOZZLE DIAMETER:	0.247 inches
PERCENT MOISTURE:	28.73	NOZZLE AREA:	0.0003 sq. feet
Bws:	0.2873	STACK DIAMETER:	48x48 inches
		STACK AREA:	16.00 sq. feet
		METER TEMPERATURE:	73.6 degrees F
		BAROMETRIC PRES.:	30.30 inches Hg
		STATIC PRESSURE:	-0.70 inches H2O
		STACK PRESSURE:	30.25 inches Hg
		ORIFICE PRESSURE:	1.574 inches H2O
		METER PRESSURE:	30.42 inches Hg
INIT. METER VOLUME:	998.494		
FINAL METER VOLUME:	1038.756		
VOLUME SAMPLED:	40.262	AVERAGE CONC. CO2:	5.4 percent
STD VOLUME (DSCF):	40.864	AVERAGE CONC. O2:	13.0 percent
STD VOLUME (DSCM):	1.157	AVERAGE CONC. CO:	366 ppm
Y FACTOR:	1.009	MOLECULAR WEIGHT:	29.38 g/g-mole-dry
		MOLECULAR WEIGHT:	26.11 g/g-mole-wet

SAMPLE POINT	VELOCITY " OF H20	TEMPERATURE °F	SAMPLE POINT	VELOCITY " OF H20	TEMPERATURE °F
E 1	1.28	254	4	0.46	263
2	1.23	256	5	0.47	262
3	0.92	258	B 1	0.83	267
4	0.64	257	2	0.83	272
5	0.45	228	3	0.61	272
D 1	1.05	264	4	0.42	270
2	1.25	276	5	0.37	267
3	0.93	270	A 1	0.94	271
4	0.66	267	2	0.90	269
5	0.55	264	3	0.68	250
C 1	1.05	267	4	0.62	250
2	0.96	270	5	0.55	250
3	1.03	267			

PERCENT ISOKINETICS:	104 %		
STACK TEMPERATURE:	262.4 degrees F	722.4	degrees R
AVERAGE VELOCITY HEAD:	0.764 " of H20		
STACK GAS VELOCITY:		60.0	ft/second
STACK GAS AIR FLOW:	57612.6 acf/min	30338.1	dscf/min
PARTICULATE EMISSION CONCENTRATION (front-half):		0.029	gr/dscf
PARTICULATE EMISSION CONCENTRATION (back-half):		0.003	gr/dscf
TOTAL PARTICULATE EMISSION CONC. (front & back-half):		0.032	gr/dscf
TOTAL PARTICULATE EMISSION CONCENTRATION:		73.0	mg/dscm
TOTAL PARTICULATE MATTER EMISSION RATE:		8.30	lb/hr

FRONTHALF PARTICULATE MATTER MASS LOADING

FILTER NUMBER:	#110-113
TARE WEIGHT OF FILTER (grams):	0.6160
FINAL WEIGHT OF FILTER (grams):	0.6763
NET WEIGHT OF PARTICULATE MATTER (grams):	0.0603
BEAKER NUMBER:	#150-521
TARE WEIGHT OF BEAKER (grams):	66.0034
FINAL WEIGHT OF BEAKER (grams):	66.0198
NET WEIGHT OF PARTICULATE MATTER (grams):	0.0164
VOLUME OF ACETONE (milliliters):	125.0
WT./VOL. OF ACETONE BLANK (milligrams/ml):	0.000
NET WEIGHT OF PARTIC. DUE TO ACETONE (grams):	0.0000
TOTAL FRONTHALF PARTICULATE MATTER (grams):	0.0767

BACKHALF PARTICULATE MATTER MASS LOADING

"C" SECTION - CONDENSER PARTICULATE	#150-544
TARE WEIGHT OF BEAKER (grams):	68.0428
FINAL WEIGHT OF BEAKER (grams):	68.0498
NET WEIGHT OF PARTIC. MATTER (grams):	0.0070
TOTAL VOLUME OF WATER (milliliters):	680.0
VOLUME OF WATER CONDENSED (milliliters):	341.4
NET VOLUME OF WATER FOR BLANK (milliliters):	338.6
WT./VOL. OF WATER BLANK (milligrams/ml):	0.0008
NET WEIGHT OF PARTIC. DUE TO WATER (grams):	0.0003
"Cx" SECTION - HYDROCARBON EXTRACTION	#150-528
TARE WEIGHT OF BEAKER (grams):	65.1550
FINAL WEIGHT OF BEAKER (grams):	65.1557
NET WEIGHT OF PARTIC. MATTER (grams):	0.0007
TOTAL VOLUME OF CH2Cl2 (milliliters):	150.0
WT./VOL. OF CH2Cl2 BLANK (milligrams/ml):	0.000
NET WEIGHT OF PARTIC. DUE TO CH2Cl2 (grams):	0.0000
"D" SECTION - ACETONE RINSE OF CONDENSER	#150-525
TARE WEIGHT OF BEAKER (grams):	65.2138
FINAL WEIGHT OF BEAKER (grams):	65.2142
NET WEIGHT OF PARTIC. MATTER (grams):	0.0004
TOTAL VOLUME OF ACETONE (milliliters):	85.0
WT./VOL. OF ACETONE BLANK (milligrams/ml):	0.000
NET WEIGHT OF PARTIC. DUE TO ACETONE (grams):	0.0000
TOTAL BACKHALF PARTICULATE MATTER (grams):	0.0078
TOTAL WEIGHT OF PARTICULATE MATTER (grams):	0.0845

METHODS 1, 2, 3A, 4, AND 5
AM TEST-AIR QUALITY, INC.

FILE NAME:	201B\LAKE-3	LAB #:	4152
CLIENT:	LAKESIDE INDUSTRIES	START TIME:	11:18 o'clock
LOCATION:	MONROE, WASHINGTON	STOP TIME:	12:28 o'clock
SAMPLE SITE:	BAGHOUSE EXHAUST STACK	SAMPLE LENGTH:	62.5 minutes
SAMPLE DATE:	JULY 26, 1993		
RUN #:	3 - METHOD 5		
OPERATORS:	PEDRONI/LAWRENCE		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
918.5	641.4	277.1
677.2	643.5	33.7
533.7	531.4	2.3
791.9	782.9	9.0
TOTAL H2O GAIN:		322.1
TOTAL VOLUME (SCF):		15.19
PERCENT MOISTURE:		28.19
Bws:		0.2819

PITOT TUBE Cp:	0.84		
NOZZLE DIAMETER:	0.247	inches	
NOZZLE AREA:	0.0003	sq. feet	
STACK DIAMETER:	48x48	inches	
STACK AREA:	16.00	sq. feet	
METER TEMPERATURE:	77.9	degrees F	
BAROMETRIC PRES.:	30.30	inches Hg	
STATIC PRESSURE:	-0.75	inches H2O	
STACK PRESSURE:	30.24	inches Hg	
ORIFICE PRESSURE:	1.429	inches H2O	
METER PRESSURE:	30.41	inches Hg	

INIT. METER VOLUME:	39.104		
FINAL METER VOLUME:	77.547		
VOLUME SAMPLED:	38.443		
STD VOLUME (DSCF):	38.692		
STD VOLUME (DSCM):	1.096		
Y FACTOR:	1.009		
AVERAGE CONC. CO2:	5.3	percent	
AVERAGE CONC. O2:	13.7	percent	
AVERAGE CONC. CO:	379	ppm	
MOLECULAR WEIGHT:	29.40	g/g-mole-dry	
MOLECULAR WEIGHT:	26.18	g/g-mole-wet	

SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " OF H2O	TEMPERATURE °F
A 1	0.74	243	4	0.55	273
2	0.77	254	5	0.50	272
3	0.90	245	C 1	0.87	269
4	0.70	247	2	1.16	276
5	0.61	250	3	0.87	275
B 1	0.78	263	4	0.66	276
2	0.83	266	5	0.54	274
3	0.85	269	D 1	1.20	266
4	0.73	268	2	1.13	266
5	0.46	263	3	0.85	266
C 1	0.81	268	4	0.56	263
2	0.99	270	5	0.42	264
3	0.74	273			

PERCENT ISOKINETICS:	98 %		
STACK TEMPERATURE:	264.8	degrees F	724.8 degrees R
AVERAGE VELOCITY HEAD:	0.755	" of H20	
STACK GAS VELOCITY:			59.7 ft/second
STACK GAS AIR FLOW:	57307.2	acf/min	30306.9 dscf/min
PARTICULATE EMISSION CONCENTRATION (front-half):			0.040 gr/dscf
PARTICULATE EMISSION CONCENTRATION (back-half):			0.012 gr/dscf
TOTAL PARTICULATE EMISSION CONC. (front & back-half):			0.052 gr/dscf
TOTAL PARTICULATE EMISSION CONCENTRATION:			119.5 mg/dscm
TOTAL PARTICULATE MATTER EMISSION RATE:			13.6 lb/hr

FRONTHALF PARTICULATE MATTER MASS LOADING

FILTER NUMBER:	#110-111
TARE WEIGHT OF FILTER (grams):	0.6409
FINAL WEIGHT OF FILTER (grams):	0.7144
NET WEIGHT OF PARTICULATE MATTER (grams):	0.0735
BEAKER NUMBER:	#150-522
TARE WEIGHT OF BEAKER (grams):	80.0714
FINAL WEIGHT OF BEAKER (grams):	80.0993
NET WEIGHT OF PARTICULATE MATTER (grams):	0.0279
VOLUME OF ACETONE (milliliters):	165.0
WT./VOL. OF ACETONE BLANK (milligrams/ml):	0.000
NET WEIGHT OF PARTIC. DUE TO ACETONE (grams):	0.0000
TOTAL FRONTHALF PARTICULATE MATTER (grams):	0.1014

BACKHALF PARTICULATE MATTER MASS LOADING

"C" SECTION - CONDENSER PARTICULATE	#150-545
TARE WEIGHT OF BEAKER (grams):	67.6686
FINAL WEIGHT OF BEAKER (grams):	67.6982
NET WEIGHT OF PARTIC. MATTER (grams):	0.0296
TOTAL VOLUME OF WATER (milliliters):	665.0
VOLUME OF WATER CONDENSED (milliliters):	313.1
NET VOLUME OF WATER FOR BLANK (milliliters):	351.9
WT./VOL. OF WATER BLANK (milligrams/ml):	0.0008
NET WEIGHT OF PARTIC. DUE TO WATER (grams):	0.0003
"Cx" SECTION - HYDROCARBON EXTRACTION	#150-529
TARE WEIGHT OF BEAKER (grams):	66.4119
FINAL WEIGHT OF BEAKER (grams):	66.4120
NET WEIGHT OF PARTIC. MATTER (grams):	0.0001
TOTAL VOLUME OF CH2Cl2 (milliliters):	150.0
WT./VOL. OF CH2Cl2 BLANK (milligrams/ml):	0.000
NET WEIGHT OF PARTIC. DUE TO CH2Cl2 (grams):	0.0000
"D" SECTION - ACETONE RINSE OF CONDENSER	#150-526
TARE WEIGHT OF BEAKER (grams):	67.1209
FINAL WEIGHT OF BEAKER (grams):	67.1210
NET WEIGHT OF PARTIC. MATTER (grams):	0.0001
TOTAL VOLUME OF ACETONE (milliliters):	90.0
WT./VOL. OF ACETONE BLANK (milligrams/ml):	0.000
NET WEIGHT OF PARTIC. DUE TO ACETONE (grams):	0.0000
TOTAL BACKHALF PARTICULATE MATTER (grams):	0.0295
TOTAL WEIGHT OF PARTICULATE MATTER (grams):	0.1309

APPENDIX B

Example Calculations and Field Data Sheets

SAMPLE CALCULATION SHEET
METHODS 1, 2, 3A, 4 AND 5

CLIENT: Lakeside Industries DATE OF TEST: 7-26-93

LOCATION: Monroe, WA: Baghouse Exhaust stack RUN #: 3: Method 1, 2, 3A, 4, 5

Particulate Matter Emission Concentration - Equation 5-1

Vm_{std} =
17.647°R/"Hg * 38.443 ft³ * 1.009 * (30.30 "Hg + (1.429 "H_2O/13.6))/(460 + 77.9 °F)

= 38.692 dscf

dscm = 38.692 dscf/35.31 ft³/m³

= 1.096 dscm

Substitution of Equation 5-4 into 5-5

W_a = 0 mg * 165 ml / 150 ml

= 0 mg

M_n = (net weight filter catch) + (net weight "B" section) - Wa + Back-half

= 130.9 mg = 73.5 mg + 27.9 mg - 0 mg + 29.5 mg

C_s= (0.001 g/mg) * (15.43 grains/gram) * 130.9 mg / 38.692 dscf

= 0.052 gr/dscf (Equation 5-6)

gr/dscf @7% O_2 = _____ gr/dscf * (20.9% - 7%O_2)/(20.9% - _____ %O_2)

= N/A gr/dscf @ 7% O_2

gr/dscf @ 12% CO_2 = _____ gr/dscf * 12% / _____ %CO_2

= N/A gr/dscf @ 12% CO_2

mg/dscm = 130.9 mg/ 1.096 dscm

= 119.5 mg/dscm

Particulate Matter Emission Rate

pounds/hour = 0.052 gr/dscf * 30306.9 dscf/min * 60 min/hr * 1 lb/7000 grains

= 13.6 lb/hr

Moisture - Equation 5-2 and 5-3

Vw_{std} = 0.04715 ft³/g * 322.1 grams of H_2O collected in impingers = 15.19 scf

SAMPLE CALCULATION SHEET (continued)
METHODS 1, 2, 3A, 4 and 5

B_{ws} = (15.19 scf)/(1519 scf + 38.692 dscf)

= 0.2819

%Moisture = 0.2819 * 100

= 28.19 %

Molecular weight - Equation 3-2

M_d = 0.440 * (5.3 $\%CO_2$) + [0.320 * (13.7 $\%O_2$)] + [0.280 * (81.0 % CO + $\%N_2$) / (100 - (13.7 + 5.3))]

M_d = 29.40 g/g-mole (dry)

M_s = 29.40 g/g-mole * (1 - 0.2819) + (18.0 g/g-mole * 0.2819)

M_s = 26.18 g/g-mole (wet)

Stack gas velocity and volumetric flow rate - Equation 2-9 and 2-10

V_s = 85.49 * 0.84 * $\sqrt{0.755 * 724.8^\circ R / 26.18 g/g\text{-mole} / 30.24 \text{"Hg}}$ (460 + 264.8 = °R) (30.30 + (-.75/13.6))

V_s = 59.7 ft/sec

Q_{sd} = 3600 * (1 - 0.2819) * 59.7 ft/sec * 16.00 ft^2 * (528° R/724.8° R) * (30.24 "Hg/29.92 "Hg)

A = 48×48/144

= 1818412.6 dscf/hr / 60 min/hr

= 30306.9 dscf/min (dry standard cubic feet per minute)

acfm = 59.7 ft/sec * 16.00 ft^2 * 60 sec/min

= 57307.2 acfm (actual cubic feet per minute)

Isokinetic variation - Equation 5-8

I = [0.09450 * 38.692 dscf * 724.8° R] / [30.24 "Hg * 59.7 ft/sec * 62.5 min * 0.0003 ft^2 * (1 - 0.2819))]

$A = \pi \times .247^2/4/144$

I = 98 %

All of the above numbered equations are from the 40 CFR 60 and assume English units.

SAMPLE CALCULATION SHEET (2)

Backhalf particulate

"C" Section

29.6 mg particulate in "C" Section beaker

665 ml of water in condensers, including rinses

313.1 ml of condensation in 1st, 2nd and 3rd bubblers (final weight - initial weight, assumes 1g/1ml water density)

351.9 ml of deionized, distilled water used in bubblers including rinses

0.0008 mg/ml blank partic. = (0.5 mg H2O blank / ~~100~~ 600 ml H2O)

0.2 mg of blank particulate

= 29.3 mg of "C" partic. = 29.6 mg of partic. in "C" - 0.3 mg of blank

"Cx" Section

0.1 mg of particulate in "Cx" Section beaker

0 mg/ml of blank partic. = (0 mg CH2Cl2 blank / 150 ml CH2Cl2)

0 mg of blank particulate = (150 ml * 0 mg/ml)

= 0.1 mg of "Cx" partic = 0.1 mg of partic in "Cx" - 0 mg of blank

"D" Section

0.1 mg of particulate in "D" Section beaker

0 mg/ml of blank particulate (same as "B" Section)

0 mg of blank particulate = (90 ml * 0 mg/ml)

= 0.1 mg of "D" partic. = 0.1 mg of partic. in "D" - 0 mg of blank

Total Backhalf Particulate

+ 29.3 mg of "C" Section particulate

+ 0.1 mg of "Cx" Section particulate

+ 0.1 mg of "D" Section particulate

+ N/A mg of Backhalf filter (if applicable)

= 29.5 mg of Backhalf particulate

STACK SCHEMATIC AND LOCATION OF SAMPLE POINTS

Client Lakeside Industries

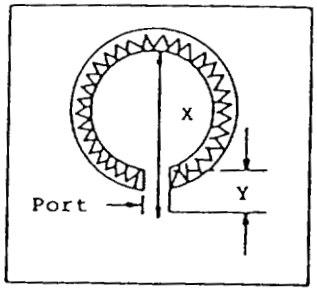
Location Monroe, WA

Sampling Location Cement Asphalt Plant Baghouse Exhaust

Inside of far wall to outside of port (distance, X) 5 1/2"

Inside of near wall to outside of port (distance, Y) 3"

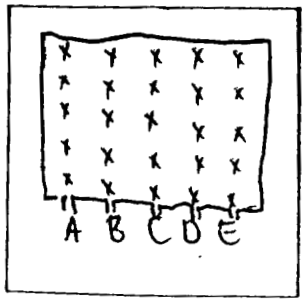
Stack I.D. (distance X - distance Y) 48.0" X 48.0" Rectangular

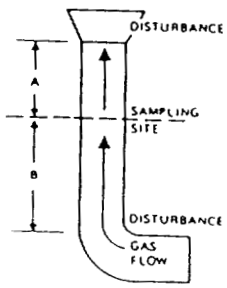


Schematic of Sampling Location

1 Traverse Point #	2 Fractional Percent of Stack I.D.	3 Stack I.D. inches	4 Column 2 x 3	5 Distance Y	6 Traverse Point Location from Outside of Port columns 4 + 5
1	10%	48.0"	4.8"	3.0"	7.8"
2	30%		14.4"		17.4"
3	50%		24.0"		27.0"
4	70%		33.6"		36.6"
5	90%		43.2"		46.2"
6					
7					
8					
9					
10					
11					
12					

CROSS SECTION

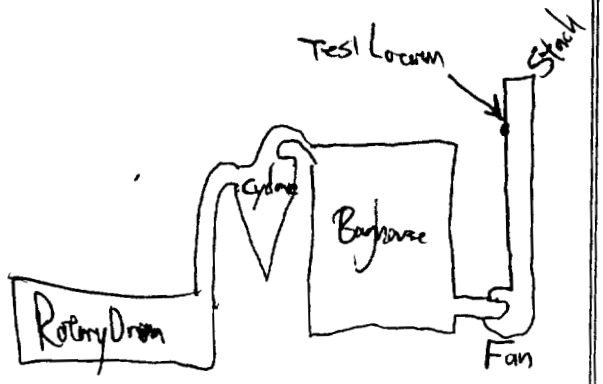




Distance A = 34 *downstream*

Distance B = 33 1/2 *upstream*

STACK, CONTROL DEVICE AND PROCESS FLOW DIAGRAM



4150

TRAVERSE SAMPLING DATA SHEET

Client Lakeside Industries Inc
Location Monroe WA
Sample Site Bag House Stack
Stack Diameter 48 x 48
Date 7-26-93
Operators JJP, KSM, ERL
Run I.D. R-1 / M-5

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	0.007 / 0.008
Leak Test Vacuum	15" / 15"
✓ Pitots, Pre Leak Ck	
✓ Pitots, Post Leak Ck	
✓ Gas Sampling System	
N/A Integrated Bag	
ISB Thermocouples @ ___ °F	

QA FORMS COMPLETED
Stack Schematic ✓
Sample Train ✓
Pitot Tube Insp. ✓
Magnehelic Cal. ✓
Temp. Probe Cal. ✓
Gas Meter Calib. ✓
silver meter box
Filter # 110-071 Box # S-1

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	846.3	- 636.6	= 209.7
#2 Imp.	756.7	- 701.5	= 55.2
#3 Imp.	549.7	- 538.6	= 11.1
#4 Imp.		-	=
#5 Imp.		-	=
#6 S.G.	749.7	- 736.5	= 13.2
Total H_2O Volume	289.2 ✓		g

Start Time 7:28
Stop Time 8:35
Barometric Pressure "Hg 30.30
Static Pres "H_2O -.75
Production Rate

SAMPLING PARAMETERS

% Moisture 24%
Meter Temp. 70
Stack Temp. 225 / 245 (25)
ΔH@ 1.998 Y ~~0.994~~ 1.009
Pitot # P5H Side # A
Cp 0.84
Nozzle Diameter .247 inch
D_1 .246 D_2 .247 D_3 .247
K Factor 2.112 2583

Sample Point		Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Pitot Reading Δ P " H_2O	Orifice Setting (Δ H) " H_2O Ideal	Orifice Setting (Δ H) " H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge " Hg	Filter Box Temp °F	Imp. Exit Temp °F	Stack Temp °F	O_2 %	CO_2 % / CO ppm
A	1	0	958.862	.68	1.37	1.37	63	63	0.0	237	58	216	14.3	4.4 / 362
	2	2.5		.77	1.57	1.57	64	62	0.0	241	54	235	14*	4.4 / 362 EC
	3	5.0		.72	1.59	1.59	65	63	1.0	244	54	241	14.4	4.4 / 365 K
	4	7.5		1.15	2.54	2.54	65	63	1.0	243	55	234	15.9	3.8 / 423
	5	10.0		1.30	2.83	2.83	66	63	1.0	246	56	225	15.9	3.3 / 427
B	1	12.5		0.35	.76	.76	65	63	1.0	245	56	221	15.9	3.3 / 408
	2	15.0		0.68	1.48	1.48	66	63	1.0	247	56	230	14.3	4.1 / 388
	3	17.5		0.72	1.57	1.57	67	63	1.0	248	57	236	14.3	4.1 / 389
	4	20.0		0.69	1.50	1.50	68	64	1.5	246	58	241	14.4	4.1 / 397
	5	22.5		0.65	1.41	1.41	68	64	1.5	248	59	242	14.5	4.1 / 403
C	1	25.0	975.467	0.65	1.41	1.41	69	64	1.5	237	58	243	14.3	4.2 / 386
	2	27.5		0.78	1.67	1.67	69	65	1.5	239	58	246	14.0	4.2 / 382
	3	30.0		0.74	1.59	1.59	70	65	1.5	248	56	245	14.0	4.2 / 350
	4	32.5		0.64	1.37	1.37	70	65	1.5	250	55	247	14.1	4.2 / 374
	5	35.0		0.53	1.14	1.14	71	65	1.5	250	57	246	14.3	4.2 / 342
D	1	37.5	983.200	0.79	1.69	1.69	70	66	1.5	250	57	244	14.2	4.2 / 388 Chan K
	2	40.0		0.89	1.88	1.88	71	66	1.5	248	58	248	14.1	4.3 / 387
	3	42.5		0.82	1.73	1.73	72	66	1.5	252	56	242	13.5	4.4 / 377
	4	45.0		0.70	1.48	1.48	72	67	1.5	257	58	250	13.4	4.6 / 340
	5	47.5		0.47	0.99	0.99	73	67	1.5	259	60	257	13.6	4.6 / 356
E	1	50.0	991.240	0.72	1.50	1.50	72	68	1.5	250	53	250	13.9	4.3 / 349 Chan K
	2	52.5		0.71	1.48	1.48	73	68	1.5	251	53	252	13.9	4.5 / 346
	3	55.0		0.57	1.19	1.19	73	68	1.5	251	54	247	13.7	4.5 / 351
	4	57.5		0.42	0.88	0.88	73	68	1.5	250	54	232	13.8	4.6 / 358
	5	60.0		0.25	0.52	0.52				257	54	217	13.5	4.7 / 373
		62.5	997.977	$\sqrt{(\Delta P)^2}$ .729		ΔH 1.486		Tm 67.0				T 239.5	14.3	4.2 / 377

1.48

METHOD 5
LABORATORY ANALYSIS

Client Lakeside Run Number 1

Sample Location

Date 7-26-93

"A" Section (Filter)

Filter # 110-071 Tare Weight 0.6293 grams

Final Weight 0.6587 grams

Net Weight 0.0294 grams

"B" Section (Probe Wash)

Beaker # 520 Tare Weight 65.8299 grams

Volume Acetone 165 mls Final Weight 65.8481 grams

Blank: 523 vol: 150 Net Weight 0.0182 grams

T: 79.3017 gm 0.0 mg/ml

F: 79.3012

"C" Section (Condenser Particulate - Inorganic Catch)

Beaker # 543 Tare Weight 67.3187 grams

Volume Water 625 mls Final Weight 67.3305 grams

Blank: 546 vol: 600mls Net Weight 0.0118 grams

T: 66.1552 gm 0.0008 mg/ml

F: 66.1557

"Cx" Section (Condenser Particulate - Organic Catch)

Beaker # 527 Tare Weight 64.6931 grams

Volume CH_2Cl_2 150 mls Final Weight 64.6961 grams

Blank: 530 vol: 150mls Net Weight 0.0030 grams

T: 64.0333 gm 0.0

F: 64.0324

"D" Section (Final Acetone Rinse of Impingers)

Beaker # 524 Tare Weight 79.1025 grams

Volume Acetone 90 mls Final Weight 79.1045 grams

Net Weight 0.0020 grams

4150

4151

TRAVERSE SAMPLING DATA SHEET

Page ___ of ___

Client Lakeside Industries Inc.
Location Moncor, WA
Sample Site Baghouse Stack
Stack Diameter 48x48
Date 7-26-93
Operators VJP - ERL
Run I.D. R2 M5

EQUIPMENT CHECKS

	Initial	Final
Leak Rate cfm	0.010	0.011
Leak Test Vacuum	15"	15"

✓ Pitots, Pre Leak Ck
✓ Pitots, Post Leak Ck
✓ Gas Sampling System
N/A Integrated Bag
TSB Thermocouples @ ___ °F

QA FORMS COMPLETED
Stack Schematic ✓
Sample Train ✓
Pitot Tube Insp. ✓
Magnehelic Cal. ✓
Temp. Probe Cal. ✓
Gas Meter Calib. ✓

Silver meter Box
Filter # 110-113 Box # S-2

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	947.9	644.6	303.3
#2 Imp.	704.5	667.6	36.9
#3 Imp.	538.7	537.5	1.2
#4 Imp.			
#5 Imp.			
#6 S.G.	827.5	819.5	8.0

Total H_2O Volume 349.4 ✓ g

Start Time 9:15
Stop Time 10:45
Barometric Pressure "Hg 30.30
Static Pres "H_2O -.70
Production Rate

SAMPLING PARAMETERS

% Moisture .26
Meter Temp. 68 74
Stack Temp. 245 250 265
ΔH@ 1.998 Y 1.009
Pitot # P54 Side # A
Cp 0.84
Nozzle Diameter .247 inch
D_1 .246 D_2 .247 D_3 .247
K Factor 2.012 2.021* 1.979+

Sample Point		Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Pitot Reading Δ P " H_2O	Orifice Setting (Δ H) " H_2O Ideal	Orifice Setting (Δ H) " H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge " Hg	Filter Box Temp °F	Imp. Exit Temp °F	Stack Temp °F	O_2 %	CO_2% / CO ppm
A	1	0	998.494	1.28	2.58	2.58	71	70	0.0	244	58	254	13.0	5.3/340
	2	2.5		1.23	2.48	2.48	72	70	1.0	252	56	256	13.0	5.3/327
	3	5.0		0.92	1.85	1.85	73	70	2.0	250	53	258	13.1	5.3/338
	4	7.5		0.64	1.29	1.29	73	76	2.0	257	53	257	13.3	5.3/332
	5	10.0		0.45	0.91	0.91	73	70	1.5	246	54	228	13.4	5.3/345*
B	1	12.5		1.05	2.12	2.12	73	71	1.5	261	55	264	13.7	5.3/338
	2	15.0		1.25	2.53	2.53	75	71	1.5	252	55	276	13.1	5.6/357
	3	17.5		0.93	1.88	1.88	75	71	1.5	256	54	270	13.1	5.5/346
	4	20.0		0.66	1.33	1.33	75	71	1.5	251	54	267	13.0	5.7/347
	5	22.5		0.55	1.11	1.11	75	71	2.0	260	56	264	13.0	5.6/345*
C	1	25.0	1015.815	1.05	2.12	2.12	75	72	2.0	244	57	267	12.9	5.3/312
	2	27.5		0.96	1.90	1.90	76	72	2.0	249	58	270	12.6	5.3/376+
	3	30.0		1.03	2.04	2.04	76	72	2.0	256	58	267	12.9	5.5/367
	4	32.5		0.46	0.91	0.91	76	72	2.0	258	58	263	13.1	5.4/357
	5	35.0		0.47	0.93	0.93	76	72	2.0	246	57	262	13.0	5.4/369
B	1	37.5		0.83	1.64	1.64	76	73	1.5	259	57	267	12.8	5.4/404
	2	40.0		0.83	1.64	1.64	77	73	1.5	248	56	272	12.8	5.6/446
	3	42.5		0.61	1.21	1.21	77	73	2.0	255	57	272	12.6	5.7/447
	4	45.0		0.42	0.83	0.83	77	73	2.0	266	58	276	12.7	5.6/377
	5	47.5		0.37	0.73	0.73	77	73	1.5	249	59	267	12.8	5.6/363
A	1	50.0		0.94	1.86	1.86	77	74	2.0	234	59	271	12.9	5.4/366
	2	52.5		0.90	1.78	1.78	78	74	2.0	271	59	269	13.0	5.4/371
	3	55.0		0.68	1.35	1.35	76	75	2.0	253	59	250	13.6	4.1/345
	4	57.5		0.62	1.23	1.23	76	74	2.0	256	61	250	13.4	4.9/360
	5	60.0		0.55	1.09	1.09	76	74	2.0	264	61	250	13.1	5.3/364
		62.5	1038.756	$\sqrt{(\Delta P)^2}$ 0.943		ΔH 1.574	T_m 73.6					T_s 260.4	13.0	5.4/362

METHOD 5
LABORATORY ANALYSIS

Client Lakeside Run Number 2

Sample Location BH Stack

Date 7-26-93

"A" Section (Filter)

Filter # 110-113 Tare Weight 0.6160 grams
Final Weight 0.6763 grams
Net Weight 0.0603 grams

"B" Section (Probe Wash)

Beaker # 521 Tare Weight 66.0034 grams
Volume Acetone 125 mls Final Weight 66.0198 grams
Net Weight 0.0198 grams

"C" Section (Condenser Particulate - Inorganic Catch)

Beaker # 544 Tare Weight 68.0428 grams
Volume Water 680 mls Final Weight 68.0498 grams
Net Weight 0.0070 grams

"Cx" Section (Condenser Particulate - Organic Catch)

Beaker # 528 Tare Weight 65.1550 grams
Volume CH_2Cl_2 150 mls Final Weight 65.1557 grams
Net Weight 0.0007 grams

"D" Section (Final Acetone Rinse of Impingers)

Beaker # 525 Tare Weight 65.2138 grams
Volume Acetone 85 mls Final Weight 65.2142 grams
Net Weight 0.0004 grams

N) 4151

4152

TRAVERSE SAMPLING DATA SHEET

Page ___ of ___

Client Lakeside Industries Inc
Location Monroe WA
Sample Site
Bag house Stack
Stack Diameter 48" x 48"
Date 7-26-93
Operators USP - ERL
Run I.D. M5 w/B11
R-3

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	0.006/ 0.004
Leak Test Vacuum	15"/ 15"
✓ Pitots, Pre Leak Ck	
✓ Pitots, Post Leak Ck	
✓ Gas Sampling System	
N/A Integrated Bag	
TSB Thermocouples @ ___ °F	

QA FORMS COMPLETED
Stack Schematic ✓
Sample Train ✓
Pitot Tube Insp. ✓
Magnehelic Cal. ✓
Temp. Probe Cal. ✓
Gas Meter Calib. ✓
silver M5 Box ✓
Filter # 110-111 Box # S-3

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	918.5	- 641.4	=
#2 Imp.	677.2	- 643.5	=
#3 Imp.	533.7	- 531.4	=
#4 Imp.		-	=
#5 Imp.		-	=
#6 S.G.	791.9	- 782.9	=
Total H_2O Volume	322.1 ✓		g

Start Time 11:18
Stop Time 12:28
Barometric Pressure "Hg 30.30
Static Pres "H_2O -.75
Production Rate

SAMPLING PARAMETERS

% Moisture .29
Meter Temp. 76 79
Stack Temp. 265 258 263 ↑ 270
ΔH@ 1.998 N.009
Pitot # P58 Side # A
Cp 0.84
Nozzle Diameter .247 inch
D_1 .246 D_2 .247 D_3 .247
K Factor 1.850 1.900* 1.84 1.861 ↑

Sample Point		Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Pitot Reading Δ P " H_2O	Orifice Setting (Δ H) " H_2O Ideal	Orifice Setting (Δ H) " H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge " Hg	Filter Box Temp °F	Imp. Exit Temp °F	Stack Temp °F	O_2 %	CO_2 % / CO (ppm)
A	1	0	39.104	0.74	1.37	1.37	76	75	0	268	59	243	14.0	5.1 / 384
	2	2.5		0.77	1.43	1.43	76	75	0	244	60	254	14.1	5.3 / 400
	3	5.0		0.90	1.67	1.67	77	75	0	235	61	245	13.5	5.3 / 410 *
	4	7.5		0.70	1.33	1.33	77	75	1	242	61	247	13.0	5.4 / 440
	5	10		0.61	1.16	1.16	77	75	1	255	61	250	12.9	5.7 / 474
B	1	12.0		0.78	1.48	1.48	77	75	1	256	62	263	13.8	5.3 / 364
	2	15.0		0.83	1.54	1.54	78	75	1	257	60	266	13.8	5.4 / 334 +
	3	17.5		0.85	1.58	1.58	79	76	1	256	58	269	13.9	5.4 / 341
	4	20.0		0.73	1.36	1.36	79	75	1	255	59	268	13.9	5.4 / 338
	5	22.5		0.46	0.86	0.86	79	76	1	252	55	263	13.8	5.4 / 337
C	1	25.0		0.81	1.51	1.51	77	76	1	254	55	268	13.7	5.1 / 364
	2	27.5		0.99	1.84	1.84	80	76	2	248	58	270	13.7	5.4 / 370
	3	30.0		0.74	1.38	1.38	80	76	2	250	58	273	13.7	5.4 / 360
	4	32.5		0.55	1.02	1.02	80	76	1.5	252	59	273	13.7	5.4 / 353
	5	35.0		0.56	0.92	0.92	80	76	1.5	245	59	272	13.7	5.3 / 350
D	1	37.5		0.87	1.61	1.61	80	77	1.5	248	61	269	13.7	5.2 / 321
	2	40.0		1.16	2.14	2.14	81	77	2.0	245	61	276	13.6	5.3 / 349
	3	42.5		0.87	1.61	1.61	81	77	2.0	255	60	275	13.7	5.3 / 339
	4	45.0		0.66	1.22	1.22	82	77	2.0	254	60	276	13.7	5.2 / 354
	5	47.5		0.54	1.00	1.00	81	77	2.0	253	63	274	13.9	5.2 / 354
E	1	50.0		1.20	2.22	2.22	82	78	2.0	250	63	266	13.7	4.9 / 346
	2	52.5		1.13	2.09	2.09	83	77	2.0	257	64	266	13.6	5.3 / 441
	3	55.0		0.85	1.57	1.57	83	78	2.0	250	63	266	13.7	5.3 / 418
	4	57.5		0.56	1.04	1.04	83	78	2.0	261	63	263	13.7	5.1 / 419
	5	60.0		0.42	.78	.78	83	78	2.0	249	64	264	12.9	5.6 / 611
		62.5	77.547	$\sqrt{(\Delta P)^2}$	ΔH 1.429		Tm 77.0					Ts 264	13.7	53/270 ✓

METHOD 5
LABORATORY ANALYSIS

Client Lakeside Run Number 3

Sample Location Baghouse Stack

Date 7-26-93

"A" Section (Filter)

Filter # 110-111

Tare Weight 0.6409 grams
Final Weight 0.7144 grams
Net Weight 0.0735 grams

"B" Section (Probe Wash)

Beaker # 522
Volume Acetone 165 mls

Tare Weight 80.0714 grams
Final Weight 80.0993 grams
Net Weight 0.0279 grams

"C" Section (Condenser Particulate - Inorganic Catch)

Beaker # 545
Volume Water 665 mls

Tare Weight 67.6686 grams
Final Weight 67.6982 grams
Net Weight 0.0296 grams

"Cx" Section (Condenser Particulate - Organic Catch)

Beaker # 529
Volume CH_2Cl_2 150 mls

Tare Weight 66.4119 grams
Final Weight 66.4120 grams
Net Weight .0001 grams

"D" Section (Final Acetone Rinse of Impingers)

Beaker # 526
Volume Acetone 90 mls

Tare Weight 67.1209 grams
Final Weight 67.1210 grams
Net Weight 0.0001 grams

AMTEST AIR QUALITY, INC.

SAMPLE RECOVERY INFORMATION

Fill Out One Sheet Per Site and Per Test Type

Client: LAKE SIDE Industries Inc.

Location: Monroe

Site: Asphalt Plant Baghouse Exhaust Stack

Date(s): 7/26/03

Test Team: KSM/VJP/ERL

Run Numbers: 1-3 Type: Method 5 (From Hole & Body Port)

If this information is not accurate for all runs, note all exceptions:

Impinger Train Solutions/ Recovery Information	Solution Used	Bottle Type	No. of mls
Probe Rinse	Acetone		
Filter			
#1	Bubbler + 100ml DI H_2O		
#2	Impinger + 100ml DI H_2O		
#3	MT Bubbler		
#4	Silica Gel		
#5			
#6			
#7			

COMMENTS: 5 ft S.S. Probe & Nozzle were used
110 mm Quartz Fibre Filters were used

APPENDIX C

Supporting Information

SOURCE TEST OBSERVATION CHECKLIST
ASPHALT PLANTS WITH BAGHOUSE

AMTEST AIR QUALITY, INC.

CLIENT: LAKESIDE INDUSTRIES

LOCATION: Monroe WA

SAMPLE SITE: Baghouse Stack

TEST DATE: 7-26-93

TYPE OF PLANT: COUNTERFLOW DRUM MIT ASPHALT PLANT

EQUIPMENT MANUFACTURER: GENCOR

MODEL: ULTRAPLANT 300 CONSTRUCTED/INSTALLED: JUNE '93

IDENTIFICATION NO.: 7390-92-NA DATE LAST TESTED: NONE

PROCESS RATE: 300 TPH. DISCHARGE TEMP °F: 300

FUEL FIRING RATE: 94 % TYPE OF FUEL: PROPANE

A/C INJECTION LOCATION: IN DRUM (MIX CHAMBER)

FINES IN GRAVEL (-200 mesh): 5 %

GRAVEL MOISTURE: 5.7 % ASPHALT TYPE: AR 4000

DENSITY 8.527 lb/gal FLASHPOINT °F 580

TYPE OF EMISSION CONTROL DEVICE: BAGHOUSE

EQUIPMENT MANUFACTURER: GENCOR MODEL: BH-110

IDENTIFICATION NO.: BH 110 - 7389 - 92 - NA

BAG MATERIAL: 14 oz NOMEX NO. OF BAGS: 420

BAG SIZE: 6 1/4" ϕ x 16' DATE BAGS LAST CHANGED: —

TYPE OF BAG CLEANING: PULSE JET CLEANING.

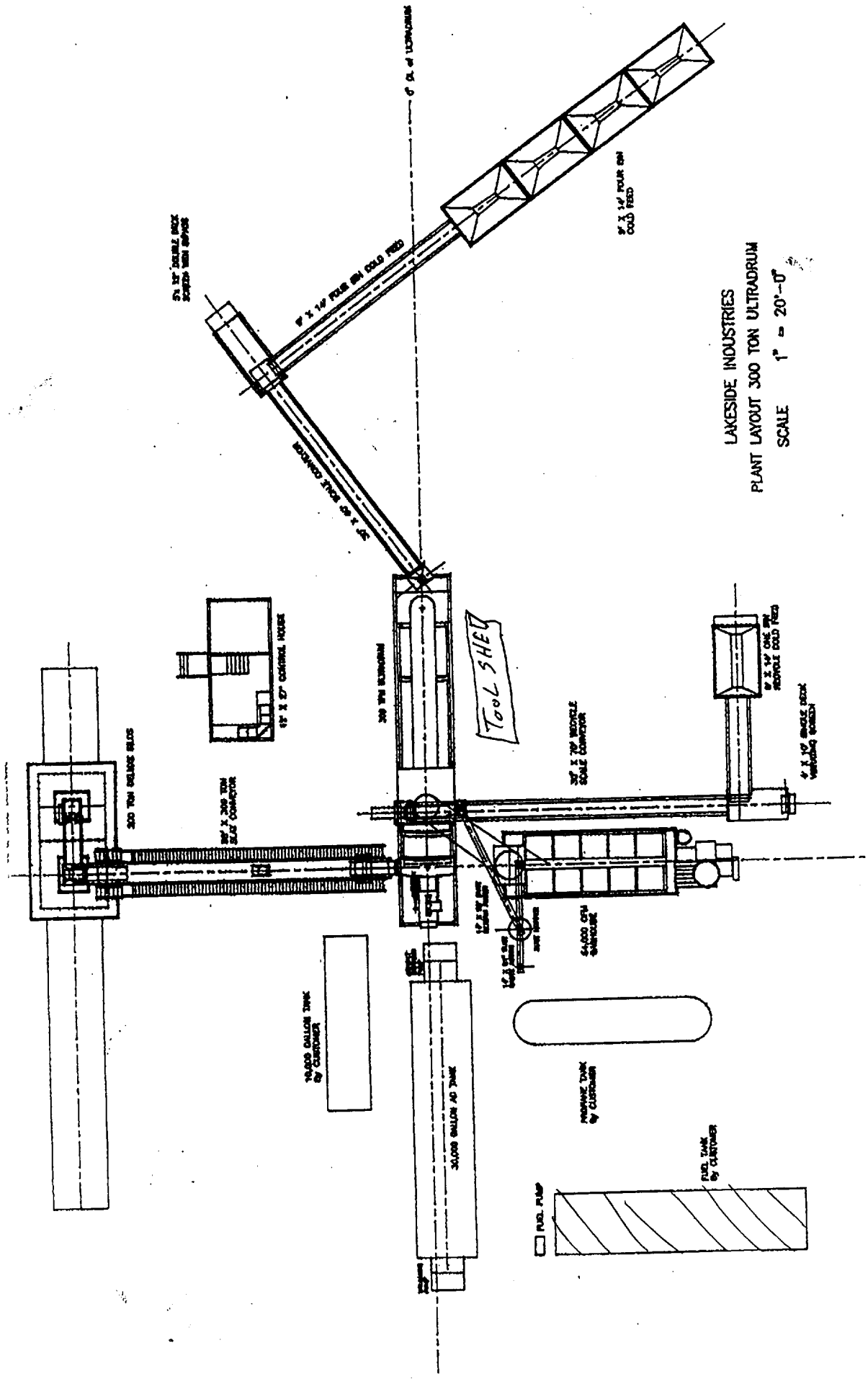
BAGHOUSE PRESSURE ΔP = 4 " H_2O (OR PRESSURE DROP ACROSS BAGHOUSE)

CLEANING CYCLE DURATION: 20 Pul/min

DISPOSITION OF COLLECTED DUST: RETURNED TO PRODUCT

ADDITIONAL INFORMATION:

SKETCH OF SYSTEM:


LAKESIDE INDUSTRIES
PLANT LAYOUT 300 TON ULTRADRUM
SCALE 1" = 20'-0"
TOOL SHED

CROSS SECTIONAL AREA

Traverse Point	Distance (inches)
1	4.8
2	14.4
3	24.0
4	33.6
5	43.2

Port	Distance (inches)
A	4.8
B	14.4
C	24.0
D	33.6
E	43.2

STACK DIMENSIONS

48-inch x 48-inch rectangular stack

5 ports located along one side

A = 3 feet downstream

B = 33 feet upstream

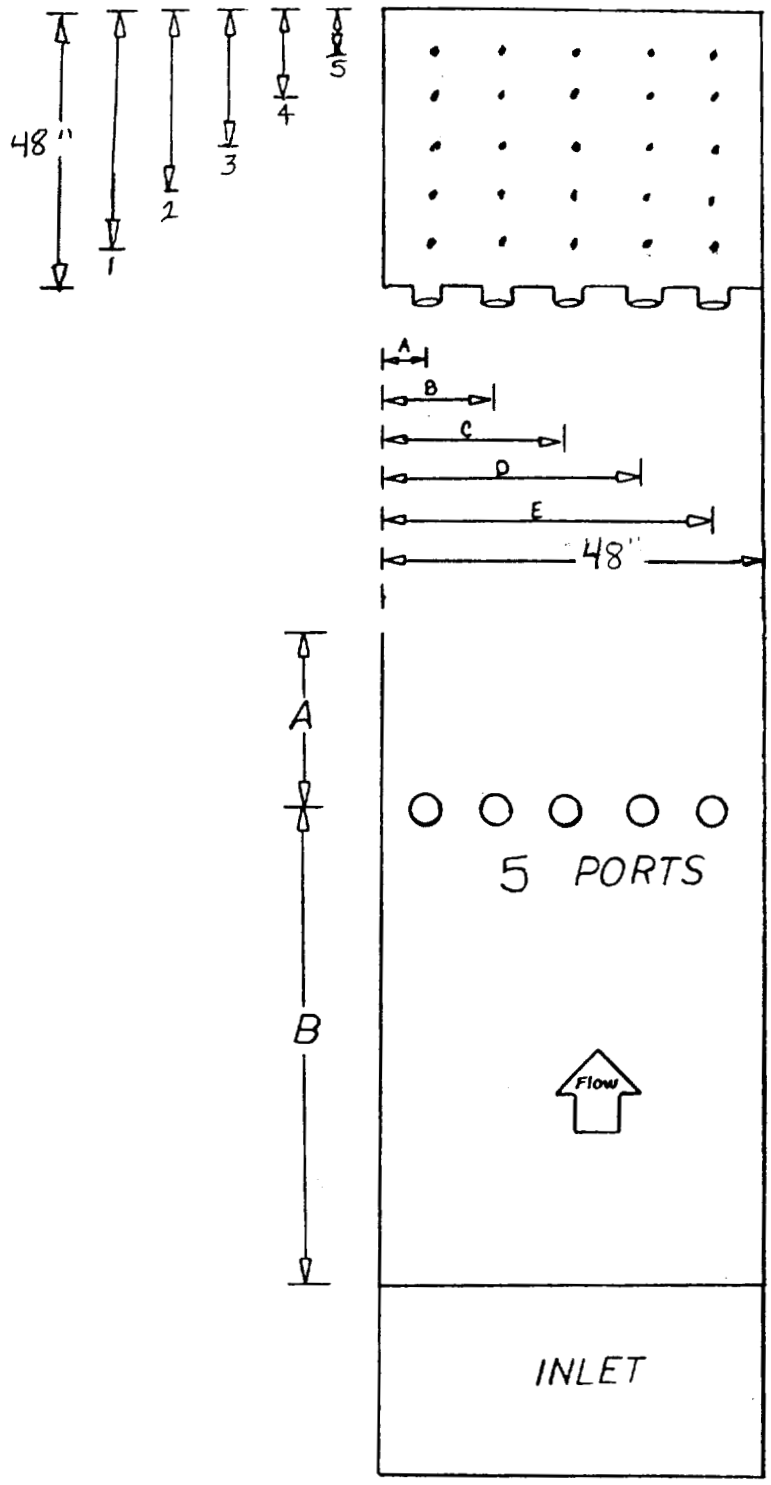


Figure 1. Location of sampling ports and traverse points.

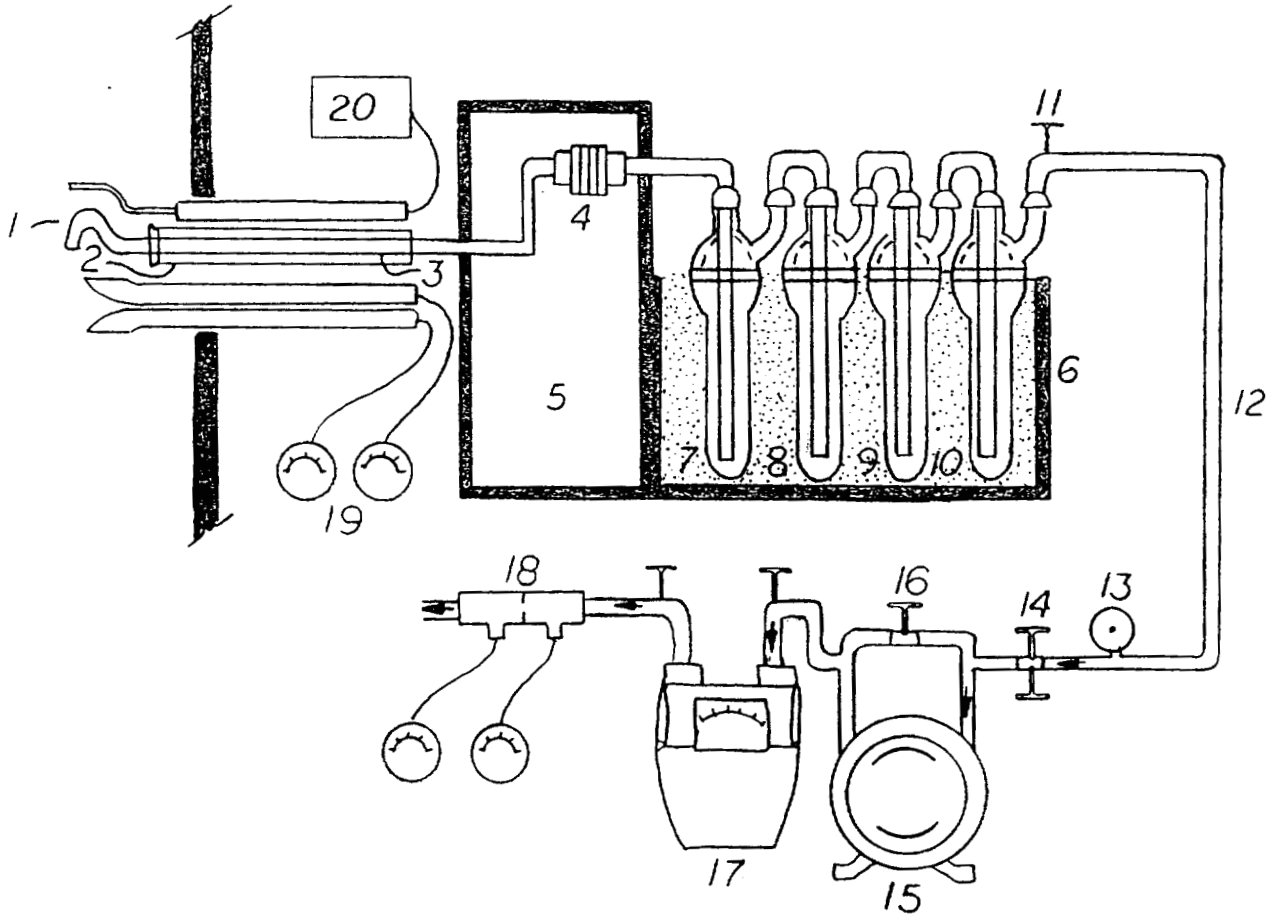


Figure 2. Method 5 Sample Train.

1. Sampling nozzle
2. Sampling probe sheath
3. Heated sample probe liner
4. Out of stack filter assembly
5. Heated filter compartment maintained at 248°F ± 25°F (or temperature specified in 40 CFR subpart)
6. Impinger case - contains ice during sampling
7. First impinger containing 100 ml H_2O
8. Modified Greenburg-Smith impinger containing 100 ml H_2O
9. Third impinger - empty
10. Fourth impinger containing indicating silica gel desiccant
11. Impinger exit gas temperature sensor
12. Umbilical cord - vacuum line
13. Vacuum gauge
14. Fine and coarse adjustment valves
15. Leak free pump
16. By-pass valve
17. Dry gas meter with inlet and outlet temperature sensors
18. Orifice meter with magnehelic gauges
19. S-type pitot tube with magnehelic gauges
20. Fluke multi-channel digital thermocouple indicator

METHOD 1 - LOCATION OF TRAVERSE POINTS

Circular Stacks

TRAVERSE POINT	DISTANCE, % of diameter
1	4.4
2	14.7
3	29.5
4	70 5
5	85 3
6	95.6

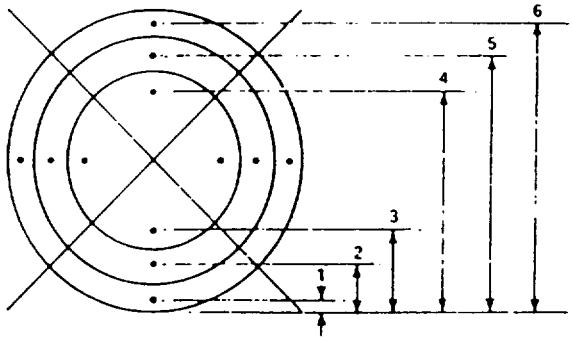


Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

TABLE 1-2. LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

(Percent of stack diameter from inside wall to traverse point)

Traverse point number on a diameter	Number of traverse points on a diameter—											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	65.4	80.6
18									98.6	93.3	88.4	83.9

Rectangular Stacks

For a rectangular cross section, an equivalent diameter (D_e) shall be calculated from the following equation, to determine the upstream and downstream distances:

$$D_e = \frac{2LW}{(L+W)}$$

where L = length and W = width.

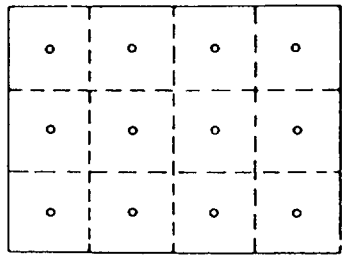


Figure 1-4. Example showing rectangular stack cross section divided into 12 equal areas, with a traverse point at centroid of each area.

METHOD 1 - MINIMUM NUMBER OF TRAVERSE POINTS

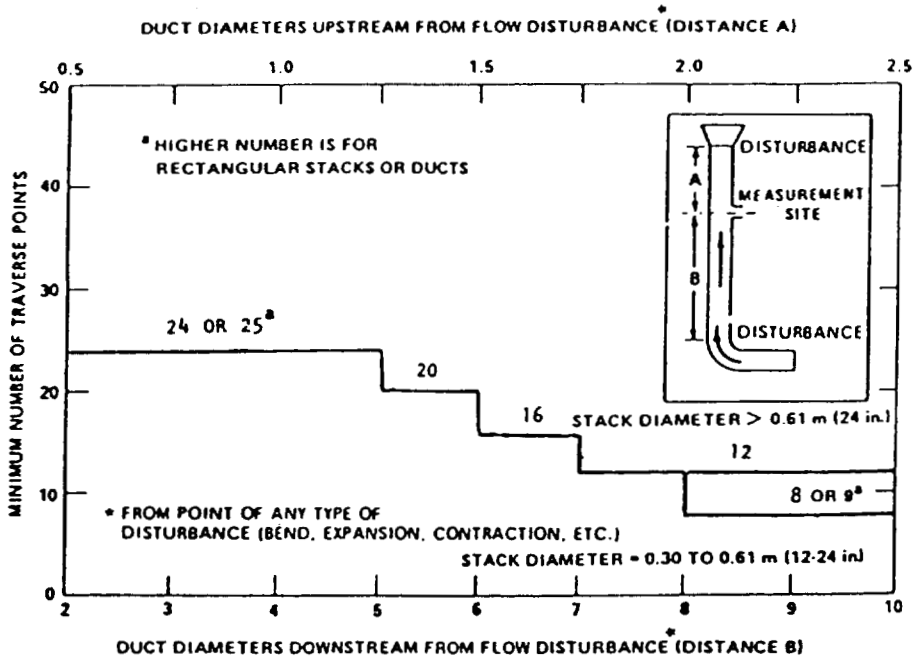


Figure 1-1. Minimum number of traverse points for particulate traverses.

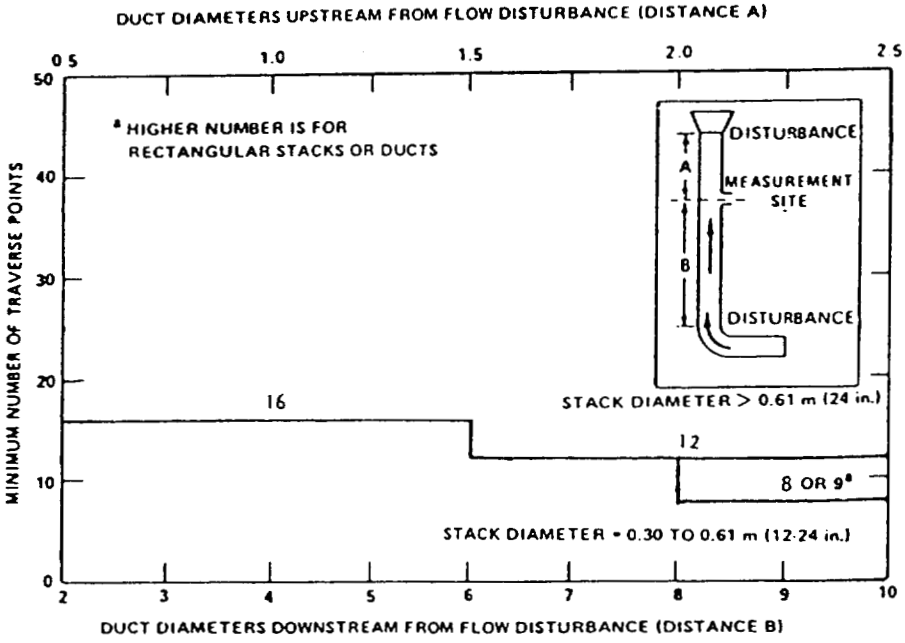


Figure 1-2. Minimum number of traverse points for velocity (nonparticulate) traverses.

METHOD 2 - STACK GAS VELOCITY AND VOLUMETRIC FLOW CALCULATIONS

5.1 Nomenclature.

A = Cross-sectional area of stack, m^2 (ft^2).
B_{ws} = Water vapor in the gas stream (from Method 5 or Reference Method 4), proportion by volume.
C_p = Pitot tube coefficient, dimensionless.
K_p = Pitot tube constant,

$$34.97 \frac{\text{m}}{\text{sec}} \left[\frac{(g/g\text{-mole})(\text{mm Hg})}{(°\text{K})(\text{mm H}_2\text{O})} \right]^{1/2}$$

for the metric system and

$$85.49 \frac{\text{ft}}{\text{sec}} \left[\frac{(\text{lb/lb-mole})(\text{in. Hg})}{(°\text{R})(\text{in. H}_2\text{O})} \right]^{1/2}$$

for the English system.

M_d = Molecular weight of stack gas, dry basis (see Section 3.6) g/g-mole (lb/lb-mole).
M_s = Molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole).

$$= M_d (1 - B_{ws}) + 18.0\, B_{ws}$$

Eq. 2-5

P_{bar} = Barometric pressure at measurement site, mm Hg (in. Hg).
P_g = Stack static pressure, mm Hg (in. Hg).
P_s = Absolute stack gas pressure, mm Hg (in. Hg).

$$= P_{bar} + P_g$$

Eq. 2-6

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscm/hr (dscf/hr).
t_s = Stack temperature, °C (°F).
T_s = Absolute stack temperature, °K, (°R).

$$= 273 + t_s \text{ for metric.}$$

Eq. 2-7

$$= 460 + t_s \text{ for English.}$$

Eq. 2-8

T_{std} = Standard absolute temperature, 293 °K (528° R).
v_s = Average stack gas velocity, m/sec (ft/sec).
Δ_p = Velocity head of stack gas, mm H_2O (in. H_2O).
3,600 = Conversion factor, sec/hr.
18.0 = Molecular weight of water, g/g-mole (lb/lb-mole).

5.2 Average Stack Gas Velocity.

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{T_{s(avg)}}{P_s M_s}}$$

Equation 2-9

5.3 Average Stack Gas Dry Volumetric Flow Rate.

$$Q_{sd} = 3{,}600(1 - B_{ws}) v_s A \left(\frac{T_{std}}{T_{s\,(avg)}} \right) \left(\frac{P_s}{P_{std}} \right)$$

Eq. 2-10

METHOD 3 - MOLECULAR WEIGHT AND EXCESS AIR CALCULATIONS

6.1 Nomenclature.

M_d = Dry molecular weight, g/g-mole (lb/lb-mole).
%EA = Percent excess air.
$\%CO_2$ = Percent CO_2 by volume (dry basis).
$\%O_2$ = Percent O_2 by volume (dry basis).
%CO = Percent CO by volume (dry basis).
$\%N_2$ = Percent N_2 by volume (dry basis).
0.264 = Ratio of O_2 to N_2 in air, v/v.
0.280 = Molecular weight of N_2 or CO, divided by 100.
0.320 = Molecular weight of O_2 divided by 100.
0.440 = Molecular weight of CO_2 divided by 100.

6.2 Percent Excess Air. Calculate the percent excess air (if applicable), by substituting the appropriate values of percent O_2, CO, and N_2 (obtained from Section 4.1.3 or 4.2.4) into Equation 3-1.

$$\%\,EA = \frac{\%O_2 - 0.5\%\ CO}{0.264\%\ N_2(\%O_2 - 0.5\%\ CO)} \times 100$$

Eq. 3-1

NOTE: The equation above assumes that ambient air is used as the source of O_2 and that the fuel does not contain appreciable amounts of N_2 (as do coke oven or blast furnace gases). For those cases when appreciable amounts of N_2 are present (coal, oil, and natural gas do not contain appreciable amounts of N_2) or when oxygen enrichment is used, alternate methods, subject to approval of the Administrator, are required.

6.3 Dry Molecular Weight. Use Equation 3-2 to calculate the dry molecular weight of the stack gas

$$M_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(\%N_2 + \%CO)$$

Eq. 3-2

METHOD 4 - STACK GAS MOISTURE CALCULATIONS

2.3.1 Nomenclature.

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

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_m = Absolute pressure (for this method, same as barometric pressure) at the dry gas meter, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 (mm Hg) (m^3)/(g-mole) (°K) for metric units and 21.85 (in. Hg) (ft^3)/(lb-mole) (°R) for English units.

T_m = Absolute temperature at meter, °K (°R).

T_{std} = Standard absolute temperature, 293° K (528°R).

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

ΔV_m = Incremental dry gas volume measured by dry gas meter at each traverse point, dcm (dcf).

$V_{m(std)}$ = Dry gas volume measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

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

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

V_f = Final volume of condenser water, ml.

V_i = Initial volume, if any, of condenser water, ml.

W_f = Final weight of silica gel or silica gel plus impinger, g.

W_i = Initial weight of silica gel or silica gel plus impinger, g.

Y = Dry gas meter calibration factor.

ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).

2.3.2 Volume of Water Vapor Condensed.

$$V_{wc(std)} = \frac{(V_f - V_i)\rho_w R T_{std}}{P_{std} M_w}$$

$$= K_1 (V_f - V_i)$$

Eq. 4-1

K_1 = 0.001333 m^3/ml for metric units
= 0.04707 ft^3/ml for English units

2.3.3 Volume of Water Vapor Collected in Silica Gel.

$$V_{wg(std)} = \frac{(W_f - W_i) R T_{std}}{P_{std} M_w}$$

$$= K_2 (W_f - W_i)$$

Eq. 4-2

Where:

K_2 = 0.001335 m^3/g for metric units
= 0.04715 ft^3/g for English units

2.3.4 Sample Gas Volume.

$$V_{m(std)} = V_m Y \frac{(P_m)(T_{std})}{(P_{std})(T_m)}$$

$$= K_3 Y \frac{V_m P_m}{T_m}$$

Eq. 4-3

Where:

K_3 = 0.3858 °K/mm Hg for metric units
= 17.64 °R/in. Hg for English units

NOTE: If the post-test leak rate (Section 2.2.6) exceeds the allowable rate, correct the value of V_m in Equation 4-3, as described in Section 6.3 of Method 5.

2.3.5 Moisture Content.

$$B_{ws} = \frac{V_{wc(std)} + V_{wg(std)}}{V_{wc(std)} + V_{wg(std)} + V_{m(std)}}$$

Eq. 4-4

NOTE: In saturated or moisture droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one using a value based upon the saturated conditions (see Section 1.2), and another based upon the results of the impinger analysis. The lower of these two values of B_{ws} shall be considered correct.

METHOD 5 - PARTICULATE EMISSION CALCULATIONS - (1)

6.1 Nomenclature.

A_n = Cross-sectional area of nozzle, m^2 (ft^2).
B_{ws} = Water vapor in the gas stream, proportion by volume.
C_a = Acetone blank residue concentration, mg/g.
c_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (g/dscf).
I = Percent of isokinetic sampling.
L_a = Maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change; equal to 0.0057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate, whichever is less.
L_i = Individual leakage rate observed during the leak check conducted prior to the "i^{th}" component change ($i = 1, 2, 3 \ldots n$), m^3/min (cfm).
L_p = Leakage rate observed during the post-test leak check, m^3/min (cfm).
m_a = Mass of residue of acetone after evaporation, mg.
m_n = Total amount of particulate matter collected, mg.
M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).
P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).
P_s = Absolute stack gas pressure, mm Hg (in. Hg).
P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
R = Ideal gas constant, 0.06236 mm Hg-m^3/°K-g-mole (21.85 in. Hg-ft^3/°R-lb-mole).
T_m = Absolute average dry gas meter temperature (see Figure 5-2), °K (°R).
T_s = Absolute average stack gas temperature (see Figure 5-2), °K (°R).
T_{std} = Standard absolute temperature, 293° K (528° R).
V_a = Volume of acetone blank, ml.
V_{aw} = Volume of acetone used in wash, ml.
V_{lc} = Total volume of liquid collected in impingers and silica gel (see Figure 5-3), ml.
V_m = Volume of gas sample as measured by dry gas meter, dcm (dscf).
$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).
$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).
v_s = Stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 5, m/sec (ft/sec).
W_a = Weight of residue in acetone wash, mg.
Y = Dry gas meter calibration factor.
ΔH = Average pressure differential across the orifice meter (see Figure 5-2), mm H_2O (in. H_2O).
ρ_a = Density of acetone, mg/ml (see label on bottle).
ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).
θ = Total sampling time, min.
θ_1 = Sampling time interval, from the beginning of a run until the first component change, min.
θ_i = Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min.
θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min.
13.6 = Specific gravity of mercury.
60 = Sec/min.
100 = Conversion to percent.

6.2 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop. See data sheet (Figure 5-2).

6.3 Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20° C, 760 mm Hg or 68° F, 29.92 in. Hg) by using Equation 5-1.

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right)\left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right]$$

$$= K_1 V_m Y \frac{P_{bar} + (\Delta H/13.6)}{T_m}$$

Equation 5-1

Where:
K_1 = 0.3858 °K/mm Hg for metric units
= 17.64 °R/in. Hg for English units

NOTE: Equation 5-1 can be used as written unless the leakage rate observed during any of the mandatory leak checks (i.e., the post-test leak check or leak checks conducted prior to component changes) exceeds L_a. If L_p or $_i$ exceeds L_a, Equation 5-1 must be modified as follows:

(a) Case I. No component changes made during sampling run. In this case, replace V_m in Equation 5-1 with the expression:

$$[V_m - (L_p - L_a)\theta]$$

(b) Case II. One or more component changes made during the sampling run. In this case, replace V_m in Equation 5-1 by the expression:

$$\left[V_m - (L_1 - L_a)\theta_1 - \sum_{i=2}^{n} (L_i - L_a)\theta_i - (L_p \quad L_a)\theta_p\right]$$

and substitute only for those leakage rates (L_i or L_p) which exceed L_a.

6.4 Volume of Water Vapor.

METHOD 5 - PARTICULATE EMISSION CALCULATIONS - (2)

Equation 5-2

$$V_{w\,(std)} = V_{lc}\left(\frac{\rho_w}{M_w}\right)\left(\frac{RT_{std}}{P_{std}}\right) = K_2 V_{lc}$$

Where:
K_2=0.001333 m³/ml for metric units
=0.04707 ft³/ml for English units.

6.5 Moisture Content.

$$B_{ws} = \frac{V_{w\,(std)}}{V_{m\,(std)} + V_{w\,(std)}}$$

Eq. 5-3

NOTE: In saturated or water droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one from the impinger analysis (Equation 5-3), and a second from the assumption of saturated conditions. The lower of the two values of B_w shall be considered correct. The procedure for determining the moisture content based upon assumption of saturated conditions is given in the Note of Section 1.2 of Method 4. For the purposes of this method, the average stack gas temperature from Figure 5-2 may be used to make this determination, provided that the accuracy of the in-stack temperature sensor is ±1° C (2° F).

6.6 Acetone Blank Concentration.

$$C_a = \frac{m_a}{V_a \rho_a}$$

Eq. 5-4

6.7 Acetone Wash Blank.

$$W_a = C_a V_{aw} \rho_a$$

Eq. 5-5

6.8 Total Particulate Weight. Determine the total particulate catch from the sum of the weights obtained from Containers 1 and 2 less the acetone blank (see Figure 5-3).

NOTE: Refer to Section 4.1.5 to assist in calculation of results involving two or more filter assemblies or two or more sampling trains.

6.9 Particulate Concentration.

$$c_s = (0.001\ g/mg)\,(m_n / V_{m\,(std)})$$

Eq. 5-6

6.10 Conversion Factors:

From	To	Multiply by
scf	m³	0.02832
g/ft³	gr/ft³	15.43
g/ft³	lb/ft³	2.205×10^{-3}
g/ft³	g/m³	35.31

6.11 Isokinetic Variation.

6.11.1 Calculation From Raw Data.

$$I = \frac{100\ T_s[K_3 V_r + (P_m/T_m)(P_{bar} + \Delta H/13.6)]}{60\theta v_s P_s A_n}$$

Eq. 5-7

Where:
K_3=0.003454 mm Hg-m³/ml-°K for metric units.
=0.002669-in. Hg-ft³/ml-°R for English units.

6.11.2 Calculation From Intermediate Values.

$$I = \frac{T_s V_{m\,(std)} P_{std}\, 100}{T_{std} v_s \theta A_n P_s 60(1 - B_{ws})}$$

$$= K_4 \frac{T_s V_{m\,(std)}}{P_s v_s A_n \theta (1 - B_{ws})}$$

Equation 5-8

where:
K_4=4.320 for metric units
=0.09450 for English units.

6.12 Acceptable Results. If 90 percent < I < 110 percent, the results are acceptable. If the particulate results are low in comparison to the standard, and I is over 110 percent or less than 90 percent, the Administrator may accept the results.

NOMENCLATURE
METHOD 5 CALCULATIONS

Vm_{std} = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

Y = Dry gas meter calibration factor

P_b = Barometric pressure at the sampling site, mm Hg (in. Hg)

H = Average pressure differential across the orifice meter, mm H_2O (in. H_2O)

T_m = Absolute average dry gas meter temperature, ° K (° R)

dscm = Dry standard cubic meters

dscf = Dry standard cubic feet

W_a = Weight of residue in acetone wash

M_a = Mass of residue of acetone after evaporation, mg

C_a = Acetone blank residue concentration, mg/g

V_a = Volume of acetone blank

V_{aw} = Volume of acetone used in wash, ml

M_n = Total amount of particulate matter collected, mg

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, mg/dscm (gr/dscf)

gr/dscf = grains per dry standard cubic foot

Vw_{std} = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf)

B_{ws} = Water vapor in the gas stream, proportion by volume

M_d = Molecular weight of stack gas, g/g-mole on dry basis

M_s = Molecular weight of stack gas, g/g-mole on wet basis

V_s = Stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 5, m/sec (ft/sec)

C_p = Pitot tube coefficient, dimensionless

Δ_p = Velocity head of stack gas, mm H_2O (in. H_2O)

P_s = Absolute stack gas pressure, mm Hg (in. Hg)

NOMENCLATURE (continued)
METHOD 5 CALCULATIONS

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

dscf/min = dry standard cubic feet per minute (also identified as dcfm or scfm)

acfm = actual cubic feet per minute

I = Percent of isokinetic sampling

A_n = Cross-sectional area of nozzle, m^2 (ft^2)

AMTEST
AIR QUALITY, INC.

DRY GAS METER CALIBRATION
AM TEST - AIR QUALITY, INC.

FILE NAME: SLV6-93.WK1
METER BOX #: SILVER MANOMETER
CALIBRATION DATE: 6-29-93
METHOD OF CALIB.: STANDARD DRY GAS METER (Method 5 Section 7.1)

TOTAL TIME min	DELTA H "H2O	METER VOL V1 cf	METER VOL V2 cf	TEMP IN deg F	TEMP OUT deg F	BARO. PRES. "Hg	STD DGM V1	STD DGM V2	ST.DGM TEMP IN deg F	ST.DGM TEMP OUT deg F	ST.DGM Yds FACTOR	Y FACTOR	DELTA H@
10.81	0.5	120.078	124.068	65.0	63.0	29.59	321.900	325.900	62.0	62.0	1.001	1.0061	2.034
10.60	1.0	125.064	130.639	66.0	63.0	29.59	326.900	332.500	63.0	63.0	1.001	1.0059	2.003
11.08	1.5	131.634	138.788	68.0	64.0	29.59	333.500	340.700	64.0	64.0	1.001	1.0075	1.990
12.07	2.0	140.869	149.811	70.0	65.0	29.59	342.800	351.800	64.0	64.0	1.001	1.0092	2.011
11.53	2.5	150.804	160.431	72.0	66.0	29.59	352.800	362.500	64.0	64.0	1.001	1.0119	1.971
10.43	3.0	161.819	171.335	74.0	66.0	29.59	363.900	373.500	64.0	64.0	1.001	1.0138	1.976
AVERAGE												1.009	1.998

AMTEST
AIR QUALITY, INC.

STANDARD DRY GAS METER CALIBRATION DATA SUMMARY
AMTEST - AIR QUALITY, INC.

Run #	CAL. DGM IND. SCFM	PRIMARY STANDARD	Y std.	DEVIATION
1	0.249	0.250	1.004	0.001
2	0.349	0.350	1.003	0.001
3	0.448	0.450	1.004	0.002
4	0.498	0.500	1.004	0.002
5	0.598	0.600	1.003	0.002
6	0.799	0.800	1.001	0.001
7	0.900	0.900	1.000	0.000
8	1.001	1.000	0.999	-0.001
9	1.150	1.150	1.000	0.000
10	1.302	1.300	0.998	-0.002
11	1.506	1.500	0.996	-0.006
		AVG Y std. =	1.001	

DATE: 1/15/93
FILE NAME: STD-GASM

DICK MUNNS COMPANY

Liquid and Gas - Flowmeter Calibration Service
10571 Calle Lee - 133 • Los Alamitos, California 90720
Telephone (213) 596-1559 • Telefax (714) 827-0823

CERTIFICATE OF CALIBRATION

Client Name:	KRIS A HANSEN CO	Calibration Date:	01-05-1993
Reference Number:	955	Calibration Due:	01-05-1994
Instrument Manufacturer:	QUIMETER	Calibration Fluid:	AIR 14.7 PSIA 70F
Instrument Description:	DRY GAS METER	Test Unit(s):	A3
Model Number:	T-110	NIST Traceability Per:	M-0122
Serial Number:	27688	Ambient Conditions:	54% RH
Rated Accuracy:	+/- .5%	Data File:	93KRQU7688
Accuracy Given:	AS RECEIVED		

	IND.SCFM	ACT.SCFM
1	0.249	0.250
2	0.349	0.350
3	0.448	0.450
4	0.498	0.500
5	0.598	0.600
6	0.799	0.800
7	0.900	0.900
8	1.001	1.000
9	1.150	1.150
10	1.302	1.300
11	1.506	1.500

Remarks:

All instruments used in the performance of the above calibration have direct traceability to the National Institute of Standards and Technology (NIST). Calibration has been performed in accordance with MIL-STD-45662A.

Calibration Performed By:

RA

Approved By:

R.MUNNS

ATA FILE NAME: N7688

CLIENT NAME: KRIS A. HANSEN CO
EFERENCE NUMBER / P.O.: 955
NSTRUMENT MANUFACTURER: KRIS A. HANSEN CO
INSTRUMENT DESCRIPTION: DRY GAS METER
ODEL NUMBER: T110
ERIAL NUMBER: 27688
RATED ACCURACY: +/- .5%
ACCURACY GIVEN: AS RECEIVED
ALIBRATION DATE: 01-05-1993
ALIBRATION DUE: 01-05-1994
CALIBRATION FLUID: AIR 14.7 PSIA 70F
TEST UNITS:
IST TRACEABILITY PER:
MBIENT CONDITIONS:
CALIBRATION BY:
PPROVED BY: R.MUNNS
-UNITS, Y-UNITS: IND.SCFM, ACT.SCFM

IND.SCFM	ACT.SCFM	K = ACT.SCFM/IND.SCFM	
0.25000	0.25100	1.00398	*
0.27000	0.27092	1.00339	
0.29000	0.29088	1.00302	
0.31000	0.31088	1.00284	
0.33000	0.33092	1.00279	*
0.35000	0.35101	1.00287	
0.37000	0.37117	1.00316	
0.39000	0.39141	1.00362	
0.41000	0.41167	1.00407	
0.43000	0.43189	1.00439	
0.45000	0.45201	1.00446	*
0.47000	0.47202	1.00431	
0.49000	0.49200	1.00409	
0.51000	0.51200	1.00393	
0.53000	0.53201	1.00380	
0.55000	0.55202	1.00368	
0.57000	0.57202	1.00355	
0.59000	0.59201	1.00341	
0.61000	0.61198	1.00324	
0.63000	0.63193	1.00306	
0.65000	0.65187	1.00288	
0.67000	0.67179	1.00268	
0.69000	0.69171	1.00247	
0.71000	0.71161	1.00226	
0.73000	0.73149	1.00204	
0.75000	0.75137	1.00182	
0.77000	0.77123	1.00159	
0.79000	0.79107	1.00136	
0.81000	0.81091	1.00112	
0.83000	0.83072	1.00086	
0.85000	0.85052	1.00061	
0.87000	0.87031	1.00035	
0.89000	0.89010	1.00011	
0.91000	0.90989	0.99988	
0.93000	0.92966	0.99964	
0.95000	0.94942	0.99939	
0.97000	0.96921	0.99918	
0.99000	0.98905	0.99904	
1.01000	1.00899	0.99900	*
1.03000	1.02905	0.99908	
1.05000	1.04922	0.99925	

1.07000	1.06943	0.99947
1.09000	1.08967	0.99969
1.11000	1.10986	0.99988
1.13000	1.12999	0.99999
1.15000	1.15000	1.00000 *
1.17000	1.16989	0.99991
1.19000	1.18971	0.99976
1.21000	1.20947	0.99956
1.23000	1.22918	0.99934
1.25000	1.24886	0.99909
1.27000	1.26853	0.99884
1.29000	1.28819	0.99860
1.31000	1.30787	0.99838
1.33000	1.32754	0.99815
1.35000	1.34719	0.99792
1.37000	1.36683	0.99769
1.39000	1.38646	0.99745
1.41000	1.40607	0.99721
1.43000	1.42567	0.99697
1.45000	1.44525	0.99672
1.47000	1.46482	0.99647
1.49000	1.48437	0.99622

* INDICATES LOCAL K-FACTOR MINIMUM / MAXIMUM

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 6-21-93 Thermocouple Indicator # RCO 4/F

Ambient Temperature 65 °F Barometric Pressure 29.4 in Hg

THERMOCOUPLE # OR REFERENCE	REFERENCE THERMOMETER TEMPERATURE °F	THERMOCOUPLE TEMPERATURE °F	TEMPERATURE DIFFERENCE °F	TEMPERATURE DIFFERENCE %
Standard DGM				
Meter in	32	32	0.0°	0.0%
	212	214	2°	0.3%
Meter out	32	32	0.0°	0.0%
	212	213	1°	0.1%

$$\frac{(\text{ref temp, °F} + 460) - (\text{test therm. temp, °F} + 460)}{(\text{ref temp, °F} + 460)} \cdot 100 \leq 1.5\%$$

17P

TYPE S PITOT TUBE INSPECTION DATA FORM

Date 2-22-93 Pitot Tube # P5H

Client LAKESIDE INDUSTRIES, Inc

Location Monroe, WA

Site(s) Baghouse Exhaust

Test Date(s) July 26, 1993

Pitot tube assembly level? ✓ yes _____ no

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

α_1 = 0.0 ° (<10°), α_2 = 2.0 ° (<10°), β_1 = 1.0 ° (<5°),

β_2 = 1.0 ° (<5°)

γ = 1.5 °, θ = 0.5 °, A = 1.100 cm (in.)

$z = A \sin \gamma$ = 0.029 cm (in.); <0.32 cm (<1/8 in.),

$w = A \sin \theta$ = 0.010 cm (in.); <.08 cm (<1/32 in.)

P_A 0.549 cm (in.) P_b 0.551 cm (in.)

D_t = 0.375 cm (in.)

Comments:

_____

_____

_____

Calibration required? ____ yes* ✓ no

*If yes, tag and take out of service until repaired.

VP

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-4-93 Thermocouple Indicator # Blue Controler

Ambient Temperature 65 °F Barometric Pressure 29.5 in Hg

THERMOCOUPLE # OR REFERENCE	REFERENCE THERMOMETER TEMPERATURE °F	THERMOCOUPLE TEMPERATURE °F	TEMPERATURE DIFFERENCE °F	%
T5B	32	32	0 °F	0.0%
	212	211	1 °F	0.15%
	333	328	5	0.63%

$$\frac{(\text{ref temp, °F} + 460) - (\text{test therm. temp, °F} + 460)}{(\text{ref temp, °F} + 460)} * 100 \leq 1.5\%$$

VP