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INTERNATIONAL TECHNOLOGY CORPORATION

Project No. 313674
February 1994

Final Report

Diagnostic Test
Dry Gas Cleaning Exhauster Stack
Miles Inc.

Prepared for:

Miles Inc.
Industrial Chemicals Division
Baltimore, Maryland

Prepared by:

IT Corporation
Monroeville, Pennsylvania

RESPONSIVE TO THE NEEDS OF ENVIRONMENTAL MANAGEMENT

Diagnostic Test
Dry Gas Cleaning Exhauster Stack
Miles Inc.

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1.0 Introduction

On January 11, 12, and 15, 1994, IT Corporation (IT) conducted diagnostic emission tests on the baghouse dry filter system (Building No. 8) at Miles Inc. (Miles), Baltimore, Maryland facility. The baghouse dry filter system provides emission controls for eight continuous and three rotary smelters used in the manufacture of frit. Sampling was conducted to determine concentration and mass emission rates of barium (Ba), cobalt (Co), chromium (Cr), copper (Cu), manganese (Mn), nickel (Ni), lead (Pb), zinc (Zn), total fluoride, total nitrogen oxide (NO_x), and total particulate matter.

IT utilized "U.S. Environmental Protection Agency (EPA) Draft Reference Method 29 Methodology for the Determination of Trace Metals Emissions in Exhaust Gases from Combustion Sources" for multimetals sampling. Particulate testing was conducted by utilizing EPA Reference Method 5 (EPA RM5) and total fluoride samples were obtained by utilizing EPA RM13B. Nitrogen oxide testing was conducted by utilizing EPA RM7A.

In conjunction with the emission tests, measurements were also made for total stack gas flow rate, temperature, moisture, oxygen, and carbon dioxide content by EPA Reference Methods 1-4.

All sampling methods (Appendix A) were instituted based on an IT testing protocol submitted to the state of Maryland.

2.0 Summary of Results

This section summarizes the results of the test program in tabular form. The appendices contain the backup data for the tables as follows:

- Appendix B - Example Calculations
- Appendix C - Field Data Sheets
- Appendix D - Laboratory Data
- Appendix E - Calibration Data

2.1 Particulate

Table 2-1 represents particulate emission concentrations in grains per dry standard cubic foot (gr/dscf) and emission rates in pounds per hour (lb/hr). The product of the particulate concentration and the stack gas flow rate yields the mass emission rate in lb/hr.

The particulate emissions in Table 2-1 represent that material collected on the filter and in the probe, both of which were heated to 250 degrees Fahrenheit (°F). The particulate emission test conducted on the first day of sampling yielded an average filterable concentration of 5.35×10^{-4} gr/dscf, which corresponds to an average emission rate of 9.47×10^{-2} lb/hr.

Table 2-1
Particulate Emissions

Run No.	Concentration (gr/dscf)[a]	Emission Rate (lb/hr)
1	5.60×10^{-4}	9.55×10^{-2}
2	5.11×10^{-4}	9.38×10^{-2}
Average	5.35×10^{-4}	9.47×10^{-2}

[a]Grains per dry standard cubic foot (gr/dscf); standard conditions are 68 °F, 29.92 in Hg and zero percent moisture.

2.2 Total Fluoride

Table 2-2 represents total fluoride emission concentrations in gr/dscf and emission rates in lb/hr. An average concentration of 2.25×10^{-2} gr/dscf was found during sampling. This concentration corresponds to an average emission rate of 4.05 lb/hr.

Table 2-2
Fluoride Emissions

Run No.	Concentration (gr/dscf)[a]	Emission Rate (lb/hr)
1	2.42×10^{-2}	4.34
2	2.08×10^{-2}	3.76
Average	2.25×10^{-2}	4.05

[a]Grains per dry standard cubic foot (gr/dscf); standard conditions are 68 °F, 29.92 in Hg and zero percent moisture.

2.3 Specific Metals

Table 2-3 represents emission concentrations and emission rates for specific metals recovered over each of two runs as well as the average stack gas concentration and mass emission rate.

Table 2-3
Trace Metal Emissions

Metal	Run #1		Run #2		Average	
	Conc.[a] ($\mu g/m^3$)	Emission Rate (lbs/hr)	Conc.[a] ($\mu g/m^3$)	Emission Rate (lbs/hr)	Conc.[a] ($\mu g/m^3$)	Emission Rate (lbs/hr)
Ba	2.02	1.5×10^{-4}	1.36	1.09×10^{-4}	1.69	1.30×10^{-4}
Co	0.36	2.68×10^{-5}	<0.31	$<2.51 \times 10^{-5}$	<0.337	$<2.60 \times 10^{-5}$
Cr	0.97	7.20×10^{-5}	0.71	5.70×10^{-5}	0.84	6.45×10^{-5}
Cu	1.64	1.22×10^{-4}	0.65	5.20×10^{-5}	1.14	8.71×10^{-5}
Mn	1.08	8.04×10^{-5}	0.65	5.20×10^{-5}	0.86	6.62×10^{-5}
Ni	1.51	1.12×10^{-4}	<1.04	$<8.38 \times 10^{-5}$	<1.27	$<9.80 \times 10^{-5}$
Pb	0.63	4.69×10^{-5}	0.52	4.19×10^{-5}	0.58	4.44×10^{-5}
Zn	12.81	9.55×10^{-4}	<5.22	$<4.19 \times 10^{-4}$	<9.01	$<6.87 \times 10^{-4}$

[a]Concentration ($\mu g/m^3$)

2.4 Nitrogen Oxides

Table 2-4 represents total NO_x emission concentration in parts per million (ppm) by volume and the corresponding emission rate in lb/hr. An average concentration of 583 ppm was found during sampling. This corresponds to an average emission rate 80.8 lb/hr.

Table 2-4
NO_x Emissions

Run No.	Concentration (ppm)	Emission Rate (lb/hr)
1	536	80.0
2	548	81.9
3	587	75.7
4	661	85.5
Average	583	80.8

2.5 Stack Gas Conditions

Table 2-5 represents a summary of gas conditions during each of the sample runs. The stack gas flow rate averaged 19,778 dry standard cubic feet per minute (dscfm) (26,650 actual cubic feet per minute [acfm]) during the testing events. The stack gas temperature averaged 238 degrees Fahrenheit (°F). Moisture content averaged 3.81 percent while the carbon dioxide (CO_2) and oxygen (O_2) content averaged 1.7 percent and 19.4 percent, respectively.

Table 2-5
Summary of Stack Conditions

Run No.	Flow Rate (acfm)[a]	Flow Rate (dscfm)[b]	Temperature (°F)	Moisture (%)	O_2[c] (%)	CO_2[c] (%)
Day 1	27,426	19,904	251	4.90	19.4	2.0
Day 2	28,776	21,440	238	3.87	19.4	1.4
Day 3	23,749	17,989	226	2.66	19.4	1.7
Average	26,650	19,778	238	3.81	19.4	1.7

[a] Actual cubic feet per minute.
[b] Dry standard cubic feet per minute; standard conditions are 68°F and 29.92 in Hg and 0% moisture.
[c] ORSAT analysis of integrated bag sample.

Example calculations used to determine the results presented in Tables 2-1 through 2-5 are found in Appendix B.

3.0 Process Description

The dry filter system processes air from eight continuous smelters. It consists of five primary filter compartments and three secondary filter compartments. Each compartment houses approximately 160 bags coated with soda ash. The air passes through the filters to two fans and finally exhausts through a 100 foot high stack.

4.0 Sampling Locations and Methods

This section contains a brief description of the sampling locations and methods.

4.1 Sampling Location

Particulate testing was conducted at the sample location on the final exit stack serving emissions from the baghouse dry filter system. (As shown in Figure 4-1)

The two sample ports used for testing were located 6.2 stack diameters downstream from the air entry point and 1.5 stack diameters upstream from the bottom of the silencer. A total of 24 sampling points (12 per port) were used to traverse the cross-sectional area of the 48 inch inside-diameter round stack. Each point of the multimetals sampling train was sampled for 6.5 minutes, which yielded a total of 156 minutes per test run. Fluoride testing was conducted at 60 minutes per test run, which equates to 2.5 minutes per sampling point. All sampling was conducted isokinetically by regulating the sampling rate relative to the stack gas velocity as measured by a pitot tube attached to the sample probe.

4.2 Sampling Methods

The test methods are described briefly below. Detailed descriptions of the sampling and analytical procedures used are contained in Appendix A.

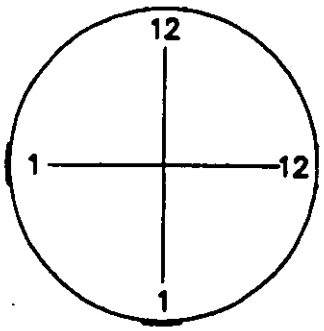
4.2.1 Velocity and Gas Temperature

All gas velocities were measured with a Type-S pitot tube and a 0- to 10-inch inclined manometer. In all cases, velocities were measured at the field sample location at each sampling point across the stack to determine an average value according to procedures described in EPA RM2.[1]

4.2.2 Molecular Weight

Stack gas composition and molecular weight were determined by EPA RM3.[1] Integrated bag samples were collected simultaneously with the particulate tests. Analyses for CO_2 and O_2 were made with an Orsat gas analyzer.

[1]40 CFR 60, Appendix A, July 1991.



STACK I.D.=48"

TRAVERSE POINT NO.	DISTANCE FROM NEAR WALL, IN.
1	1
2	3.22
3	5.66
4	8.50
5	12
6	17.09
7	30.91
8	36
9	39.5
10	42.34
11	44.8
12	47

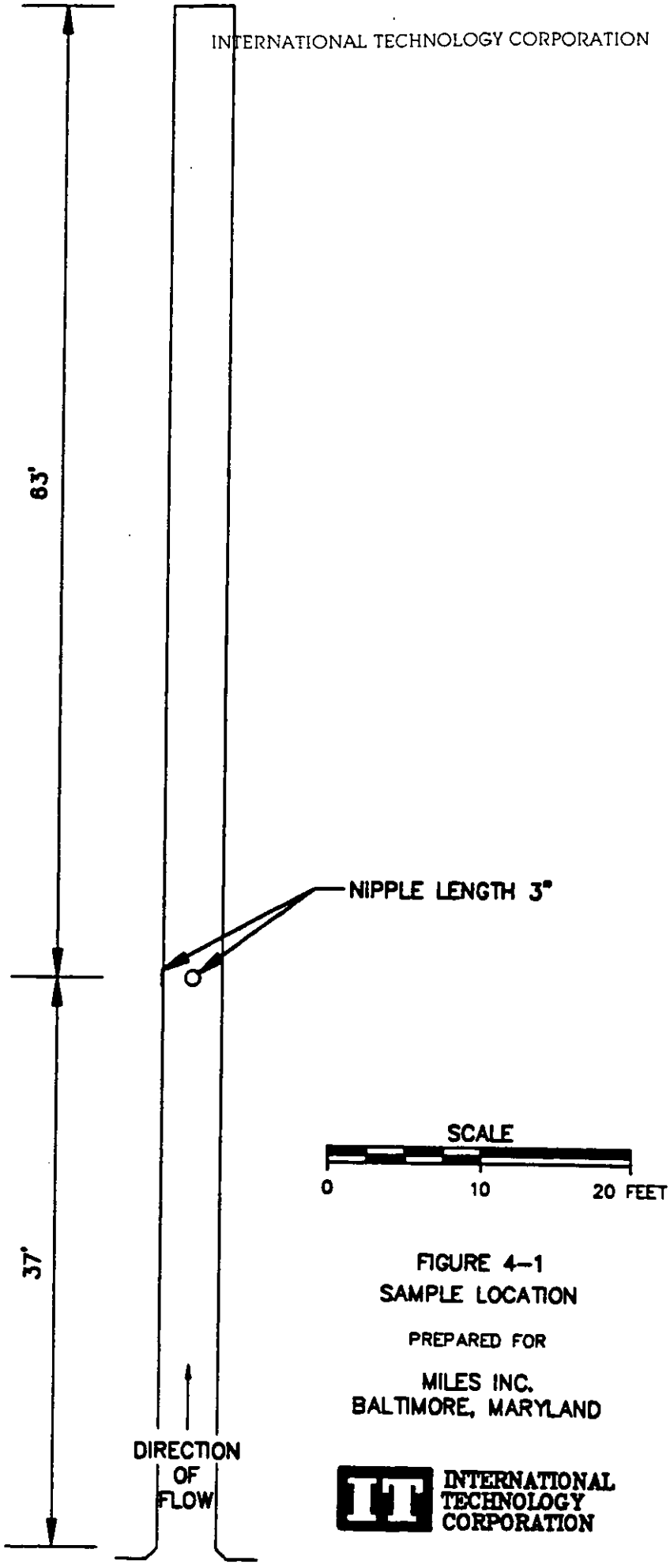


FIGURE 4-1
SAMPLE LOCATION

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MILES INC.
BALTIMORE, MARYLAND

PT/02-94/313674.MIL

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4.2.3 Moisture

The stack gas moisture content was determined by EPA RM4.[1] Testing was conducted simultaneously with the particulate testing. The data generated from the following test methods include: Field Data, Appendix C; Laboratory Data, Appendix D; and Calibration Data, Appendix E.

4.2.4 Particulate

Particulate grain loading at the outlet stack serving Building No. 8 was measured by EPA RM5.[1] A sampling train consisting of a heated borosilicate glass-lined probe, a heated 3-inch-diameter glass fiber filter (Whatman Reeve Angel 934 AH), and a series of Greenburg-Smith and modified impingers was used in each test. The nozzle, probe, and filter holder portions of the sampling train were acetone-rinsed at the end of each test. The acetone rinse and the particulate caught on the filter media were dried at room temperature, desiccated to a constant weight, and weighed on an analytical balance. Total filterable particulate matter was determined by adding these two values.

The contents of the impingers were measured volumetrically in the field for moisture determination and transferred to a polyethylene container. The impingers and connecting glassware were then rinsed with distilled water and both sample fractions were placed in a polyethylene container.

4.2.5 Fluoride

Fluoride was sampled by EPA RM13B[1] single point samples were collected in an impinger train containing distilled water absorbing solution. Three tests were run, each test lasting 60 minutes. Samples were analyzed by the specific ion electrode method.

4.2.6 Trace Metals

Trace metals, consisting of those illustrated in Table 2-3, were sampled by methods described in the previously discussed EPA Reference Methods Manual for compliance with BIF regulations.

4.2.7 Nitrogen Oxides

NO_x emissions were sampled using EPA RM7A. Single point samples were collected in an evacuated flask containing sulfuric acid and hydrogen peroxide. Four flasks were filled per

hour (15 minutes each). Eight flasks were filled on January 12, 1994 and 8 more were filled on January 15, 1994. A total of 16 grab samples were taken at 15 minute intervals. The arithmetic average of the first four flasks is reported in Table 2-4 as Run No. 1.

5.0 Quality Assurance

Routine standard reference method quality control procedures were followed throughout this test series. These included, but were not limited to, the following:

- Calibration of field sampling equipment. Appendix E contains calibration data for equipment used during this testing event. Calibration guidelines are described in more detail in Appendix E.
- Train configuration (field) and calculation checks (office).
- On-site quality assurance checks, such as leak checks of the sampling train, pitot tube, and Orsat line.
- Use of designated analytical equipment and sampling reagent (field and laboratory).
- Laboratory analysis quality assurance procedures. (Appendix D contains quality assurance results for filter and reagent blank analyses.)

Sampling equipment, reagents, and analytical procedures for this test series met all necessary guidelines set forth for accurate test results. Calibration showed that all particulate sampling equipment was within the limits described for EPA RM5 with the exception of isokinetics. Isokinetic requirements are 100 ± 10 percent of target flow rate. Isokinetics for the particulate sampling were 85.2 and 71.5 for the first and second runs, respectively. This condition allows for an overestimation of the concentration and corresponding emission rate by allowing larger particles not originally in the gas volume sampled to enter the probe.[2] The quality of analytical procedures and reagents met federal regulations described in EPA RM5.

[2]William C. Hind, 1982, *Properties, Behavior, and Measurement of Airborne Particles.*

APPENDIX A
SAMPLING METHODS

DETERMINATION OF PARTICULATE AND METAL EMISSIONS

Sampling for filterable particulate matter and total metals (particulate and gaseous) emissions was conducted in accordance with the Methodology for the Determination of Trace Metal Emissions in Exhaust Gases From Stationary Source Combustion Processes* and that in Subsection 3.1 of the Methods Manual for Compliance with BIF Regulations.** The particulate determination in this method is consistent with EPA Method 5.***

Sampling Apparatus

The sampling train used in these tests is assembled by ITAQS personnel and meets all design specifications established by the U.S. EPA. The sampling apparatus consists of:

Nozzle - Borosilicate glass with an accurately measured round opening.

Probe - Borosilicate glass with a heating system capable of maintaining a minimum gas temperature of 250°F at the exit end during sampling.

Pitot Tube - A Type-S pitot tube that meets all geometric standards is used to measure gas velocity during each sampling run.

Temperature Gauge - Type-K thermocouple attached to the pitot tube in an interference-free arrangement to monitor stack gas temperature with a digital readout to within 1.5 percent Rankine.

Filter Holder - Pyrex glass with a heating system capable of maintaining a filter temperature of 250° ±25°F. A Teflon filter support is used.

Filter - 87-mm (3-in.)-diameter, Pallflex Type 2500 QAT-UP ultra-pure filter.

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* EPA Draft Protocol, July 1988.

** EPA/530-SW-91-010, December 1990.

*** 40 CFR 60, Appendix A, July 1990.

Draft Gauge - An inclined manometer made by Dwyer with a readability of 0.01 in.H_2O in the 0- to 10-in.H_2O range is used.

Impingers - Five Greenburg-Smith design impingers connected in series with glass ball joints. The first, third, and fifth impingers are modified by removing the tip and extending the tube to within 1.3 cm (0.5 in.) of the bottom of the flask. For gas streams with high moisture contents, an optional empty impinger may be used before the first impinger as a condensate collector. An optional empty impinger may also be used as a condensate collector between the second and third impingers to avoid carryover into the permanganate solution.

Metering System - Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 2.8°C (5°F), calibrated dry gas meter, and related equipment to maintain an isokinetic sampling rate and to determine sample to volume. The dry gas meter is made by Rockwell, and the fiber vane pump is made by Gast.

Barometer - Aneroid tube type to measure atmospheric pressures to ±2.5 mmHg (±0.1 in.Hg).

Sampling Procedure

Pallflex filters are desiccated for at least 24 hours and weighed to the nearest 0.1 mg on an analytical balance. One hundred mL of 5 percent nitric acid/10 percent hydrogen peroxide solution are placed in each of the first two impingers; if mercury is to be determined, the third and fourth impingers contain 100 mL of acidic potassium permanganate solution--otherwise the third and fourth impingers are not used; and the last impinger contains 200 to 400 g of silica gel.

The train is set up with the probe as shown in Figure PMM-1. If used, the empty condensate collector is placed before the first impinger or after the second impinger. The sampling train is leak-checked at the sampling site prior to each test run by plugging the inlet to the nozzle and pulling a 15-in.Hg vacuum, and at the conclusion of the test by plugging the inlet to the nozzle and pulling a vacuum equal to the highest vacuum reached during the test run.

The pitot tube and lines are leak-checked at the test site prior to and at the conclusion of each test run. This check is made by blowing into the impact opening of the pitot tube until 3 or more inches of water is recorded on the manometer and then capping the impact opening and holding it for 15 seconds to ensure that it is leak

Title: PMM
Date: 3/15/93

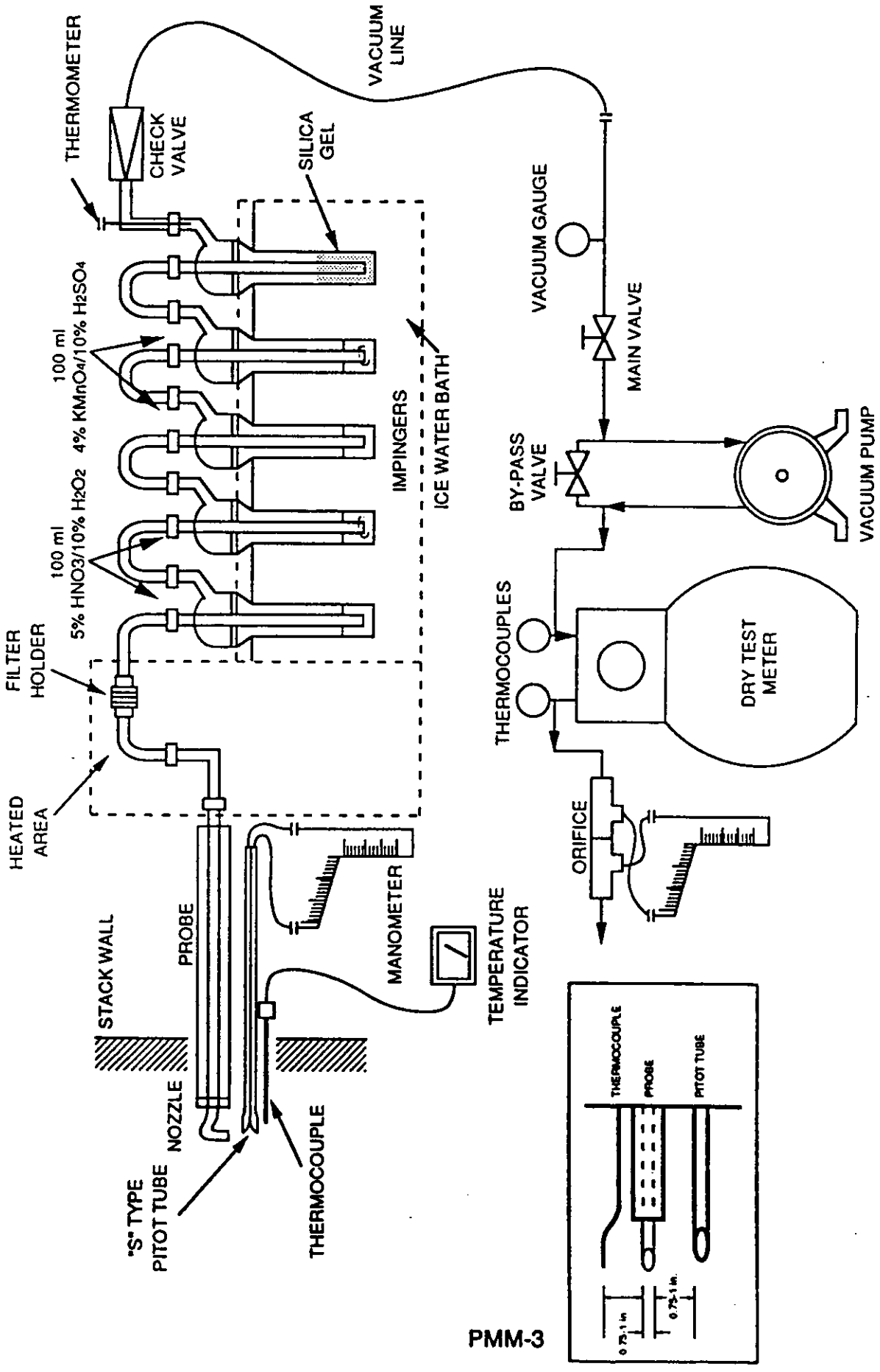

Figure PMM-1. Particulate/metals sampling train.

free. The static-pressure side of the pitot tube is leak-checked by the same procedure, except suction is used to obtain the 3-in.H_2O manometer reading.

Crushed ice is placed around the impingers to keep the temperature of the gas leaving the last impinger at 68°F or less. During sampling, stack gas and sampling train data are recorded at each sampling point. Sampling rates are determined with the aid of a programmable calculator, and all sampling data are recorded on the Emission Testing Field Data Sheet.

Recovery Procedures

Upon completion of each sample run, the sampling train is allowed to cool and is then disassembled into sections. The probe and impinger sections are sealed and carefully transported to the cleanup area.

The amount of moisture collected is determined volumetrically using a graduated cylinder or by weighing each impinger before and after the sample run. After being weighed, the silica gel is discarded. Figure PMM-2 is a schematic of the sample recovery performed on the different sample fractions. The samples are recovered as follows:

Container No. 1 - The filter is placed into a petri dish, sealed, and labeled.

Container No. 2 - The filter holder, probe, and nozzle are rinsed with acetone to recover particulate. A nylon brush is used to remove particulate. The rinse is recovered in a glass jar.

Container No. 3 - The nozzle, probe, and filter holder front halves are rinsed with 0.1 N HNO_3 into a leak-free polyethylene container.

The contents of the first two impingers (and condensate collector if used) and a 0.1 N HNO_3 rinse of the filter holder backhalf and connecting glassware are placed in the same leak-free polyethylene container. The container is sealed and labeled, and the liquid level is marked.

Container No. 4 - The contents of the third and fourth impingers and an acidified potassium permanganate rinse are placed in an amber glass container. A final rinse with Type II water is added to the same container. The container is sealed and labeled, and the liquid level is marked. To prevent pressure buildup in the container, one of the following two procedures is used: 1) a small hole is drilled in the container lid (~1/16 in. dia.), or 2) the lid is left approximately

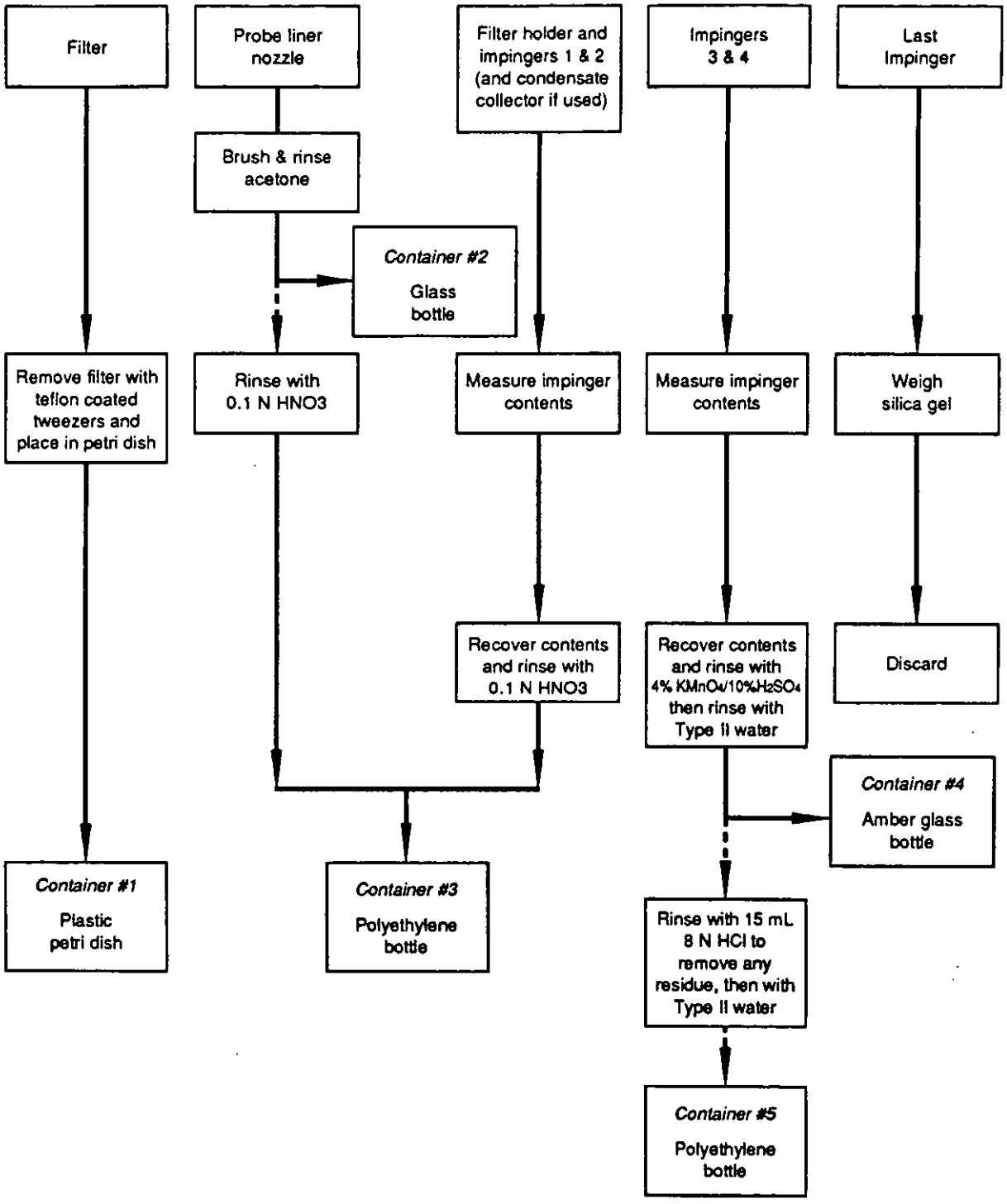

Figure PMM-2. Multimetals train recovery procedures.

one-quarter turn from closed and is taped in position. In either case, the containers should be packed to maintain them in an upright position.

Container No. 5 - If a brown residue remains in the third and fourth impingers following the water rinse, 15 mL of 8 N HCl is measured in a graduated cylinder. Then 200 mL of Type II water is put in the empty polyethylene container. One impinger is rinsed with the HCl until the residue is removed, then the rinse is poured into the other impinger using a funnel. When the residue is removed, the HCl rinse is added to the water in Container 5. Both impingers are again rinsed with Type II water into Container 5.

Blanks of each reagent are taken in the field for preparation and analysis in a manner identical to that for the samples. The blanks consist of one or more of the following, depending upon the specific project requirements:

1) Field blank - A sampling train is set up, leak-checked, recovered, and analyzed as a sample.

2) Reagent blank - A sample of each reagent used is taken and analyzed either separately or by combining them in the same proportion as that used for samples.

3) Blank spike - A set of blank reagents is taken and combined in the same proportion as was used for the samples. Prior to analysis, the blank set is spiked with a known amount of each metal.

A diagram illustrating sample preparation and analysis procedures for each of the sample train components is shown in Figure PMM-3.

Sample Preparation and Analysis, Particulate

Container No. 1 - The filter and any loose particulate matter from this sample are placed into a tared weighing dish, desiccated for 24 hours to a constant weight, and weighed to the nearest 0.1 mg.

Container No. 2 - The acetone washings are transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours to a constant weight, and weighed to the nearest 0.1 mg.

Sample Preparation and Analysis, Metals

Container Nos. 1 and 2 - The filter with its filter catch and the acetone residue are divided into portions containing approximately 0.5 g each and placed into the analyst's choice of either individual microwave pressure-relief vessels or

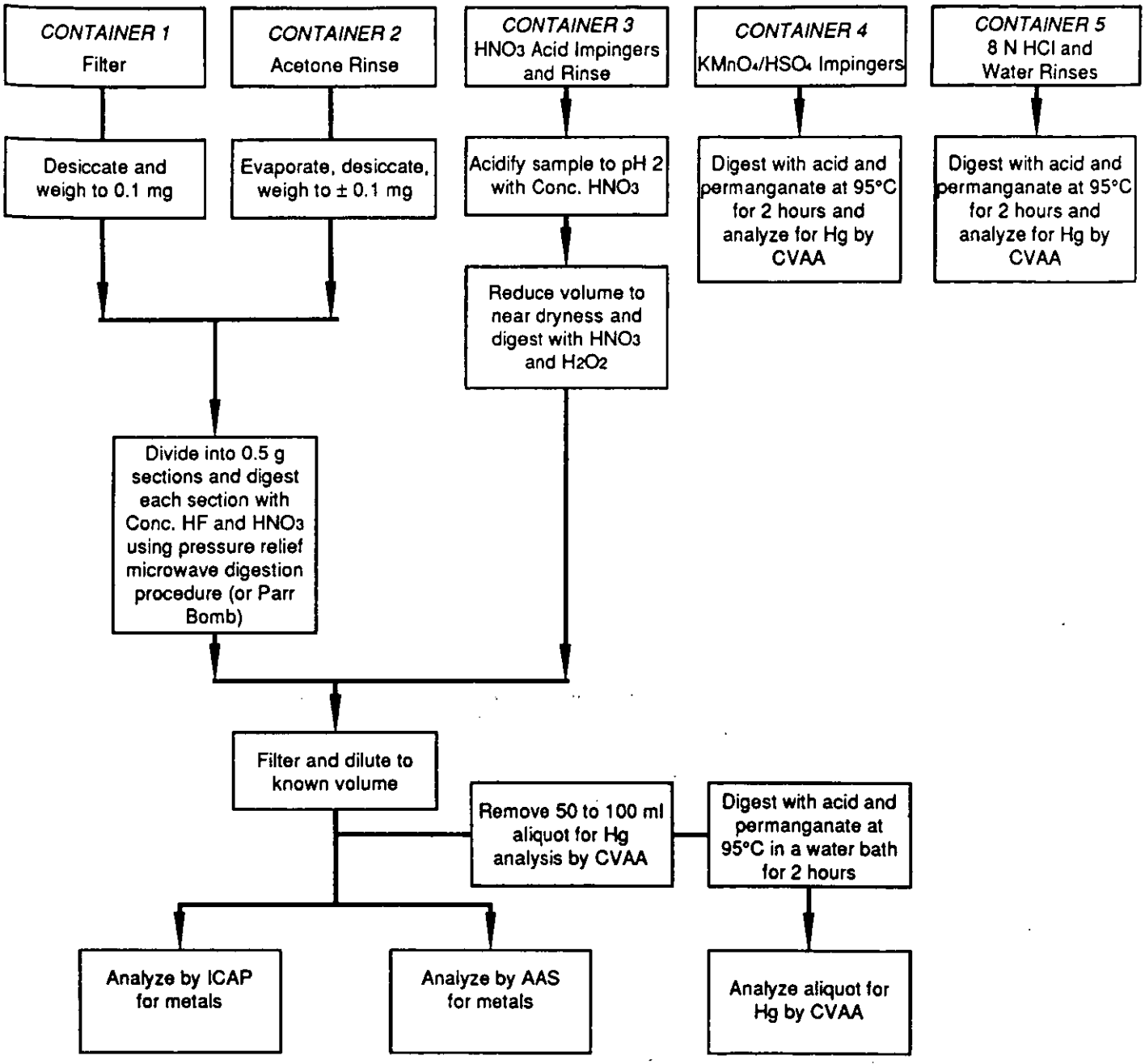

Figure PMM-3. Sample preparation and analysis scheme.

Parr® Bombs. Six mL of concentrated nitric acid and 4 mL of concentrated hydrofluoric acid are added to each vessel. For microwave heating, the sample vessels are microwaved for approximately 12 to 15 minutes (in intervals of 1 to 2 minutes) at 600 Watts. For conventional heating, the Parr Bombs are heated at 140°C (285°F) for 6 hours. The samples are then cooled to room temperature and combined with the acid-digested probe rinse.

Container No. 3 - If necessary, the pH of this sample is lowered to 2 with concentrated nitric acid. After pH adjustment, the sample is rinsed into a beaker with water, and the beaker is covered with a ribbed watchglass. The sample volume is reduced to approximately 20 mL by heating on a hot plate at a temperature just below boiling. The sample is then digested as follows:

a) 30 mL of 50 percent nitric acid is added to the sample, and the solution is heated for 30 minutes on a hot plate at a temperature just below boiling.

b) 10 mL of 3 percent hydrogen peroxide is added, and the solution is heated for an additional 10 minutes.

c) 50 mL of hot water is added, and the solution is heated for an additional 20 minutes.

After digestion, the remaining sample is combined with the contents of Container 1. This combined solution of the acid-digested filter, probe, and probe rinse and the impinger contents is filtered by using Whatman 541 filter paper.

The filtered solution is then divided into three fractions. The first fraction is analyzed by inductively coupled argon plasma emission spectroscopy (ICAP) in accordance with EPA Method 200.7 (40 CFR 136, Appendix C) which is the same as Method 6010 from SW 846.* The second fraction is analyzed by graphite furnace atomic absorption spectroscopy (AAS). The third fraction is then digested and analyzed for mercury by cold vapor atomic absorption (CVAA) spectroscopy.

The following list shows the methods normally used for each metal. The listed detection limits are shown in micrograms per sample; actual detection limits will vary depending on blank levels, any dilutions made to account for high levels of metals, or interferences. The detection limit for mercury includes the permanganate fraction.

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* Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW 846, Third Edition, September 1988.

Metal	Normal procedure			Optional alternate procedure		
	Method	No.*	Nominal detection limit, µg	Method	No.*	Nominal detection limit, µg
Antimony	ICAP	6010	30	AA	7041	2
Arsenic	AA	7060	0.3	-	-	-
Barium	ICAP	6010	0.5	-	-	-
Beryllium	ICAP	6010	0.7	-	-	-
Cadmium	ICAP	6010	1	-	-	-
Chromium	ICAP	6010	3	-	-	-
Copper	-	-	-	ICAP	6010	3
Lead	AA	7421	0.4	ICAP	6010	60
Nickel	-	-	-	ICAP	6010	10
Manganese	-	-	-	ICAP	6010	1
Mercury	AA	7470	0.2	-	-	-
Selenium	-	-	-	AA	7740	0.5
Silver	AA	7761	0.1	-	-	-
Thallium	ICAP	6010	120	AA	7841	0.7
Zinc	-	-	-	ICAP	6010	4

Container No. 4 - A known aliquot of the sample is taken and diluted to approximately 120 mL with mercury-free water. Approximately 15 mL of 50 percent potassium permanganate solution, 5 mL of 50 percent nitric acid, 5 mL of concentrated sulfuric acid, and 9 mL of 5 percent potassium sulfate are added to the sample. The sample is then heated for 2 hours at 95°C in a convection oven or water bath. After cooling, 5 mL of hydroxylamine hydrochloride solution is added and mixed with the sample. Then 7 mL of stannous chloride is added and the sample is analyzed for mercury by CVAA spectroscopy.

Container No. 5 - Analysis of this sample for mercury depends on project requirements; it may be retained for potential analysis, it may be combined with the same fraction from other runs for one analysis, the sample from one run may be analyzed to confirm the absence of mercury, or each sample may be analyzed for mercury. If analyzed, the procedures are the same as for Container 4.

Normal analytical quality assurance measures include daily full instrument calibration (ICAP is a zero and standard; AAS is a zero and minimum three standards), analysis of a method blank, analysis of a laboratory control sample (LCS, a method blank spiked with a known quantity of each metal), analysis of one sample by ICAP in duplicate, performance of all AAS analyses in duplicate, and performance of a post-digestion spike for each metal analyzed by AAS. For specific projects, a matrix spike may be designated for mercury in the permanganate fraction.

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* Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW 846, Third Edition, September 1988.

SAMPLING AND ANALYTICAL PROCEDURES

DETERMINATION OF TOTAL FLUORIDE EMISSIONS BY EPA METHOD 13b

The sampling procedures followed during this test program are those described in EPA Method 13b.*

Sampling Apparatus

The sampling train used at the exit stack during these tests meets design specifications established by the Federal EPA. Assembled by ITAQS personnel, it consists of the following:

Nozzle - Stainless steel (316) with sharp, tapered, leading edge and accurately measured round opening.

Probe - Borosilicate glass with a heating system capable of maintaining a gas temperature of 248 ±25°F at the exit end during sampling.

Pitot Tube - A Type-S pitot tube that meets all geometric standards; attached to the probe to monitor stack gas velocity.

Filter Holder - Pyrex glass. If the filter is placed between the probe and the first impinger, the filter support must be a 20-mesh stainless steel or Teflon screen. A glass frit cannot be used.

Filter - Whatman No. 541 paper filter, 3-in. diameter.

Draft Gauge - A dual-inclined manometer made by Dwyer with a readability of 0.01 in.H_2O in the 0- to 1-in. range and 0.1 in.H_2O in the 1- to 10-in. range.

Impingers - Four impingers connected in series with glass ball joints. The first, third, and fourth impingers are of the Greenburg-Smith design, modified by replacing the tip with a ½-in.-i.d. glass tube extending to ½-in. from the bottom of the flask. The second is a standard Greenberg-Smith type.

Metering System - Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with 2 percent accuracy, and related equipment to maintain an isokinetic sampling rate and to determine

* 40 CFR 60, Appendix A, July 1991.

sample volume. The dry gas meter is made by Rockwell and the fiber vane pump is made by Gast.

Barometer - Aneroid type to measure atmospheric pressure to ±0.1 in.Hg.

Sampling Procedure

After the sampling site and the minimum number of traverse points are selected, the stack pressure, temperature, composition (percent CO_2 and percent O_2 by volume), moisture, and range of velocity head are measured according to procedures described in EPA Methods 1 through 4.*

Approximately 200 grams of silica gel is weighed and placed in a sealed impinger prior to each test. One hundred milliliters (mL) of distilled water is placed in each of the first two impingers; the third impinger is initially empty; and the fourth impinger contains silica gel. The train is set up with the probe as shown in Figure M13-1. As an option, the filter may be placed between the probe and the first impinger and heated to 248° ±25°F. The sampling train is leak-checked at the sampling site prior to each test run by plugging the inlet to the nozzle and pulling a 15-in.Hg vacuum; and at the conclusion of the test, by plugging the inlet to the nozzle and pulling a vacuum equal to the highest vacuum reached during the test run. The leak check is acceptable if the leakage rate is less than 0.02 ft^3/min or 4 percent of the average sampling rate, whichever is lower.

The pitot tube and lines are leak-checked at the test site prior to and at the conclusion of each test run. The check is made by blowing into the impact opening of the pitot tube until 3 or more inches of water is recorded on the manometer and then capping the impact opening and holding it for 15 seconds to assure it is leak-free. The static pressure side of the pitot tube is leak-checked by the same procedure, except suction is used to obtain the 3-in.H_2O manometer reading. Crushed ice is placed around the impingers to keep the temperature of the gases leaving the last impinger at 68°F or less.

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* 40 CFR 60, Appendix A, July 1991.

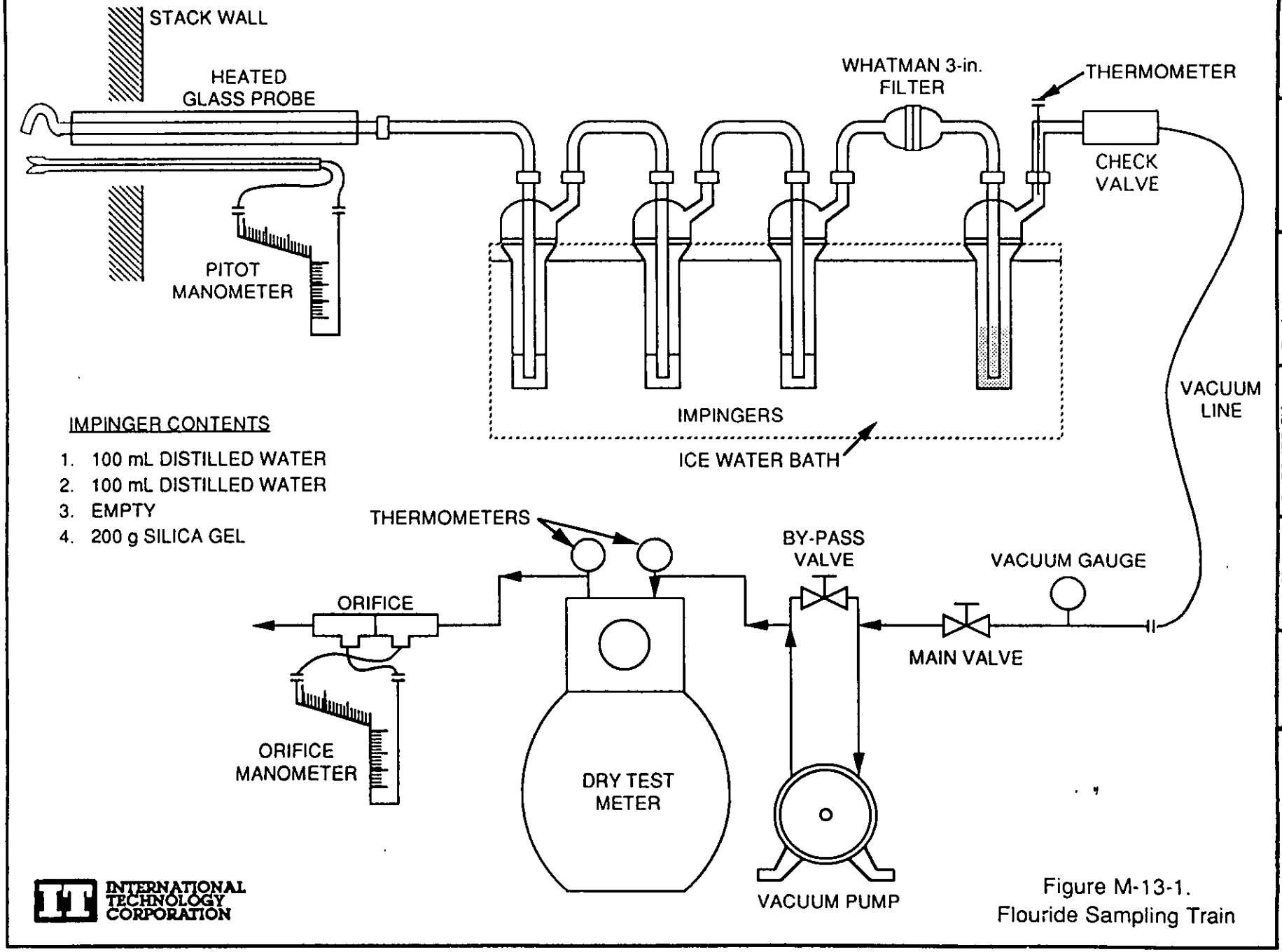

Figure M-13-1.
Flouride Sampling Train

Title: M13
Date: 12/20/91

During sampling, stack gas and sampling train data are recorded at each sampling point and whenever significant changes occur in stack flow conditions. Isokinetic sampling rates are set throughout the sampling period with the aid of a calculator. All sampling data are recorded on the Particulate Field Data Sheet.

Sample Recovery Procedure

The sampling train is moved carefully from the test site to the cleanup area. The volume of water from the first three impingers is measured, and sample fractions are recovered as follows:

> Container No. 1 - Distilled H_2O in the impinger section of the sampling train is placed in a polyethylene container. The impingers, connecting glassware, probe, and nozzle are rinsed with distilled H_2O, and this rinse is added to the container for shipment to the laboratory. A nylon brush is used to remove particulate from the probe and nozzle fractions and the stem of the first impinger if needed. The filter is also added to this container.

The silica gel from the fourth impinger is weighed, and this value is recorded on the Sample Recovery and Integrity Sheet along with other pertinent data. An unused filter and a minimum of 200 mL each of distilled water are taken as blanks.

Analytical Procedures

The analytical procedures followed during this program are those described in EPA Method 13b.* Analysis is conducted by specific ion electrode.

The sample is initially filtered. The filtered solids are then combusted in the presence of CaO to prevent loss of fluorine. The ash is then fused with crushed NaOH and quantitatively mixed with the filtrate. The filtrate solution is acidified and distilled. The distillate is diluted, buffered, and analyzed by specific ion electrode. The ion electrode is calibrated with five standards between 0.1 and 10.0 mg/liter. If no fluoride is detected, the reported detection limit is 0.1 mg/liter.

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* 40 CFR 60, Appendix A, July 1991.

DETERMINATION OF NITROGEN OXIDE EMISSIONS

This test program follows the sampling procedures described in EPA Method 7A.*

Sampling Apparatus

The nitrogen oxide (NO_x) sampling train used in these tests meets design specifications established by the Federal EPA. Assembled by ITAQS personnel, it consists of the following:

Probe - Borosilicate glass tubing with a heating system capable of maintaining a gas temperature of approximately 250°F at the exit end to prevent water condensation. A glass-wool plug is placed in the end of the probe to remove particulate matter, as shown in Figure 7A-1.

Collection Flask - Two-liter borosilicate, round-bottom flask, with short neck and 24/40 standard taper opening, protected against implosion or breakage.

Flask Valve - Two-way stopcock connected to a 24/10 standard taper joint.

Manifold - Two- and three-way Teflon stopcock and connected 24/10 standard taper joints.

Temperature Gauge - Dial-type thermometer capable of measuring 2°F intervals from 25° to 125°F.

Vacuum Line - Tubing capable of withstanding a vacuum of 3 in.Hg absolute pressure, with "T" connection and T-bore stopcock.

Vacuum Gauge - U-tube manometer, 36 in.Hg with 0.1-in. divisions.

Pump - Capable of evacuating the collection flask to a pressure equal to or less than 3 in.Hg absolute.

Barometer - Aneroid type to measure atmospheric pressures to ±0.1 in.Hg.

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* 40 CFR 60, Appendix A, July 1990.

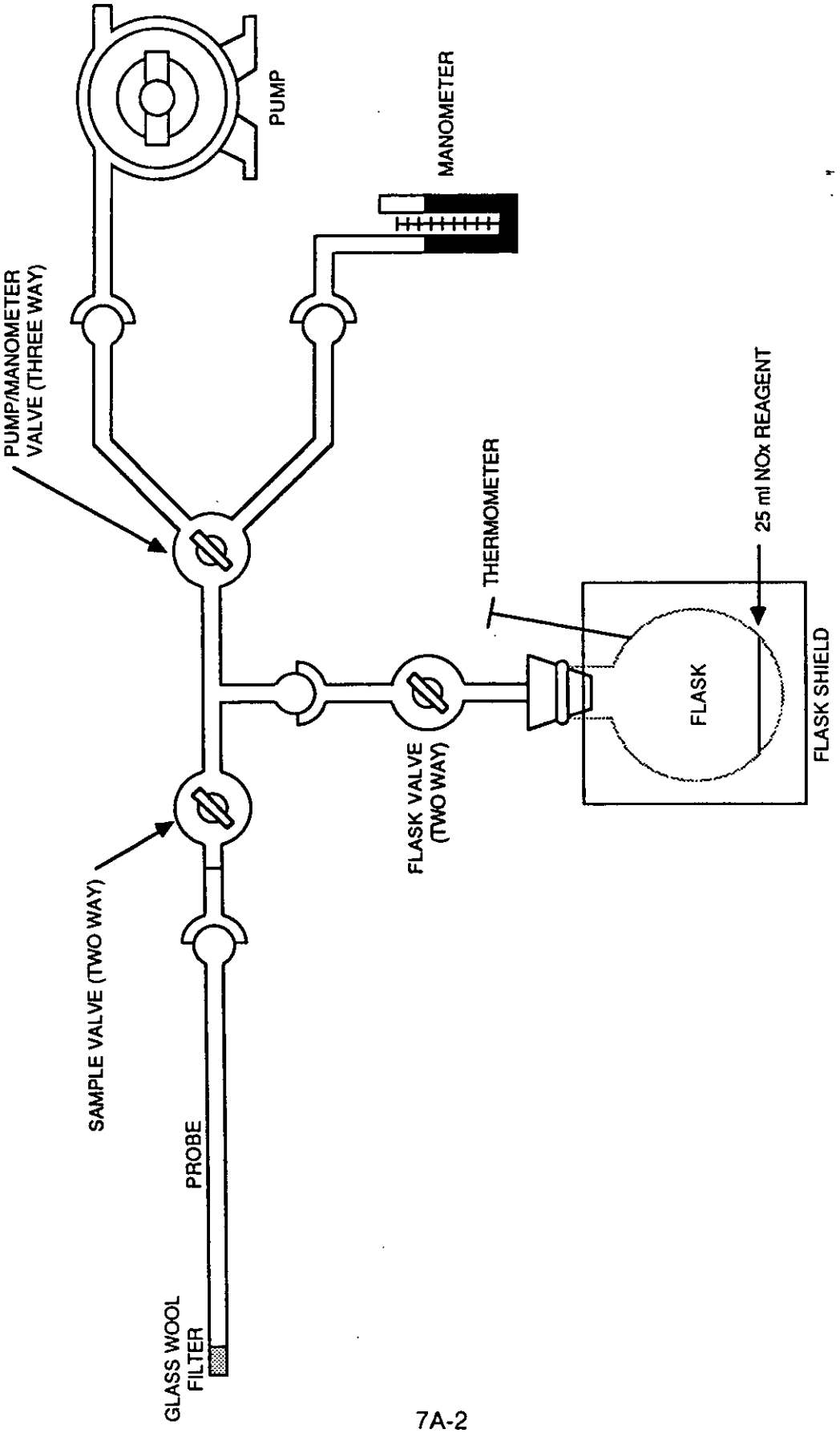

Figure 7A-1. Method 7 sampling train.

Sampling Procedure

Following the selection of the sampling site and minimum number of traverse points, the stack pressure, temperature, moisture, and range of velocity head are measured according to procedures described in EPA Methods 1 through 4.*

One sampling point, representing the average flow rate, is chosen. The sampling flask is charged with 25 mL of absorbing solution (made by mixing 1 liter of distilled water, 2.8 mL of concentrated H_2SO_4, and 6 mL of 3 percent H_2O_2). A portion of the reagent is retained for use in preparing the calibration standards.

With the sample valve closed, the flask valve open, and the pump/manometer valve open to pump, the flask is evacuated to less than 3 in.Hg absolute pressure. Flask vacuum is determined by moving the pump/manometer valve to manometer. Leakage is checked by observing the manometer for pressure fluctuation. Any variation greater than 0.4 in.Hg over a 1-minute period is corrected before sampling.

With the flask closed, the sample valve open, and the pump/manometer valve turned to pump, the sampling apparatus is purged for 5 minutes. The probe heater setting is adjusted to prevent any visible condensation. With the sample valve closed and the pump/manometer valve open to manometer, an initial flask vacuum is determined by opening the flask valve. The sample valve is then slowly opened, allowing stack gas to enter the flask. The vacuum is allowed to drop to 3 in.Hg (approximately 15 seconds), and then the sample flask valves are closed. The flask is shaken for 5 minutes to ensure contact between the sample and absorbing solution.

Sample Recovery Procedure

The collection flasks are transported to the laboratory for sample recovery. The flasks are set aside for a minimum of 16 hours. At the end of the period, the flasks are shaken for 2 minutes and the final flask pressure and temperatures are measured. All pertinent data are recorded on the recovery data sheets.

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* 40 CFR 60, Appendix A, July 1990.

The contents of the flask are measured volumetrically and transferred to a polyethylene container. The flask is then rinsed with two separate 5-mL portions of deionized, distilled water, and the solution is added to the same container.

Analytical Procedure

The volume of absorbing solution is recorded and diluted to 50 mL with deionized, distilled water. A 5-mL aliquot of this solution is pipetted to a volumetric flask and diluted to 50 mL with deionized water. The samples from the second dilution are analyzed by ion chromatography. A calibration curve of μg NO_x versus peak area response is prepared using standards of known concentration.

APPENDIX B
EXAMPLE CALCULATIONS

IT AIR QUALITY SERVICES
VELOCITY DETERMINATION

validated 11/1/90

PLANT :	Miles
SAMPLE LOCATION :	Dry Gas Exhaust Stack
RUN NUMBER :	M-V-1

DATE :	1/15/94	**BAROMETRIC PRES., in. Hg :**	30.26
TIME(24-HR) :	703	**STATIC PRES., in. H2O :**	-0.11
OPERATOR(S) :	JN,SF		
PERCENT MOISTURE :	2.7	**PITOT TUBE, Cp :**	0.84
STACK AREA, SQ. IN. :	1809.56	**PERCENT CO2 :**	1.7
NO. OF TRAVERSE PTS. :	24	**PERCENT O2 :**	19.4

TRAVERSE PT. NO.	VELOCITY HEAD, in. H2O	STACK TEMP., deg. F
1	0.21	223
2	0.24	225
3	0.25	227
4	0.24	224
5	0.25	224
6	0.26	227
7	0.24	227
8	0.24	227
9	0.23	228
10	0.23	228
11	0.22	227
12	0.23	228
13	0.22	225
14	0.24	225
15	0.24	225
16	0.25	225
17	0.24	225
18	0.26	224
19	0.27	224
20	0.25	224
21	0.26	224
22	0.25	224
23	0.23	226
24	0.24	226
	0.24	**226**

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validated 11/1/90

IT AIR QUALITY SERVICES
VELOCITY DETERMINATION

PLANT : Miles
SAMPLE LOCATION : Dry Gas Exhaust Stack
RUN NUMBER : M-V-2

DATE :	1/15/94	**BAROMETRIC PRES., in. Hg :**	30.26
TIME(24-HR) :	835	**STATIC PRES., in. H2O :**	-0.12
OPERATOR(S) :	JN,SF		
PERCENT MOISTURE :	2.7	**PITOT TUBE, Cp :**	0.84
STACK AREA, SQ. IN. :	1809.56	**PERCENT CO2 :**	1.7
NO. OF TRAVERSE PTS. :	24	**PERCENT O2 :**	19.4

TRAVERSE PT. NO.	VELOCITY HEAD, in. H2O	STACK TEMP., deg. F
1	0.23	224
2	0.24	225
3	0.25	225
4	0.25	225
5	0.25	225
6	0.24	225
7	0.22	225
8	0.23	225
9	0.23	225
10	0.24	227
11	0.27	227
12	0.26	227
13	0.26	225
14	0.26	226
15	0.23	226
16	0.23	226
17	0.24	226
18	0.25	226
19	0.25	226
20	0.26	224
21	0.25	224
22	0.27	224
23	0.27	226
24	0.26	226
	0.25	**225**

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validated 11/1/90

IT AIR QUALITY SERVICES
VELOCITY DETERMINATION

PLANT : Miles
SAMPLE LOCATION : Dry Gas Exhaust Stack
RUN NUMBER : M-V-3

DATE :	1/15/94	**BAROMETRIC PRES., in. Hg :**	30.28
TIME(24-HR) :	920	**STATIC PRES., in. H2O :**	-0.11
OPERATOR(S) :	JN,SF		
PERCENT MOISTURE :	2.7	**PITOT TUBE, Cp :**	0.84
STACK AREA, SQ. IN. :	1809.56	**PERCENT CO2 :**	1.7
NO. OF TRAVERSE PTS. :	24	**PERCENT O2 :**	19.4

TRAVERSE PT. NO.	VELOCITY HEAD, in. H2O	STACK TEMP., deg. F
1	0.24	224
2	0.24	226
3	0.23	225
4	0.25	228
5	0.25	228
6	0.26	228
7	0.26	228
8	0.24	228
9	0.25	228
10	0.28	228
11	0.28	228
12	0.26	228
13	0.24	228
14	0.24	228
15	0.24	228
16	0.25	228
17	0.24	228
18	0.22	228
19	0.22	228
20	0.22	228
21	0.24	228
22	0.24	228
23	0.24	228
24	0.22	228
	0.24	**228**

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IT AIR QUALITY SERVICES
VELOCITY DETERMINATION

validated 11/1/90

PLANT : Miles
SAMPLE LOCATION : Dry Gas Exhaust Stack

Run No:	M-V-1	M-V-2	M-V-3	AVERAGE
STACK PRESSURE, in Hg :	30.25	30.25	30.27	30.26
STACK TEMP., deg. F :	226	225	228	226
MOLECULAR WEIGHT, DRY :	29.05	29.05	29.05	29.05
MOLECULAR WEIGHT, STACK :	28.75	28.75	28.75	28.75
AVG. SQRT. VELOCITY HEAD :	0.49	0.50	0.49	0.49
VELOCITY, fps :	31.30	31.70	31.49	31.50
ACTUAL CUBIC FEET/ MINUTE :	23599	23901	23747	23,749
)RY STANDARD CUBIC FEET/ MINUTE :	17889	18120	17958	17,989

AVERAGE FLOW RATE RUN#1 TO RUN#2: 18005 dscfm

AVERAGE FLOW RATE RUN#2 TO RUN#3: 18039 dscfm

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IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

FIELD DATA

Plant: **Miles**
Sampling location: **Dry Gas Exhaust Outlet**
Test time (start-stop): **1110-1344**

Date: **1/11/94**
Run number: **Miles-PMM-1**

Sample type: **Part./Metals**
Bar. press. (in. Hg): **30.75**
Static press. (in. H20): **-0.250**
Filter number(s): **9370107**
Stack inside dia. (in.): **48.00**
Pitot tube coeff.: **0.84**
Total H2O collected (ml): **171.9**
% O2 by volume (dry): **19.4**

Volume correction (cu. ft.): **0.000**
Meter calibration factor: **0.946**
Data interval (min.): **6.5**
Nozzle dia. (in.): **0.370**
Meter box number: **FT-5**
Number of traverse points: **24**
% CO2 by volume (dry): **2.0**
% CO by volume (dry): **0.0**

Sample time (min)	Gas meter reading (cu. ft.)	Velocity head ΔP (in. H2O)	Orifice drop actual ΔH (in. H2O)	Stack Temp. (°F)	Dry gas meter temp. (°F)	
					inlet	outlet
0.0	935.702					
6.5		0.240	1.65	248	40	40
13.0		0.250	1.73	248	44	40
19.5		0.260	1.81	249	49	40
26.0		0.260	1.85	250	54	44
32.5		0.260	1.83	250	58	44
39.0		0.260	1.86	250	66	54
45.5		0.290	2.08	252	70	56
52.0		0.280	2.01	253	72	56
58.5		0.270	1.95	254	74	60
65.0		0.260	1.87	255	74	60
71.5		0.250	1.80	256	74	60
78.0		0.210	1.51	257	74	60
84.5		0.280	1.98	259	66	56
91.0		0.310	2.20	260	70	56
97.5		0.350	2.48	261	70	56
104.0		0.390	2.75	265	70	56
110.5		0.400	2.84	264	74	58
117.0		0.400	2.85	262	74	60
123.5		0.430	3.11	253	76	62
130.0		0.440	3.23	242	76	64
136.5		0.410	3.05	235	76	64
143.0		0.410	3.08	229	77	65
149.5		0.410	3.08	230	77	65
156.0	1094.632	0.380	2.84	234	78	66
156.0	**158.930**	**0.321**	**2.31**	**251**	**68**	**56**

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IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

FIELD DATA

Plant: **Miles**
Sampling location: **Dry Gas Exhaust Outlet**
Test time (start-stop): **1429-1712**

Date: **1/11/94**
Run number: **Miles-PMM-2**

Sample type: **Part./Metals**
Bar. press. (in. Hg): **30.68**
Static press. (in. H20): **-0.250**
Filter number(s): **9370108**
Stack inside dia. (in.): **48.00**
Pitot tube coeff.: **0.84**
Total H2O collected (ml): **144.7**
% O2 by volume (dry): **19.4**

Volume correction (cu. ft.): **0.000**
Meter calibration factor: **0.946**
Data interval (min.): **6.5**
Nozzle dia. (in.): **0.370**
Meter box number: **FT-5**
Number of traverse points: **24**
% CO2 by volume (dry): **1.4**
% CO by volume (dry): **0.0**

Sample time (min)	Gas meter reading (cu. ft.)	Velocity head ΔP (in. H2O)	Orifice drop actual ΔH (in. H2O)	Stack Temp. (°F)	Dry gas meter temp. (°F)	
					inlet	outlet
0.0	94.788					
6.5		0.400	2.86	243	56	54
13.0		0.410	2.94	243	58	54
19.5		0.390	2.81	242	60	55
26.0		0.390	2.83	241	66	58
32.5		0.390	2.83	241	67	58
39.0		0.370	2.70	241	70	60
45.5		0.360	2.63	241	70	60
52.0		0.370	2.70	241	70	60
58.5		0.320	2.34	242	71	60
65.0		0.330	2.42	241	71	61
71.5		0.320	2.34	241	71	61
78.0		0.300	2.20	240	71	61
84.5		0.330	2.38	238	60	52
91.0		0.320	2.31	240	62	54
97.5		0.330	2.39	239	64	54
104.0		0.340	2.46	238	66	54
110.5		0.360	2.62	238	66	54
117.0		0.360	2.63	237	66	56
123.5		0.350	2.57	235	68	56
130.0		0.360	2.66	232	69	57
136.5		0.360	2.66	230	69	57
143.0		0.360	2.66	230	69	57
149.5		0.350	2.58	230	68	56
156.0	266.087	0.350	2.58	231	68	56
156.0	**171.299**	**0.355**	**2.59**	**238**	**67**	**57**

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IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

TEST RESULTS

Plant: **Miles** Test date(s): 1/11/94 1/11/94
Sampling location: **Dry Gas Exhaust Outlet**

			Run Numbers Miles-PMM-1	Miles-PMM-2	AVERAGE
Ø	Net time of test (min)	-------	156.0	156.0	
NP	Net sampling points	-------	24	24	
Y	Meter calibration factor	-------	0.946	0.946	
Dn	Sampling nozzle diameter (in)	-------	0.370	0.370	
Cp	Pitot tube coefficient	-------	0.84	0.84	
ΔH	Average orifice pressure drop (in. H2O)	-------	2.31	2.59	2.45
Vm	Volume of dry gas sampled at meter conditions (cu. ft.)	-------	158.930	171.299	165.115
Tm	Average gas meter temperature (°F)	-------	62.0	61.7	61.9
Vmstd	Volume of dry gas sampled at standard conditions (scf)	-------	157.164	169.218	163.191
Vlc	Total H2O collected in impingers and silica gel (ml)	-------	171.9	144.7	158.3
Vwstd	Volume of water vapor at standard conditions (scf)	-------	8.091	6.811	7.451
Bws	Percent moisture by volume, as measured	-------	4.90	3.87	4.39
	Percent moisture by volume, at saturation	-------	100.00	100.00	
	Percent moisture by volume, used in calculations	-------	4.90	3.87	4.39
Fmd	Mole fraction of dry gas	-------	0.951	0.961	0.956
%CO2	Percent CO2 by volume (dry)	-------	2.0	1.4	1.7
%O2	Percent O2 by volume (dry)	-------	19.4	19.4	19.4
%CO	Percent CO by volume (dry)	-------	0.0	0.0	0.0
%N2	Percent N2 by volume (dry)	-------	78.6	79.2	78.9
Md	Molecular weight - dry stack gas	-------	29.10	29.00	29.05
Ms	Molecular weight - stack gas	-------	28.55	28.57	28.56
Pbar	Barometric pressure (in. Hg)	-------	30.75	30.68	30.72
Psi	Static pressure of stack gas (in. H2O)	-------	-0.250	-0.250	
Ps	Stack pressure - absolute (in. Hg)	-------	30.73	30.66	30.70
Ts	Average stack gas temperature (°F)	-------	250.7	238.1	244.4

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IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

TEST RESULTS

Plant: **Miles** Test date(s): 1/11/94 1/11/94
Sampling location: **Dry Gas Exhaust Outlet**

			Run Numbers Miles-PMM-1	Miles-PMM-2	AVERAGE
Vh	Average square root of velocity head (in. H2O)	-------	0.5628	0.5954	0.5791
Vs	Average stack gas velocity (feet/sec.)	-------	36.37	38.16	37.27
As	Stack area (sq. in.)	-------	1809.6	1809.6	1809.6
Qs	Actual stack flow rate (acfm)	-------	27426	28776	28,101
Qsstd	Stack flow rate - dry (scfm)	-------	19904	21440	20,672
ISO	Percent isokinetic	-------	85.2	85.2	85.2

			Mass of pollutant	=	5.7	5.6	
			If below detection limits, replace 0 with 1.		0	0	
Mn	**Filterable Particulate**	**mass**		**mg**	**5.7**	**5.6**	
Cs	**Filterable Particulate**	**concentration**		**gr/dscf**	**5.596E-04**	**5.106E-04**	5.351×10^{-4}
Pmr	**Filterable Particulate**	**emission rate**		**lb/h**	**9.548E-02**	**9.384E-02**	9.466×10^{-2}

			Mass of pollutant	=	9.0	6.5	
			If below detection limits, replace 0 with 1.		0	0	
Mn	**Barium**	**mass**		**µg**	**9.0**	**6.5**	
Cs	**Barium**	**concentration**		**µg/m3**	**2.022**	**1.357**	1.690
Pmr	**Barium**	**emission rate**		**lb/h**	**1.508E-04**	**1.089E-04**	1.299×10^{-4}

			Mass of pollutant	=	4.3	3.4	
			If below detection limits, replace 0 with 1.		0	0	
Mn	**Chromium**	**mass**		**µg**	**4.3**	**3.4**	
Cs	**Chromium**	**concentration**		**µg/m3**	**0.966**	**0.710**	0.838
Pmr	**Chromium**	**emission rate**		**lb/h**	**7.203E-05**	**5.697E-05**	6.450×10^{-5}

Calc by BLC 2/4/94

2/4/94

IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

TEST RESULTS

Plant: **Miles** Test date(s): 1/11/94 1/11/94
Sampling location: **Dry Gas Exhaust Outlet**

				Run Numbers Miles-PMM-1	Miles-PMM-2	AVERAGE
		Mass of pollutant =		1.6	1.5	
		If below detection limits, replace 0 with 1.		0	1	
Mn	**Cobalt**	**mass**	µg	**1.6**	**<1.5**	
Cs	**Cobalt**	**concentration**	µg/m3	**0.360**	**<0.313**	<0.337
Pmr	**Cobalt**	**emission rate**	lb/h	**2.680E-05**	**<2.514E-05**	$< 2.597 \times 10^{-5}$
		Mass of pollutant =		7.3	3.1	
		If below detection limits, replace 0 with 1.		0	0	
Mn	**Copper**	**mass**	µg	**7.3**	**3.1**	
Cs	**Copper**	**concentration**	µg/m3	**1.640**	**0.647**	1.144
Pmr	**Copper**	**emission rate**	lb/h	**1.223E-04**	**5.195E-05**	9.713×10^{-5}
		Mass of pollutant =		2.8	2.5	
		If below detection limits, replace 0 with 1.		0	0	
Mn	**Lead**	**mass**	µg	**2.8**	**2.5**	
Cs	**Lead**	**concentration**	µg/m3	**0.629**	**0.522**	0.576
Pmr	**Lead**	**emission rate**	lb/h	**4.690E-05**	**4.189E-05**	4.440×10^{-5}
		Mass of pollutant =		4.8	3.1	
		If below detection limits, replace 0 with 1.		0	0	
Mn	**Manganese**	**mass**	µg	**4.8**	**3.1**	
Cs	**Manganese**	**concentration**	µg/m3	**1.079**	**0.647**	0.863
Pmr	**Manganese**	**emission rate**	lb/h	**8.040E-05**	**5.195E-05**	6.618×10^{-5}
		Mass of pollutant =		6.7	5.0	
		If below detection limits, replace 0 with 1.		0	1	
Mn	**Nickel**	**mass**	µg	**6.7**	**<5.0**	
Cs	**Nickel**	**concentration**	µg/m3	**1.505**	**<1.043**	<1.274
Pmr	**Nickel**	**emission rate**	lb/h	**1.122E-04**	**<8.378E-05**	$< 9.799 \times 10^{-5}$

Calc by BLG 2/4/94

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IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

TEST RESULTS

Plant: **Miles** Test date(s): **1/11/94** **1/11/94**
Sampling location: **Dry Gas Exhaust Outlet**

					Run Numbers Miles-PMM-1	Miles-PMM-2	AVERAGE
		Mass of pollutant	=		57.0	25.0	
		If below detection limits, replace 0 with 1.			0	1	
Mn	**Zinc**	**mass**	**µg**		**57.0**	**<25.0**	
Cs	**Zinc**	**concentration**	**µg/m3**		**12.808**	**<5.217**	< 9.013
Pmr	**Zinc**	**emission rate**	**lb/h**		**9.548E-04**	**<4.189E-04**	$< 6.869 \times 10^{-4}$

Calc by BLG 2/4/94

MJ 2/4/94

IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

FIELD DATA

Plant: **Miles**
Sampling location: **Dry Gas Exhaust Outlet**
Test time (start-stop): **1128-1328**

Date: **1/11/94**
Run number: **Miles-F-1**

Sample type: **Fluoride**
Bar. press. (in. Hg): **30.75**
Static press. (in. H20): **-0.250**
Filter number(s): **NA**
Stack inside dia. (in.): **48.00**
Pitot tube coeff.: **0.84**
Total H2O collected (ml): **42.6**
% O2 by volume (dry): **19.4**

Volume correction (cu. ft.): **0.000**
Meter calibration factor: **1.004**
Data interval (min.): **2.5**
Nozzle dia. (in.): **0.323**
Meter box number: **FT-4**
Number of traverse points: **24**
% CO2 by volume (dry): **2.0**
% CO by volume (dry): **0.0**

Sample time (min)	Gas meter reading (cu. ft.)	Velocity head ΔP (in. H2O)	Orifice drop actual ΔH (in. H2O)	Stack Temp. (°F)	Dry gas meter temp. (°F)	
					inlet	outlet
0.0	884.118					
2.5		0.240	1.02	247	40	40
5.0		0.250	1.06	249	42	40
7.5		0.260	1.10	250	42	40
10.0		0.280	1.19	248	43	40
12.5		0.280	1.19	248	44	40
15.0		0.290	1.23	250	45	41
17.5		0.290	1.23	250	46	42
20.0		0.300	1.29	250	48	44
22.5		0.310	1.33	250	50	44
25.0		0.310	1.33	252	52	44
27.5		0.300	1.29	252	52	44
30.0		0.290	1.24	252	56	44
32.5		0.370	1.57	262	50	48
35.0		0.390	1.65	264	50	48
37.5		0.380	1.61	263	51	48
40.0		0.380	1.61	263	51	48
42.5		0.400	1.70	262	52	48
45.0		0.430	1.83	262	52	48
47.5		0.460	1.97	258	54	48
50.0		0.460	1.97	258	54	48
52.5		0.470	2.04	248	54	48
55.0		0.440	1.92	244	54	48
57.5		0.440	1.93	240	54	48
60.0	921.924	0.420	1.87	236	60	50
60.0	**37.806**	**0.352**	**1.51**	**252**	**50**	**45**

D Cahill
1-24-94

IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

FIELD DATA

Plant: **Miles**
Sampling location: **Dry Gas Exhaust Outlet**
Test time (start-stop): **1510-1626**

Date: **1/11/94**
Run number: **Miles-F-2**

Sample type: **Fluoride**
Bar. press. (in. Hg): **30.68**
Static press. (in. H20): **-0.250**
Filter number(s): **NA**
Stack inside dia. (in.): **48.00**
Pitot tube coeff.: **0.84**
Total H2O collected (ml): **40.6**
% O2 by volume (dry): **19.4**

Volume correction (cu. ft.): **0.000**
Meter calibration factor: **1.004**
Data interval (min.): **2.5**
Nozzle dia. (in.): **0.323**
Meter box number: **FT-4**
Number of traverse points: **24**
% CO2 by volume (dry): **1.4**
% CO by volume (dry): **0.0**

Sample time (min)	Gas meter reading (cu. ft.)	Velocity head ΔP (in. H2O)	Orifice drop actual ΔH (in. H2O)	Stack Temp. (°F)	Dry gas meter temp. (°F) inlet	outlet
0.0	922.132					
2.5		0.330	1.44	242	50	46
5.0		0.350	1.52	241	50	46
7.5		0.370	1.61	241	52	46
10.0		0.370	1.61	242	52	46
12.5		0.360	1.57	242	52	46
15.0		0.360	1.57	241	52	46
17.5		0.360	1.57	241	52	46
20.0		0.350	1.52	241	52	46
22.5		0.350	1.52	241	52	46
25.0		0.360	1.57	240	52	44
27.5		0.360	1.57	240	52	44
30.0		0.350	1.53	240	52	44
32.5		0.320	1.40	240	50	46
35.0		0.310	1.35	240	50	46
37.5		0.320	1.40	239	50	46
40.0		0.320	1.40	239	50	46
42.5		0.310	1.35	240	50	46
45.0		0.340	1.49	239	50	46
47.5		0.350	1.53	239	52	46
50.0		0.350	1.53	239	52	46
52.5		0.380	1.66	239	52	46
55.0		0.370	1.62	238	52	46
57.5		0.370	1.62	238	52	48
60.0	960.237	0.380	1.67	237	52	47
60.0	**38.105**	**0.350**	**1.53**	**240**	**51**	**46**

O Cahill
1-24-94

IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

TEST RESULTS

Plant: **Miles** Test date(s): 1/11/94 1/11/94 1/1/04
Sampling location: **Dry Gas Exhaust Outlet**

			Run Numbers Miles-F-1	Miles-F-2	0	AVERAGE
Ø	Net time of test (min)	-------	60.0	60.0		
NP	Net sampling points	-------	24	24		
Y	Meter calibration factor	-------	1.004	1.004		
Dn	Sampling nozzle diameter (in)	-------	0.323	0.323		
Cp	Pitot tube coefficient	-------	0.84	0.84		
ΔH	Average orifice pressure drop (in. H2O)	-------	1.51	1.53		1.52
Vm	Volume of dry gas sampled at meter conditions (cu. ft.)	-------	37.806	38.105		37.956
Tm	Average gas meter temperature (°F)	-------	47.4	48.6		48.0
Vmstd	Volume of dry gas sampled at standard conditions (scf)	-------	40.737	40.874		40.806
Vlc	Total H2O collected in impingers and silica gel (ml)	-------	42.6	40.6		41.6
Vwstd	Volume of water vapor at standard conditions (scf)	-------	2.005	1.911		1.958
Bws	Percent moisture by volume, as measured	-------	4.69	4.47		4.58
	Percent moisture by volume, at saturation	-------	100.00	100.00		
	Percent moisture by volume, used in calculations	-------	4.69	4.47		4.58
Fmd	Mole fraction of dry gas	-------	0.953	0.955		0.954
%CO2	Percent CO2 by volume (dry)	-------	2.0	1.4		1.7
%O2	Percent O2 by volume (dry)	-------	19.4	19.4		19.4
%CO	Percent CO by volume (dry)	-------	0.0	0.0		
%N2	Percent N2 by volume (dry)	-------	78.6	79.2		78.9
Md	Molecular weight - dry stack gas	-------	29.10	29.00		29.05
Ms	Molecular weight - stack gas	-------	28.58	28.51		28.55
Pbar	Barometric pressure (in. Hg)	-------	30.75	30.68		30.72
Psi	Static pressure of stack gas (in. H2O)	-------	-0.250	-0.250		
Ps	Stack pressure - absolute (in. Hg)	-------	30.73	30.66		30.70
Ts	Average stack gas temperature (°F)	-------	252.4	240.0		246.2

Calc by
BLG 1/24/94

D Cahill
1/24/94

IT AIR QUALITY SERVICES
EMISSION TEST REPORT

validated 7/3/91

TEST RESULTS

Plant: **Miles** Test date(s): 1/11/94 1/11/94
Sampling location: **Dry Gas Exhaust Outlet**

			Run Numbers Miles-F-1	Miles-F-2	AVERAGE
Vh	Average square root of velocity head (in. H2O)	-------	0.5897	0.5910	0.5904
Vs	Average stack gas velocity (feet/sec.)	-------	38.14	37.98	38.06
As	Stack area (sq. in.)	-------	1809.6	1809.6	
Qa	Actual stack flow rate (acfm)	-------	28759	28634	28,697
Qastd	Stack flow rate - dry (scfm)	-------	20866	21146	21,006
ISO	Percent isokinetic	-------	71.9	71.1	71.5

		Mass of pollutant	=	64.0	55.0	
		If below detection limits, replace 0 with 1.		0	0	
Mn	**Fluoride**	**mass**	**mg**	**64.0**	**55.0**	
Cs	**Fluoride**	**concentration**	**gr/dscf**	**2.424E-02**	**2.076E-02**	2.25×10^{-2}
Pmr	**Fluoride**	**emission rate**	**lb/h**	**4.336E+00**	**3.763E+00**	4.050×10^{0}

Calc by BLG 2/4/94

2.4.94

NOx Emissions Calculations

validated 2/16/90

PLANT : Miles
LOCATION : Dry Gas Exhaust Outlet
DATE : 1/12/94

	Final	Initial
Barometric Pressure(in. Hg):	29.60	30.34

Run No.	Test Time (24-hr)	Flask Volume ml	Final Pressure in. Hg.	Final Temp. °F	Initial Pressure in. Hg	Initial Temp. °F	Sample Volume ml	PNOx µg	CPPM ppm	Qstd dscfm	NOx Emissions lb/dscf	NOx Emissions lb/h
M-NOx-1A	0914	1979.3	3.3	35	26.70	35	1578.8	1700	563	20839	6.72E-05	84.1
M-NOx-1B	0929	2064.2	2.5	37	27.00	34	1718.9	1700	517	20839	6.17E-05	77.2
M-NOx-1C	0944	2078.5	2.8	34	27.00	34	1720.9	1740	528	20839	6.31E-05	78.9
M-NOx-1D	0959	2094.8	2.3	34	26.80	34	1756.8	1800	535	20839	6.40E-05	80.0
Average									**536**		**6.40E-05**	**80.0**
M-NOx-2A	1014	2071.6	2.7	33	26.90	33	1718.6	1750	532	20839	6.36E-05	79.5
M-NOx-2B	1029	2051.0	2.5	34	26.90	34	1712.4	1780	543	20839	6.49E-05	81.1
M-NOx-2C	1044	1930.4	2.3	34	26.70	34	1610.4	1680	545	20839	6.51E-05	81.4
M-NOx-2D	1059	1990.4	2.8	34	26.80	34	1633.1	1790	573	20839	6.84E-05	85.6
Average									**548**		**6.55E-05**	**81.9**
Overall Average									542		6.48×10^{-5}	81.0

Calc by BLG
2/4/94

NOx Emissions Calculations

validated 2/16/95

PLANT : Miles
LOCATION : Dry Gas Exhaust Outlet
DATE : 1/15/94

	Final	Initial
Barometric Pressure(in. Hg):	30.10	30.26

Run No.	Test Time (24-hr)	Flask Volume ml	Final Pressure in. Hg.	Final Temp. ° F	Initial Pressure in. Hg	Initial Temp. ° F	Sample Volume ml	PNOx µg	CPPM ppm	Qsstd dscfm	NOx Emissions lb/dscf	NOx Emissions lb/h
M-NOx-3A	0730	2020.5	0.2	67	27.50	15	1793.3	1900	554	18005	6.61E-05	71.5
M-NOx-3B	0745	2064.6	0.4	66	27.20	15	1800.4	2110	612	18005	7.32E-05	79.0
M-NOx-3C	0800	2012.8	0.5	67	27.10	14	1739.7	2050	616	18005	7.36E-05	79.5
M-NOx-3D	0815	2027.4	0.8	67	27.10	16	1730.0	1870	565	18005	6.75E-05	72.9
Average									**587**		**7.01E-05**	**75.7**
M-NOx-4A	0830	2014.9	2.2	68	27.00	17	1615.6	2030	657	18039	7.84E-05	84.9
M-NOx-4B	0845	2073.3	1.0	68	26.90	17	1737.5	2190	659	18039	7.87E-05	85.2
M-NOx-4C	0900	2095.9	1.4	67	26.90	16	1732.3	2170	655	18039	7.82E-05	84.6
M-NOx-4D	0915	2049.9	1.0	67	26.90	16	1720.9	2220	674	18039	8.05E-05	87.2
Average									**661**		**7.90E-05**	**85.5**
Overall Average									624		7.46×10^{-5}	80.6

Calc by BLC
1/4/94

JJ
1-4-94

NO_x CALCULATIONS

Equation 1: $$V_s = 17.647 \times (V_f - 25) \times \left[\left(\frac{P_b - P}{T + 460} \right)_f - \left(\frac{P_b - P}{T + 460} \right)_i \right]$$

Where:

V_s = Sample volume, ml

V_f = Flask volume, ml

P_b = Barometric pressure, in.Hg

P = Flask pressure, in.Hg

T = Flask temperature, °F

Note: Subscripts f and i indicate final and initial, respectively.

Equation 2: $$C_{NO_x} = \frac{522.5 \times P_{NO_x}}{V_s}$$

Where:

C_{NO_x} = NO_x concentration, ppm

P_{NO_x} = micrograms NO_x, µg

Equation 3: $$C'_{NO_x} = \frac{6.243 \times 10^{-5} \times P_{NO_x}}{V_s}$$

Where:

C'_{NO_x} = NO_x concentration, lb/dscf

Equation 4: $$E_{NO_x} = C'_{NO_x} \times Q_{s_{std}} \times 60$$

Where:

E_{NO_x} = NO_x emission rate, lb/h

$Q_{s_{std}}$ = Volumetric flow rate, dscfm

APPENDIX C
FIELD DATA

INTERNATIONAL TECHNOLOGY CORPORATION

FIELD ACTIVITY DAILY LOG

DAILY LOG				
	DATE	1	10	94
	NO.			
	SHEET	1	OF	1

PROJECT NAME: Miles | PROJECT NO.: 313674-6

FIELD ACTIVITY SUBJECT: Set-up Day

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

DC & JN Arrive @ 0840
Met Alice Webber.
Had health & safety bricfing
She mentioned that scaffolding may not be safe
ck'd scaffold — No ladder, no side rails at any level, No kick plates / Alice Webber said she would have fixed
Began Set-up & calibrations
1300 trains set & boxes cal'd
1330 talked to Maintenance / they said they could have scaffolding fixed in morning
Could not locate Alice Webber / will call later
DC & JN off site @ 1400

VISITORS ON SITE:

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.
Scaffolding unsafe

WEATHER CONDITIONS:
cold & clear

IMPORTANT TELEPHONE CALLS:

IT PERSONNEL ON SITE: DC JN

SIGNATURE: Doug Calvert | DATE: 1-10-94

INTERNATIONAL TECHNOLOGY CORPORATION

FIELD ACTIVITY DAILY LOG

DAILY LOG | DATE 1 | 11 | 94 | NO. | | | | SHEET 1 OF 1

PROJECT NAME Miles | PROJECT NO. 313674-6

FIELD ACTIVITY SUBJECT: DAY 1 Testing

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

DC + JN Arrive on site @ 0810
Scaffolding finished & Acceptable
Workers taking off port caps (ok @ 0830)
Began platform set-up
Testing

Test	RUN #	Start	Stop
PART/MM	miles-m-1	1110	1344
FLOURIDE	miles-f-1	1128	1328
PART/MM	miles-m-2	1429	1712
FLOURIDE	miles-f-2	1510	1626

Tests complete @ 1712
DC & JN off site @ 1745

VISITORS ON SITE:

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.
Scaffolding repaired

WEATHER CONDITIONS:
COLD, clear

IMPORTANT TELEPHONE CALLS:

IT PERSONNEL ON SITE: DC JN

SIGNATURE Doug Call DATE: 1/11/94

327A-7-86

INTERNATIONAL TECHNOLOGY CORPORATION

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	1	12	94
	NO.			
	SHEET	1	OF	1

PROJECT NAME Miles | PROJECT NO. 313674-6

FIELD ACTIVITY SUBJECT: DAY 2 Testing

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

DC & JN Arrive @ 0745
Met Alice Webber
she informed me that NOX without N_2 compounds test was supposed to be run on 1/11/94
It is not possable to switch back at this time
I called scott Furlong (pitts. office), He is going to ck when the plant will return to non N_2 compounds and Coordinate with J.P. concerning scheduling.
I called J.P. to inform.
Going ahead with Nox testing with N_2 Compounds
Testing

M-Nox-1A 914-959

M-NOX-2A 1014-1059

Began tear down
talked to Alice Weber
She will contact Scott Furlond when she finds out when they can run other Nox tests
JN off site 1300
DC off site 1330

VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.
WEATHER CONDITIONS: Cool, Raining	IMPORTANT TELEPHONE CALLS: Scott Furlong, John Prohaska

IT PERSONNEL ON SITE: DC, JN

SIGNATURE Doug Call DATE: 1-12-94

327A-7-86

INTERNATIONAL TECHNOLOGY CORPORATION

By_____ Date_____ Subject_____ Sheet No.____ of____

Chkd. By____ Date_____ Proj. No._____

1-x 3 3-4 4 4-9 5 8 6

Scott Furlong (call when job is done)

Miles LAB plant 0830 or later

Alice Webber or John Jozefowicz

IT TAILGATE SAFETY MEETING

Division/Subsidiary ITAQS Facility Cinci

Date 1-10-94 Time 0930 Job Number 313674-6

Customer Miles Address 701 Eastern, Balt. Md

Specific Location Dry gas exhauster stack

Type of Work source testing

Chemicals Used Acetone [illegible]

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment Hard hat, safety glasses, shoes

Poly gloves when handling reagent

Chemical Hazards reagents [illegible]

Physical Hazards * SCAffolding is not entirely usable

slips, trips, falls

Emergency Procedures [illegible]

Hospital / Clinic [illegible] Emergency Phone ( ) 911

Hospital Address 900 [illegible]

Special Equipment

Other

ATTENDEES

NAME PRINTED	SIGNATURE
[illegible]	[illegible]
Doug [illegible]	[illegible]
[illegible]	
[illegible]	

Meeting conducted by: Doug [illegible] Doug [illegible]

NAME PRINTED SIGNATURE

Supervisor Manager

36-8-85

IT TAILGATE SAFETY MEETING

Division/Subsidiary ITAQS Facility Cinci

Date 1-11-94 Time 0900 Job Number 313674-6

Customer Miles Address: 301 East

Specific Location Ocy Gas Exhausters

Type of Work source test

Chemicals Used Ace, Acids

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment Hard Hat, safety glasses, shoes gloves handling reagent

Chemical Hazards reagents above

Physical Hazards Scaffold ok slips, trips, falls

Emergency Procedures call operator

Hospital / Clinic Bethesda [illegible] Phone ( ) [illegible] ( ) 911

Hospital Address 300 [illegible]

Special Equipment

Other

ATTENDEES

NAME PRINTED | SIGNATURE

Jerry [illegible] | [signature]

Do[illegible] | Doug [illegible]

Meeting conducted by:

Doug Cahill | [signature]

NAME PRINTED | SIGNATURE

Supervisor | Manager

36-8-85

IT TAILGATE SAFETY MEETING

Division/Subsidiary: ITAQS Facility: Cinci

Date: 1-12-94 Time: 0930 Job Number: 913674-G

Customer: Miles Address:

Specific Location: Dry Gas Exhauster

Type of Work: Source testing

Chemicals Used: Acetone - 5% HNO_3 / 10% H_2O_2 / .1N HNO_3

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment: Hard hat, safety glasses & shoes
Poly gloves when handling reagent

Chemical Hazards: Reagents above

Physical Hazards: Slips, Falls, Falls

Emergency Procedures: Call plant operator

Hospital/Clinic: [illegible] Phone: 911

Hospital Address: [illegible]

Special Equipment:

Other:

ATTENDEES

NAME PRINTED	SIGNATURE
[illegible]	[illegible]

Meeting conducted by:

Doug Cahill — Doug Cahill
NAME PRINTED — SIGNATURE

Supervisor: Manager:

36-8-85

IT TAILGATE SAFETY MEETING

Division/Subsidiary: IT Facility

Date 1-15-94 Time 0600 Job Number 313674

Customer Mitco Address:

Specific Location Bulk dry gas - Exhaust

Type of Work Source test

Chemicals Used Acids

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment Level B

Chemical Hazards Benzene

Physical Hazards Extreme Cold - Heights

Emergency Procedures

Hospital / Clinic

Hospital Address

Special Equipment

Other

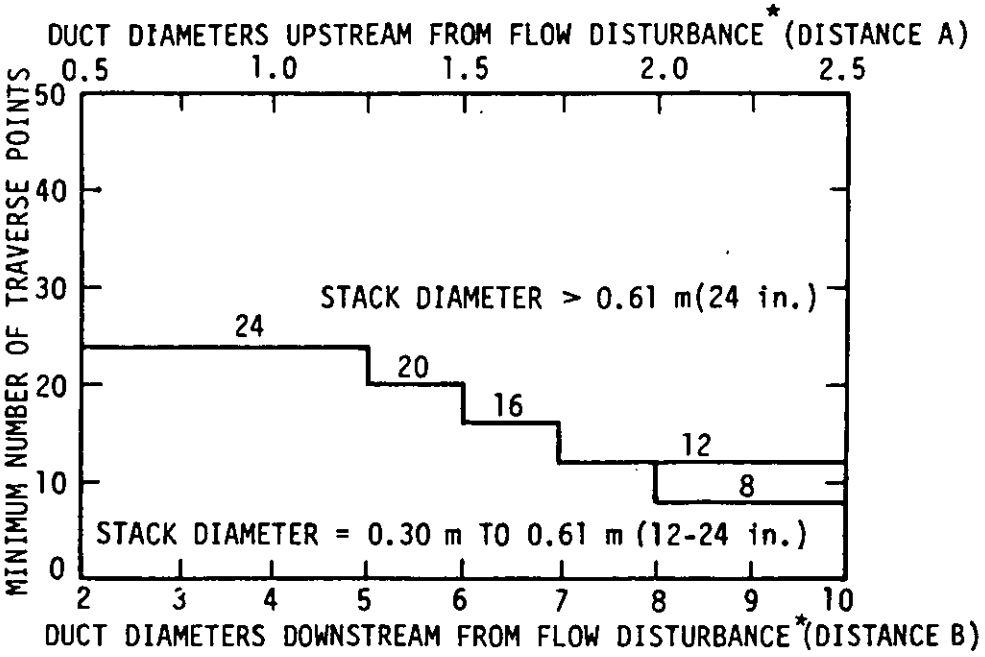
NAME PRINTED

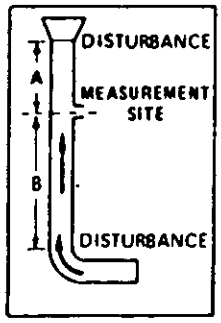
Meeting conducted by:

NAME PRINTED SIGNATURE

Supervisor Manager

36-8-85





* FROM POINT OF ANY TYPE OF DISTURBANCE (BEND, EXPANSION, CONTRACTION, ETC.)

TABLE 1-2. LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS
(Fraction of stack diameter from inside wall to traverse point)

Traverse point number on a diameter	Number of traverse points on a diameter				
	4	6	8	10	12
1	0.067	0.044	0.032	0.026	0.021
2	0.250	0.146	0.105	0.082	0.067
3	0.750	0.296	0.194	0.146	0.118
4	0.933	0.704	0.323	0.226	0.177
5		0.854	0.677	0.342	0.250
6		0.956	0.806	0.658	0.356
7			0.895	0.774	0.644
8			0.968	0.854	0.750
9				0.918	0.823
10				0.974	0.882
11					0.933
12					0.979

FIELD AUDIT REPORT: DRY GAS METER
BY CRITICAL ORIFICE

DATE: 1-10-94 CLIENT: Miles Lab

BAROMETRIC PRESSURE (P_{bar}): 30.88 in.Hg METER BOX NO. FT-4

ORIFICE NO. 3 PRETEST Y: 1.004 ΔH@ 1.98 in.H_2O

ORIFICE K FACTOR: 5.483×10^{-4} AUDITOR: J. Neese

Orifice manometer reading ΔH, in.H_2O	Dry gas meter reading V_i/V_f, ft³	Temperatures: Ambient T_{ai}/T_{af}, °F	Ambient Average T_a, °F	Dry gas meter Inlet T_{ii}/T_{if}, °F	Dry gas meter Outlet T_{oi}/T_{of}, °F	Dry gas meter Average T_m, °F	Duration of run Ø min.
2.90	868.3	30	30	46	46	46	17:28.38
	883.6	30		46	46		

Dry gas meter V_m, ft³	$V_{m_{std}}$, ft³	$V_{m_{act}}$, ft³	Audit, Y	Y deviation, %	Audit ΔH@, in.H_2O	ΔH@ Deviation, in.H_2O
15.3	16.59	16.08	~~1.04~~ .969	3.5%	2.06	.08

$$V_{m_{std}} = \frac{17.647(V_m)(P_{bar} + \Delta H/13.6)}{(T_m + 460)} = 16.59 \text{ ft}^3$$

(P_{bar} = 31.09)

$$V_{m_{act}} = \frac{1203(\text{Ø})(K)(P_{bar})}{(T_a + 460)^{1/2}} = 16.075 \text{ ft}^3$$

(Ø = 11.47)

$$\text{Audit Y} = \frac{V_{m_{act}}}{V_{m_{std}}} = .969 \qquad \text{Y deviation} = \frac{\text{Audit Y} - \text{Pretest Y}}{\text{Pretest Y}} \times 100 = 3.5\%$$

$$\text{Audit } \Delta H@ = (0.0317)(\Delta H)(P_{bar})(T_m + 460)\left[\frac{\text{Ø}}{Y\,(V_m)(P_{bar} + \Delta H/13.6)}\right]^2 = 2.06 \text{ in.}H_2O$$

Audit Y must be in the range, pretest Y ±0.05 Y.
Audit ΔH@ must be in the range pretest ΔH@ ±0.15 inches H_2O.

INTERNATIONAL TECHNOLOGY CORPORATION

DIGITAL INDICATOR AUDIT DATA SHEET

Indicator No. FT-4
Client Miles Lab.
Date 1-10-94

Project No. 313674-6
Operator J. Neese

Test Point No.	Equivalent Temperature F	Digital Indicator Temperature F	% Difference
1	0	1	.22
2	100	99	.18
3	200	199	.15
4	400	398	.23

Percent Difference Must Be Less Than or Equal To 0.5%

Percent Difference:

$$-\frac{(\text{Equivalent Temperature} - \text{Digital Indicator Temperature})(100)}{(\text{Equivalent Temperature} + 460)}$$

FIELD AUDIT REPORT: DRY GAS METER BY CRITICAL ORIFICE

DATE: 1-10-94 CLIENT: Miles

BAROMETRIC PRESSURE (P_{bar}): 30.88 in.Hg METER BOX NO. FT-5

ORIFICE NO. 3 PRETEST Y: .946 ΔH@ 1.34 in.H_2O

ORIFICE K FACTOR: 5.483×10^{-4} AUDITOR: J.N.

Orifice manometer reading ΔH, in.H_2O	Dry gas meter reading V_i/V_f, ft^3	Temperatures: Ambient T_{ai}/T_{af}, °F	Ambient Average T_a, °F	Dry gas meter Inlet T_{ii}/T_{if}, °F	Dry gas meter Outlet T_{oi}/T_{of}, °F	Dry gas meter Average T_m, °F	Duration of run Ø min.
1.95	918.7	30	30	44	42	44	12:12.93
	934.3	30		48	42		

Dry gas meter V_m, ft^3	$V_{m_{std}}$, ft^3	$V_{m_{act}}$, ft^3	Audit, Y	Y deviation, %	Audit ΔH@, in.H_2O	ΔH@ Deviation, in.H_2O
15.6	16.944	15.845	.935	1.16	1.36	0.02

$$V_{m_{std}} = \frac{17.647(V_m)(P_{bar} + \Delta H/13.6)}{(T_m + 460)} = \frac{17.647(15.6)(30.88 + 1.95/13.6)}{(504)} = 16.944\ ft^3$$

$$V_{m_{act}} = \frac{1203(\Phi)(K)(P_{bar})}{(T_a + 460)^{1/2}} = \frac{1203(12.22)(5.483 \times 10^{-4})(30.88)}{(504)^{1/2}} = 15.845\ ft^3$$

$$\text{Audit Y} = \frac{V_{m_{act}}}{V_{m_{std}}} = .935 \qquad \text{Y deviation} = \frac{\text{Audit Y} - \text{Pretest Y}}{\text{Pretest Y}} \times 100 = 1.16$$

$$\text{Audit } \Delta H@ = (0.0317)(\Delta H)(P_{bar})(T_m + 460)\left[\frac{\Phi}{Y\,(V_m)(P_{bar} + \Delta H/13.6)}\right]^2 = 1.36\ \text{in.}H_2O$$

$$= (0.0317)(1.95)(30.88)(504)\left[\frac{12.22}{.946\,(15.6)(31.02)}\right]^2$$

Audit Y must be in the range, pretest Y ±0.05 Y.
Audit ΔH@ must be in the range pretest ΔH@ ±0.15 inches H_2O.

INTERNATIONAL TECHNOLOGY CORPORATION

DIGITAL INDICATOR AUDIT DATA SHEET

Indicator No. FT-5
Client Miles Lab
Date 1-10-94

Project No. 313674-6
Operator J. Neese

Test Point No.	Equivalent Temperature F	Digital Indicator Temperature F	% Difference
1	0	0	0
2	100	98	.36
3	200	200	0
4	400	398	.23

Percent Difference Must Be Less Than or Equal To 0.5%

Percent Difference:

$$-\frac{(\text{Equivalent Temperature} - \text{Digital Indicator Temperature})(100)}{(\text{Equivalent Temperature} + 460)}$$

INTERNATIONAL TECHNOLOGY CORPORATION

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Miles Lab
DATE 1-11-94 TEST NO Miles - M-1
SAMPLING TIME (24-hr CLOCK) 1110 - 1350
SAMPLING LOCATION Dry Gas Exhauster Stack
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) ~~BAG~~
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE 68
OPERATOR JN
ORSAT LEAK CHECKED ✓

COMMENTS: 142

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	2.0	2.0	2.0	2.0			2.0	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	21.4	19.4	21.4	19.4			19.4	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)							✓ 1/14/94	28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City Miles Baltimore Md Date 1-11-93

Sampling Location DRY GAS Exhaust Clock Time 0845

Run No. Pre Test Operator DC & JN

Barometric Pressure, in.Hg 30.75 Static Pressure, in.H_2O -.25

Moisture, % ~5 Molecular wt., Dry 29.12 Pitot Tube, Cp .84

Stack Dimension, in. Diameter or Side 1 48 ~~Side 2~~

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (ΔP_s), in.H_2O	STACK TEMP., °F
A 1	.15	
2	.20	
3	.22	
4	.25	~245
5	.26	
6	.26	
B 1	.18	
2	.21	
3	.24	
4	.24	
5	.25	
6	.25	

CALCULATIONS

$M_s = Md \times (1 - \frac{H_2O}{100}) + 18 (\frac{H_2O}{100})$

$M_s = (29.12) \times (1 - \frac{5}{100}) + 18 (\frac{5}{100})$

$M_s = 28.56$

$T_s = 245$ °F = 705 °R = (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$P_s = 30.73$ in.Hg

$\sqrt{\Delta P} = .474$

$V_s = 85.49 \times Cp \times \sqrt{\Delta P} \times \sqrt{\frac{T_s, °R}{P_s \times M_s}}$

$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{}{x}}$

$V_s = 27.3$ ft/s

$A_s = 12.57$ ft² $\quad \frac{R^2 \times Pi}{144}$

$Q_s = V_s \times A_s \times \frac{60\ s}{m}$

$Q_s = \quad \times \quad \times 60$

$Q_s = 20,589$ acfm

$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{H_2O\ \%}{100})$

$Q_{s_{std}} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Q_{s_{std}} = \quad$ dscfm

CALCULATIONS FOR SELECTING A NOZZLE AND SETTING ISOKINETIC SAMPLING RATES

I. NOZZLE SELECTION

$$D_n = \left(\frac{T_s\ M_s}{\Delta P\ P_s}\right)^{0.25} \left(\frac{0.02678\ P_b}{(1-B_{wo})T_m C_p}\right)^{0.5}$$

T_s, °R	M_s	ΔP	P_s, in.Hg	P_b, in.Hg	B_{wo}→, decimal	$(1-B_{wo})$, decimal	T_m, °R	Cp	Dn, inches
705	28.56	.23	30.73	30.75	.05 →	.95	530	.84	.322
					→				

Note: Approximate $\Delta H = \left(\frac{Dn\ selected}{Dn\ calculated}\right)^4 \times \Delta Ha$

II. K FACTOR FOR ISOKINETIC EQUATION

$$K = Dn^4\ Cp^2\ (1-B_{wo})^2\ (850.5\ \Delta Ha)\ \frac{M_d}{M_s}\ \frac{P_s}{P_m}$$

Dn, in.	Cp	B_{wo}→, decimal	$(1-B_{wo})$, decimal	ΔHa	M_d	M_s	P_s in.Hg	P_m in.Hg	K
.323	.84	.05 →	.95						6.01 FT=4
		→							
.370	.84	.05 →	.95						9.76 FTS

G-107

G-101

III. ISOKINETIC ΔH CALCULATION

$$\Delta H = K\ \frac{\Delta P\ T_m}{T_s} \quad \text{for } T = °R$$

If desired, a calculator can be programmed to calculate ΔH during a test by storing the K value calculated above.

1. Program: GTO 000, LRN, 2nd Lbl, A, CLR, RCL, 1, x, (, R/S, +, 4, 6, 0,), ÷, (, R/S, +, 4, 6, 0,), x, R/S, =, R/S, LRN.

2. Store K in Register 01.

3. Press A, enter t_m, °F, press R/S, enter t_s, °F, press R/S, enter ΔP, press R/S, ΔH is displayed.

4. For next point, repeat step 3.

Note: To verify program let K = 10, t_m = 70°F, t_s = 250°F, ΔP = 1.0, →ΔH = 7.46

INTERNATIONAL TECHNOLOGY CORPORATION

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Miles Lab
DATE 1-11-94 TEST NO Miles-M-2
SAMPLING TIME (24-hr CLOCK) 1429 -
SAMPLING LOCATION Dry Gas Exhauster Stack
SAMPLE TYPE (BAG) INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE 68
OPERATOR JN
ORSAT LEAK CHECKED ✓

COMMENTS: 142

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	1.4	1.4	1.4	1.4			1.4	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.8	19.4	20.8	19.4			19.4	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)							✓BLG 1/14/94	28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

INTERNATIONAL TECHNOLOGY CORPORATION

PARTICULATE/METALS TRAIN
SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Miles
Sample location Dry Gas Exhauster
Run number Miles - PMM - 1
Filter number(s) 9370107

Sample date 1-11-94
Recovery date 1-11-94
Recovered by DC

MOISTURE

Impingers	Condensate	1st	2nd	3rd	4th	5th
Contents	~~Empty~~	5%HNO_3/10%H_2O_2		Empty	~~$KMnO_4$~~ Silica Gel	Silica gel
Final wt/vol	~~g~~	661.9 g	647.4 g	508.5 g	703.4 g	~~g~~ g
Initial wt/vol	~~g~~	591.6 g	592.1 g	495.6 g	670.0 g	~~g~~ g
Net Gain	~~g~~	70.3 g	55.3 g	12.9 g	33.4 g	~~g~~ g

Description of impinger water clear

Total moisture 171.9 g ✓ 1/14/94 BLG

RECOVERED SAMPLE

Filter container number(s) 01945B Sealed ✓
Description of particulate on filter Very light

	Sample solution/rinse container numbers	Sealed/liquid level marked
Acetone probe rinse	01945A	✓
5%HNO_3/10%H_2O_2 solution and 0.1N HNO_3 rinse	01946A	✓
$KMnO_4$ solution and rinse	NOT USED	
8N HCl rinse	NOT USED	

Samples stored and locked ✓
Remarks Blanks, Acetone 01425A, 1NHNO3 01423A, 5% HNO3 10% H2O2 01424A, Pallflex filter 01423B

INTERNATIONAL TECHNOLOGY CORPORATION

Emission Testing Field Data

Plant and City		Date	Sampling Location	Sample Type	Run Number
Miles	Baltimore Md	1/11/94	Dry Gas Exhaust OUT	PART/MM	Miles PMM2

Operator(s)	Bar. Press. (in. Hg)	Static Press. (in. H_2O)	Amb. Temp. (°F)	Filter Number(s)	Probe Length and Type	Nozzle Dia. (in.)	Nozzle Number
OL & JN	30.68	-.25	2[illegible]	9320108	6FT GLASS	.320	G-101

Moisture (%)	Meter Box No.	Meter ΔH@	Meter Cal. Factor (Y)	K Factor	Probe Heat (°F)	Box Heat (°F)	Therm. No.	Pitot No.	Imp. Therm. No.	Gas Bag Pump No.	Gas Bag Sys. Leak Check	Train Leak Check (Initial) in. Hg	Train Leak Check (Initial) CFM	Train Leak Check (final) in. Hg	Train Leak Check (final) CFM	Pitot Leak Check initial	Pitot Leak Check final
~5	FT-5	1.34	.946	9.76	250	250	690	559	I-49	102	✓	14	0.002	5	0.000	✓	✓

Traverse Point No.	Sampling Time (min.)	Clock Time (24-hr)	Gas Meter Reading (Vm), ft^3	Velocity Head* (ΔP), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O* Desired	Orifice Pressure Differential (ΔH), in. H_2O* Actual	Temperature (°F) Stack (T_s)	Dry Gas Meter Inlet (T_{mi})	Dry Gas Meter Outlet (T_{mo})	Probe	Sample Box	Resin	Impinger	Pump Vac. (in. Hg)	Gas Bag Sample Data
	0	14:29	94.788												
B 1	6.5		102.1	.40	2.86	2.86	243	56	54	246	249	N/A	51	3	200cc
2	13	1442	109.6	.41	2.94	2.94	243	58	54	249	253		55	4	"
3	19.5		117.1	.37	2.81	2.81	242	60	55	253	255		57	4	"
4	26	1455	124.5	.39	2.83	2.83	241	66	58	251	252		60	4	"
5	32.5		132.2	.39	2.83	2.83	241	67	58	253	254		62	4	"
6	39	1508	139.4	.37	2.70	2.70	241	70	60	247	250		63	4	"
7	45.5		146.3	.36	2.63	2.63	241	70	60	245	249		63	4	"
8	52	1521	154.3	.39	2.70	2.70	241	70	60	250	253		64	4	"
9	58.5		160.6	.32	2.34	2.34	242	71	60	253	254		63	4	"
10	65	1534	167.5	.33	2.42	2.42	241	71	61	255	259		62	4	"
11	71.5		174.4	.32	2.34	2.34	241	71	61	251	255		60	3	"
12	78	1547	180.949	.30	2.20	2.20	240	71	61	255	254		60	3	STOP
A 1	84.5		187.8	.33	2.38	2.38	238	60	52	255	252		50	3	START
2	91	1607	194.6	.32	2.31	2.31	240	62	54	248	250		48	3	200cc
3	97.5		201.4	.33	2.39	2.39	239	64	54	253	251		49	3	"
4	104	1620	208.4	.34	2.46	2.46	238	66	54	251	255		50	3	"
5	110.5		215.4	.36	2.62	2.62	238	66	54	253	251		49	3	"
6	117	1633	222.7	.36	2.63	2.63	237	66	56	254	252		50	4	"
7	123.5		229.8	.35	2.57	2.57	236	68	56	251	250		50	4	"
8	130	1646	237.2	.36	2.66	2.66	232	69	57	253	255		51	4	"
9	136.5		244.5	.36	2.66	2.66	230	69	57	255	253		51	4	"
10	143	1659	251.7	.36	2.66	2.66	230	69	57	255	254		51	4	END
11	149.5		258.9	.35	2.58	2.58	230	68	56	252	254		52	4	
12	156	1712	266.087	.35	2.58	2.58	231	68	56	254	252		52	4	

S-ETFD-1/93

*Record pressure differentials to 2 significant figures, e.g., 0.015, 0.88, 1.2, etc. Comments:

(continue on reverse, if necessary)

INTERNATIONAL TECHNOLOGY CORPORATION

PARTICULATE/METALS TRAIN
SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Miles
Sample location Dry Gas Exhauster
Run number Miles-PMM-2
Filter number(s) 9370108

Sample date 1-11-94
Recovery date 1-11-94
Recovered by DC

MOISTURE

Impingers Contents	Condensate Empty	1st 5%HNO_3/10%H_2O_2	2nd 5%HNO_3/10%H_2O_2	3rd Empty	4th ~~$KMnO_4$~~ Silica Gel	5th Silica gel
Final wt/vol	X g	655.6 g	670.5 g	486.4 g	738.0 g	X g
Initial wt/vol	X g	610.1 g	619.1 g	471.6 g	705.0 g	X g
Net Gain	X g	45.5 g	51.4 g	14.8 g	33 g	X g

Description of impinger water Clear

Total moisture 144.7 g ✓BLG 1/14/94

RECOVERED SAMPLE

Filter container number(s) 01947B Sealed ✓
Description of particulate on filter Very light

	Sample solution/rinse container numbers	Sealed/liquid level marked
Acetone probe rinse	01947A	✓
5%HNO_3/10%H_2O_2 solution and 0.1N HNO_3 rinse	01948A	✓
$KMnO_4$ solution and rinse	Not Used	
8N HCl rinse	Not Used	

Samples stored and locked ✓
Remarks

INTERNATIONAL TECHNOLOGY CORPORATION

Emission Testing Field Data

Plant and City	Date	Sampling Location	Sample Type	Run Number
MILES BALTIMORE MD	1 III 94	DRY GAS Exhaust OUT	FLOURIDE	Miles - F-1

Operator(s)	Bar. Press. (in. Hg)	Static Press. (in. H_2O)	Amb. Temp. (°F)	Filter Number(s)	Probe Length and Type	Nozzle Dia. (in.)	Nozzle Number
DC & JN	30.75	-.25	26.	PAPER N.T.	6 FT GLASS	.323	S-107

Moisture (%)	Meter Box No.	Meter Δ H @	Meter Cal. Factor (Y)	K Factor	Probe Heat (°F)	Box Heat (°F)	Therm. No.	Pitot No.	Imp. Therm. No.	Gas Bag Pump No.	Gas Bag Sys. Leak Check	Train Leak Check (initial) in. Hg	Train Leak Check (initial) CFM	Train Leak Check (final) in. Hg	Train Leak Check (final) CFM	Pitot Leak Check initial	Pitot Leak Check final
25.	FT4	1.98	1.004	6.01	250	N/A		H-1	I-21	N/A	—	13.	0.003	3.	0.002	✓	✓

Traverse Point No.	Sampling Time (min.)	Clock Time (24-hr)	Gas Meter Reading (Vm), ft^3	Velocity Head* (ΔP), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O* Desired	Orifice Pressure Differential (ΔH), in. H_2O* Actual	Temperature (°F) Stack (T_s)	Dry Gas Meter Inlet (T_{mi})	Dry Gas Meter Outlet (T_{mo})	Probe	Sample Box	Resin	Impinger	Pump Vac. (in. Hg)	Gas Bag Sample Data
	0	11:28	884.118												
B 12	2.5		885.4	.24	1.02	1.02	247	42	42	247	N/A	N/A	43	1	N/A
11	5	1133	886.7	.25	1.06	1.06	249	42	40	251			45	1	
10	7.5		888.1	.26	1.10	1.10	250	42	40	253			46	1	
9	10	1138	889.4	.28	1.19	1.19	248	43	40	251			46	1	
8	12.5		890.8	.28	1.19	1.19	248	44	40	252			44	1	
7	15	1143	892.3	.29	1.23	1.23	250	45	41	253			44	1	
6	17.5		893.7	.29	1.23	1.23	250	46	42	253			45	1	
5	20	1148	895.2	.30	1.29	1.29	250	48	44	254			44	1	
4	22.5		896.7	.31	1.33	1.32	250	50	44	250			46	1	
3	25	1153	898.2	.31	1.33	1.33	252	52	44	253			47	1	
2	27.5		899.6	.30	1.29	1.29	252	52	44	252			48	1	
1	30	1158	901.062	.29	1.24	1.24	252	56	44	254			49	1	
A 12	32.5		902.7	.37	1.57	1.57	262	50	48	255			44	2	
11	35	1303	904.4	.39	1.65	1.65	264	50	48	253			43	2	
10	37.5		906.0	.38	1.61	1.61	263	51	48	255			42	2	
9	40	1308	907.6	.38	1.61	1.61	263	51	48	255			43	2	
8	42.5		909.3	.40	1.70	1.70	262	52	48	253			43	2	
7	45	1313	911.1	.43	1.83	1.83	262	52	48	255			45	2	
6	47.5		913.0	.46	1.97	1.97	258	54	48	256			46	2	
5	50	1318	914.8	.46	1.97	1.97	258	54	48	259			47	2	
4	52.5		916.6	.47	2.04	2.04	248	54	48	255			48	2	
3	55	1323	918.4	.44	1.92	1.92	244	54	48	257			48	2	
2	57.5		920.1	.44	1.93	1.93	246	54	48	253			49	2	
1	60	1328	921.924	.42	1.87	1.87	236	60	50	258			50	2	

S-ETFD-1.93

*Record pressure differentials to 2 significant figures, e.g., 0.015, 0.88, 1.2, etc. Comments: @ port change, wait for P/mm TRAIN / START @ 1258

(continue on reverse, if necessary)

FLOURIDE

~~PARTICULATE~~ SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Miles Sample date 1-11-94

Sample location Dry Gas Exhauster Recovery date 1-11-94

Run number Miles - F - 1 Recovered by DC

Filter number(s) PAPER N.T.

MOISTURE

Impingers			Silica gel		
Final volume (wt)	231	ml(g)	Final wt	211.6	g
Initial volume (wt)	200	ml(g)	Initial wt	200	g
Net volume (wt)	31	ml(g)	Net wt	11.6	g
Description of impinger water	clear			20	% spent

Total moisture 42.6 g ✓BLG 1/14/94

RECOVERED SAMPLE

Filter container number(s) Paper N.T. Sealed IN POLY CONTAINER

Description of particulate on filter None visable

Probe rinse container no.	01950A	Liquid level marked	✓
DI H_2O blank container no.	01952A	Liquid level marked	✓
Impinger contents container no.	01950B	Liquid level marked	✓
Filter blank container no.	01952B	Liquid level marked	N/A

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Date

Remarks

INTERNATIONAL TECHNOLOGY CORPORATION

Emission Testing Field Data

Plant and City	Date	Sampling Location	Sample Type	Run Number
Miles Baltimore MD	1 11 94	DRY GAS Exhaust OUT	FLUORIDE	Miles-F-2

Operator(s)	Bar. Press. (In. Hg)	Static Press. (in. H_2O)	Amb. Temp. (°F)	Filter Number(s)	Probe Length and Type	Nozzle Dia. (in.)	Nozzle Number
DC & JN	30.68	-.25	29	PAPER N.T.	6FT GLASS	.323	5-107

Moisture (%)	Meter Box No.	Meter ΔH@	Meter Cal. Factor (Y)	K Factor	Probe Heat (°F)	Box Heat (°F)	Therm. No.	Pitot No.	Imp. Therm. No.	Gas Bag Pump No.	Gas Bag Sys. Leak Check	Train Leak Check (initial) in. Hg	Train Leak Check (initial) CFM	Train Leak Check (final) in. Hg	Train Leak Check (final) CFM	Pitot Leak Check initial	Pitot Leak Check final
~5	FT4	1.98	1.004	6.01	250	—	T-21	H-1	T-21	—	—	13	0.006	3	0003	✓	✓

Traverse Point No.	Sampling Time (min.)	Clock Time (24-hr)	Gas Meter Reading (Vm), ft^3	Velocity Head* (ΔP), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O* Desired	Orifice Pressure Differential (ΔH), in. H_2O* Actual	Temperature (°F) Stack (T_s)	Dry Gas Meter Inlet (T_{mi})	Dry Gas Meter Outlet (T_{mo})	Probe	Sample Box	Resin	Impinger	Pump Vac. (in. Hg)	Gas Bag Sample Data
	0	15:10	922.132												
A 1	2.5		923.7	.33	1.44	1.44	242	50	46	251	N/e	N/e	40	1	N/A
2	5	1515	925.3	.35	1.52	1.52	241	50	46	254			39	1	
3	7.5		926.9	.37	1.61	1.61	241	52	46	251			41	1	
4	10	1520	928.6	.37	1.61	1.61	242	52	46	250			41	1	
5	12.5		930.2	.36	1.57	1.57	242	52	46	252			42	1	
6	15	1525	931.8	.36	1.57	1.57	241	52	46	250			43	1	
7	17.5		933.4	.36	1.57	1.57	241	52	46	253			43	1	
8	20	1530	935.0	.35	1.52	1.52	241	52	46	255			44	1	
9	22.5		936.6	.35	1.52	1.52	241	52	46	253			44	1	
10	25	1535	938.2	.36	1.57	1.57	240	52	44	250			45	1	
11	27.5		939.8	.36	1.57	1.57	240	52	44	252			45	1	
12	30	1540	941.432	.35	1.53	1.53	240	52	44	255			44	1	
B 1	32.5		943.0	.32	1.40	1.40	240	50	46	251			42	1	
2	35	1601	944.5	.31	1.35	1.35	240	50	46	254			42	1	
3	37.5		946.0	.32	1.40	1.40	239	50	46	252			43	1	
4	40	1606	947.6	.32	1.40	1.40	239	50	46	254			43	1	
5	42.5		949.1	.31	1.35	1.35	240	50	46	251			44	1	
6	45	1611	950.6	.34	1.49	1.49	239	50	46	255			44	1	
7	47.5		952.0	.35	1.53	1.53	239	52	46	256			44	1	
8	50	1616	953.6	.33	1.53	1.53	239	52	46	252			45	1	
9	52.5		955.1	.38	1.66	1.66	239	52	46	252			45	1	
10	55	1621	956.8	.37	1.62	1.62	238	52	46	250			46	1	
11	57.5		958.5	.37	1.62	1.62	238	52	47	251			47	1	
12	60	1626	960.237	.38	1.67	1.67	237	52	48	253			46	1	

PORT START 1550

S-ETFD-1/93

*Record pressure differentials to 2 significant figures, e.g., 0.015, 0.88, 1.2, etc. Comments: _____

(continue on reverse, if necessary)

FLOURIDE

~~PARTICULATE~~ SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Miles Sample date 1-11-94

Sample location Dry GAS Exhauster Recovery date 1-11-94

Run number Miles - F - 2 Recovered by OC

Filter number(s) PAPER N.T

MOISTURE

Impingers			Silica gel		
Final volume (wt)	230	ml(g)	Final wt	210.6	g
Initial volume (wt)	200	ml(g)	Initial wt	200	g
Net volume (wt)	30	ml(g)	Net wt	10.6	g
Description of impinger water	clear			20	% spent

Total moisture 40.6 g BLG 1/14/94

RECOVERED SAMPLE

Filter container number(s) Paper N.T. Sealed In Poly Container

Description of particulate on filter None Visable

Probe rinse container no.	01951A	Liquid level marked	✓
DI H_2O blank container no.	01952A	Liquid level marked	✓
Impinger contents container no.	01951A	Liquid level marked	✓
Filter blank container no.	01952B	Liquid level marked	N/A

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Date

Remarks

NITROGEN OXIDE FIELD DATA SHEET

PLANT: Mass Lab
CITY: Baltimore
SAMPLE LOCATION: DRY GAS Exhauster
DATE: 1-12-94
OPERATOR: J. Hesse
INITIAL BAROMETRIC PRESSURE: 30.34 in. Hg
REAGENT VOLUME: 25 ml
FINAL BAROMETRIC PRESSURE: 29.60 in. Hg

RUN NO.	SAMPLE TIME (24 hr.)	FLASK AND VALVE NO's	VOLUME OF FLASK AND VALVE, ml	FLASK TEMP. (INITIAL), °F	INITIAL FLASK PRESSURE LEG 1 in. Hg	INITIAL FLASK PRESSURE LEG 2 in. Hg	FLASK TEMP. (FINAL) °F	FINAL FLASK PRESSURE LEG 1 in. Hg	FINAL FLASK PRESSURE LEG 2 in. Hg
M-NOx-1A	914	GKE	1971.3	35	14	12.7	35	1.4	0.7
B	929	ZZ	2064.2	34	14.1	12.9	37	1.9	0.6
C	944	TG	2078.5	34	14.1	12.9	34	2.0	0.9
D	959	ZA	2094.8	34	14	12.8	34	1.9	0.5
M-NOx-2A	1014	XC	2071.6	33	14.1	12.8	33	2.0	0.7
B	1029	MN	2051.0	34	14.1	12.8	34	1.9	0.6
C	1044	QKB	1990.4	34	14.0	12.7	34	1.8	0.5
D	1059	5HD	1990.4	34	14.1	12.7	34	2.0	0.8

Reagent Blank ID# 00468A

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 424627
Page 1 of ____

Project Name/No.[1] Miles/313674-6
Sample Team Members[2] OC, JN
Profit Center No.[3] 3572
Project Manager[4] Cinci - B. Garls; Pitts - S. Eucland
Purchase Order No.[6] To be determ.
Required Report Date[11]

Samples Shipment Date[7] 1-13-94
Lab Destination[8] Cinci ITAS
Lab Contact[9] Ken Mueller
Project Contact/Phone[12] B.Garls

Bill to:[5] ITAQS - Cinci
Report to:[10] B. GARLS - Cinci - ITAQS

ONE CONTAINER PER LINE

Sample Number[14]	Sample Description/Type[15]	Date/Time Collected[16]	Container Type[17]	Sample Volume[18]	Preservative[19]	Requested Testing Program[20]	Condition on Receipt[21]	Disposal Record No.[22]
01945A	Miles-PMM-1 Front Rinse	1-11-94	500ml Amber			PART/MM per QAP/METHOD	BIF	
01946A	Back Half Rinse & SOLUTION	1-11-94	1000ml poly			" (Ba, Co, Cr, Cu, Fe, Mn, Pb & Zn)	USED	
01945B	9370107 Pallflex filter	1-11-94	petri			"		
01947A	Miles-PMM-2 Front Rinse	1-11-94	500ml Amber			"	BLG 1/14/94	
01948A	Back half rinse & solution	1-11-94	1000ml poly			"	Notified Ken Mueller (ITAS Cinci)	
01947B	9370108 Pallflex filter	1-11-94	petri			"	of Metals to be reported analytical Method	
01423A	.1N HNO3 BLANK	1-11-94	250ml Amber			"	USED	
01424A	5% HNO3 10% H2O2 BLANK	1-11-94	250ml Amber			"		

Special Instructions:[23]

Possible Hazard Identification:[24] Non-hazard ☐ Flammable ☑ Skin Irritant ☑ Poison B ☐ Unknown ☐

Sample Disposal:[25] Return to Client ☐ Disposal by Lab ☑ Archive ____ (mos.)

Turnaround Time Required:[26] Normal ☑ Rush ☐

QC Level:[27] I. ☐ II. ☐ III. ☐ Project Specific (specify): ____

1. Relinquished by[28] (Signature/Affiliation) Doug Cahill ITAQS	Date: 1-13-94 Time: 1740	1. Received by[28] (Signature/Affiliation) [illegible] ITASci	Date: 1/13-94 Time: 1740
2. Relinquished by (Signature/Affiliation)	Date: Time:	2. Received by (Signature/Affiliation)	Date: Time:
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments:[29]

White: To accompany samples Yellow: Field copy *See back of form for special instructions.

MCA 3/15/91

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD (cont.)*

Reference Document No.[30] 424822-7
Page 2 of 2

Project Name Miles   Project No. 313674-6   Samples Shipment Date 1-13-94

ONE CONTAINER PER LINE

Sample[14] Number	Sample[15] Description/Type	Date/Time[16] Collected	Container[17] Type	Sample[18] Volume	Pre-[19] servative	Requested Testing[20] Program	Condition on[21] Receipt	Disposal[22] Record No.
01425A	ACETONE Blank	1-11-94	250ml AMBER			PART/MM		
01423B	BLANK Pallflex filter	1-11-94	Petri			"		
Miles-F-1 01950A	Impinger contents, Rinse & Paper filter	1-11-94	1000ml Poly			Flourides per	13B CARB method	
Miles-F-2 01951A	Impinger contents, Rinse & Paper filter	1-11-94	1000ml Poly			"	BLG	
01952A DI H2O BLANK	Water Blank	1-11-94	500ml Poly			"		
01952B	Paper filter Blank	1-11-94	Petri			"		
6KB	01952A NOx FLASK	1-12-94	NOx FLASK			NITROGEN OXIDE per	7A CARB method	
ZZ	"	"	"			"	BLG 1/14/94	
TG	01952B	"	N/A			"		
ZA	"	"	"			"		
XC	"	"	"			"		
MN	"	"	"			"		
9KB	"	"	"			"		
5HD	"	"	"			"		
00468A	NOx Reagent BLANK	"	"			"		

M-NOX-1A,1B,1C,1D (6KB, ZZ, TG, ZA)
M-NOX-2A,2B,2C,2D (XC, MN, 9KB, 5HD)

FOR LAB USE ONLY

COPY

White: To accompany samples   Yellow: Field copy   *See back of form for special instructions.

MCA 3/15/91

INTERNATIONAL TECHNOLOGY CORPORATION

Emission Testing Field Data

Plant and City	Date	Sampling Location	Sample Type	Run Number
Miles Lab - Baltimore	1/15/94	Stack	H_2O	4-H_2O-1

Operator(s)	Bar. Press. (in. Hg)	Static Press. (in. H_2O)	Amb. Temp. (°F)	Filter Number(s)	Probe Length and Type	Nozzle Dia. (in.)	Nozzle Number
JN	30.26	-0.11	10	—	3' Glass	—	

Moisture (%)	Meter Box No.	Meter Δ H @	Meter Cal. Factor (Y)	K Factor	Probe Heat (°F)	Box Heat (°F)	Therm. No.	Pitot No.	Imp. Therm. No.	Gas Bag Pump No.	Gas Bag Sys. Leak Check	Train Leak Check (initial) In. Hg	Train Leak Check (initial) CFM	Train Leak Check (final) In. Hg	Train Leak Check (final) CFM	Pitot Leak Check initial	Pitot Leak Check final
—	FT-10	1.97	.978	—	250	—	—	—	I-97	—	—	15	.003	2	0.000	—	—

Traverse Point No.	Sampling Time (min.)	Clock Time (24-hr)	Gas Meter Reading (Vm), ft^3	Velocity Head* (ΔP), In. H_2O	Orifice Pressure Differential (ΔH), In. H_2O* Desired	Orifice Pressure Differential (ΔH), In. H_2O* Actual	Temperature (°F) Stack (T_s)	Dry Gas Meter Inlet (T_{mi})	Dry Gas Meter Outlet (T_{mo})	Probe	Sample Box	Resin	Impinger	Pump Vac. (in. Hg)	Gas Bag Sample Data
	0	08:15	641.034												
	10	0825	655.500	N/A	1.97	1.97	—	42.4	41	255	N/A	N/A	16	1.5	N/A
	20	0835	669.588		1.97	1.97		43	41	257			20	1.5	
			Vm = 14.854					$\bar{T}_m$ = 42							

*Record pressure differentials to 2 significant figures, e.g., 0.015, 0.88, 1.2, etc. Comments: _____

(continue on reverse, if necessary)

1

JM 2-4-94

S-ETR0-1/93

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City Miles Lab Buttonwood Date 1-15-94

Sampling Location Stack Clock Time 0920

Run No. M-V-3 Operator JN, SF

Barometric Pressure, in.Hg 30.28 Static Pressure, in.H_2O -0.11

Moisture, % _____ Molecular wt., Dry _____ Pitot Tube, Cp .84

Stack Dimension, in. Diameter or Side 1 48 ~~Side 2~~ →

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (ΔP_s), in.H_2O	STACK TEMP., °F
B-1	.24	224
2	.24	226
3	.23	225
4	.25	228
5	.25	
6	.26	
7	.26	
8	.24	
9	.25	
10	.28	
11	.28	
12	.26	↓
A-1	.24	
2	.24	
3	.24	
4	.26	
5	.24	
6	.20	
7	.22	
8	.22	
9	.24	
10	.24	
11	.24	
12	.22	

CALCULATIONS

$M_s = Md \times (1 - \frac{H_2O}{100}) + 18 (\frac{H_2O\ \%}{100})$

$M_s = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$M_s =$

$T_s =$ ____ °F = ____ °R = (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$P_s =$ ____ in.Hg

$\sqrt{\Delta P} =$

$V_s = 85.49 \times Cp \times \sqrt{\Delta P} \times \sqrt{\frac{T_s, °R}{P_s \times M_s}}$

$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{x}}$

$V_s =$ ____ ft/s

$A_s =$ ____ ft²

$Q_s = V_s \times A_s \times \frac{60\ s}{m}$

$Q_s =$ ____ x ____ x60

$Q_s =$ ____ acfm

$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{H_2O\ \%}{100})$

$Q_{s_{std}} =$ ____ x 17.647 x $\frac{\quad}{\quad}$ x $(1 - \frac{\quad}{100})$

$Q_{s_{std}} =$ ____ dscfm

INTERNATIONAL TECHNOLOGY CORPORATION

DRY MOLECULAR WEIGHT DETERMINATION

PLANT _____

DATE _____ TEST NO _____

SAMPLING TIME (24-hr CLOCK) _____

SAMPLING LOCATION _____

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) _____

ANALYTICAL METHOD _____

AMBIENT TEMPERATURE _____

OPERATOR _____

ORSAT LEAK CHECKED _____

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2							2	44/100	.88
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)							20	32/100	6.4
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							~~78~~ 78	28/100	21.84
								TOTAL	29.12

NITROGEN OXIDE FIELD DATA SHEET

PLANT: Miles Lab
CITY: Mt Baltimore
SAMPLE LOCATION: Stack
DATE: 1-15-94
OPERATOR: JN
INITIAL BAROMETRIC PRESSURE: 30.26 in. Hg
REAGENT VOLUME: 25 ml
FINAL BAROMETRIC PRESSURE: ~~30.28~~ 30.10 in. Hg

RUN NO.	SAMPLE TIME (24 hr.)	FLASK AND VALVE NO's	VOLUME OF FLASK AND VALVE, ml	FLASK TEMP. (INITIAL), °F	INITIAL FLASK PRESSURE		FLASK TEMP. (FINAL) °F	FINAL FLASK PRESSURE	
					LEG 1 in. Hg	LEG 2 in. Hg		LEG 1 in. Hg	LEG 2 in. Hg
1-~~Nox-1~~A	0730	8E	2020.5	15	14.5	13.0	67	0.1	0.1
B	0745	00	2064.6	~~15~~ 14	14.4	12.8	66	0.~~2~~	0.~~2~~
C	0800	9F	2012.8	14	14.4	12.7	67	0.25	0.2
D	0815	JQ	2027.4	16	14.3	12.8	67	0.4	0.4
M-~~Nox-4~~A	0830	6C	2014.9	17	14.3	12.7	68	1.1	1.1
B	0845	FU	2073.3	17	14.3	12.6	68	0.5	0.5
C	0900	EE	2095.9	16	14.3	12.6	67	0.7	0.7
D	0915	SS	2049.9	16	14.3	12.6	67	0.5	0.5

Final P.rm by BLG 1/19/94

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 42615
Page 1 of 1

Project Name/No.[1] Miles/313674-06
Sample Team Members[2] JNeese, SEnlong
Profit Center No.[3] 3572
Project Manager[4] Scott Enlong
Purchase Order No.[6] U/K
Required Report Date[11] 2/4/94

Samples Shipment Date[7] 1/19/94
Lab Destination[8] ITAS-Cinti
Lab Contact[9] K Mueller
Project Contact/Phone[12] BGoals x4249
Carrier/Waybill No.[13]

Bill to:[5] ITAQS
Report to:[10] BGoals
IT-CINTI

ONE CONTAINER PER LINE

Sample Number[14]	Sample Description/Type[15]	Date/Time Collected[16]	Container Type[17]	Sample Volume[18]	Preservative[19]	Requested Testing Program[20]	Condition on Receipt[21]	Disposal Record No.[22]
M-NOx-3A	Air/NOx Flask	1/15/94	Flask	≈2 l	None	EPA Method 7A		
M-NOx-3B						Blank w/other NOx shipment		
M-NOx-3C								
M-NOx-3D								
M-NOx-4A								
M-NOx-4B								
M-NOx-4C								
M-NOx-4D								

COPY

FOR LAB USE ONLY

FOR LAB USE ONLY

Special Instructions:[23]

Possible Hazard Identification:[24] Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

Sample Disposal:[25] Return to Client ☐ Disposal by Lab ☒ Archive ____ (mos.)

Turnaround Time Required:[26] Normal ☒ Rush ☐

QC Level:[27] I ☒ II ☐ III ☐ Project Specific (specify):

1. Relinquished by[28] (Signature/Affiliation) Jenny Neese	Date: 1/19/94 Time: 1515	1. Received by[28] (Signature/Affiliation) Brian L Sanders	Date: 1/19/94 Time: 1515
2. Relinquished by (Signature/Affiliation) Brian L Sanders AQS	Date: 1/19/94 Time: 1527	2. Received by (Signature/Affiliation) Nicholas W. Newman ITAS-C	Date: 1-19-94 Time: 15 27
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments:[29]

MCA 3/15/91

White: To accompany samples Yellow: Field copy *See back of form for special instructions.

INTERNATIONAL TECHNOLOGY CORPORATION

Emission Testing Field Data

Plant and City	Date	Sampling Location	Sample Type	Run Number
MILES BALTIMORE MO	1/11/94	DRY GAS Exhaust out	PART/MM	MilesFMM-1

Operator(s)	Bar. Press. (in. Hg)	Static Press. (in. H_2O)	Amb. Temp. (°F)	Filter Number(s)	Probe Length and Type	Nozzle Dia. (in.)	Nozzle Number
DC & JN	30.75	-.25	26	9370107	6FT GLASS	.370	G-101

Moisture (%)	Meter Box No.	Meter Δ H @	Meter Cal. Factor (Y)	K Factor	Probe Heat (°F)	Box Heat (°F)	Therm. No.	Pitot No.	Imp. Therm. No.	Gas Bag Pump No.	Gas Bag Sys. Leak Check	Train Leak Check (initial) in. Hg	Train Leak Check (initial) CFM	Train Leak Check (final) in. Hg	Train Leak Check (final) CFM	Pitot Leak Check initial	Pitot Leak Check final
~5	FT-5	1.34	.946	9.76	250	250	690	559	I-99	102	✓	15	0.005	4	0.001	✓	✓

Traverse Point No.	Sampling Time (min.)	Clock Time (24-hr)	Gas Meter Reading (Vm), ft^3	Velocity Head* (ΔP), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O* Desired	Orifice Pressure Differential (ΔH), in. H_2O* Actual	Temperature (°F) Stack (T_s)	Dry Gas Meter Inlet (T_{mi})	Dry Gas Meter Outlet (T_{mo})	Probe	Sample Box	Resin	Impinger	Pump Vac. (in. Hg)	Gas Bag Sample Data
	0	11:10	935.702												
A 1	6.5		941.1	.24	1.65	1.65	248	40	40	253	247	N/A	44	2	200cc
2	13	1123	946.7	.25	1.73	1.73	248	44	40	249	248		47	2	"
3	19.5		952.4	.26	1.81	1.81	249	49	40	248	250		49	2	"
4	26	1136	958.3	.26	1.85	1.85	250	54	44	249	253		50	2	"
5	32.5		964.2	.26	1.83	1.83	250	58	44	250	251		51	2	"
6	39	1149	970.2	.26	1.86	1.86	250	66	54	255	253		53	2	"
7	45.5		976.5	.29	2.08	2.08	252	70	56	251	252		54	2	"
8	52	1202	982.7	.28	2.01	2.01	253	72	56	254	251		56	2	"
9	58.5		988.8	.27	1.95	1.95	254	74	60	254	253		57	2	"
10	65	1215	994.8	.26	1.87	1.87	255	74	60	252	255		57	2	"
11	71.5		1000.5	.25	1.80	1.80	256	74	60	254	240		56	2	"
12	78	1228	1005.982	.21	1.51	1.51	257	74	60	248	254		55	2	STOP
B 1	84.5		1012.2	.28	1.98	1.98	259	66	56	251	252		52	2	START
2	91	1249	1018.6	.31	2.20	2.20	260	70	56	253	255		53	2	200cc
3	97.5		1025.7	.35	2.48	2.48	261	70	56	250	252		50	3	"
4	104	1302	1033.1	.39	2.75	2.75	265	70	56	248	255		49	3	"
5	110.5		1040.5	.40	2.84	2.84	264	74	58	250	253		49	3	"
6	117	1315	1049.0	.40	2.85	2.85	262	74	60	255	251		50	3	"
7	123.5		1056.0	.43	3.11	3.11	253	76	62	252	250		50	3	"
8	130	1328	1063.9	.44	3.23	3.23	242	76	64	255	251		51	3	"
9	136.5		1071.60	.41	3.05	3.05	235	76	64	253	254		52	3	"
10	143	1341	1079.3	.41	3.08	3.08	229	77	65	255	255		53	3	"
11	149.5		1087.2	.41	3.08	3.08	230	77	65	253	251		53	3	END
12	156	1344	1094.632	.38	2.84	2.84	234	78	66	251	254		53	3	

*Record pressure differentials to 2 significant figures, e.g., 0.015, 0.88, 1.2, etc. Comments: _____

(continue on reverse, if necessary)

S-ETFD-1993

15893

INTERNATIONAL TECHNOLOGY CORPORATION

MODIFIED METHOD 5 SEMIVOLATILE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Miles Lab
Sample location Stack
Run number M-H2O-1
Filter type
XAD-2 trap No.

Sample date 1-15-94
Recovery date 1-15-94
Recovered by JM

MOISTURE

Impingers Contents	Condensate Empty	1st H_2O	2nd H_2O	3rd Empty	4th Silica gel
Final weight/volume	g	617.5 g	588.0 g	498.4 g	714.0 g
Initial weight/volume	g	594.3 g	605.0 g	497.6 g	712.0 g
Net Gain	g	23.2 g	-17.0 g	0.8 g	2.0 g

Description of impinger contents

Total moisture 9 g

RECOVERED SAMPLE

✓BL-G 1/18/94

Filter container number(s) Sealed
Description of particulate on filter

XAD-2 container number(s) Sealed Foil-wrapped

	Sample solution/rinse container numbers	Sealed/liquid level marked
Acetone/$MeCl_2$ probe rinse		
Toluene rinse		

Samples stored and locked
Remarks

LABORATORY CUSTODY

Received by Date
Remarks

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City Miles Lab - Baltimore Date 1-15-94

Sampling Location Stack Clock Time 0703

Run No. M-V-1 Operator JN, SF

Barometric Pressure, in.Hg 30.26 Static Pressure, in.H_2O -0.11

Moisture, % _____ Molecular wt., Dry _____ Pitot Tube, Cp .84

Stack Dimension, in. Diameter or Side 1 48" ~~Side 2~~

0-3.0" manometer

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (ΔP_s), in.H_2O	STACK TEMP., °F
A-1	.21	223
2	.24	223
3	.25	223
4	.24	224
5	.25	224
6	.26	224
7	.24	224
8	.24	224
9	.23	228
10	.23	228
11	.23	227
12	.23	228
B-1	.22	225
2	.24	↓
3	.24	
4	.25	
5	.24	↓
6	.26	224
7	.27	↓
8	.25	
9	.26	
10	.25	224
11	.23	225
12	.24	226

CALCULATIONS

$M_s = Md \times (1 - \frac{H_2O}{100}) + 18 (\frac{H_2O\ s}{100})$

$M_s = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$M_s =$

$T_s =$ °F = °R = (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$P_s =$ in.Hg

$\sqrt{\Delta P} =$

$V_s = 85.49 \times Cp \times \sqrt{\Delta P} \times \sqrt{\frac{T_s, °R}{P_s \times M_s}}$

$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{x}}$

$V_s =$ ft/s

$A_s =$ ft²

$Q_s = V_s \times A_s \times \frac{60\ s}{m}$

$Q_s =$ x x 60

$Q_s =$ acfm

$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{H_2O\ \%}{100})$

$Q_{s_{std}} =$ x 17.647 x $\frac{\quad}{\quad}$ x $(1 - \frac{\quad}{100})$

$Q_{s_{std}} =$ dscfm

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant and City Miles Lab - Baltimore Date 1-15-94

Sampling Location Stack Clock Time 0835

Run No. M-V-2 Operator JN

Barometric Pressure, in.Hg 30.26 Static Pressure, in.H_2O -0.12

Moisture, % _____ Molecular wt., Dry _____ Pitot Tube, Cp .84

Stack Dimension, in. Diameter or Side 1 48" ~~Side 2~~ →

FIELD DATA

TRAVERSE POINT NUMBER	VELOCITY HEAD (ΔP_s), in.H_2O	STACK TEMP., °F
B-1	.23	224
2	.24	225
3	.25	
4	.25	
5	.25	
6	.24	
7	.22	
8	.23	
9	.23	
10	.24	227
11	.27	227
12	.26	227
A-1	.26	225
2	.26	226
3	.23	
4	.23	
5	.24	
6	.25	
7	.25	
8	.26	224
9	.25	224
10	.27	224
11	.27	226
12	.26	226

CALCULATIONS

$M_s = Md \times (1 - \frac{H_2O}{100}) + 18 (\frac{H_2O_s}{100})$

$M_s = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$M_s =$

$T_s =$ °F = °R = (°F + 460)

$P_s = P_b + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$P_s =$ in.Hg

$\sqrt{\Delta P} =$

$V_s = 85.49 \times Cp \times \sqrt{\Delta P} \times \sqrt{\frac{T_s, °R}{P_s \times M_s}}$

$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{\quad}{\quad}}$

$V_s =$ ft/s

$A_s =$ ft²

$Q_s = V_s \times A_s \times \frac{60\ s}{m}$

$Q_s =$ x x 60

$Q_s =$ acfm

$Q_{s_{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{H_2O\ \%}{100})$

$Q_{s_{std}} =$ x 17.647 x $\frac{\quad}{\quad}$ x $(1 - \frac{\quad}{100})$

$Q_{s_{std}} =$ dscfm

APPENDIX D
LABORATORY DATA

ITAS CINCINNATI

Method 5 Train Blank Data
Acetone Rinses and Filter

Plant: MILES

Density of Acetone: 0.7899 g/ml (pa)

Sample Type	Sample Identifiable	Liquid level at mark and/or container sealed
Acetone	YES	YES
Filter	YES	YES

Acetone Blank Container No: 01425A

Lab #: 3223-AC6020

Acetone Volume: 112 ml. (Va)

Date & Time of Wt. 1-19-94 10:30AM

Beaker Gross Wt.: 98796.1 mg

Date & Time of Wt. 1-19-94 4:55PM

Beaker Gross Wt.: 98796.5 mg

Average Gross Wt.: 98796.3 mg

Beaker Tare Wt.: 98796.4 mg

Ca, (mg/g) = ma/(Va x pa)

Beaker Net Wt.: -0.1 mg (ma)

Acetone Blank Value: 0 mg/g (Ca)

Blank Value Used for Calculations: 0.0000 mg/g

Filter # : 9370028

Lab #: 3223-AC6021

Date & Time of Wt. 1-19-94 4:25PM

Filter Gross Wt.: 311.5 mg

Date & Time of Wt. 1-20-94 8:00AM

Filter Gross Wt.: 311.9 mg

Average Gross Wt.: 311.7 mg

Filter Tare Wt.: 310.2 mg

Difference: 1.5 mg

Signature of Analyst : [signature]

Date: 1-21-94

Signature of Reviewer: [signature]

Date: 1/24/94

ITAS CINCINNATI

Method 5 Train Analytical Particulate Data
Acetone Rinses and Filter(s)

Plant: MILES

Run No.: MILES-PMM-1

Sample Location: DRY GAS EXHAUSTER

Density of Acetone: 0.7899 g/ml

Sample Type	Sample Identifiable	Liquid level at mark and/or container sealed
Acetone	YES	YES
Filter	YES	YES

Acetone Blank Residue Conc. 0.0000 mg/g

Lab #: 3223-AC6014

Acetone Volume: 160 ml.

Date & Time of Wt. 1-19-94 4:55PM

Beaker Gross Wt.: 107581.9 mg

Date & Time of Wt. 1-20-94 8:15AM

Beaker Gross Wt.: 107582.0 mg

Average Gross Wt.: 107582.0 mg

Beaker Tare Wt.: 107577.8 mg

Less acetone blank wt.: 0.0 mg

Acetone Rinse Particulate Wt.: 4.2 mg

Filter # 9370107

Lab #: 3223-AC6015

Date & Time of Wt. 1-19-94 10:00AM

Filter Gross Wt.: 309.6 mg

Date & Time of Wt. 1-20-94 8:00AM

Filter Gross Wt.: 309.4 mg

Average Gross Wt.: 309.5 mg

Filter Tare Wt.: 308.0 mg

Weight of Particulate on Filter: 1.5 mg

Weight of Particulate in Acetone Rinse: 4.2 mg

Total Weight of Particulate : 5.7 mg

Signature of Analyst: [signature]

Date: 1-21-94

Signature of Reviewer: [signature]

Date: 1/24/94

ITAS CINCINNATI

Method 5 Train Analytical Particulate Data
Acetone Rinses and Filter(s)

Plant: MILES

Run No.: MILES-PMM-2

Sample Location: DRY GAS EXHAUSTER

Density of Acetone: 0.7899 g/ml

Sample Type	Sample Identifiable	Liquid level at mark and/or container sealed
Acetone	YES	YES
Filter	YES	YES

Acetone Blank Residue Conc. 0.0000 mg/g

Lab #: 3223-AC6017

Acetone Volume: 168 ml.

Date & Time of Wt. 1-19-94 4:55PM

Beaker Gross Wt.: 112749.4 mg

Date & Time of Wt. 1-20-94 8:15AM

Beaker Gross Wt.: 112749.7 mg

Average Gross Wt.: 112749.6 mg

Beaker Tare Wt.: 112746.7 mg

Less acetone blank wt.: 0.0 mg

Acetone Rinse Particulate Wt.: 2.9 mg

Filter # 9370108

Lab #: 3223-AC6018

Date & Time of Wt. 1-19-94 10:00AM

Filter Gross Wt.: 310.8 mg

Date & Time of Wt. 1-20-94 8:00AM

Filter Gross Wt.: 310.5 mg

Average Gross Wt.: 310.7 mg

Filter Tare Wt.: 308.0 mg

Weight of Particulate on Filter: 2.7 mg

Weight of Particulate in Acetone Rinse: 2.9 mg

Total Weight of Particulate : 5.6 mg

Signature of Analyst: [signature]

Date: 1-21-94

Signature of Reviewer: Ken Mueller

Date: 1/24/94

PROJECT AQS - Miles WO# 3223

Notebook No. ______

Continued From Page MM EPAS

Acetones

Run #	Cont #	Job #	(mls) Volume	(g) Tare wt	10:30 Am mwene 1/19/94 (g) Gross wt	4:55 pm mwene 1/19/94 (g) Gross wt	mwene 1/20/94 8:15 am (g) Gross wt
Miles PMM-1	01945A	AC6014	160	107.5778	107.5808	107.5819	107.5820
Miles-PMM-2	01947A	AC6017	168	112.7467		112.7494	112.7497
Blank	01425A	AC6020	112	98.7964	98.7961	98.7965	

Filters

Run #	Cont #	Job #	Filter #	(g) Tare wt	mwene 1/19/94 10:00 Am (g) Gross wt	mwene 1/19/94 4:35 pm (g) Gross wt	mwene 1/20/94 8:00 Am (g) Gross wt
Miles-PMM-1	01945B	AC6015	9370107	.3080 ✓	.3096	.3107	.3094
Miles-PMM-2	01947B	AC6018	9370108	.3080 ✓	.3108	.3095	.3105
Blank	01423B	AC6021	9370078	.3102 ✓	.3142	.3115	.3119

Continued on Page

Mwene — Signed | 1-21-94 — Date

Read and Understood By: Kem 1/24/94 — Signed | Date

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

IT Corporation

Date: February 03, 1994

Attn: Mr. Brian Garls

Project Number 516

This is the Certificate of Analysis for the following samples:

Client Project ID:	Miles Laboratories
Date Received:	January 13, 1994
Work Order:	3223
Number of Samples:	15
Sample Type:	Air

I. Introduction

Fifteen samples arrived at ITAS Cincinnati on January 23, 1994. The samples were collected on January 11, 1994 and were labeled as follows:

Client Sample ID	Lab Sample ID	Client Sample ID	Lab Sample ID
MILES-PMM-1 COMPOSITE	AC6024	6KB M-NOx-1A	AC6031
MILES-PMM-2 COMPOSITE	AC6025	ZZ M-NOx-1B	AC6032
MILES-BLANK COMPOSITE	AC6026	TG M-NOx-1C	AC6033
10950A MILES-F-1	AC6027	ZA M-NOx-1D	AC6034
10950A MILES-F-2	AC6028	XC M-NOx-2A	AC6035
10952A BLANK FLUORIDE	AC6029	MN M-NOx-2B	AC6036
10952A FILTER FLUORIDE	AC6030	9KB M-NOx-2C	AC6037
		5HD M-NOx-2D	AC6038

II. Analytical Results/Methodology

The analytical results for this report are presented by analytical test. The data will include sample identification information, the analytical results, and the appropriate detection limits.

The analyses requested and the methods used are listed on the following page.

Reviewed and Approved by:

Kenneth Mueller, C.H.M.M.
Project Manager

IT ANALYTICAL SERVICES
CINCINNATI, OH
(513) 782-4700

II. Analytical Results/Methodology (cont.)

* NOX; EPA Method 7A
* Fluoride; EPA Method 13B
* Barium, Cobalt, Copper, Chromium, Manganese, Nickel and Zinc by Inductively Coupled Plasma Spectroscopy; EPA Mehtod 6010
* Lead by Graphite Furance Atomic Absorption; EPA Method 7421

III. Quality Control

Immediately following the analytical data for the samples can be found the QA/QC information that pertains to these samples. The purpose of this information is to demonstrate that the data enclosed is scientifically valid and defensible. This QA/QC data is used to assess the laboratory's performance during the analysis of the samples it accompanies. All quantitations were performed within the calibrated range of the analytical instrument.

IV. Comments

Due to an interferent in the sample matrix, the lead analysis was done by the method of standard additions.

Client: Miles Laboratories
Work Order: 3223
01322304

IT ANALYTICAL SERVICES
CINCINNATI, OH
(513) 782-4700

Analytical Results, ug

Client Sample ID	Lab Sample ID		NOX	
6KB M-NOx-1A	AC6031	Run 1	1680	
		Run 2	1710	
		Average	1700	
ZZ M-NOx-1B	AC6032	Run 1	1720	
		Run 2	1680	
		Average	1700	
TG M-NOx-1C	AC6033	Run 1	1740	
		Run 2	1750	
		Average	1740	
ZA M-NOx-1D	AC6034	Run 1	1780	
		Run 2	1810	
		Average	1800	
XC M-NOx-2A	AC6035	Run 1	1770	
		Run 2	1730	
		Average	1750	
MN M-NOx-2B	AC6036	Run 1	1730	
		Run 2	1830	
		Average	1780	
9KB M-NOx-2C	AC6037	Run 1	1690	
		Run 2	1660	
		Average	1680	
5HD M-NOx-2D	AC6038	Run 1	1800	
bl6 2/4/94		Run 2	1780	
		Average	1790	
00468A NOX BLANK	AC6039	Run 1	ND	
		Run 2	ND	
		Average	ND	
Audit 3080		Run 1	131	
T.V. 125		Run 2	119	
		Average	125	100% Recovery
Detection Limit			62	

ND = Not detected above the reported detection limit

Client: Miles Laboratories
Work Order: 3223
01322303

IT ANALYTICAL SERVICES
CINCINNATI, OH
(513) 782-4700

Analytical Results, mg

Client Sample ID	Lab Sample ID	Fluoride
10950A MILES-F-1	AC6027	64
10950A MILES-F-2	AC6028	55
01952A BLANK FLUORIDE	AC6029	0.19
01952B FILTER BLANK	AC6030	0.12
Detection Limit		0.1

Client: Miles Laboratories
Work Order: 3223
01322302

IT ANALYTICAL SERVICES
CINCINNATI, OH
(513) 782-4700

Analytical Results, ug

Client Sample ID	MILES-PMM-1 COMPOSITE	MILES-PMM-1 COMPOSITE Duplicate	Miles-PMM-1 AVG.	MILES-PMM-2 COMPOSITE	Detection Limit
Lab Sample ID	AC6024	AC6024		AC6025	
Analyte					
Barium	9.2	8.8	9.0	6.5	0.25
Cobalt	1.6	ND	1.6	ND	1.5
Copper	7.4	7.2	7.3	3.1	1.0
Chromium	4.4	4.2	4.3	3.4	1.0
Lead	2.8	---	2.8	2.5	1.5
Manganese	4.9	4.6	4.8	3.1	0.3
Nickel	6	7.3	6.7	ND	5.0
Zinc	56	57	57	ND	25

calc by DLG 2/4/94

Client Sample ID	MILES-BLANK COMPOSITE	Method Blank	Method Blank	Detection Limit
Lab Sample ID	AC6026	PBM1 1/25/94	PBM2 1/25/94	
Analyte				
Barium	3.6	0.25	1.6	0.25
Cobalt	ND	ND	ND	1.5
Copper	ND	ND	ND	1.0
Chromium	2.2	ND	ND	1.0
Lead	ND	ND	ND	1.5
Manganese	1.4	ND	0.35	0.3
Nickel	ND	ND	ND	5.0
Zinc	29	ND	44	25

ND = Not detected above the reported detection limit

MJ 2-4-94

Client: Miles Laboratories
Work Order: 3223
01322305

IT ANALYTICAL SERVICES
CINCINNATI, OH
(513) 782-4700

Quality Assurance Data

Quality Control
Standard Reference Solutions

Analyte	Theoretical Value	Percent Recovery
NOX	125	105, 95
Fluoride	1.6	95, 94
Barium	1.25	107, 108
Cobalt	1.25	107, 107
Copper	1.25	105, 107
Chromium	1.25	106, 105
Lead	0.05	98, 108
Manganese	1.25	105, 106
Nickel	1.25	105, 106
Zinc	1.25	106, 107

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

IT Corporation

Date: January 27, 1994

Attn: Mr. Brian Garls

Project Number 516

This is the Certificate of Analysis for the following samples:

Client Project ID:	Miles Laboratories
Date Received:	January 19, 1994
Work Order:	3255
Number of Samples:	8
Sample Type:	Air

I. Introduction

Eight samples arrived at ITAS Cincinnati on January 19, 1994. The samples were collected on Janaury 15, 1994 and were labeled as follows:

Client Sample ID	Lab Sample ID
M-NOX-3A	AC6216
M-NOX-3B	AC6217
M-NOX-3C	AC6218
M-NOX-3D	AC6219
M-NOX-4A	AC6220
M-NOX-4B	AC6221
M-NOX-4C	AC6222
M-NOX-4D	AC6223

II. Analytical Results/Methodology

The analytical results for this report are presented by analytical test. The data will include sample identification information, the analytical results, and the appropriate detection limits.

The analysis requested was NOX by EPA Method 7A.

Reviewed and Approved by:

Kenneth Mueller, C.H.M.M.
Project Manager

IT ANALYTICAL SERVICES
CINCINNATI, OH
(513) 782-4700

III. Quality Control

Immediately following the analytical data for the samples can be found the QA/QC information that pertains to these samples. The purpose of this information is to demonstrate that the data enclosed is scientifically valid and defensible. This QA/QC data is used to assess the laboratory's performance during the analysis of the samples it accompanies. All quantitations were performed within the calibrated range of the analytical instrument.

IV. Comments

Method 7A states that samples should not be held more then four days between sampling and recovery. The samples were collected on 1/15/94 and received in the laboratory 1/19/94 and recovered on 1/20/94.

Client: Miles Laboratories
Work Order: 3255
01325502

IT ANALYTICAL SERVICES
CINCINNATI, OH
(513) 782-4700

Analytical Results, Total ug

Client Sample ID	Lab Sample ID		NOX
M-NOX-3A	AC6216	Run 1	1890
		Run 2	1900
		Average	1900
M-NOX-3B	AC6217	Run 1	2110
		Run 2	2100
		Average	2110
M-NOX-3C	AC6218	Run 1	2060
		Run 2	2050
		Average	2050
M-NOX-3D	AC6219	Run 1	1870
		Run 2	1860
		Average	1870
M-NOX-4A	AC6220	Run 1	2020
		Run 2	2040
		Average	2030
M-NOX-4B	AC6221	Run 1	2190
		Run 2	2180
		Average	2190
M-NOX-4C	AC6222	Run 1	2200
		Run 2	2140
		Average	2170
M-NOX-4D	AC6223	Run 1	2240
		Run 2	2210
		Average	2220
Detection Limit			120

Client: Miles Laboratories
Work Order: 3255
01325503

IT ANALYTICAL SERVICES
CINCINNATI, OH
(513) 782-4700

Quality Assurance Data

Quality Control
Standard Reference Solutions

Analyte	Theoretical Value	Analyticl Value	Percent Recovery
Audit # 3080			
NOX	125 mg/DSCM	129.0 mg/DSCM	103
		129.8 mg/DSCM	104
	Average	129.4 mg/DSCM	104

3255

INTERNATIONAL TECHNOLOGY CORPORATION

COC NO. *0003296*

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 426175
Page 1 of 1

Project Name/No.[1] Miles/313674-06
Sample Team Members[2] J Neese, S Furlong
Profit Center No.[3] 3572
Project Manager[4] Scott Furlong
Purchase Order No.[6] U/K
Required Report Date[11] 2/4/94

Samples Shipment Date[7] 1/19/94
Lab Destination[8] ITAS-Cinti.
Lab Contact[9] K. Mueller
Project Contact/Phone[12] B Canals x4249
Carrier/Waybill No.[13]

Bill to:[5] ITAS
Report to:[10] B Canals IT-CINTI

ONE CONTAINER PER LINE

CSN	Sample Number[14]	Sample Description/Type[15]	Date/Time Collected[16]	Container Type[17]	Sample Volume[18]	Preservative[19]	Requested Testing Program[20]	Condition on Receipt[21]	Disposal Record No.[22]
24807	M-NOx-3A	Air/NOx Flask	1/15/94	Flask	≈2 L	None	EPA Method 7A	Intact	
24808	M-NOx-3B						Blank w/other NOx shipment	FOR LAB USE ONLY	
24809	M-NOx-3C							1/19/94	
24810	M-NOx-3D							[illegible]	
24811	M-NOx-4A								
24812	M-NOx-4B								
24813	M-NOx-4C								
24814	M-NOx-4D								

Special Instructions:[23] RLH 2232

Possible Hazard Identification:[24] Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

Sample Disposal:[25] Return to Client ☐ Disposal by Lab ☒ Archive ____ (mos.)

Turnaround Time Required:[26] Normal ☒ Rush ☐

QC Level:[27] I ☒ II. ☐ III. ☐ Project Specific (specify):

1. Relinquished by[28] (Signature/Affiliation) Jenny Neese	Date: 1/19/94 Time: 1515	1. Received by[28] (Signature/Affiliation) Brian Fordale	Date: 1/19/94 Time: 1515
2. Relinquished by (Signature/Affiliation) Brian L Fordale ADS	Date: 1/19/94 Time: 1527	2. Received by (Signature/Affiliation) Kimberly W Plummer ITAS-Ci	Date: 1/19/94 Time: 15 27hrs
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments:[29]

MCA 3/15/91

3255

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 4261A
Page 1 of 1

Project Name/No.[1] Miles/313674-06
Sample Team Members[2] JNeese, S Furlong
Profit Center No.[3] 3572
Project Manager[4] Scott Furlong
Purchase Order No.[6] U/K
Required Report Date[11] 2/4/94

Samples Shipment Date[7] 1/19/94
Lab Destination[8] ITAS-Cinti
Lab Contact[9] K. Mueller
Project Contact/Phone[12] B Gaels x4849
Carrier/Waybill No.[13]

Bill to:[5] ITAS
Report to:[10] B Gaels
IT-CINTI

ONE CONTAINER PER LINE

Sample Number[14]	Sample Description/Type[15]	Date/Time Collected[16]	Container Type[17]	Sample Volume[18]	Preservative[19]	Requested Testing Program[20]	Condition on Receipt[21]	Disposal Record No.[22]
M-NOx-3A	Air/NOx Flask	1/15/94	Flask	~2 l	None	EPA Method 7A	Handle with care	
M-NOx-3B							FOR LAB USE ONLY	
M-NOx-3C						Blank w/other NOx shipment	Rec'd at IC	
M-NOx-3D							1/19/94	
M-NOx-4A							[signature]	
M-NOx-4B							FOR LAB USE ONLY	
M-NOx-4C								
M-NOx-4D								

Special Instructions:[23]

Possible Hazard Identification:[24] Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

Sample Disposal:[25] Return to Client ☐ Disposal by Lab ☒ Archive _____ (mos.)

Turnaround Time Required:[26] Normal ☒ Rush ☐

QC Level:[27] I ☒ II ☐ III ☐ Project Specific (specify):

1. Relinquished by[28] (Signature/Affiliation) Jenny Neese	Date: 1/19/94 Time: 1515	1. Received by[28] (Signature/Affiliation) Brian L Stanley	Date: 1/19/94 Time: 1515
2. Relinquished by (Signature/Affiliation) Brian L Stanley ADS	Date: 1/19/94 Time: 1527	2. Received by (Signature/Affiliation) [signature] ITAS-CI	Date: 1/19/94 Time: 1527hrs
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments:[29]

MCA 3/15/9

APPENDIX E
CALIBRATION DATA

APPENDIX E

CALIBRATION PROCEDURES AND RESULTS

CALIBRATION PROCEDURES AND RESULTS

All of the equipment used is calibrated in accordance with the procedures outlined in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III.* The following pages describe these procedures and include the data sheets.

*EPA 600/4-77-027b.

Nozzle Diameter

Each nozzle used in these tests is calibrated by making three separate measurements and calculating the average. If a deviation of more than 0.004 inch is found between any two measurements, the nozzle is either discarded or reamed out and remeasured. A micrometer is used for measuring. These calibration data are shown in the following Nozzle Calibration data sheet(s).

INTERNATIONAL TECHNOLOGY CORPORATION

NOZZLE CALIBRATION

Client Miles

Project No. 313674-06

Date 1-11-94

Calibrated By QC

Nozzle I.D.	D1 in.	D2 in.	D3 in.	&D in.	D avg.
S-107	.323	.324	.323	.001	.323
G-101	.370	.370	.370	.000	.370

Where:

D 1, 2, 3 = nozzle diameter measured on a different diameter, in.
Tolerance = measure within 0.001 in.

&D = maximum difference in any two measurements, in.
Tolerance = 0.004 in.

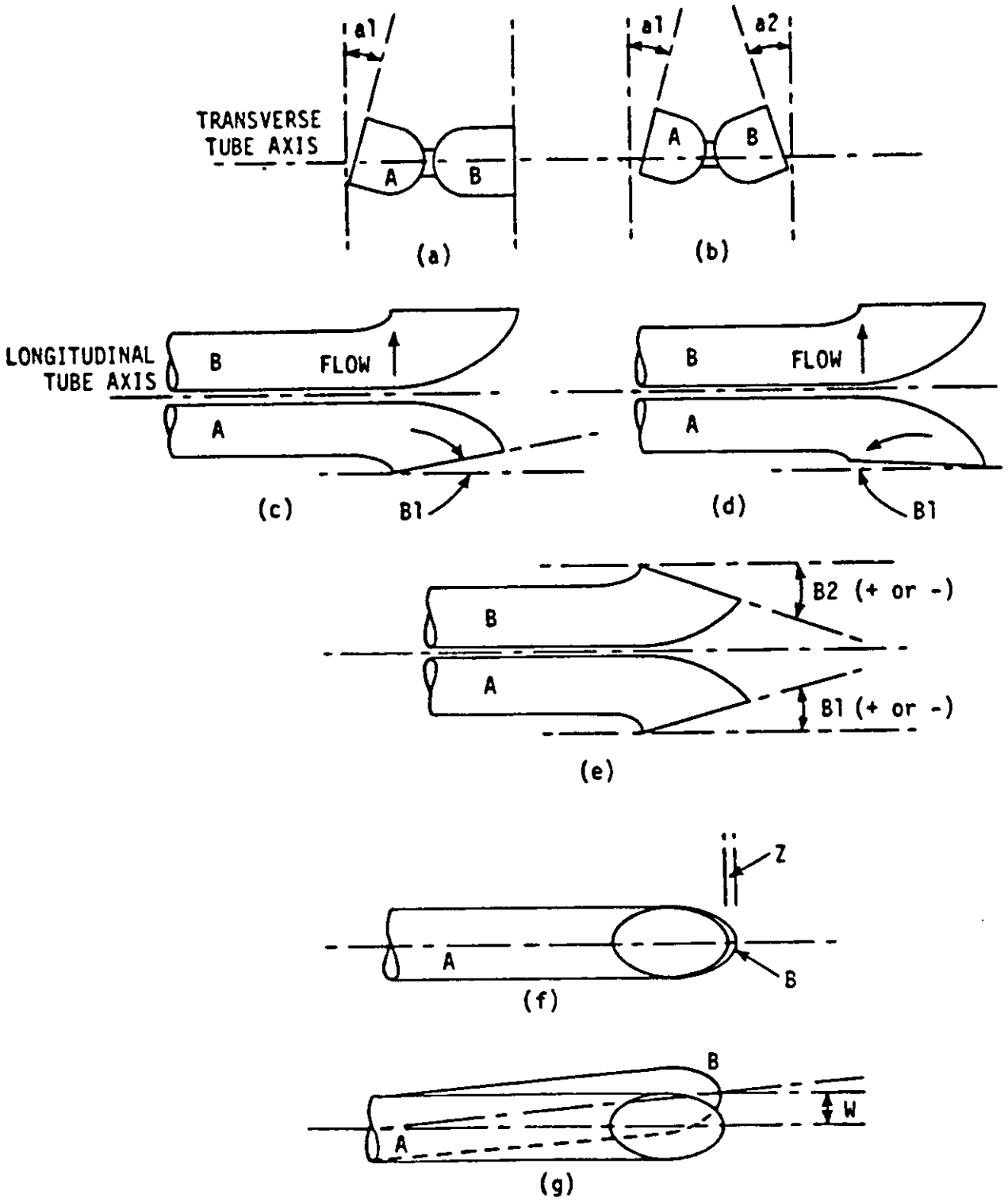
D avg. = average of D1, D2, and D3

Pitot Tube Calibration

Each pitot tube used in sampling is constructed by ITAQS and meets all requirements of EPA Method 2, Section 4.1.* Therefore, a baseline coefficient of 0.84 is assigned to each pitot tube. The following pages show the alignment requirements of Method 2 and the Pitot Tube Inspection Data Sheet(s) for each pitot tube used during the test program.

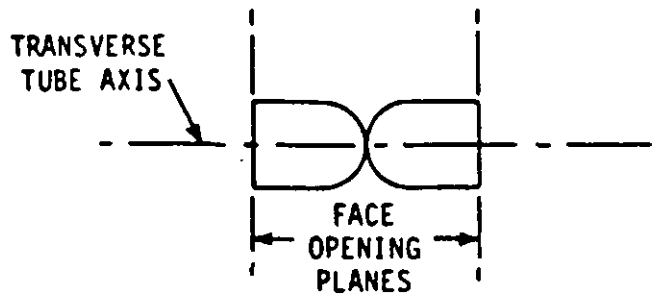
*40 CFR 60, Appendix A, July 1989.

Title: E-2
Date: 3/23/)2

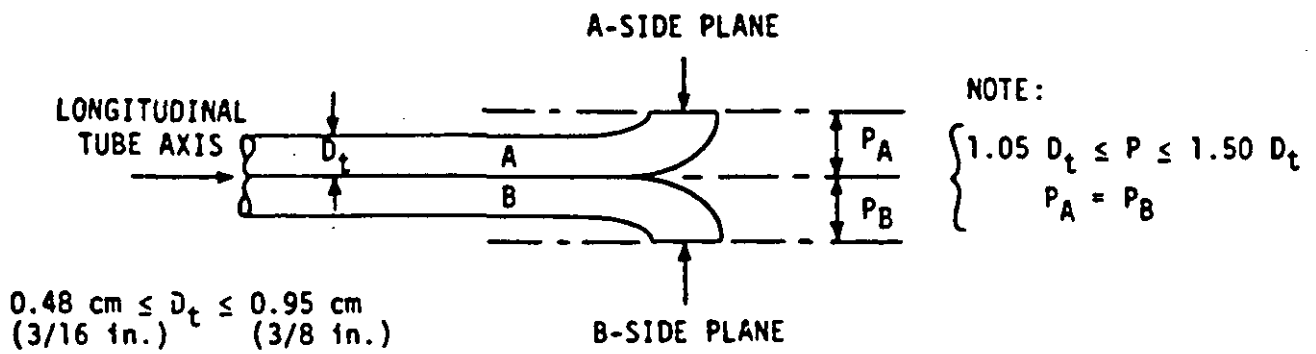


Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect Cp as long as a_1 and a_2 are <10°, B_1 and B_2 are <5°, z is <0.32 (1/8 in.), and w is <0.08 cm (1/32 in.).

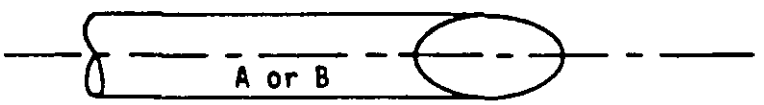
Title: E-2
Date: 3/23/92



(a) ENDVIEW



(b)



(c)

Properly constructed Type S pitot tubes shown in: (a) end view, face opening planes perpendicular to transverse axis; (b) top view, face opening planes parallel to longitudinal axis; (c) side view, both legs of equal length and centerlines coincident when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

INTERNATIONAL TECHNOLOGY CORPORATION

PITOT TUBE INSPECTION DATA SHEET

Pilot Tube No. 559 Date 12/29/93 Inspector HB

α_1 degrees	α_2 degrees	β_1 degrees	β_2 degrees
0	0	0	0
<10°	<10°	<5°	<5°

D_t inches	P inches	1.05 D_t inches	1.50 D_t inches
.371	1.56	.390	.557
$0.185 \le P_t < 0.380$	-	-	-

γ degrees	φ degrees	$P_{sin(\gamma)}$ inches	$P_{sin(\varphi)}$ inches
1	1	.027	.027
-	-	<0.125	<0.03125

P_1 inches	P_2 inches	$\lvert P_1 - P_2 \rvert$ inches	Meet specifications
.428	.421	.007	✓
1.05 D_t <P_1 <1.50 D_t	1.05 D_t <P_2 <1.50 D_t	≤0.010	

Lower line in each table is limits for meeting specifications.

Checked by JM Date 1/19/94

INTERNATIONAL TECHNOLOGY CORPORATION

PITOT TUBE INSPECTION DATA SHEET

Pilot Tube No. H1 Date 12-28-93 Inspector C. Miller

α_1 degrees	α_2 degrees	β_1 degrees	β_2 degrees
0	0	0	0
<10°	<10°	<5°	<5°

D_t inches	P inches	1.05 D_t inches	1.50 D_t inches
.372	1.05	.391	.558
$0.185 \le P_t < 0.380$	-	-	-

γ degrees	φ degrees	$P_{sin(\gamma)}$ inches	$P_{sin(\varphi)}$ inches
1	0	.018	0
-	-	<0.125	<0.03125

P_1 inches	P_2 inches	$\lvert P_1 - P_2 \rvert$ inches	Meet specifications
.509	.502	.007	✓
$1.05\ D_t < P_1 < 1.50\ D_t$	$1.05\ D_t < P_2 < 1.50\ D_t$	≤0.010	

Lower line in each table is limits for meeting specifications.

Checked by HB Date 1/3/94

Dry Gas Meter and Orifice Meter

The following page shows the Calibration Setup used for the initial and post-test calibration. A wet-test meter with a 2-cubic-feet-per-minute capacity and ±1 percent accuracy is used. The pump is run for approximately 15 minutes at an orifice manometer setting of 0.5 in.H_2O to heat up the pump and wet the interior surface of the wet-test meter. The information in the following example Calibration Data Sheet is gathered for the initial calibration; the ratio of accuracy of the wet-test meter to the dry-test meter and the ΔH@ are then calculated.

Post-Test Meter Calibration Check

A post-test meter calibration check is made on each meter box used during the test to check its accuracy against the last calibration check. This post-test calibration must be within ±5 percent of the initial calibration. The initial calibration is performed as described in APTD-0576. The post-test calibration is performed by the same method. Three calibration runs are made by using the average orifice setting obtained during each test run and setting the vacuum at the maximum value obtained during each test run. The post-test calibration check indicated that all three runs for each meter box were within the ± 5 percent range allowed by EPA Method 5.*

The Particulate Sampling Meter Box Initial Calibration and Post-Test Calibration data sheets are included in the following pages.

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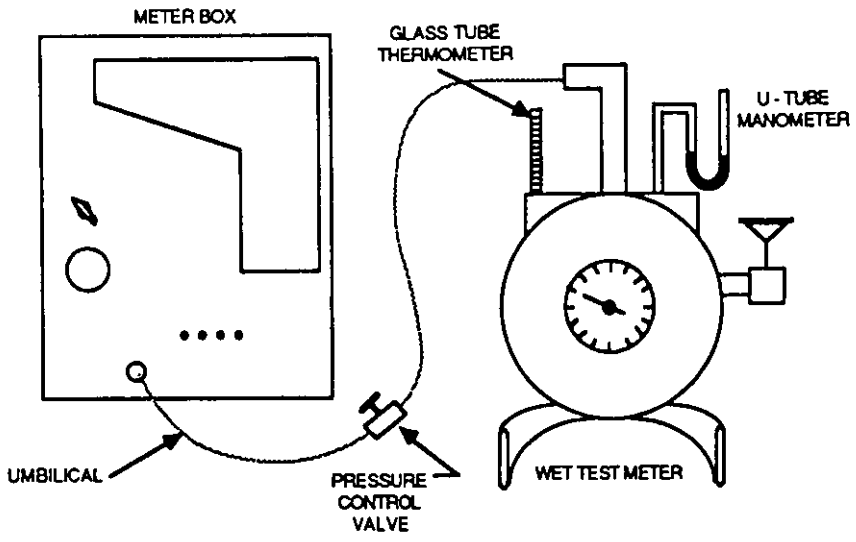
* 40 CFR 60, Appendix A, July 1990.

Title: E-2
Date: 3/23/92



Calibration setup.

DATE _____ METER BOX NO. _____

BAROMETRIC PRESSURE, P_b = _____ in. Hg. DRY GAS METER NO. _____

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	WET TEST METER T_w, °F	DRY GAS METER			TIME θ, min.	Y	$\Delta H@$
				INLET t_{di}, °F	OUTLET t_{do}, °F	AVERAGE t_d, °F			
0.5	5								
1.0	5								
1.5	10								
2.0	10								
3.0	10								
4.0	10								

AVERAGE _____

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

Y = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01
$\Delta H@$ = Orifice of pressure differential that gives 0.75 cfm of air at 70° F and 29.92 inches of mercury, in H_g). Tolerance = ± 0.15.

Calibration data sheet.

IT INTERNATIONAL TECHNOLOGY CORPORATION

METER BOX INITIAL CALIBRATION

validated 11/8/90

Date: 12/29/93 — Meter Box No.: FT-4

Barometric Pressure, (Pbar): 29.44 — Calibrator: Neese

Run No.	Orifice manometer setting* ΔH In. H2O	Wet test meter volume Vw ft3	Dry gas meter volume Vd ft3	Temperatures: Wet test meter Tw °F	Temperatures: Dry gas meter Inlet Tdi °F	Temperatures: Dry gas meter Outlet Tdo °F	Temperatures: Dry gas meter Average Td °F	Vacuum setting** In. Hg	Duration of run, Ø min.	Duration of run, Ø sec
1	0.50	5.000	811.710	67	76	72				
			816.760	67	76	72	74.0	10	13	5
2	1.00	10.000	801.417	67	75	72				
			811.500	67	76	72	73.8	10	18	35
3	1.50	10.000	817.147	67	76	72				
			827.208	67	76	72	74.0	10	15	17
4	2.00	14.500	827.829	67	76	72				
			842.417	67	77	74	74.8	10	19	31
5	3.00	10.000	842.822	67	77	74				
			852.848	67	78	74	75.8	10	11	1
6	4.00	10.000	853.332	67	78	74				
			863.349	67	78	74	76.0	10	9	28

Run No.	Y	ΔH@
1	1.002	1.92
2	1.002	1.93
3	1.003	1.96
4	1.004	2.03
5	1.006	2.03
6	1.005	2.00
Pretest average	1.004	1.98
Difference*=	0.003	0.12

$$y = \frac{(Vw)(Pbar)(Td+460)}{(Vd)(Pbar+\Delta H/13.6)(Tw+460)}$$

$$\Delta H@ = \frac{(0.0317)(\Delta H)}{(Pbar)(Td+460)} \times \left|\frac{(Tw+460)\ (Ø)}{Vw}\right|^2$$

Data checked by: HB

Date: 1/3/94

* Y must not deviate by more than ±0.02Y.
ΔH@ must not deviate by more than ±0.15 ΔH@i

INTERNATIONAL TECHNOLOGY CORPORATION

METER BOX POST-TEST CALIBRATION

validated 10/24/90

Date:	1/26/94	Meter Box No.:	FT-4		
Barometric Pressure, (Pbar):	29.76	Initial Y:	1.004	ΔH@:	1.98
Plant:	Miles	Project No.:	313674		
Project Manager:	Garis	Calibrator:	Neese		

Run No.	Orifice manometer setting* ΔH in. H2O	Wet test meter volume Vw ft3	Dry gas meter volume Vd ft3	Temperatures: Wet test meter Tw °F	Dry gas meter: Inlet Tdi °F	Dry gas meter: Outlet Tdo °F	Dry gas meter: Average Td °F	Vacuum setting** in. Hg	Duration of run, Ø min.	Duration of run, Ø sec
1	1.70	10.000	995.487	68	84	74	79.5	4	14	32
			1005.553	68	85	75				
2	1.70	10.000	5.553	68	85	75	80.5	4	14	34
			15.672	68	86	76				
3	1.70	10.500	15.672	68	86	76	81.8	4	15	16
			26.329	68	88	77				

Run No.	Y	ΔH@
1	1.011	1.98
2	1.007	1.98
3	1.007	1.97
Post-test average***	1.008	1.98
Difference from Pretest ***=	0.004	0.00

$$y = \frac{(Vw)(Pbar)(Td+460)}{(Vd)(Pbar+\Delta H/13.6)(Tw+460)}$$

$$\Delta H@ = \frac{(0.0317)(\Delta H) \times}{(Pbar)(Td+460)} \left[\frac{(Tw+460)\ (Ø)}{Vw}\right]^2$$

* To be the average ΔH used during the test series.
** To be the highest vacuum used during the test series.
*** Post-test Y must be within ±0.05 initial Y.
ΔY = (Posttest Y - Initial Y) / Initial Y
Post-test ΔH@ must be within ±0.15 in.H2O of the intial ΔH@.
ΔH@ difference = Posttest ΔH@ - Initial ΔH@

Data checked by: JJ
Date: 1-26-94

INTERNATIONAL TECHNOLOGY CORPORATION

METER BOX INITIAL CALIBRATION

validated 1-1/8/90

Date: 9/28/93 Meter Box No.: FT-5

Barometric Pressure, (Pbar): 29.44 Calibrator: Neese

Run No.	Orifice manometer setting* ΔH in. H2O	Wet test meter volume Vw ft3	Dry gas meter volume Vd ft3	Temperatures: Wet test meter Tw °F	Temperatures: Dry gas meter Inlet Tdi °F	Temperatures: Dry gas meter Outlet Tdo °F	Temperatures: Dry gas meter Average Td °F	Vacuum setting** in. Hg	Duration of run, Ø min.	Duration of run, Ø sec
			564.105	64	80	64				
1	0.50	5.000	569.494	64	76	64	71.0	10	11	0
			569.942	64	76	64				
2	1.00	10.000	580.705	64	80	64	71.0	10	15	32
			552.548	64	84	66				
3	1.50	10.000	563.281	64	82	65	74.3	10	12	41
			581.358	63	80	64				
4	2.00	11.000	593.151	63	86	66	74.0	10	12	6
			593.631	63	86	66				
5	3.00	10.000	604.296	63	89	67	77.0	10	9	2
			541.152	64	82	64				
6	4.00	10.000	551.783	64	84	66	74.0	10	7	49

Run No.	Y	ΔH@
1	0.939	1.35
2	0.939	1.34
3	0.946	1.34
4	0.948	1.33
5	0.956	1.34
6	0.949	1.35
Pretest average	0.946	1.34
Difference*=	0.010	0.02

$$y = \frac{(Vw)(Pbar)(Td+460)}{(Vd)(Pbar+\Delta H/13.6)(Tw+460)}$$

$$\Delta H@ = \frac{(0.0317)(\Delta H)}{(Pbar)(Td+460)} \times \left[\frac{(Tw+460)(\Theta)}{Vw}\right]^2$$

Data checked by: MJ

Date: 9/30/93

* Y must not deviate by more than ±0.02Y.

ΔH@ must not deviate by more than ±0.15 ΔH@

INTERNATIONAL TECHNOLOGY CORPORATION

METER BOX POST-TEST CALIBRATION

validated 10/24/90

Date:	1/26/94	Meter Box No.:	FT-5		
Barometric Pressure, (Pbar):	29.76	Initial Y:	0.946	ΔH@:	1.34
Plant:	Miles	Project No.:	313674		
Project Manager:	Garis	Calibrator:	Neese		

Run No.	Orifice manometer setting* ΔH in. H2O	Wet test meter volume Vw ft3	Dry gas meter volume Vd ft3	Temperatures: Wet test meter Tw °F	Temperatures: Dry gas meter Inlet Tdi °F	Temperatures: Dry gas meter Outlet Tdo °F	Temperatures: Dry gas meter Average Td °F	Vacuum setting** in. Hg	Duration of run, Ø min.	Duration of run, Ø sec
			278.640	69	74	68				
1	2.80	10.000	289.047	69	83	70	73.8	3	9	20
			289.047	69	83	70				
2	2.80	10.000	299.581	69	88	72	78.3	3	9	24
			299.581	69	88	72				
3	2.80	12.000	312.292	69	93	73	81.5	3	11	19

Run No.	Y	ΔH@
1	0.963	1.36
2	0.959	1.37
3	0.960	1.37
Post-test average***	0.961	1.37
Difference from Pretest ***=	0.015	0.03

$$y = \frac{(Vw)(Pbar)(Td+460)}{(Vd)(Pbar+\Delta H/13.6)(Tw+460)}$$

$$\Delta H@ = \frac{(0.0317)(\Delta H) \times}{(Pbar)(Td+460)} \left| \frac{(Tw+460)\ (Ø)}{Vw} \right|^2$$

* To be the average ΔH used during the test series.
** To be the highest vacuum used during the test series.
*** Post-test Y must be within ±0.05 initial Y.
ΔY = (Posttest Y - Initial Y) / Initial Y
Post-test ΔH@ must be within ±0.15 in.H2O of the intial ΔH@.
ΔH@ difference = Posttest ΔH@ - Initial ΔH@

Data checked by: C. M
Date: 1-26-94

Stack Thermocouples

Each thermocouple is calibrated by comparing it with an ASTM-3F thermometer at approximately 32°F, ambient temperature, 100°F, and 500°F. The thermocouple read within 1.5 percent of the reference thermometer throughout the entire range when expressed in degrees Rankine. If the stack gas is saturated with moisture, the thermocouple is calibrated at 10° intervals between 70° and 180°F using a water bath. The thermocouple agreed within ±2°F of the reference thermometer over the entire range. The thermocouples may be checked at ambient temperature at the test site to verify the calibration. Calibration data are included in the following Thermocouple Calibration Data Sheet(s).

INTERNATIONAL TECHNOLOGY CORPORATION

THERMOCOUPLE CALIBRATION DATA SHEET

Date: 12/27/93 Thermocouple No: 690

Calibrator: M-Bowling Reference: ASTM-3F

Range: _____

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference %**
1	2	70	69	.19
2	1	32	34	-.41
3	3	185	187	-.31
4	4	455	456	-.11

* Source: 1) Ice bath
2) Ambient
3) Water bath
4) Oil bath

** Percent difference.

$$\frac{\text{Reference temp. °R - thermocouple temp. °R}}{\text{(Reference temp. °R)}} \times 100\%$$

where °R = °F + 460

Each percent difference must be less than or equal to 1.5%.

Checked by _____ Date 1/19/94

INTERNATIONAL TECHNOLOGY CORPORATION

DIGITAL INDICATOR CALIBRATION DATA SHEET

DATE: 12-29-93 INDICATOR: FT-4

OPERATOR: J. Neese

Test Point Number	Equivalent Temperature, °F T_e	Digital Indicator Temperature, °F T_{dI}	Difference,* %
1	0	0	0
2	100	98	.36
3	200	201	.15
4	300	298	.26
5	400	398	.23
6	500	497	.31
7	1000	997	.21
8	1300	1295	.28
9	1600	1593	.34
10	1900	1890	.42

*PERCENT DIFFERENCE MUST BE LESS THAN OR EQUAL TO 0.5%

$$\% \text{ DIFFERENCE} = \frac{(T_e, °F - T_{di}, °F)}{(T_e, °F + 460)} \times 100$$

Checked By HB Date 1/3/94

INTERNATIONAL TECHNOLOGY CORPORATION

DIGITAL INDICATOR CALIBRATION DATA SHEET

DATE: 9-27-93 INDICATOR: FT-5

OPERATOR: J. Neese

Test Point Number	Equivalent Temperature, °F T_e	Digital Indicator Temperature, °F T_{di}	Difference,* %
1	0	1	.22
2	100	100	0
3	200	201	.15
4	300	300	0
5	400	399	.12
6	500	501	.10
7	1000	1002	.14
8	1300	1301	.06
9	1600	1602	.10
10	1900	1901	.04

*PERCENT DIFFERENCE MUST BE LESS THAN OR EQUAL TO 0.5%

$$\% \text{ DIFFERENCE} = \frac{(T_e, °F - T_{di}, °F)}{(T_e, °F + 460)} \times 100$$

Checked By [illegible] Date [illegible]

Dry Gas Thermocouples and Impinger Thermocouples

The dry gas thermocouples are calibrated by comparing them with an ASTM-3F thermometer at approximately 32°F, ambient temperature, and a higher temperature between approximately 100° and 200°F. The thermocouples agreed within 5°F of the reference thermometer. The impinger thermocouples are checked in a similar manner at approximately 32°F and ambient temperature, and they agreed within 2°F. The thermocouples may be checked at ambient temperature prior to the test series to verify calibration. Calibration data are included in the following Dry Gas Thermometer and Impinger Thermocouple Calibration Data Sheet(s).

INTERNATIONAL TECHNOLOGY CORPORATION

DRY GAS THERMOCOUPLE CALIBRATION DATA SHEET

Date: 12-29-93 Thermocouple No: FT-4

Calibrator: J. Neese Reference: ASTM-3F

Inlet

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	70	70	0
2	2	32	35	3
3	3	166	166	0

Outlet

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	70	69	1
2	2	32	34	2
3	3	166	162	4

* Source: 1) Ambient
2) Ice bath
3) Water bath

** Difference must be less than 5°F at both points.

Checked by HIB Date 1/3/94

INTERNATIONAL TECHNOLOGY CORPORATION

DRY GAS THERMOCOUPLE CALIBRATION DATA SHEET

Date: 9-27-93 Thermocouple No: FT-5

Calibrator: J. Neese Reference: ASTM

Inlet

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	68	66	2
2	2	36	35	1
3	3	144	142	2

Outlet

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	68	67	1
2	2	36	36	0
3	3	144	142	2

* Source: 1) Ambient
2) Ice bath
3) Water bath

** Difference must be less than 5°F at both points.

Checked by _____ Date _____

INTERNATIONAL TECHNOLOGY CORPORATION

IMPINGER THERMOCOUPLE CALIBRATION DATA SHEET

Date: 1-7-93 Thermocouple No: I-21

Calibrator: GThress Reference: ASTM

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	68°	68°	0
2	2	33	34	+1

* Source: 1) Ambient
2) Ice bath

** Difference must be less than 2°F at both points.

Checked by JM Date 1/19/94

INTERNATIONAL TECHNOLOGY CORPORATION

IMPINGER THERMOCOUPLE CALIBRATION DATA SHEET

Date: 12-17-92 Thermocouple No: I-99

Calibrator: PT Reference: ASTM 3F

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	69	69	0.0
2	2	35	35	0

* Source: 1) Ambient
2) Ice bath

** Difference must be less than 2°F at both points.

Checked by JM Date 12/29/92

INTERNATIONAL TECHNOLOGY CORPORATION

IMPINGER THERMOCOUPLE CALIBRATION DATA SHEET

Date: 1-24-94 Thermocouple No: I-99

Calibrator: J. Neese Reference: ASTM

Reference point no.	Source*	Reference thermometer temperature °F	Thermocouple temperature °F	Difference °F**
1	1	70	71	1
2	2	34	35	1

* Source: 1) Ambient
2) Ice bath

** Difference must be less than 2°F at both points.

Checked by K. Wells Date 1/24/94

Trip Balance

The trip balance is calibrated by comparing it with Class-S standard weights, and it agreed within 0.5 g. Calibration data are shown in the following Trip Balance Calibration Data Sheet(s).

INTERNATIONAL TECHNOLOGY CORPORATION

TRIP BALANCE CALIBRATION DATA SHEET

	Balance No.	Date	Calibrator	Mass determined for					
				5 g	Error	50 g	Error	100 g	Error
*	198	1/6/93	J. Neese	5	0	50	0	100	0
	422	1/6/93	J. Neese	5	0	50	0	100	0
	199	1/6/93	J. Neese	4.8	.2	49.7	.3	99.9	.1
	Mettler	1/6/93	J. Neese	5	0	50	0	100	0
	421	1/6/93	J. Neese	5	0	49.8	.2	99.8	.2
	418	1/6/93	J. Neese	4.7	.3	49.9	1	100	0
	419	1/6/93	J. Neese	5	0	49.9	1	100	0

Error must not exceed 0.5 grams at each point.

Checked by Doug Gibbs Date 1-6-93

Barometer

The field barometer is calibrated to within 0.1 in.Hg of an NBS-traceable mercury-in-glass barometer before the test series. It is checked against the reference barometer after each test series to determine if it reads within 0.2 in.Hg. The barometer read within the allowable limits each time. Calibration data are included in the following Barometer Calibration Log(s).

INTERNATIONAL TECHNOLOGY CORPORATION

BAROMETER CALIBRATION LOG

	BAROMETER NO.	401	420	431	415	420	431	401
	Client	Sverdrup	Jefferson Smurfit	Cychem	E. Detroit	Jefferson Chemical	St. Louis	Miles
	Project No.	332356	332			332353 332352		313674-6
PRETEST	BAROMETER READING	29.50	29.36	29.25	29.67	29.40	29.25	29.39
	REFERENCE BAROMETER READING	29.52	29.34	29.28	29.67	29.40	29.22	29.40
	DIFFERENCE*	.02	.02	.03	.00	.00	.03	.01
	DATE	12-13-93	12-14-93	12-14-93	12/16/93	1-3-94	1.4.94	1-7-94
	CALIBRATOR							

POST-TEST	BAROMETER READING	29.36	29.40		29.72	29.40	29.61	29.55
	REFERENCE BAROMETER READING	29.40	29.40		29.79	29.38	29.69	29.57
	DIFFERENCE**	0.04	.00		.07	.02	0.08	0.02
	DATE	12/21/93	1-3-94		12/30/93	1-12-94	1/24/94	2/4/94
	CALIBRATOR	BCmdg						BLG

*Barometer is adjusted so that difference does not exceed 0.05 in. Hg.
**Barometer is not adjusted. If difference exceed 0.10 in. Hg, inform project manager immediately.

Orsat Analyzer

The Orsat analyzer is calibrated before the test series by determining the percentages of carbon dioxide and oxygen in a calibration gas containing known percentages of each. The analyzer read within 0.5 percent of the known values. Calibration data are shown in the following Orsat Calibration Data Sheets.

INTERNATIONAL TECHNOLOGY CORPORATION

Reference Gas: Matheson Gas Products, Inc.
Cylinder No. 4
Control No.
Analysis: CO_2 - 4.96 %
O_2 - 9.92 %
CO - 1.99 %

ORSAT CALIBRATION DATA SHEET

Orsat No.: 142 Gas: CO_2

Calibrator	Date	PN	Value determined
G Thress	7-19-93	332310	5.0
J. Neese	8/28/93	332319-01	5.0
G Thress	9-11-93	Fenco	5.0
P. Fitzgerald	12-3-93	JAM	4.9 (P7)
D Cahill	1-3-94	332-352	4.9
D Cahill	1-7-94	miles	4.9