ADVANCED FLUE GAS DESULFURIZATION (AFGD) DEMONSTRATION PROJECT

TECHNICAL PROGRESS REPORT NO. 19

July 1, 1994 to September 30, 1994

PARTICIPANT

Pure Air on the Lake, L.P.
Allentown, Pennsylvania

HOST UTILITY

Northern Indiana Public Service Company
Hammond, Indiana

Prepared for the United States Department of Energy
Pittsburgh Energy Technology Center
Under Cooperative Agreement No. DE-FC22-90PC89660

Patents Cleared by Chicago on (TBD)

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DL C

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

Pure Air on the Lake, Limited Partnership

23 August 1995

Ms. Karen M. Khonsari
PETC Technical Project Manager
Mail Stop 920-L
U.S. Department of Energy/PETC
P. O. Box 10940
Pittsburgh, PA 15236

Subject: DOE Cooperative Agreement No. DC-FC-22-90PC89660
AFGD Demonstration Project
Technical Progress Report - Final - #19

Dear Karen

In accordance with Attachment No. 4, paragraph 5.2 of the subject Agreement, the Technical Progress Report #19 - Final for the periods July 1994 to September 1994, is as follows:

A. Executive Summary
B. Introduction
C. Project Description
D. Project Status
E. Planned Activities
F. Summary
G. Report Distribution

If you have any questions concerning this report, please call me at 610-481-3687.

Very truly yours,

Don C Vymazal

Don C. Vymazal
Manager, Contract Administration

DCV/pm/5028
Encl.

7201 Hamilton Boulevard, Allentown, PA 18195-1501
(215) 481-3682
Facsimile (215) 481-4606

Distribution:

Mr. Thomas A. Sarkus (1)
Director
Mail Stop 920-L
U.S. Department of Energy/PETC
P. O. Box 10940
Pittsburgh, PA 15236

Ms. Karen M. Khonsari (2)
PETC Technical Project Manager
Mail Stop 920-L
U.S. Department of Energy/PETC
P. O. Box 10940
Pittsburgh, PA 15236

Mr. William R. Mundorf (1)
Contracting Specialist
AD-21, Mail Stop 921-143
U.S. Department of Energy/PETC
P. O. Box 10940
Pittsburgh, PA 15236

Dr. C. Lowell Miller (1)
Associate Deputy Assistant
Secretary for Clean Coal Technology
FE-22, 3E-042, Forrestal
U.S. Department of Energy
Washington, DC 20585

Dr. S. N. Roger Rao (1)
Burns and Roe Technical Group Mgr.
P. O. Box 18288
Pittsburgh, PA 15236

Dr. Lawrence Saroff (1)
HQ DOE Program Manager
FE-221, 3E-042, Forrestal
U.S. Department of Energy
Washington, DC 20585

Department of Energy (3)
Office of Technology Transfer
Mail Stop 58-MEZZ
Pittsburgh Energy Technology Center
P. O. Box 10940
Pittsburgh, PA 15236

copy: J. R. Brown - Bailly
J. Henderson
G. B. Manavizadeh
R. D. Pettit

DCV/pm/5028

ADVANCED FLUE GAS DESULFURIZATION (AFGD) DEMONSTRATION PROJECT

TECHNICAL PROGRESS REPORT NO. 19

July 1, 1994 to September 30, 1994

PARTICIPANT

Pure Air on the Lake, L.P.
Allentown, Pennsylvania

HOST UTILITY

Northern Indiana Public Service Company
Hammond, Indiana

Prepared for the United States Department of Energy
Pittsburgh Energy Technology Center
Under Cooperative Agreement No. DE-FC22-90PC89660

Patents Cleared by Chicago on (TBD)

MASTER

EXECUTIVE SUMMARY

The "Advanced Flue Gas Desulfurization (AFGD) Demonstration Project" is a $150.5 million cooperative effort between the U.S. Department of Energy and Pure Air, a general partnership of Air Products and Chemicals, Inc. and Mitsubishi Heavy Industries America, Inc.

The goal of the AFGD project is to demonstrate that, by combining state-of-the-art technology, highly efficient plant operation and maintenance capabilities, and by-product gypsum sales, significant reductions of SO_2 emissions can be achieved at approximately one-half the life cycle cost of a conventional Flue Gas Desulfurization (FGD) system. Further, this emission reduction is achieved without generating solid waste and while minimizing liquid wastewater effluent.

Briefly, this project entails the design, construction and operation of a nominal 600 MWe AFGD facility to remove SO_2 from coal-fired power plant flue gas at the Northern Indiana Public Service Company's Bailly Generating Station, located approximately 12 miles northeast of Gary, Indiana. The facility is used to demonstrate a variety of advanced technical and business-related features, during a three-year period of operation which began in the summer of 1992. The aim of this demonstration is to accelerate near-term commercialization. Key features of the AFGD project are:

- Large single absorber for multiple boilers.
- Single loop absorber with in situ oxidation to produce commercial gypsum.
- SO_2 removal levels of 95% without chemical additives.
- High velocity co-current absorber.
- Direct injection of pulverized limestone.
- Air rotary sparger.
- Wastewater evaporation system.
- "Own-and-Operate" business arrangement.

In broader terms, the AFGD demonstration offers several potential benefits, including: protection of markets for high-sulfur U.S. coal, smaller space requirements, lower costs for electric utilities and their customers, and improved environmental performance compared to conventional FGD systems. During this reporting period, July 1 through September 30, 1994,

- The AFGD facility achieved 100% availability for the quarter with 100% year-to-date. (This reflects the use of July 1 as the beginning of the contract year.)
- The AFGD facility achieved an average SO_2 removal of 94.62% year-to-date.
- The AFGD facility produced 51,995 tons (dry) of Gypsum during this Quarter and 18,963 tons of SO_2 were removed.
- Contract to date production of Gypsum is 51,995 tons (dry) of Gypsum and 18,963 tons of SO_2 were removed.

INTRODUCTION

The "Advanced Flue Gas Desulfurization (AFGD) Demonstration Project" is a $150.5 million cooperative effort between the U.S. Department of Energy and Pure Air, a general partnership of Air Products and Chemicals, Inc. and Mitsubishi Heavy Industries America, Inc. The AFGD process is one of several alternatives to conventional flue gas desulfurization (FGD) being demonstrated under the Department of Energy's Clean Coal Technology Demonstration Program. The AFGD demonstration project is located at the Northern Indiana Public Service Company's Bailly Generating Station, about 12 miles northeast of Gary, Indiana.

PROJECT DESCRIPTION

The AFGD demonstration at Bailly station is showcasing several advanced features, compared to conventional FGD systems in operation throughout the United States. These features are described below.

Single Large Absorber

Ordinarily, an FGD facility contains several SO_2 absorber or "scrubber" modules, with one or two spare modules added to improve system reliability. The AFGD facility at Bailly utilizes a single nominal 600 MWe absorber module. It is the largest capacity absorber module in the United States, and it scrubs all of the flue gases from the Bailly station's two coal-fired boilers. There is no spare or back-up module. Instead, a high degree of system reliability will be demonstrated, as the scrubber is capable of removing 95% or more of the SO_2, without the use of performance-enhancing chemical additives.

Single Loop Scrubber with In Situ Oxidation

Another space-saving feature is the utilization of the SO_2 absorber to perform three separate functions: prequencher, absorber, and oxidation of scrubber sludge ($CaSO_3 \cdot \frac{1}{2}H_2O$, calcium sulfite) to gypsum ($CaSO_4 \cdot 2H_2O$, calcium sulfate). Old FGD systems often employ two or three separate vessels to perform these functions. The AFGD system at Bailly produces a gypsum by-product that is suitable for commercial uses such as wallboard or cement. This is in lieu of producing scrubber sludge, which would have to be landfilled as a solid waste.

High Velocity Co-Current Absorber

The SO_2 absorber utilizes a high velocity cocurrent design, in which the scrubbing slurry moves in the same direction as the flue gas flow. Operation at a relatively high flue gas velocity of approximately 20 feet per second allows for a more compact absorber. This feature, combined with the absence of any back-up modules, contributes to improved space requirements for the AFGD system.

Direct Limestone Injection

At Bailly, pulverized limestone is injected directly into the SO_2 absorber. The pulverized limestone is purchased from a limestone supplier, thereby eliminating the need for on-site wet grinding systems.

Air Rotary Sparger

A novel device known as an air rotary sparger (ARS) is demonstrated within the absorber module. Basically, the ARS combines the functions of mixing and air distribution within the absorber, thereby facilitating the oxidation of scrubber sludge to gypsum. In a conventional FGD system, mixing would be done by agitators while oxidation air distribution would be performed by a separate fixed sparger arrangement. Merging these functions into one equipment item is expected to provide better mixing within the base of the absorber.

Wastewater Evaporation System

Wastewater disposal often poses a difficult problem for scrubber operators, particularly where the oxidation of scrubber sludge to gypsum is employed. The AFGD project at Bailly will demonstrate a novel wastewater evaporation system (WES), whereby process wastewater is injected into the flue gas ductwork upstream of the existing electrostatic precipitator (ESP). The hot flue gas will evaporate the wastewater, and dissolved solids in the wastewater will solidify so that they are collected by the ESP, along with the fly ash. At Bailly, the WES will be demonstrated only on one boiler unit (i.e., 345 MWe). If successful, it could lead to zero liquid discharge scrubbers. That is, scrubbers which produce a usable gypsum by-product and no wastewater effluent.

PowerChip™ Gypsum

The AFGD by-product gypsum is in a finely powdered form. However, the Bailly project includes a process to agglomerate and flake part of the by-product gypsum stream, in an attempt to improve the marketability of scrubber gypsum to end-users which are more accustomed to using natural gypsum rock. This PowerChip™ gypsum can be transported more easily and handled with existing equipment at most wallboard and/or cement plants. Pure Air will also attempt to blend fly ash and wastewater treatment solids into the PowerChip™ gypsum by-product. Although these impurities would make the gypsum unacceptable for wallboard applications, it could still be used in cement. Pilot tests have indicated that maximum fly ash loading of 20% to 30% may be achieved. In combination with wastewater evaporation and the co-production of wallboard grade gypsum, this process may bring coal-fired power generation technology one step closer to the goal of a zero-discharge power plant.

On-Site Own and Operate

In addition to state-of-the-art technical features, the AFGD project will showcase a novel business arrangement. Normally, utility companies must contract with several different firms to design and build a scrubber. And once it is built, the utility must operate the scrubber. By contrast, Pure Air designed, financed, built, owns, maintains and operates the Bailly AFGD facility for Northern Indiana as a contractual service. This "own and operate" approach has been employed successfully by Pure Air's parent, Air Products & Chemicals, in other business lines. Its application to flue gas cleanup is attractive to many utilities for a variety of reasons. For example, it allows the utility company to focus on the business of electricity generation and distribution, while Pure Air utilizes its own expertise to own and operate the scrubber facility.

The project was originally selected for award under DOE's Clean Coal Technology Program in September 1988. Following negotiations, Pure Air entered into a long-term flue gas processing agreement with Northern Indiana in October 1989 and a cooperative agreement with DOE in December 1989. Construction activities began in March 1990. and were completed in June 1992. A three-year demonstration period started in July 1992 to prove the efficacy of AFGD technology with a range of high sulfur United States coals. If successful, the demonstration will be followed by a long-term commercial operation period, pursuant to the agreement between Pure Air and Northern Indiana.

Project Status
July -September , 1994

During the reporting period of July 1-September 30 , 1994, the AFGD unit continued with a stable commercial operation. Several important activities were completed within the quarter. The DOE test of (2.0-2.5 %S) coal was completed and the (2.5-3.0 %S) coal run was started. The results of the test are not compiled as of the date of this report.

The results of the high sulfur coal test run in June have been received and are given in Attachment "A".

Project Milestones

- The AFGD facility achieved 100% availability for the quarter with 100% year-to-date.
- The AFGD facility achieved an average SO_2 removal of 94.62% year-to-date.
- The AFGD facility produced 51,995 tons (dry) of Gypsum during this Quarter and 18,963 tons of SO_2 were removed.
- Contract year to date production of Gypsum is 51,995 tons (dry) of Gypsum and 18,893 tons of SO_2 were removed.

PowerChip™ Operation

- There was no chip production during the quarter.

JULY, 1994

General Performance

- Unit #8 shutdown on July 26, 1994 at 2200 hours for air heater cleaning.

Maintenance Activities

- Began modifications of the centrifuge filtrate chutes.
- Performed repairs of M300 variable frequency drive units due to ground fault.
- Rebuilt P125 bleed pump.
- Upgrade A150 agitator motor
- Performed WES piping nozzle inspection and clean out.
- Maintenance painting throughout the facility continues.

Testing Activities

- DOE low sulfur coal test began on July 25, 1994 (2.0-2.5%).
- Long term performance testing of the WES system continues.

AUGUST, 1994

General Performance

- Unit #8 down at beginning of month, back on line at 0100 on 8/9/94.
- Unit #7 tripped at 1047 on 8/7/94, back on line at 2330 on 8/7/94.

Maintenance Activities

- Completed modifications to M300 centrifuge filtrate chutes.
- Rebuilt P120"G" recirculation pump.
- Miscellaneous maintenance of M300 centrifuges.
- Rebuilt P370"A" pump.
- Rebuilt P700"A" absorber sump pump.
- Rebuilt LV129 absorber level control valve.
- Replaced spray nozzles on WES system nozzles in east duct.
- Replaced limestone unloading hoses.
- Made rubber lining repairs to M300"B" centrifuge.

- Minor repairs (replaced 3 rollers) on C311 conveyor.
- Installed Victaulic piping spool piece in centrifuge feed line (test spool).

Testing Activities

- Completed DOE low sulfur coal test (2.0-2.5%).
- Long term performance testing of the WES system continues.

SEPTEMBER, 1994

General Performance

- Unit #8 down at 0230 on 9/6/94. Back on line at 0620 on 9/7/94 (boiler water quality bad).
- Unit #8 down at 0814 on 9/28/94. Back on line at 0600 on 10/1/94 (tube leak).

Maintenance Activities

- Installed new shaker bed on chipper to reduce fines.
- Rebuilt P330 "B" pump.
- Modified ductwork on chipper process to facilitate cleaning.
- Installed temporary roller on C311 conveyor to aid in belt replacement during outage.
- Numerous miscellaneous repairs on M300 centrifuges.
- Replaced packing on A140 "A" and "B" agitators.
- Replaced packing on A130 "A" and "B" agitators.
- Replaced light curtain on WWTP filter press.
- Repaired nipple on expansion joint EJ-109.
- Extended vacuum line on 2nd Floor of Dewatering Building.
- Replaced motor sheave on P370 "A" pump.

Testing Activities

- Continue extended test run on WES system.
- Started DOE Test #5 (2.5-3.0% sulfur coal) on 9/12/94.
- On Tuesday, September 6, 1994 Pure Air Bailly Facility hosted a tour complete with dinner for 180+ Clean Coal Conference attendees.
- J. Henderson presented a paper at the Clean Coal Conference on September 8th.

Planned Activities

Three major tests are planned for the remainder the DOE demonstration .

1.	Fifth DOE coal test 2.5- 3.0% S.	9/7/94 (In Progress)
2.	Sixth DOE coal test Optimum	5/1/95
3.	WES test	4/15/95

There are two tests remaining in the DOE test program, these are the Optimum test and a third WES test, both these tests are scheduled for completion in April, 1995. The focus for the next six months will be completion of outstanding reports and the target of closing out the project.

Summary

In summary during the reporting period of July 1 through September, 1994, the AFGD unit continued with a stable commercial operation. Several important activities were successful complete within the quarter. The DOE test of (2.0 - 2.5% S) coal was completed and the (2.5 - 3.0% S) coal run was started. To date the AFGD unit has meet or exceeded our expectations.

ATTACHMENT A

Environmental Services of America, Inc.

The Almega Division
601A Country Club Drive
Bensenville, IL 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

REPORT OF EMISSION TESTING ON THE ADVANCED FLUE GAS DESULPHURIZATION INLET AND OUTLET AT THE BAILLY GENERATING STATION LOCATED IN CHESTERTON, INDIANA

Prepared for:

PURE AIR
BAILLY GENERATING STATION
246 BAILLY STATION ROAD
CHESTERTON, IN 46304

Prepared by:

ENVIRONMENTAL SERVICES OF AMERICA
THE ALMEGA DIVISION
601A COUNTRY CLUB DRIVE
BENSENVILLE, IL 60106

OCTOBER, 1994
THE ALMEGA CORPORATION PROJECT NO. I-7316
THE ALMEGA CORPORATION REPORT NO. I-7316-2

Prepared by:

Bill J. Byczynski
Project Manager

Reviewed by:

Lawrence E. Fisher
Senior Project Manager

TABLE OF CONTENTS

1.0 INTRODUCTION

2.0 TEST RESULTS

Tables 1 - 7	SO_2, SO_3, NO_x, at the FGD Inlet
Tables 8 - 14	Particulate, HCl, HF, at the FGD Inlet
Tables 15 - 21	SO_2, SO_3, NO_x, at the FGD Outlet
Tables 22 - 28	Particulate, HCl, HF, at the FGD Outlet

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Exhaust Gas Parameters
- 3.1.1 Traverse and Sampling Points
- 3.1.2 Velocity Traverse
- 3.1.3 Gas Composition
- 3.1.4 Moisture Content

3.2 SO_2 and NO_x (Instrumental Methods)
- 3.2.1 Sample Collection
- 3.2.2 Sample Duration
- 3.2.3 Calibration and Zeroing
- 3.2.4 Data Reduction

3.3 Sulphur Dioxide/Sulfur Trioxide
- 3.3.1 Sampling Method
- 3.3.2 Sample Duration and Frequency
- 3.3.3 Sample Recovery
- 3.3.4 Analytical Procedures
- 3.3.5 Blanks
- 3.3.6 Calibrations

3.4 Particulate, HCl, HF
- 3.4.1 Sampling Method
- 3.4.2 Sample Duration and Frequency
- 3.4.3 Sample Recovery
- 3.4.4 Analytical Procedures
- 3.4.5 Blanks
- 3.4.6 Calibrations

TABLE OF CONTENTS

APPENDIX A	METHOD 1	Sample And Velocity Traverses For Stationary Sources
APPENDIX B	METHOD 2	Determination Of Stack Gas Velocity And Volumetric Flow Rate (Type S Pitot Tube)
APPENDIX C	METHOD 3	Gas Analysis For Carbon Dioxide, Oxygen, Excess Air And Dry Molecular Weight
APPENDIX D	METHOD 4	Determination Of Moisture Content In Stack Gases
APPENDIX E	METHOD 5	Determination Of Particulate Emissions From Stationary Sources
APPENDIX F	METHOD 6C	Determination of Sulfur Dioxide Emissions From Stationary Sources (Instrumental Analyzer Procedure)
APPENDIX G	METHOD 7E	Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure)
APPENDIX H	METHOD 8	Determination Of Sulfuric Acid Mist and Sulfur Dioxide Emissions From Stationary Sources
APPENDIX I	METHOD 26A	Determination of Hydrogen Halide and Halogen Emissions From Stationary Sources - Isokinetic Method
APPENDIX J	EXAMPLE CALCULATIONS	
APPENDIX K	FIELD DATA SHEETS	
APPENDIX L	LABORATORY ANALYSIS	
APPENDIX M	CALIBRATIONS AND SAMPLE CHAIN-OF-CUSTODY	

1.0

INTRODUCTION

1.0 INTRODUCTION

Environmental Services of America, (ENSA) Almega Division, conducted an air emissions study on the Pure Air Flue Gas Desulphurization inlet and outlet at the Bailly Generating Station located in Chesterton, Indiana. The purpose of these tests were for compliance with the Department of Energy (DOE) phase III requirements. Testing was conducted on June 7, 8, 9, 13, 27, 28, and 29, 1994.

Two tests were conducted each day on the FGD Inlet and Outlet for Hydrogen Chloride (HCl), Hydrogen Fluoride (HF), Sulphur Dioxide (SO_2) and Sulphur Trioxide (SO_3) using USEPA Method 8. Three emissions tests were conducted on each test date for Particulate, Nitrogen Oxides (NO_x), and SO_2 using USEPA Method 6C. All tests also include exhaust gas parameters such as temperature moisture content, molecular weight, and velocity.

Emission testing was supervised by Bill Byczynski, Project Manager of ENSA - Almega, and coordinated by Mr. Ghassem Manavi of Pure Air and the entire operating staff.

The purpose of this report is to summarize the test methods, procedures, and findings of this test series. Attached as appendices is a complete documentation of all field test data and test methodologies.

2.0

TEST RESULTS

2.0 TEST RESULTS

Tables 1 through 7 present the FGD Inlet results for SO_2 (both methods 6C and 8), SO_3, and NO_x. Results are reported in parts per million (ppm), pounds per hour (lbs/hr), and pounds per million BTU's (lb/MBTU). Also preceded in these tables are test times, flue gas temperature, percent O_2/CO_2, and flow rates in actual cubic feet per minute (ACFM) and standard cubic feet per minute (SCFM).

Tables 8 through 14 present the Particulate, HCl and HF results. These results are reported in grains per dry standard cubic feet (grains/dscf), pounds per dscf, lbs/hr, and lbs/MBTU. Also presented are the auxiliary gas results reported in tables 1 through 7.

Tables 15 through 21 present the SO_2, SO_3, NO_x results for the FGD Outlet. These results are presented in the same format and units as Tables 1 through 7.

Tables 22 through 28 present the Particulate, HCl, and HF results for the FGD Outlet. These results are presented in the same format and units as Tables 8 through 14.

Copies of the calculations used to determine these emission rates are found in Appendix J. Copies of the field data sheets are located in Appendix K. Copies of the laboratory analysis are found in Appendix L. Copies of the calibrations and sample-chain-of-custody are located in Appendix M.

TABLE 1

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T. Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/7/94	6/7/94	6/7/94
TEST RUN #:	1 $SO_2/SO_3/NO_x$	2 $SO_2/SO_3/NO_x$	3 SO_2/NO_x
TIME:	9:55-11:10A	13:23-14:40P	14:30-15:34P
STACK GAS			
Temperature, Average F°	323.6	323.6	323.0
Volumetric Flow			
acfm	2,004,353	1,965,186	2,132,192
scfm	1,365,456	1,388,775	1,451,461
Orsat, average % CO_2	12.3	12.2	12.4
average % O_2	6.4	6.4	6.5
SULFUR TRIOXIDE			
Concentration, ppm_v	14.9	14.8	
Emission Rate, lb/hr	238.2	230.1	
Emission Rate, lb/10^6 BTU	0.044	0.043	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	2491.9	2127.1	
Emission Rate, lb/hr	31,865.4	26,468.2	
Emission Rate, lb/10^6 BTU	5.825	4.973	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	2697.0	2660.0	2708.0
Emission Rate, lb/hr	34,481.4	33,092.2	36,818.4
Emission Rate, lb/10^6 BTU	6.304	6.217	6.373
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	900.8	912.4	885.7
Emission Rate, lb/hr	8277.7	8158.4	8655.3
Emission Rate, lb/10^6 BTU	1.513	1.533	1.498

TABLE 2

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T. Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/8/94	6/8/94	6/8/94
TEST RUN #:	4 $SO_2/SO_3/NO_x$	5 $SO_2/SO_3/NO_x$	6 SO_2/NO_x
TIME:	10:05-11:25A	1:03-14:20A	14:30-16:00P
STACK GAS			
Temperature, Average F°	330.5	337.1	338.6
Volumetric Flow			
acfm	2,123,216	2,082,417	2,136,544
scfm	1,442,811	1,404,754	1,438,086
Orsat, average % CO_2	12.2	12.1	12.1
average % O_2	6.3	6.2	6.2
SULFUR TRIOXIDE			
Concentration, ppm_v	18.8	34.8	
Emission Rate, lb/hr	317.3	568.1	
Emission Rate, lb/10^6 BTU	0.055	0.100	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	2554.6	2693.9	
Emission Rate, lb/hr	34,492.3	35,222.1	
Emission Rate, lb/10^6 BTU	5.931	6.212	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	2610.0	2687.0	2.785.3
Emission Rate, lb/hr	35,233.2	35,124.4	37042.2
Emission Rate, lb/10^6 BTU	6.059	6.195	6.421
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	891.0	902.0	913.0
Emission Rate, lb/hr	8645.1	8474.7	8727.2
Emission Rate, lb/10^6 BTU	1.487	1.495	1.513

TABLE 3

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T. Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/9/94	6/9/94	6/9/94
TEST RUN #:	7 $SO_2/SO_3/NO_x$	8 $SO_2/SO_3/NO_x$	9 SO_2/NO_x
TIME:	9:15-10:35A	11:27-12:55P	1:17-2:30P
STACK GAS			
Temperature, Average F°	335.7	336.6	335.8
Volumetric Flow			
acfm	2,093,569	2,114,784	2,090,849
scfm	1,412,438	1,425,608	1,402,544
Orsat, average % CO_2	12.1	12.1	12.3
average % O_2	6.2	6.2	6.3
SULFUR TRIOXIDE			
Concentration, ppm_v	28.7	25.5	
Emission Rate, lb/hr	471.4	421.6	
Emission Rate, lb/10^6 BTU	0.083	0.073	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	3028.2	2614.9	
Emission Rate, lb/hr	39,732.3	34,651.8	
Emission Rate, lb/10^6 BTU	6.983	6.030	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	2610.0	2920.0	2958.2
Emission Rate, lb/hr	34,238.5	38,687.1	38,402.3
Emission Rate, lb/10^6 BTU	6.017	6.732	6.867
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	912.4	927.5	922.3
Emission Rate, lb/hr	8602.7	8832.3	8605.6
Emission Rate, lb/10^6 BTU	1.512	1.537	1.539

TABLE 4

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T. Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/13/94	6/13/94
TEST RUN #:	10 $SO_2/SO_3/NO_x$	11 $SO_2/SO_3/NO_x$
TIME:	10:10-11:22A	12:36-1:55P
STACK GAS		
Temperature, Average F°	327.0	340.5
Volumetric Flow		
acfm	1,926,562	1,837,346
scfm	1,308,950	1,227,688
Orsat, average % CO_2	12.2	12.1
average % O_2	6.3	6.2
SULFUR TRIOXIDE		
Concentration, ppm_v	27.0	13.8
Emission Rate, lb/hr	407.6	194.0
Emission Rate, lb/10^6 BTU	0.078	0.040
SULFUR DIOXIDE RM 8		
Concentration, ppm_v	2518.1	2697.3
Emission Rate, lb/hr	30,385.8	30,258.0
Emission Rate, lb/10^6 BTU	5.846	6.220
SULFUR DIOXIDE RM 6C		
Concentration, ppm_v	2756.0	2711.0
Emission Rate, lb/hr	33,250.0	30,405.1
Emission Rate, lb/10^6 BTU	6.397	6.250
NITROGEN OXIDES RM 7E		
Concentration, ppm_v	851.4	847.8
Emission Rate, lb/hr	7382.8	6834.2
Emission Rate, lb/10^6 BTU	1.420	1.405

TABLE 5

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T. Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/27/94	6/27/94	6/27/94
TEST RUN #:	12 $SO_2/SO_3/NO_x$	13 $SO_2/SO_3/NO_x$	14 SO_2/NO_x
TIME:	10:27-12:10P	12:30-13:45P	14:13-15:37P
STACK GAS			
Temperature, Average F°	334.6	335.0	332.0
Volumetric Flow			
acfm	2,122,400	1,993,201	2,118,592
scfm	1,438,585	1,350,333	1,442,607
Orsat, average % CO_2	12.1	12.1	12.5
average % O_2	6.2	6.3	6.2
SULFUR TRIOXIDE			
Concentration, ppm_v	21.2	19.2	
Emission Rate, lb/hr	356.5	300.4	
Emission Rate, lb/10^6 BTU	0.061	0.056	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	2569.9	2909.2	
Emission Rate, lb/hr	34,616.5	36,508.1	
Emission Rate, lb/10^6 BTU	5.926	6.754	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	2725.0	2810.4	2902.3
Emission Rate, lb/hr	36,697.4	35,261.4	38.548.8
Emission Rate, lb/10^6 BTU	6.282	6.524	6.691
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	888.6	853.4	863.2
Emission Rate, lb/hr	8601.1	7695.9	8240.6
Emission Rate, lb/10^6 BTU	1.472	1.424	1.430

TABLE 6

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T. Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/28/94	6/28/94	6/28/94
TEST RUN #:	15 $SO_2/SO_3/NO_x$	16 $SO_2/SO_3/NO_x$	17SO_2/NO_x
TIME:	10:55-12:05P	12:30-13:39P	14:00-15:00P
STACK GAS			
Temperature, Average F°	333.4	333.4	328.2
Volumetric Flow			
acfm	2,118,320	2,042,977	2,054,401
scfm	1,427,155	1,375,940	1,394,142
Orsat, average % CO_2	12.2	12.3	12.3
average % O_2	6.3	6.2	6.4
SULFUR TRIOXIDE			
Concentration, ppm_v	12.6	16.9	
Emission Rate, lb/hr	208.3	271.4	
Emission Rate, lb/10^6 BTU	0.036	0.049	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	2713.1	2727.9	
Emission Rate, lb/hr	36,004.5	35,013.6	
Emission Rate, lb/10^6 BTU	6.299	6.290	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	2808.0	2815.0	2820.0
Emission Rate, lb/hr	37,255.6	36,123.8	36,033.1
Emission Rate, lb/10^6 BTU	6.518	6.490	6.591
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	826.5	876.4	878.2
Emission Rate, lb/hr	7881.6	8083.4	8065.4
Emission Rate, lb/10^6 BTU	1.379	1.452	1.475

TABLE 7

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T. Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/29/94	6/29/94	6/29/94
TEST RUN #:	18 $SO_2/SO_3/NO_x$	19 $SO_2/SO_3/NO_x$	20 SO_2/NO_x
TIME:	8:30-9:47A	11:25-12:42P	11:55-13:10P
STACK GAS			
Temperature, Average F°	335.7	332.0	330.5
Volumetric Flow			
acfm	2,073,985	2,047,873	2,134,640
scfm	1,391,406	1,379,394	1,441,520
Orsat, average % CO_2	12.3	12.2	12.3
average % O_2	6.4	6.5	6.4
SULFUR TRIOXIDE			
Concentration, ppm_v	14.3	14.5	
Emission Rate, lb/hr	230.2	232.8	
Emission Rate, lb/10^6 BTU	0.042	0.043	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	2549.8	2839.1	
Emission Rate, lb/hr	32,840.9	36,593.9	
Emission Rate, lb/10^6 BTU	5.961	6.683	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	2773.0	2805.0	2789.0
Emission Rate, lb/hr	35,708.4	36,147.4	36,956.0
Emission Rate, lb/10^6 BTU	6.481	6.602	6.519
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	830.2	872.5	868.5
Emission Rate, lb/hr	7683.9	8081.4	8271.5
Emission Rate, lb/10^6 BTU	1.395	1.476	1.459

TABLE 8

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T, Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/7/94	6/7/94	6/7/94
TEST RUN #:	1 HCl/HF/Part	2 HCl/HF/Part	3 Part
TIME:	9:55-11:06A	12:20-13:44P	14:30-15:34P
STACK GAS			
Temperature, Average F°	328.7	323.7	322.0
Volumetric Flow			
acfm	1,992,385	1,996,280	2,123,481
scfm	1,351,646	1,365,387	1,457,968
Orsat, average % CO_2	12.4	12.3	12.4
average % O_2	6.3	6.4	6.5
PARTICULATE			
Concentration, grains/dscf	0.0105	0.0104	0.0119
Concentration, x 10^{-6} lb/dscf	1.506	1.491	1.697
Emission Rate, lb/hr	116.2	113.94	139.18
Emission Rate, lb/10^6 BTU	0.021	0.021	0.024
HYDROGEN CHLORIDE			
Concentration, ppm_v	31.7	17.8	
Emission Rate, lb/hr	114.1	63.4	
Emission Rate, lb/10^6 BTU	0.021	0.012	
HYDROGEN FLUORIDE			
Concentration ppm_v	3.7	ND*	
Emission Rate, lb/hr	13.2	ND*	
Emission Rate, lb/10^6 BTU	0.002	ND*	

* ND = None Detected

TABLE 9

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T, Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/8/94	6/8/94	6/8/94
TEST RUN #:	4 HCl/HF/Part	5 HCl/HF/Part	6 Part
TIME:	10:05-11:25A	13:03-14:13P	14:38-15:50P
STACK GAS			
Temperature, Average F°	331.2	338.6	339.2
Volumetric Flow			
acfm	2,121,584	2,142,528	2,170,000
scfm	1,430,962	1,431,698	1,449,446
Orsat, average % CO_2	12.2	12.3	12.2
average % O_2	6.3	6.2	6.2
PARTICULATE			
Concentration, grains/dscf	0.0093	0.0093	0.0087
Concentration, x 10^{-6} lb/dscf	1.333	1.334	1.245
Emission Rate, lb/hr	107.63	106.67	101.28
Emission Rate, lb/10^6 BTU	0.019	0.019	0.017
HYDROGEN CHLORIDE			
Concentration, ppm_v	23.3	18.6	
Emission Rate, lb/hr	87.8	69.5	
Emission Rate, lb/10^6 BTU	0.015	0.012	
HYDROGEN FLUORIDE			
Concentration ppm_v	0.3	ND*	
Emission Rate, lb/hr	1.0	ND*	
Emission Rate, lb/10^6 BTU	0.0002	ND*	

* ND = None Detected

TABLE 10

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T, Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/9/94	6/9/94	6/9/94
TEST RUN #:	7 HCl/HF/Part	8 HCl/HF/Part	9 Part
TIME:	9:29-10:35A	11:27-12:55P	13:17-14:30P
STACK GAS			
Temperature, Average F°	336.0	336.9	335.8
Volumetric Flow			
acfm	2,095,473	2,093,297	2,090,849
scfm	1,405,292	1,402,711	1,402,544
Orsat, average % CO_2	12.3	12.2	12.3
average % O_2	6.4	6.3	6.3
PARTICULATE			
Concentration, grains/dscf	0.0069	0.0076	0.0067
Concentration, x 10^{-6} lb/dscf	0.986	1.088	0.958
Emission Rate, lb/hr	78.41	86.23	75.00
Emission Rate, lb/10^6 BTU	0.014	0.015	0.013
HYDROGEN CHLORIDE			
Concentration, ppm_v	21.9	14.2	
Emission Rate, lb/hr	81.2	52.6	
Emission Rate, lb/10^6 BTU	0.014	0.009	
HYDROGEN FLUORIDE			
Concentration ppm_v	0.1	0.1	
Emission Rate, lb/hr	0.5	0.3	
Emission Rate, lb/10^6 BTU	0.0001	0.0001	

TABLE 11

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T, Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/13/94	6/13/94
TEST RUN #:	10 HCl/HF/Part	11 HCl/HF/Part
TIME:	10:13-11:25A	12:34-13:40P
STACK GAS		
Temperature, Average F°	335.0	334.4
Volumetric Flow		
acfm	1,888,482	1,893,378
scfm	1,270,586	1,274,842
Orsat, average % CO_2	12.4	12.5
average % O_2	6.4	6.3
PARTICULATE		
Concentration, grains/dscf	0.0147	0.0159
Concentration, x 10^{-6} lb/dscf	2.106	2.278
Emission Rate, lb/hr	151.38	162.39
Emission Rate, lb/10^6 BTU	0.030	0.032
HYDROGEN CHLORIDE		
Concentration, ppm_v	4.0	32.6
Emission Rate, lb/hr	13.3	108.3
Emission Rate, lb/10^6 BTU	0.003	0.021
HYDROGEN FLUORIDE		
Concentration ppm_v	0.70	ND*
Emission Rate, lb/hr	2.3	ND*
Emission Rate, lb/10^6 BTU	0.0004	ND*

* ND = None Detected

TABLE 12

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T, Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/27/94	6/27/94	6/27/94
TEST RUN #:	12 HCl/HF/Part	13 HCl/HF/Part	14 Part
TIME:	10:07-11:43A	12:30-13:39P	14:13-15:37P
STACK GAS			
Temperature, Average F°	337.0	335.0	332.0
Volumetric Flow			
acfm	1,956,482	1,966,818	2,118,592
scfm	1,323,863	1,334,205	1,442,607
Orsat, average % CO_2	12.4	12.4	12.5
average % O_2	6.3	6.2	6.2
PARTICULATE			
Concentration, grains/dscf	0.0143	0.0130	0.0210
Concentration, x 10^{-6} lb/dscf	2.045	1.857	2.997
Emission Rate, lb/hr	152.34	138.95	240.08
Emission Rate, lb/10^6 BTU	0.029	0.026	0.042
HYDROGEN CHLORIDE			
Concentration, ppm_v	19.5	33.4	
Emission Rate, lb/hr	67.8	116.7	
Emission Rate, lb/10^6 BTU	0.013	0.022	
HYDROGEN FLUORIDE			
Concentration ppm_v	ND*	2.9	
Emission Rate, lb/hr	ND*	10.3	
Emission Rate, lb/10^6 BTU	ND*	0.002	

* ND = None Detected

TABLE 13

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T, Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/28/94	6/28/94	6/28/94
TEST RUN #:	15 HCl/HF/Part	16 HCl/HF/Part	17 Part
TIME:	10:40-11:55A	12:36-13:45P	14:00-15:10P
STACK GAS			
Temperature, Average F°	333.4	333.4	328.2
Volumetric Flow			
acfm	2,102,545	1,903,714	2,054,401
scfm	1,417,462	1,283,417	1,394,142
Orsat, average % CO_2	12.3	12.3	12.3
average % O_2	6.4	6.4	6.4
PARTICULATE			
Concentration, grains/dscf	0.0094	0.0169	0.0193
Concentration, x 10^{-6} lb/dscf	1.342	2.424	2.773
Emission Rate, lb/hr	106.51	173.92	213.68
Emission Rate, lb/10^6 BTU	0.019	0.034	0.039
HYDROGEN CHLORIDE			
Concentration, ppm_v	30.7	29.6	
Emission Rate, lb/hr	113.5	99.1	
Emission Rate, lb/10^6 BTU	0.020	0.019	
HYDROGEN FLUORIDE			
Concentration ppm_v	2.9	ND*	
Emission Rate, lb/hr	10.7	ND*	
Emission Rate, lb/10^6 BTU	0.0019	ND*	

* ND = None Detected

TABLE 14

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Inlet

OPERATORS: T, Santucci, M. Rohall, B. Flannigan, M. Ritchie

TEST DATE:	6/29/94	6/29/94	6/30/94
TEST RUN #:	18 HCl/HF/Part	19 HCl/HF/Part	20 Part
TIME:	8:30-9:50A	10:20-11:37A	12:00-13:10P
STACK GAS			
Temperature, Average F°	335.7	332.0	330.5
Volumetric Flow			
acfm	2,146,336	2,122,672	2,134,640
scfm	1,439,946	1,430,723	1,441,520
Orsat, average % CO_2	12.3	12.4	12.3
average % O_2	6.3	6.4	6.4
PARTICULATE			
Concentration, grains/dscf	0.0179	0.0209	0.0091
Concentration, x 10^{-6} lb/dscf	2.558	2.989	1.300
Emission Rate, lb/hr	205.79	241.40	103.91
Emission Rate, lb/10^6 BTU	0.036	0.042	0.018
HYDROGEN CHLORIDE			
Concentration, ppm_v	29.6	41.8	
Emission Rate, lb/hr	111.0	157.5	
Emission Rate, lb/10^6 BTU	0.019	0.027	
HYDROGEN FLUORIDE			
Concentration ppm_v	2.1	5.0	
Emission Rate, lb/hr	8.0	18.8	
Emission Rate, lb/10^6 BTU	0.0014	0.0033	

TABLE 15

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: T. Roeser, G. Blaine, C. Tien, G. Eifert

TEST DATE:	6/7/94	6/7/94	6/7/94
TEST RUN #:	1 $SO_2/SO_3/NO_x$	2 $SO_2/SO_3/NO_x$	3 SO_2
TIME:	9:55-11:06A	13:20-14:44P	14:30-15:34P
STACK GAS			
Temperature, Average F°	127.8	131.5	130.0
Volumetric Flow			
acfm	1,812,552	1,662,190	1,734,548
scfm	1,629,240	1,484,739	1,553,311
Orsat, average % CO_2	12.3	12.4	12.5
average % O_2	6.7	6.7	6.3
SULFUR TRIOXIDE			
Concentration, ppm_v	21.7	3.3	
Emission Rate, lb/hr	381.9	53.4	
Emission Rate, lb/10^6 BTU	0.065	0.010	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	206.4	228.9	
Emission Rate, lb/hr	2908.9	2933.9	
Emission Rate, lb/10^6 BTU	0.493	0.546	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	195.2	198.2	199.5
Emission Rate, lb/hr	2750.9	2540.2	2617.9
Emission Rate, lb/10^6 BTU	0.466	0.473	0.463
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	867.4	876.4	882.6
Emission Rate, lb/hr	8786.1	8073.2	8324.4
Emission Rate, lb/10^6 BTU	1.488	1.503	1.473

TABLE 16

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/8/94	6/8/94	6/8/94
TEST RUN #:	4 $SO_2/SO_3/NO_x$	5 $SO_2/SO_3/NO_x$	6 SO_2/NO_x
TIME:	10:05-11:25A	13:08-14:20P	14:40-15:50P
STACK GAS			
Temperature, Average F°	129.7	131.1	129.1
Volumetric Flow			
acfm	1,763,800	1,658,598	1,702,218
scfm	1,575,032	1,477,581	1,516,490
Orsat, average % CO_2	12.3	12.4	12.6
average % O_2	6.6	6.7	6.5
SULFUR TRIOXIDE			
Concentration, ppm_v	8.8	11.9	
Emission Rate, lb/hr	148.4	186.1	
Emission Rate, lb/10^6 BTU	0.026	0.036	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	196.1	208.6	
Emission Rate, lb/hr	2661.2	2610.8	
Emission Rate, lb/10^6 BTU	0.465	0.498	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	174.0	206.5	211.4
Emission Rate, lb/hr	2361.0	2583.4	2725.5
Emission Rate, lb/10^6 BTU	0.412	0.493	0.498
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	835.7	843.8	862.5
Emission Rate, lb/hr	8150.4	7587.4	7992.5
Emission Rate, lb/10^6 BTU	1.424	1.447	1.459

TABLE 17

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/9/94	6/9/94	6/9/94
TEST RUN #:	7 $SO_2/SO_3/NO_x$	8 $SO_2/SO_3/NO_x$	9 SO_2/NO_x
TIME:	9:15-10:35A	11:30-12:45P	13:17-14:30P
STACK GAS			
Temperature, Average F°	130.5	132.2	129.1
Volumetric Flow			
acfm	1,742,759	1,818,710	1,704,271
scfm	1,554,135	1,617,209	1,523,424
Orsat, average % CO_2	12.5	12.4	12.6
average % O_2	6.6	6.6	6.6
SULFUR TRIOXIDE			
Concentration, ppm_v	9.4	16.0	
Emission Rate, lb/hr	157.0	280.9	
Emission Rate, lb/10^6 BTU	0.028	0.048	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	185.1	290.3	
Emission Rate, lb/hr	2473.5	4064.4	
Emission Rate, lb/10^6 BTU	0.439	0.688	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	221.5	260.5	265.5
Emission Rate, lb/hr	2959.2	3647.4	3476.1
Emission Rate, lb/10^6 BTU	0.525	0.617	0.629
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	890.2	871.2	890.4
Emission Rate, lb/hr	8548.0	8767.5	8379.0
Emission Rate, lb/10^6 BTU	1.516	1.484	1.517

TABLE 18

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/13/94	6/13/94
TEST RUN #:	18 $SO_2/SO_3/NO_x$	19 $SO_2/SO_3/NO_x$
TIME:	10:13-11:25A	12:34-13:55P
STACK GAS		
Temperature, Average F°	129.0	130.0
Volumetric Flow		
acfm	1.857,198	1,833,079
scfm	1,660,405	1,636,064
Orsat, average % CO_2	12.6	12.5
average % O_2	6.7	6.6
SULFUR TRIOXIDE		
Concentration, ppm_v	9.8	6.4
Emission Rate, lb/hr	175.6	111.5
Emission Rate, lb/10^6 BTU	0.029	0.019
SULFUR DIOXIDE RM 8		
Concentration, ppm_v	113.5	123.2
Emission Rate, lb/hr	1624.8	1728.8
Emission Rate, lb/10^6 BTU	0.271	0.292
SULFUR DIOXIDE RM 6C		
Concentration, ppm_v	173.5	177.8
Emission Rate, lb/hr	2483.0	2494.5
Emission Rate, lb/10^6 BTU	0.414	0.421
NITROGEN OXIDES RM 7E		
Concentration, ppm_v	826.2	825.3
Emission Rate, lb/hr	8498.4	8322.3
Emission Rate, lb/10^6 BTU	1.417	1.406

TABLE 19

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/27/94	6/27/94	6/27/94
TEST RUN #:	12 $SO_2/SO_3/NO_x$	13 $SO_2/SO_3/NO_x$	14 SO_2
TIME:	10:27-12:10P	12:20-13:44P	14:13-15:37P
STACK GAS			
Temperature, Average F°	132.7	134.2	134.7
Volumetric Flow			
acfm	1,613,951	1,576,489	1,770,984
scfm	1,449,303	1,412,089	1,584,968
Orsat, average % CO_2	12.4	12.5	12.6
average % O_2	6.5	6.6	6.7
SULFUR TRIOXIDE			
Concentration, ppm_v	12.8	9.8	
Emission Rate, lb/hr	192.9	143.6	
Emission Rate, lb/10^6 BTU	0.038	0.029	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	191.3	182.7	
Emission Rate, lb/hr	2313.4	2152.5	
Emission Rate, lb/10^6 BTU	0.450	0.433	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	185.4	187.4	194.5
Emission Rate, lb/hr	2241.1	2207.1	2618.1
Emission Rate, lb/10^6 BTU	0.436	0.444	0.464
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	834.8	852.5	847.6
Emission Rate, lb/hr	7252.9	7216.5	8200.5
Emission Rate, lb/10^6 BTU	1.412	1.452	1.454

TABLE 20

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/28/94	6/28/94	6/28/94
TEST RUN #:	15 $SO_2/SO_3/NO_x$	16 $SO_2/SO_3/NO_x$	17 SO_2
TIME:	10:55-12:05P	12:30-13:39P	14:00-15:10P
STACK GAS			
Temperature, Average F°	132.8	133.6	124.7
Volumetric Flow			
acfm	1,678,612	1,719,153	1,743,272
scfm	1,494,620	1,528,655	1,573,696
Orsat, average % CO_2	12.5	12.6	12.6
average % O_2	6.5	6.6	7.0
SULFUR TRIOXIDE			
Concentration, ppm_v	8.6	11.5	
Emission Rate, lb/hr	135.1	187.0	
Emission Rate, lb/10^6 BTU	0.025	0.034	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	139.9	134.2	
Emission Rate, lb/hr	1765.0	1749.8	
Emission Rate, lb/10^6 BTU	0.329	0.318	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	120.5	115.8	117.3
Emission Rate, lb/hr	1520.4	1509.9	1562.6
Emission Rate, lb/10^6 BTU	0.284	0.274	0.286
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	820.1	850.3	842.4
Emission Rate, lb/hr	7437.4	7968.7	8065.7
Emission Rate, lb/10^6 BTU	1.387	1.448	1.476

TABLE 21

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/29/94	6/29/94	6/29/94
TEST RUN #:	18 $SO_2/SO_3/NO_x$	19 $SO_2/SO_3/NO_x$	20 SO_2
TIME:	8:30-9:45A	10:20-11:37A	12:00-13:10A
STACK GAS			
Temperature, Average F°	134.1	133.5	131.1
Volumetric Flow			
acfm	1,734,035	1,710,942	1,738,141
scfm	1,538,015	1,519,066	1,552,075
Orsat, average % CO_2	12.5	12.5	12.5
average % O_2	6.9	7.0	6.9
SULFUR TRIOXIDE			
Concentration, ppm_v	11.7	10.0	
Emission Rate, lb/hr	190.6	162.0	
Emission Rate, lb/10^6 BTU	0.035	0.031	
SULFUR DIOXIDE RM 8			
Concentration, ppm_v	169.9	183.9	
Emission Rate, lb/hr	2223.7	2374.4	
Emission Rate, lb/10^6 BTU	0.411	0.449	
SULFUR DIOXIDE RM 6C			
Concentration, ppm_v	149.5	155.4	161.5
Emission Rate, lb/hr	1956.2	2005.5	2118.8
Emission Rate, lb/10^6 BTU	0.362	0.379	0.391
NITROGEN OXIDES RM 7E			
Concentration, ppm_v	818.4	854.0	852.9
Emission Rate, lb/hr	7696.9	7921.6	8042.6
Emission Rate, lb/10^6 BTU	1.424	1.497	1.484

TABLE 22

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/7/94	6/7/94	6/7/94
TEST RUN #:	1 HCl/HF/Part	2 HCl/HF/Part	3 Part
TIME:	9:55-11:06A	12:20-13:44P	14:30-15:34P
STACK GAS			
Temperature, Average F°	131.0	131.0	130.0
Volumetric Flow			
acfm	1,796,130	1,716,074	1,734,548
scfm	1,605,737	1,534,167	1,553,311
Orsat, average % CO_2	12.4	12.5	12.5
average % O_2	6.5	6.3	6.3
PARTICULATE			
Concentration, grains/dscf	0.0045	0.0030	0.0059
Concentration, x 10^{-6} lb/dscf	0.637	0.435	0.850
Emission Rate, lb/hr	52.85	34.15	67.29
Emission Rate, lb/10^6 BTU	0.009	0.006	0.012
HYDROGEN CHLORIDE			
Concentration, ppm_v	0.3	0.1	
Emission Rate, lb/hr	1.0	0.5	
Emission Rate, lb/10^6 BTU	0.0002	0.0001	
HYDROGEN FLUORIDE			
Concentration ppm_v	ND*	ND*	
Emission Rate, lb/hr	ND*	ND*	
Emission Rate, lb/10^6 BTU	ND*	ND*	

* ND = None Detected

TABLE 23

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/8/94	6/8/94	6/8/94
TEST RUN #:	4 HCl/HF/Part	5 HCl/HF/Part	6 Part
TIME:	10:05-11:25A	13:03-14:13P	14:38-15:50P
STACK GAS			
Temperature, Average F°	128.6	128.9	129.1
Volumetric Flow			
acfm	1,705,810	1,758,155	1,702,218
scfm	1,520,981	1,566,855	1,516,490
Orsat, average % CO_2	12.5	12.5	12.6
average % O_2	6.6	6.5	6.5
PARTICULATE			
Concentration, grains/dscf	0.0049	0.0063	0.0050
Concentration, x 10^{-6} lb/dscf	0.694	0.907	0.712
Emission Rate, lb/hr	54.36	73.26	55.35
Emission Rate, lb/10^6 BTU	0.010	0.013	0.010
HYDROGEN CHLORIDE			
Concentration, ppm_v	0.1	0.1	
Emission Rate, lb/hr	0.4	0.4	
Emission Rate, lb/10^6 BTU	0.0001	0.0001	
HYDROGEN FLUORIDE			
Concentration ppm_v	ND*	ND*	
Emission Rate, lb/hr	ND*	ND*	
Emission Rate, lb/10^6 BTU	ND*	ND*	

* ND = None Detected

TABLE 24

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/9/94	6/9/94	6/9/94
TEST RUN #:	7 HCl/HF/Part	8 HCl/HF/Part	9 Part
TIME:	9:29-10:35A	11:27-12:55P	13:17-14:30P
STACK GAS			
Temperature, Average F°	129.1	128.3	129.1
Volumetric Flow			
acfm	1,701,339	1,715,409	1,705,196
scfm	1,520,891	1,541,482	1,524,690
Orsat, average % CO_2	12.6	12.6	12.6
average % O_2	6.6	6.7	6.6
PARTICULATE			
Concentration, grains/dscf	0.0048	0.0057	0.0052
Concentration, x 10^{-6} lb/dscf	0.686	0.825	0.745
Emission Rate, lb/hr	54.26	64.13	58.75
Emission Rate, lb/10^6 BTU	0.010	0.011	0.011
HYDROGEN CHLORIDE			
Concentration, ppm_v			
Emission Rate, lb/hr			
Emission Rate, lb/10^6 BTU			
HYDROGEN FLUORIDE			
Concentration ppm_v			
Emission Rate, lb/hr			
Emission Rate, lb/10^6 BTU			

* ND = None Detected

TABLE 25

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/13/94	6/13/94
TEST RUN #:	10 HCl/HF/Part	11 HCl/HF/Part
TIME:	10:13-11:25A	12:34-13:40P
STACK GAS		
Temperature, Average F°	133.8	137.0
Volumetric Flow		
acfm	1,751,483	1,667,835
scfm	1,558,960	1,476,549
Orsat, average % CO_2	12.6	12.5
average % O_2	6.8	6.9
PARTICULATE		
Concentration, grains/dscf	0.0067	0.0029
Concentration, x 10^{-6} lb/dscf	0.951	0.415
Emission Rate, lb/hr	76.03	31.01
Emission Rate, lb/10^6 BTU	0.014	0.006
HYDROGEN CHLORIDE		
Concentration, ppm_v	1.0	0.5
Emission Rate, lb/hr	3.6	1.7
Emission Rate, lb/10^6 BTU	0.0010	0.0003
HYDROGEN FLUORIDE		
Concentration ppm_v	1.0	ND*
Emission Rate, lb/hr	0.2	ND*
Emission Rate, lb/10^6 BTU	0.0000	ND*

* ND = None Detected

TABLE 26

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/27/94	6/27/94	6/27/94
TEST RUN #:	12 HCl/HF/Part	13 HCl/HF/Part	14 Part
TIME:	10:17-11:43A	12:30-13:39P	14:13-15:37P
STACK GAS			
Temperature, Average F°	132.2	131.8	134.7
Volumetric Flow			
acfm	1,775,090	1,799,722	1,770,984
scfm	1,595,348	1,618,580	1,584,968
Orsat, average % CO_2	12.5	12.6	12.6
average % O_2	6.6	6.6	6.7
PARTICULATE			
Concentration, grains/dscf	0.0047	0.0045	0.0049
Concentration, x 10^{-6} lb/dscf	0.665	0.642	0.697
Emission Rate, lb/hr	54.01	52.90	56.58
Emission Rate, lb/10^6 BTU	0.010	0.009	0.010
HYDROGEN CHLORIDE			
Concentration, ppm_v	ND*	5.5	
Emission Rate, lb/hr	ND*	21.0	
Emission Rate, lb/10^6 BTU	ND*	0.004	
HYDROGEN FLUORIDE			
Concentration ppm_v	ND*	ND*	
Emission Rate, lb/hr	ND*	ND*	
Emission Rate, lb/10^6 BTU	ND*	ND*	

* ND = None Detected

TABLE 27

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/28/94	6/28/94	6/28/94
TEST RUN #:	15 HCl/HF/Part	16 HCl/HF/Part	17 Part
TIME:	10:40-11:55A	12:36-13:45P	14:00-15:10P
STACK GAS			
Temperature, Average F°	124.1	124.3	124.7
Volumetric Flow			
acfm	1,751,483	1,760,207	1,743,272
scfm	1,582,733	1,590,072	1,573,696
Orsat, average % CO_2	12.6	12.6	12.6
average % O_2	7.0	7.0	7.0
PARTICULATE			
Concentration, grains/dscf	0.0068	0.0057	0.0062
Concentration, x 10^{-6} lb/dscf	0.965	0.825	0.892
Emission Rate, lb/hr	77.78	67.36	71.63
Emission Rate, lb/10^6 BTU	0.014	0.012	0.013
HYDROGEN CHLORIDE			
Concentration, ppm_v	ND*	5.8	
Emission Rate, lb/hr	ND*	22.0	
Emission Rate, lb/10^6 BTU	ND*	0.004	
HYDROGEN FLUORIDE			
Concentration ppm_v	ND*	ND*	
Emission Rate, lb/hr	ND*	ND*	
Emission Rate, lb/10^6 BTU	ND*	ND*	

* ND = None Detected

TABLE 28

SUMMARY OF EMISSION TEST DATA

PLANT: Pure Air

SOURCE: FGD Outlet

OPERATORS: B. Byczynski, T. Roeser, G. Blaine

TEST DATE:	6/29/94	6/29/94	6/30/94
TEST RUN #:	18 HCl/HF/Part	19 HCl/HF/Part	20 Part
TIME:	8:30-930A	10:20-11:37A	12:00-13:10P
STACK GAS			
Temperature, Average F°	129.3	131.0	131.1
Volumetric Flow			
acfm	1,763,286	1,781,761	1,738,141
scfm	1,579,338	1,591,295	1,552,075
Orsat, average % CO_2	12.4	12.6	12.5
average % O_2	6.9	7.0	6.9
PARTICULATE			
Concentration, grains/dscf	0.0066	0.0066	0.0058
Concentration, x 10^{-6} lb/dscf	0.937	0.937	0.824
Emission Rate, lb/hr	75.76	75.89	65.19
Emission Rate, lb/10^6 BTU	0.014	0.014	0.012
HYDROGEN CHLORIDE			
Concentration, ppm_v	ND*	ND*	
Emission Rate, lb/hr	ND*	ND*	
Emission Rate, lb/10^6 BTU	ND*	ND*	
HYDROGEN FLUORIDE			
Concentration ppm_v	ND*	ND*	
Emission Rate, lb/hr	ND*	ND*	
Emission Rate, lb/10^6 BTU	ND*	ND*	

* ND = None Detected

3.0

SAMPLING AND ANALYTICAL PROCEDURES

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 EXHAUST GAS PARAMETERS

3.1.1 Traverse and Sampling Points

The number of traverse and sampling points for the FGD Inlet and Outlet were determined using EPA Method 1. The FGD Inlet measured 408 inches by 160 inches. Four velocity traverse and sampling points were conducted in each of seven sampling ports, giving a total of twenty eight sampling points. The FGD Outlet diameter measured 396 inches. Three velocity traverse and sampling points were conducted in each of four sampling ports, giving a total of 12 points.

3.1.2 Velocity Traverse

A velocity traverse was performed during each Particulate, HCl, HF and SO_2 test in accordance with EPA Method 2. A "S" type Pitot Tube with an attached type "K" thermocouple was used to conduct the velocity traverse.

3.1.3. Gas Composition

Gas composition for oxygen, carbon dioxide, and nitrogen was determined employing EPA Method 3. An integrated gas sample was collected during each Particulate, HCl, HF and SO_2 test. Gas analysis was conducted using an Orsat analyzer.

3.1.4 Moisture Content

The exhaust gas moisture content was determined using EPA Method 4. Moisture content was measured during each of the Particulate, HCl, HF tests.

3.2 SO_2, NO_x (Instrumental Methods)

3.2.1 Sample Collection

A gas sample was drawn from the FGD Inlet and Outlet ducts through a heated stainless steel probe and transported to a Universal gas conditioner through a heated Teflon line. The gas conditioner removed the moisture from the gas stream and pumped a dry gas to the Rosemont Model, 921 NO_x Analyzer and Western Research Model 721A SO_2 analyzer through a Teflon sample line.

3.2.2 Sample Duration and Frequency

Three continuous samples lasting one hour in duration were taken for each test date.

3.2.3 Calibration and Zeroing

A calibration was performed before and after each test. Calibration gases used were USEPA Protocol 1 certified. A baseline zero was also determined at the same time the calibrations were conducted using zero air.

3.2.4 Data Reduction

The analyzer output was recorded on a data logger. The data logger stored readings every four seconds throughout the test. All data reduction was performed using the data from the data logger. The emission concentration in parts per million (ppm_v) were determined using a spreadsheet.

3.3 SO_2, SO_3 (Wet Chemistry Method)

3.3.1 Sampling Method

Determination of Sulphur Dioxide, Sulfur Trioxide emissions were determined using EPA Reference Method 8. The Method 8 sampling train consisted of the following components:

1. Appropriately sized glass nozzle
2. Sampling probe with heated glass liner
3. Five impingers placed in an insulated ice water bath in the following sequence:
   A. Greenburg-Smith design containing 100 ml 80% isopropanol
   B. Modified Greenburg-Smith containing 100 ml 3% hydrogen peroxide
   C. Greenburg-Smith design containing 100 ml 3% hydrogen peroxide
   D. Greenburg-Smith design empty
   E. Silica gel trap
4. Sampling gas measuring train

3.3.2 *Sample Duration and Frequency*

The Method 8 train was collected in duplicate, with each outlet test lasting for one hour in duration, and each inlet test lasting for 70 minutes in duration. A minimum sample size of 30 dry standard cubic feet (dscf) was collected for each test.

3.3.3 Sample

Upon completion of each test the sampling train was removed from the stack. The sample probe was removed and the impingers purged with ambient air for approximately 20 minutes. The front 1/2 of the train, up to and including the first impinger, was rinsed with Isopropanol. These rinses were then placed into a labeled container. The contents of the second and third impingers were remeasured and rinsed with deionized, distilled water. These rinses were then placed into a labeled container and analyzed for SO_2. The fourth impinger, silica gel, was reweighed for moisture gain and discarded.

3.3.4 Analytical

The SO_2, SO_3 train analytical determinations were performed using the barium-thorin titration method. Two titrations that agree within 1 percent of each other were performed for each sample.

3.3.5 Blanks

Blanks for the Method 8 train was prepared by recovering a sample train in the same manner listed above. This sample was then analyzed in the same manner as the samples.

3.3.6 Calibration

All sampling equipment was calibrated according to the procedures outlined in EPA Reference Method 8.

3.4 PARTICULATE, HYDROGEN CHLORIDE, HYDROGEN FLUORIDE

3.4.1 Sample Collection

Particulate, HCl, and HF emissions were determined following the guidelines of USEPA Reference Method 5 combined with Method 26A. The Method 5/26A sampling train consisted of the following components.

1. Appropriately sized glass nozzle
2. Sample probe with heated glass liner
3. Heated glass fiber filter
4. Four impingers placed in an insulated ice water bath in the following sequence:
   A. Greenburg-Smith design containing 100 ml H_2O
   B. Modified Greenburg-Smith containing 100 ml H_2O
   C. Greenburg-Smith design empty
   D. Know amount of Silica gel
5. Sampling gas measuring system.

3.4.2 Sample Duration and Frequency

The Method 5/26A train was collected in triplicate with each outlet test lasting for sixty minutes in duration, and each inlet test lasting for 70 minutes in duration. A minimum sample size of 30 dry standard cubic feet (dscf) was collected for each test.

3.4.3 Sample Recovery

Upon completion of each test the sampling train was removed from the stack. The probe, nozzle, and front 1/2 of the filter holder were rinsed and brushed with acetone and placed into a labeled container. The filter was placed into a separate container. The impinger catches were placed into a labeled container along with the rinses of these impingers.

3.4.4 Analytical

The total particulate mass is determined by adding the weight of the particulate from the probe and front-half wash with the particulate on the filter.

The acetone wash containing the particulate from the probe wash and the front-half of the sample train is placed into a tared beaker, evaporated to dryness, desiccated for 24 hours, then weighed in 6 hour intervals to a constant weight. An acetone blank is also analyzed and subtracted from the particulate weight of the acetone wash.

The tared glass fiber filter is desiccated for 24 hours, then weighted every six hours to constant weight.

The HCl/HF determinations were made using an ion chromatograph with a PED-II conductivity detector.

3.4.5 Blanks

Blanks for the Method 5/26A train were prepared by recovering and analyzing a sample train in the same manner listed above.

3.4.6 Calibrations

All sampling equipment was calibrated according to the procedures outlined in EPA Reference Method 5/26A.

APPENDIX A

METHOD 1

SAMPLE AND VELOCITY TRAVERSES
FOR STATIONARY SOURCES

THE ALMEGA CORPORATION

1. *Principle and Applicability*

1.1 Principle. To aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. A traverse point is then located within each of these equal areas.

1.2 Applicability. This method is applicable to flowing gas streams in ducts, stacks, and flues. The method cannot be used when: (1) flow is cyclonic or swirling (see Section 2.4), (2) a stack is smaller than about 0.30 meter (12 in.) in diameter, or 0.071 m^2 (113 $in.^2$) cross-sectional area, or (3) the measurement site is less than two stack or duct diameters downstream or less than a half diameter upstream from a flow disturbance.

The requirements of this method must be considered before construction of a new facility from which emissions will be measured; failure to do so may require subsequent alterations to the stack or deviation from the standard procedure. Cases involving variants are subject to approval by the Administrator, U.S. Environmental Protection Agency.

2. *Procedure*

2.1 Selection of Measurement Site. Sampling or velocity measurement is performed at a site located at least eight stack or duct diameters downstream and two diameters upstream from any flow disturbance such as a bend, expansion, or contraction in the stack, or from a visible flame. If necessary, an alternative location may be selected, at a position at least two stack or duct diameters downstream and a half diameter upstream from any flow disturbance. For a rectangular cross section, an equivalent diameter (D_e) shall be calculated from the following equation, to determine the upstream and downstream distances:

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

where L = length and W = width.

An alternative procedure is available for determining the acceptability of a measurement location not meeting the criteria above. This procedure, determination of gas flow angles at the sampling points and comparing the results with acceptability criteria, is described in Section 2.5.

2.2 Determining the Number of Traverse Points.

2.2.1 Particulate Traverses. When the eight- and two-diameter criterion can be met, the minimum number of traverse points shall be: (1) twelve, for circular or rectangular stacks with diameters (or equivalent diameters) greater than 0.61 meter (24 in.); (2) eight, for circular stacks with diameters between 0.30 and 0.61 meter (12-24 in.); (3) nine, for rectangular stacks with equivalent diameters between 0.30 and 0.61 meter (12-24 in.).

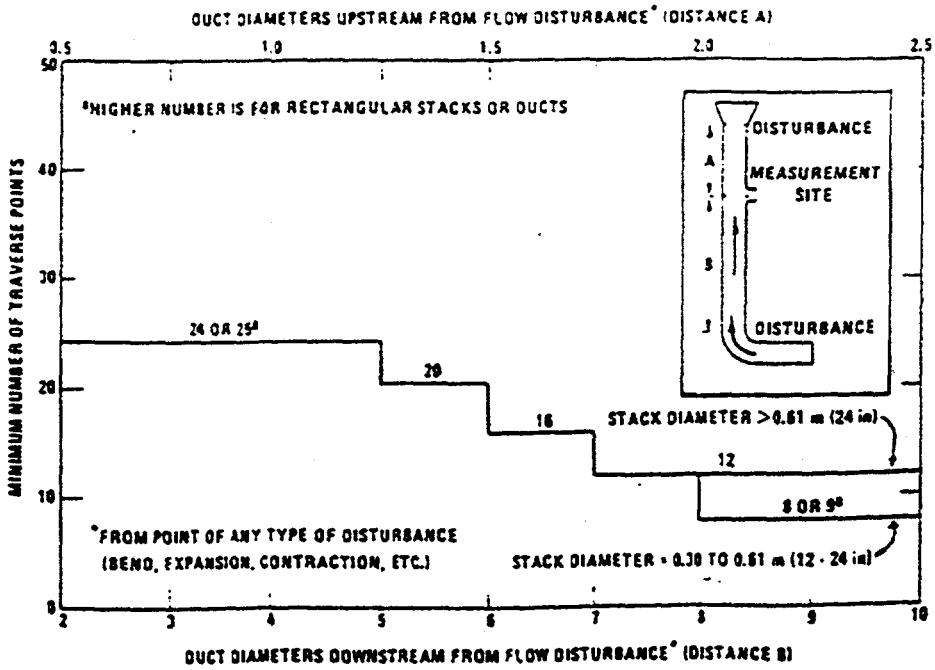


Figure 1-1. Minimum number of traverse points for particulate traverses.

When the eight- and two-diameter criterion cannot be met, the minimum number of traverse points is determined from Figure 1-1. Before referring to the figure, however, determine the distances from the chosen measurement site to the nearest upstream and downstream disturbances, and divide each distance by the stack diameter or equivalent diameter, to determine the distance in terms of the number of duct diameters. Then, determine from Figure 1-1 the minimum number of traverse points that corresponds: (1) to the number of duct diameters upstream; and (2) to the number of diameters downstream. Select the higher of the two minimum numbers of traverse points, or a greater value, so that for circular stacks the number is a multiple of 4, and for rectangular stacks, the number is one of those shown in Table 1-1.

TABLE 1-1. CROSS-SECTION LAYOUT FOR RECTANGULAR STACKS

Number of traverse points	Matrix layout
9	3x3
12	4x3
16	4x4
20	5x4
25	5x5
30	6x5
36	6x6
42	7x6
49	7x7

2.2.2 Velocity (Non-Particulate) Traverses. When velocity or volumetric flow rate is to be determined (but not particulate matter), the same procedure as that for particulate traverses (Section 2.2.1) is followed, except that Figure 1-2 may be used instead of Figure 1-1.

2.3 Cross-sectional Layout and Location of Traverse Points.

2.3.1 Circular Stacks. Locate the traverse points on two perpendicular diameters according to Table 1-2 and the example shown in Figure 1-3. Any equation (for examples, see Citations 2 and 3 in the Bibliography) that gives the same values as those in Table 1-2 may be used in lieu of Table 1-2.

For particulate traverses, one of the diameters must be in a plane containing the greatest expected concentration variation, e.g., after bends, one diameter shall be in the plane of the bend. This requirement becomes less critical as the distance from the disturbance increases; therefore, other diameter locations may be used, subject to approval of the Administrator.

In addition for stacks having diameters greater than 0.61 m (24 in.) no traverse points shall be located within 2.5 centimeters (1.00 in.) of the stack walls; and for stack diameters equal to or less than 0.61 m (24 in.), no traverse points shall be located within 1.3 cm (0.50 in.) of the stack walls. To meet these criteria, observe the procedures given below.

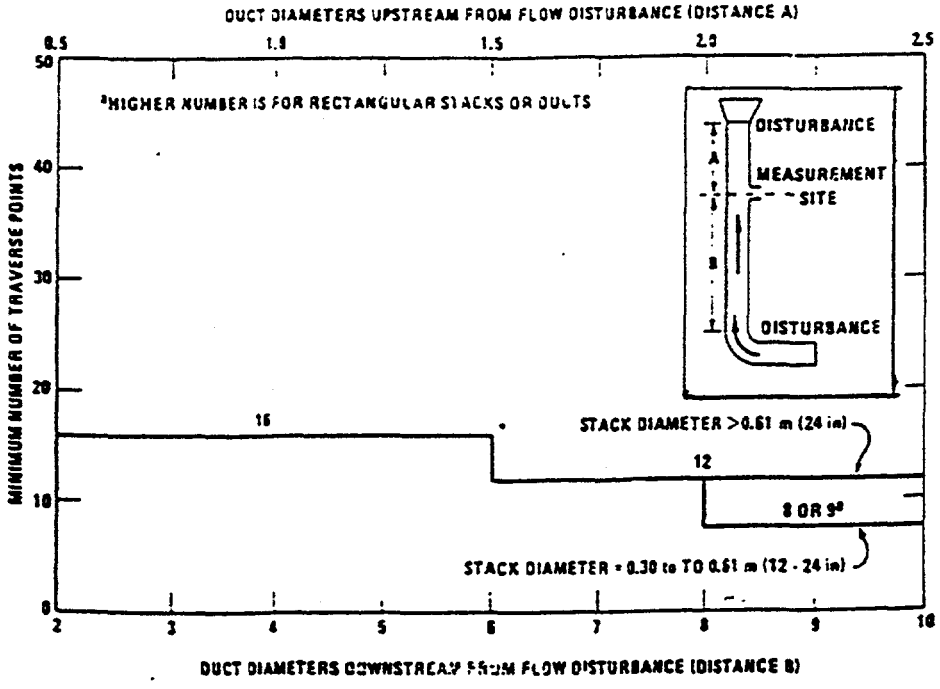


Figure 1-2. Minimum number of traverse points for velocity (nonparticulate) traverses.

2.3.1.1 Stacks With Diameters Greater Than 0.61 m (24 in.). When any of the traverse points as located in Section 2.3.1 fall within 2.5 cm (1.00 in.) of the stack walls, relocate them away from the stack walls to: (1) a distance of 2.5 cm (1.00 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger. These relocated traverse points (on each end of a diameter) shall be the "adjusted" traverse points.

Whenever two successive traverse points are combined to form a single adjusted traverse point, treat the adjusted point as two separate traverse points, both in the sampling (or velocity measurement) procedure, and in recording the data.

2.3.1.2 Stacks With Diameters Equal to or Less Than 0.61 m (24 in.). Follow the procedure in Section 2.3.1.1, noting only that any "adjusted" points should be relocated away from the stack walls to: (1) a distance of 1.3 cm (0.50 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger.

2.3.2 Rectangular Stacks. Determine the number of traverse points as explained in Sections 2.1 and 2.2 of this method. From Table 1-1, determine the grid configuration. Divide the stack cross-section into as many equal rectangular elemental areas as traverse points, and then locate a traverse point at the centroid of each equal area according to the example in Figure 1-4.

If the tester desires to use more than the minimum number of traverse points, expand the "minimum number of traverse points" matrix (see Table 1-1) by adding the extra traverse points along one or the other or both legs of the matrix; the final matrix need not be balanced. For example, if a 4x3 "minimum number of points" matrix were expanded to 36 points, the final matrix could be 9x4 or 12x3, and would not necessarily have to be 6x6. After constructing the

TRAVERSE POINT	DISTANCE, % of diameter
1	4.4
2	14.6
3	29.6
4	70.4
5	85.4
6	95.6

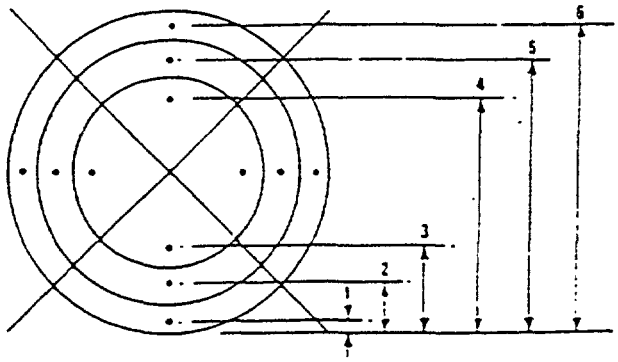


Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

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

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

Traverse point number on a diameter	Number of traverse points on a diameter—											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.0	89.5
21											96.5	92.1
22											98.9	94.5
23												96.8
24												98.9

final matrix, divide the stack cross-section into as many equal rectangular, elemental areas as traverse points, and locate a traverse point at the centroid of each equal area.

The situation of traverse points being too close to the stack walls is not expected to arise with rectangular stacks. If this problem should ever arise, the Administrator must be contacted for resolution of the matter.

2.4 Verification of Absence of Cyclonic Flow. In most stationary sources, the direction of stack gas flow is essentially parallel to the stack walls. However, cyclonic flow may exist (1) after such devices as cyclones and inertial demisters following venturi scrubbers, or (2) in stacks having tangential inlets or other duct configurations which tend to induce swirling; in these instances, the presence or absence of cyclonic flow at the sampling location must be determined. The following techniques are acceptable for this determination.

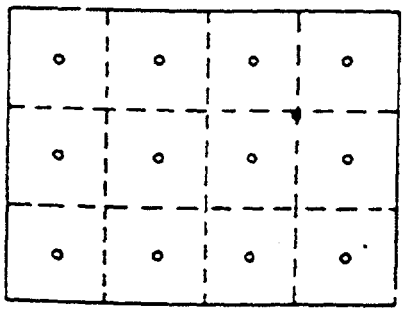


Figure 1 4. Example showing rectangular stack cross section divided into 12 equal areas, with a traverse point at centroid of each area.

Level and zero the manometer. Connect a Type S pitot tube to the manometer. Position the Type S pitot tube at each traverse point, in succession, so that the planes of the face openings of the pitot tube are perpendicular to the stack cross-sectional plane; when the Type S pitot tube is in this position, it is at "0° reference." Note the differential pressure (Δp) reading at each traverse point. If a null (zero) pitot reading is obtained at 0° reference at a given traverse point, an acceptable flow condition exists at that point. If the pitot reading is not zero at 0° reference, rotate the pitot tube (up to ±90° yaw angle), until a null reading is obtained. Carefully determine and record the value of the rotation angle (α) to the nearest degree. After the null technique has been applied at each traverse point, calculate the average of the absolute values of α; assign α values of 0° to those points for which no rotation was required, and include these in the overall average. If the average value of α is greater than 20°, the overall flow condition in the stack is unacceptable and alternative methodology, subject to the approval of the Administrator, must be used to perform accurate sample and velocity traverses.

The alternative procedure described in Section 2.5 may be used to determine the rotation angles in lieu of the procedure described above.

2.5 Alternative Measurement Site Selection Procedure. This alternative applies to sources where measurement locations are less than 2 equivalent stack or duct diameters downstream or less than ½ duct diameter upstream from a flow disturbance. The alternative should be limited to ducts larger than 24 in. in diameter where blockage and wall effects are minimal. A directional flow-sensing probe is used to measure pitch and yaw angles of the gas flow at 40 or more traverse points; the resultant angle is calculated and compared with acceptable criteria for mean and standard deviation.

NOTE: Both the pitch and yaw angles are measured from a line passing through the traverse point and parallel to the stack axis. The pitch angle is the angle of the gas flow component in the plane that INCLUDES the traverse line and is parallel to the stack axis. The yaw angle is the angle of the gas flow component in the plane PERPENDICULAR to the traverse line at the traverse point and is measured from the line passing through the traverse point and parallel to the stack axis.

2.5.1 Apparatus.

2.5.1.1 Directional Probe. Any directional probe, such as United Sensor Type DA Three-Dimensional Directional Probe, capable of measuring both the pitch and yaw angles of gas flows is acceptable. (NOTE: Mention of trade name or specific products does not constitute endorsement by the U.S. Environmental Protection Agency.) Assign an identification number to the directional probe, and permanently mark or engrave the number on the body of the probe. The pressure holes of directional probes are susceptible to plugging when used in particulate-laden gas streams. Therefore, a system for cleaning the pressure holes by "back-purging" with pressurized air is required.

2.5.1.2 Differential Pressure Gauges. Inclined manometers, U-tube manometers, or other differential pressure gauges (e.g., magnehelic gauges) that meet the specifications described in Method 2, § 2.2.

NOTE: If the differential pressure gauge produces both negative and positive readings, then both negative and positive pressure readings shall be calibrated at a minimum of three points as specified in Method 2, § 2.2.

2.5.2 Traverse Points. Use a minimum of 40 traverse points for circular ducts and 42 points for rectangular ducts for the gas flow

angle determinations. Follow § 2.3 and Table 1-1 or 1-2 for the location and layout of the traverse points. If the measurement location is determined to be acceptable according to the criteria in this alternative procedure, use the same traverse point number and locations for sampling and velocity measurements.

2.5.3 Measurement Procedure.

2.5.3.1 Prepare the directional probe and differential pressure gauges as recommended by the manufacturer. Capillary tubing or surge tanks may be used to dampen pressure fluctuations. It is recommended, but not required, that a pretest leak check be conducted. To perform a leak check, pressurize or use suction on the impact opening until a reading of at least 7.6 cm (3 in.) H_2O registers on the differential pressure gauge, then plug the impact opening. The pressure of a leak-free system will remain stable for at least 15 seconds.

2.5.3.2 Level and zero the manometers. Since the manometer level and zero may drift because of vibrations and temperature changes, periodically check the level and zero during the traverse.

2.5.3.3 Position the probe at the appropriate locations in the gas stream, and rotate until zero deflection is indicated for the yaw angle pressure gauge. Determine and record the yaw angle. Record the pressure gauge readings for the pitch angle, and determine the pitch angle from the calibration curve. Repeat this procedure for each traverse point. Complete a "back-purge" of the pressure lines and the impact openings prior to measurements of each traverse point.

A post-test check as described in § 2.5.3.1 is required. If the criteria for a leak-free system are not met, repair the equipment, and repeat the flow angle measurements.

2.5.4 Calculate the resultant angle at each traverse point, the average resultant angle, and the standard deviation using the following equations. Complete the calculations retaining at least one extra significant figure beyond that of the acquired data. Round the values after the final calculations.

2.5.4.1 Calculate the resultant angle at each traverse point:

$R_i = \text{arc cosine } [(\text{cosine } Y_i)(\text{cosine } P_i)]$

Eq. 1-2

Where:

R_i = Resultant angle at traverse point i, degree.

Y_i = Yaw angle at traverse point i, degree.

P_i = Pitch angle at traverse point i, degree.

2.5.4.2 Calculate the average resultant for the measurements:

$$\bar{R} = \frac{\Sigma R_i}{n}$$

Eq. 1-3

Where:

$\bar{R}$ = Average resultant angle, degree.

n = Total number of traverse points.

2.5.4.3 Calculate the standard deviations:

$$S_d = \sqrt{\frac{\sum_{i=1}^{n} (R_i - \bar{R})^2}{(n-1)}}$$

Eq. 1-4

Where:

S_d = Standard deviation, degree.

2.5.5 The measurement location is acceptable if $\bar{R} < 20°$ and $S_d < 10°$.

2.5.6 Calibration. Use a flow system as described in Sections 4.1.2.1 and 4.1.2.2 of Method 2. In addition, the flow system shall have the capacity to generate two test-section velocities: one between 365 and 730 m/min (1200 and 2400 ft/min) and one between 730 and 1100 m/min (2400 and 3600 ft/min).

2.5.6.1 Cut two entry ports in the test section. The axes through the entry ports shall be perpendicular to each other and intersect in the centroid of the test section. The ports should be elongated slots parallel to the axis of the test section and of sufficient length to allow measurement of pitch angles while maintaining the pitot head position at the test-section centroid. To facilitate alignment of the directional probe during calibration, the test section should be constructed of plexiglass or some other transparent material. All calibration measurements should be made at the same point in the test section, preferably at the centroid of the test-section.

2.5.6.2 To ensure that the gas flow is parallel to the central axis of the test section, follow the procedure in Section 2.4 for cyclonic flow determination to measure the gas flow angles at the centroid of the test section from two test ports located 90° apart. The gas flow angle measured in each port must be ±2° of 0°. Straightening vanes should be installed, if necessary, to meet this criterion.

2.5.6.3 Pitch Angle Calibration. Perform a calibration traverse according to the manufacturer's recommended protocol in 5° increments for angles from −60° to +60° at one velocity in each of the two ranges specified above. Average the pressure ratio values obtained for each angle in the two

flow ranges, and plot a calibration curve with the average values of the pressure ratio (or other suitable measurement factor as recommended by the manufacturer) versus the pitch angle. Draw a smooth line through the data points. Plot also the data values for each traverse point. Determine the differences between the measured data values and the angle from the calibration curve at the same pressure ratio. The difference at each comparison must be within 2° for angles between 0° and 40° and within 3° for angles between 40° and 60°.

2.5.6.4 Yaw Angle Calibration. Mark the three-dimensional probe to allow the determination of the yaw position of the probe. This is usually a line extending the length of the probe and aligned with the impact opening. To determine the accuracy of measurements of the yaw angle, only the zero or null position need be calibrated as follows. Place the directional probe in the test section, and rotate the probe until the zero position is found. With a protractor or other angle measuring device, measure the angle indicated by the yaw angle indicator on the three-dimensional probe. This should be within 2° of 0°. Repeat this measurement for any other points along the length of the pitot where yaw angle measurements could be read in order to account for variations in the pitot markings used to indicate pitot head positions.

3. *Bibliography*

1. Determining Dust Concentration in a Gas Stream. ASME. Performance Test Code No. 27. New York. 1957.

2. Devorkin, Howard, et al. Air Pollution Source Testing Manual. Air Pollution Control District. Los Angeles. CA November 1963.

3. Methods for Determination of Velocity, Volume, Dust and Mist Content of Gases. Western Precipitation Division of Joy Manufacturing Co. Los Angeles. CA. Bulletin WP-50. 1968.

4. Standard Method for Sampling Stacks for Particulate Matter. In: 1971 Book of ASTM Standards, Part 23. ASTM Designation D-2928-71. Philadelphia, PA 1971.

5. Hanson, H. A., et al. Particulate Sampling Strategies for Large Power Plants Including Nonuniform Flow. USEPA. ORD. ESRL. Research Triangle Park. NC. EPA-600/2-76-170. June 1976.

6. Entropy Environmentalists, Inc. Determination of the Optimum Number of Sampling Points: An Analysis of Method 1 Criteria. Environmental Protection Agency. Research Triangle Park. NC. EPA Contract No. 68-01-3172. Task 7.

7. Hanson, H.A., R.J. Davini, J.K. Morgan, and A.A. Iversen. Particulate Sampling Strategies for Large Power Plants Including Nonuniform Flow. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. EPA-600/2-76-170. June 1976. 350 p.

8. Brooks, E.F., and R.L. Williams. Flow and Gas Sampling Manual. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. EPA-600/2-76-203. July 1976. 93 p.

9. Entropy Environmentalists, Inc. Traverse Point Study. EPA Contract No. 68-02-3172. June 1977. 19 p.

10. Brown, J. and K. Yu. Test Report: Particulate Sampling Strategy in Circular Ducts. Emission Measurement Branch, Emission Standards and Engineering Division. U.S. Environmental Protection Agency. Research Triangle Park, NC. 27711. July 31, 1980. 12 p.

11. Hawksley, P.G.W., S. Badzioch, and J.H. Blackett. Measurement of Solids in Flue Gases. Leatherhead, England. The British Coal Utilisation Research Association. 1961. p. 129-133.

12. Knapp, K.T. The Number of Sampling Points Needed for Representative Source Sampling. In: Proceedings of the Fourth National Conference on Energy and the Environment. Theodore, L., et al. (ed.). Dayton, Dayton Section of the American Institute of Chemical Engineers. October 3-7, 1976. p. 563-568.

13. Smith, W.S. and D.J. Grove. A Proposed Extension of EPA Method 1 Criteria. "Pollution Engineering." *XV* (8):36-37. August 1983.

14. Gerhart, P.M. and M.J. Dorsey. Investigation of Field Test Procedures for Large Fans. University of Akron. Akron, OH. (EPRI Contract CS-1651). Final Report (RP-1649-5) December 1980.

15. Smith, W.S. and D.J. Grove. A New Look at Isokinetic Sampling—Theory and Applications. "Source Evaluation Society Newsletter." *VIII* (3):19-24. August 1983.

APPENDIX B

METHOD 2

DETERMINATION OF STACK GAS
VELOCITY AND VOLUMETRIC FLOW RATE
(TYPE S PITOT TUBE)

THE ALMEGA CORPORATION

1. *Principle and Applicability*

1.1 Principle. The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube.

1.2 Applicability. This method is applicable for measurement of the average velocity of a gas stream and for quantifying gas flow.

This procedure is not applicable at measurement sites which fail to meet the criteria of Method 1, Section 2.1. Also, the method cannot be used for direct measurement in cyclonic or swirling gas streams; Section 2.4 of Method 1 shows how to determine cyclonic or swirling flow conditions. When unacceptable conditions exist, alternative procedures, subject to the approval of the Administrator, U.S. Environmental Protection Agency, must be employed to make accurate flow rate determinations; examples of such alternative procedures are: (1) to install straightening vanes; (2) to calculate the total volumetric flow rate stoichiometrically, or (3) to move to another measurement site at which the flow is acceptable.

2. *Apparatus*

Specifications for the apparatus are given below. Any other apparatus that has been demonstrated (subject to approval of the Administrator) to be capable of meeting the specifications will be considered acceptable.

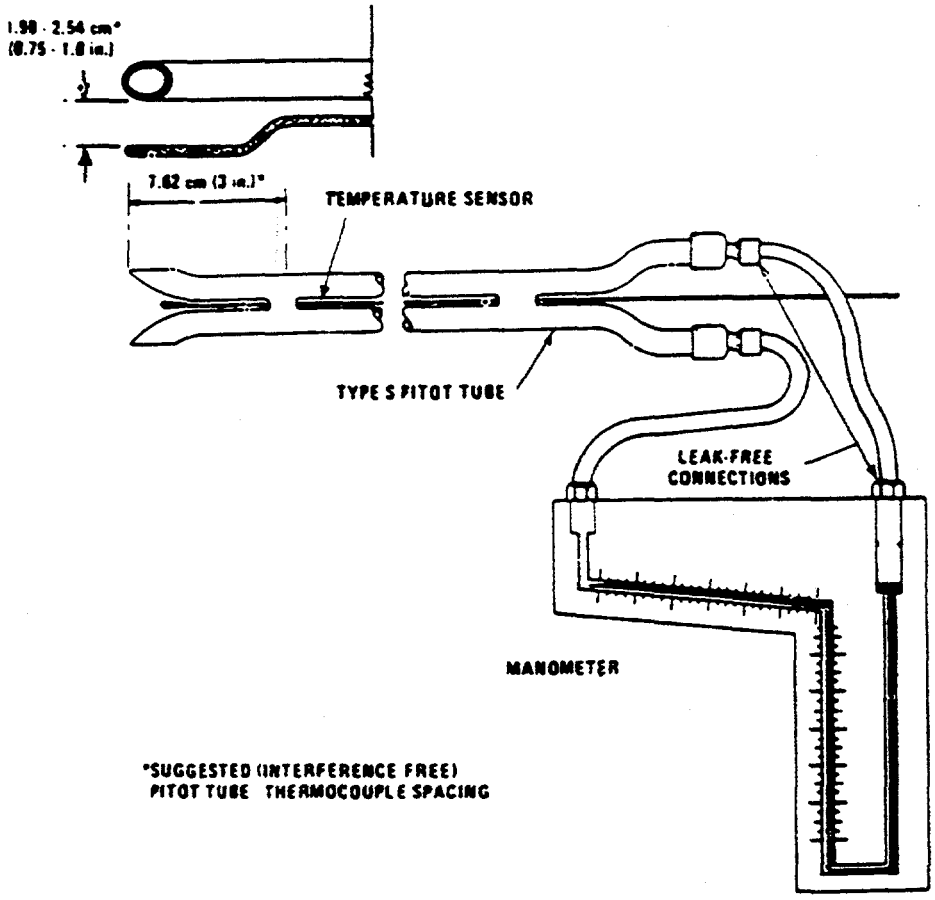


Figure 2 1 Type S pitot tube manometer assembly.

2.1 Type S Pitot Tube. The Type S pitot tube (Figure 2-1) shall be made of metal tubing (e.g., stainless steel). It is recommended that the external tubing diameter (dimension D_t, Figure 2-2b) be between 0.48 and 0.95 centimeter ($^3/_{16}$ and $^3/_8$ inch). There shall be an equal distance from the base of each leg of the pitot tube to its face-opening plane (dimensions P_A and P_B, Figure 2-2b); it is recommended that this distance be between 1.05 and 1.50 times the external tubing diameter. The face openings of the pitot tube shall, preferably, be aligned as shown in Figure 2-2; however, slight misalignments of the openings are permissible (see Figure 2-3).

The Type S pitot tube shall have a known coefficient, determined as outlined in Section 4. An identification number shall be assigned to the pitot tube; this number shall be permanently marked or engraved on the body of the tube.

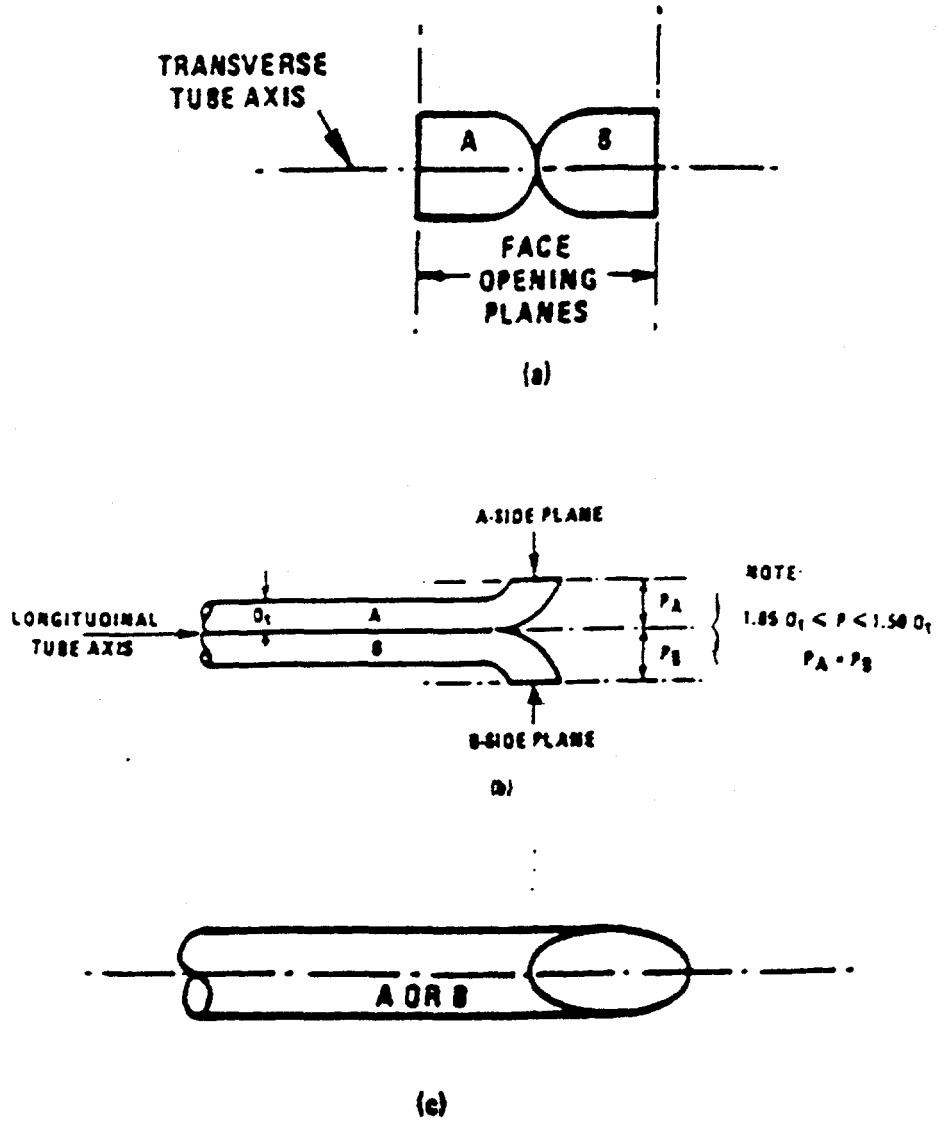


Figure 2-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis, (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

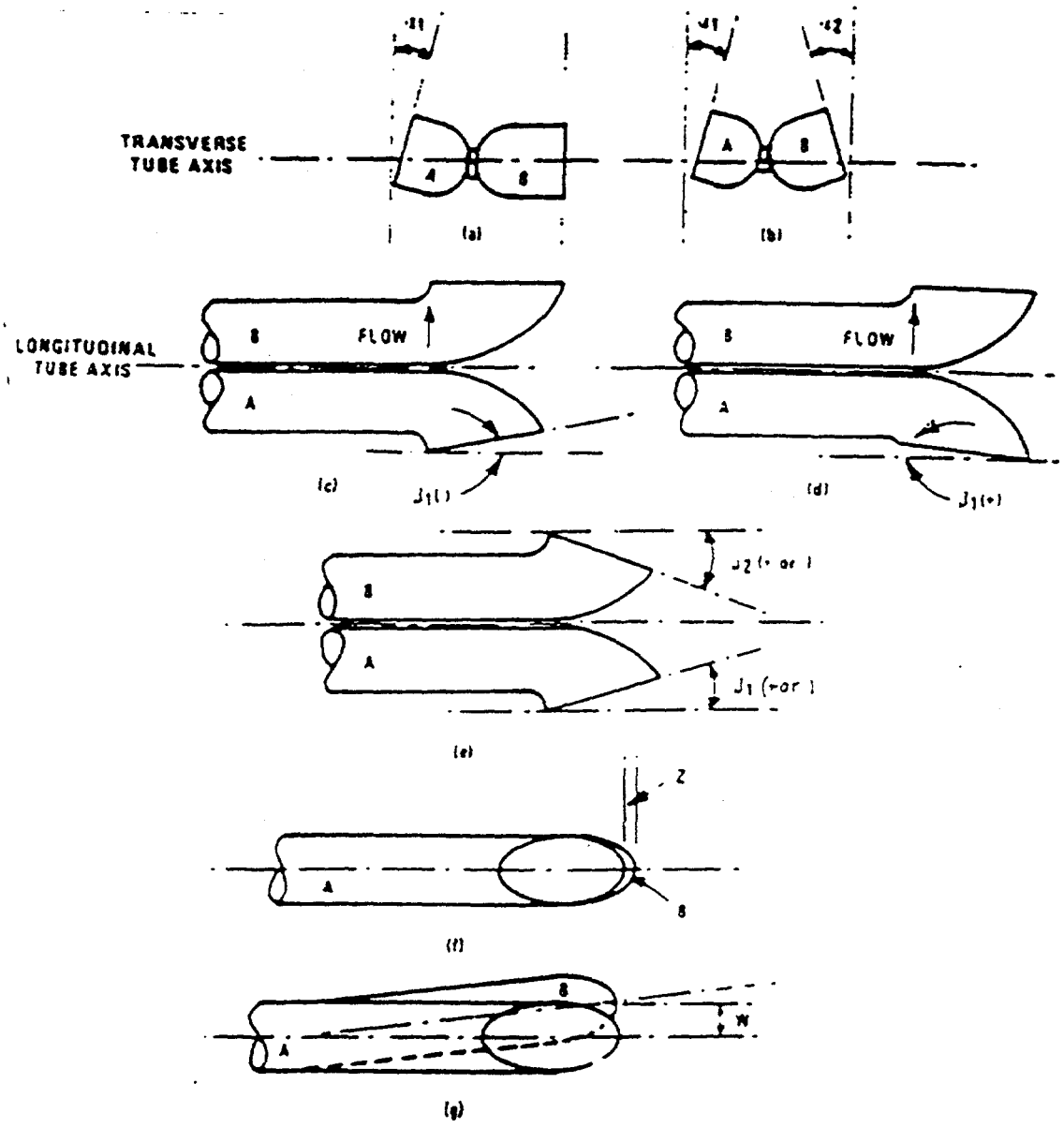


Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of Cp(s) so long as $\alpha 1$ and $\alpha 2 \leq 10°$, $\beta 1$ and $\beta 2 \leq 5°$, $z \leq 0.32$ cm (1/8 in.) and $w \leq 0.08$ cm (1/32 in.) (citation 11 in Section 6).

A standard pitot tube may be used instead of a Type S, provided that it meets the specifications of Sections 2.7 and 4.2; note, however, that the static and impact pressure holes of standard pitot tubes are susceptible to plugging in particulate-laden gas streams. Therefore, whenever a standard pitot tube is used to perform a traverse, adequate proof must be furnished that the openings of the pitot tube have not plugged up during the traverse period: this can be done by taking a velocity head (Δp) reading at the final traverse point, cleaning out the impact and static holes of the standard pitot tube by "back-purging" with pressurized air, and then taking another Δp reading. If the Δp readings made before and after the air purge are the same (± 5 percent), the traverse is acceptable. Otherwise, reject the run. Note that if Δp at the final traverse point is unsuitably low, another point may be selected. If "back-purging" at regular intervals is part of the procedure, then comparative Δp readings shall be taken, as above, for the last two back purges at which suitably high Δp readings are observed.

2.2 Differential Pressure Gauge. An inclined manometer or equivalent device is used. Most sampling trains are equipped with a 10-in. (water column) inclined-vertical manometer, having 0.01-in. H_2O divisions on the 0-to 1-in. inclined scale, and 0.1-in. H_2O divisions on the 1- to 10-in. vertical scale. This type of manometer (or other gauge of equivalent sensitivity) is satisfactory for the measurement of Δp values as low as 1.3 mm (0.05 in.) H_2O. However, a differential pressure gauge of greater sensitivity shall be used (subject to the approval of the Administrator), if any of the following is found to be true: (1) the arithmetic average of all Δp readings at the traverse points in the stack is less than 1.3 mm (0.05 in.) H_2O; (2) for traverses of 12 or more points, more than 10 percent of the individual Δp readings are below 1.3 mm (0.05 in.) H_2O; (3) for traverses of fewer than 12 points, more than one Δp reading is below 1.3 mm (0.05 in.) H_2O. Citation 18 in Section 6 describes commercially available instrumentation for the measurement of low-range gas velocities.

As an alternative to criteria (1) through (3) above, the following calculation may be performed to determine the necessity of using a more sensitive differential pressure gauge:

$$T = \frac{\sum_{i=1}^{n} \sqrt{\Delta p_i} \div K}{\sum_{i=1}^{n} \sqrt{\Delta p_i}}$$

Where:

Δp_i = Individual velocity head reading at a traverse point, mm H_2O (in. H_2O).

n = Total number of traverse points.

K = 0.13 mm H_2O when metric units are used and 0.005 in. H_2O when English units are used.

If T is greater than 1.05, the velocity head data are unacceptable and a more sensitive differential pressure gauge must be used.

NOTE: If differential pressure gauges other than inclined manometers are used (e.g., magnehelic gauges), their calibration must be checked after each test series. To check the calibration of a differential pressure gauge, compare Δp readings of the gauge with those of a gauge-oil manometer at a minimum of three points, approximately representing the range of Δp values in the stack. If, at each point, the values of Δp as read by the differential pressure gauge and gauge-oil manometer agree to within 5 percent, the differential pressure gauge shall be considered to be in proper calibration. Otherwise, the test series shall either be voided, or procedures to adjust the measured Δp values and final results shall be used subject to the approval of the Administrator.

2.3 Temperature Gauge. A thermocouple, liquid-filled bulb thermometer, bimetallic thermometer, mercury-in-glass thermometer, or other gauge, capable of measuring temperature to within 1.5 percent of the minimum absolute stack temperature shall be used. The temperature gauge shall be attached to the pitot tube such that the sensor tip does not touch any metal; the gauge shall be in an interference-free arrangement with respect to the pitot tube face openings (see Figure 2-1 and also Figure 2-7 in Section 4). Alternate positions may be used if the pitot tube-temperature gauge system is calibrated according to the procedure of Section 4. Provided that a difference of not more than 1 percent in the average velocity measurement is introduced, the temperature gauge need not be attached to the pitot tube; this alternative is subject to the approval of the Administrator.

2.4 Pressure Probe and Gauge. A piezometer tube and mercury- or water-filled U-tube manometer capable of measuring stack pressure to within 2.5 mm (0.1 in.) Hg is used. The static tap of a standard type pitot tube or one leg of a Type S pitot tube with the face opening planes positioned parallel to the gas flow may also be used as the pressure probe.

2.5 Barometer. A mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg) may be used. In many cases, the barometric reading may be obtained from a nearby National Weather Service station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and the sampling point shall be applied at a rate of minus 2.5 mm (0.1 in.) Hg per 30-meter (100 foot) elevation increase or vice-versa for elevation decrease.

2.6 Gas Density Determination Equipment. Method 3 equipment, if needed (see Section 3.6), to determine the stack gas dry molecular weight, and Reference Method 4 or Method 5 equipment for moisture content determination; other methods may be used subject to approval of the Administrator.

2.7 Calibration Pilot Tube. When calibration of the Type S pitot tube is necessary (see Section 4), a standard pitot tube is used as a reference. The standard pitot tube shall, preferably, have a known coefficient, obtained either (1) directly from the National Bureau of Standards, Route 270, Quince Orchard Road, Gaithersburg, Maryland, or (2) by calibration against another standard pitot tube with an NBS-traceable coefficient. Alternatively, a standard pitot tube

designed according to the criteria given in 2.7.1 through 2.7.5 below and illustrated in Figure 2-4 (see also Citations 7, 8, and 17 in Section 6) may be used. Pitot tubes designed according to these specifications will have baseline coefficients of about 0.99 ±0.01.

2.7.1 Hemispherical (shown in Figure 2-4), ellipsoidal, or conical tip.

2.7.2 A minimum of six diameters straight run (based upon *D*, the external diameter of the tube) between the tip and the static pressure holes.

2.7.3 A minimum of eight diameters straight run between the static pressure holes and the centerline of the external tube, following the 90 degree bend.

2.7.4 Static pressure holes of equal size (approximately 0.1 *D*), equally spaced in a piezometer ring configuration.

2.7.5 Ninety degree bend, with curved or mitered junction.

2.8 Differential Pressure Gauge for Type S Pitot Tube Calibration. An inclined manometer or equivalent is used. If the single-velocity calibration technique is employed (see Section 4.1.2.3), the calibration differential pressure gauge shall be readable to the nearest 0.13 mm H_2O (0.005 in. H_2O). For multivelocity calibrations, the gauge shall be readable to the nearest 0.13 mm H_2O (0.005 in. H_2O) for Δp values between 1.3 and 25 mm H_2O (0.05 and 1.0 in. H_2O), and to the nearest 1.3 mm H_2O (0.05 in. H_2O) for Δp values above 25 mm H_2O (1.0 in. H_2O). A special, more sensitive gauge will be required to read Δp values below 1.3 mm H_2O [0.05 in. H_2O] (see Citation 18 in Section 6).

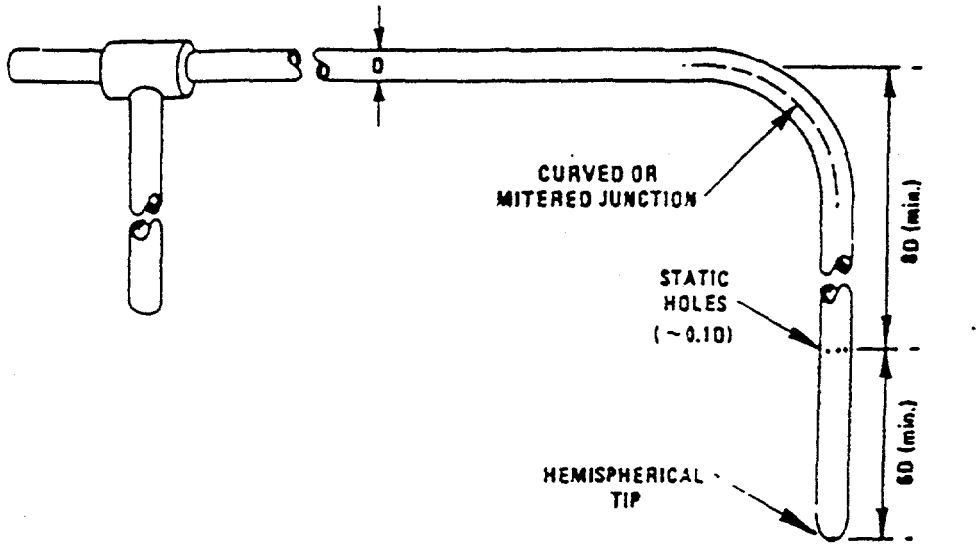


Figure 2-4. Standard pitot tube design specifications.

3. *Procedure*

3.1 Set up the apparatus as shown in Figure 2-1. Capillary tubing or surge tanks installed between the manometer and pitot tube may be used to dampen Δp fluctuations. It is recommended, but not required, that a pretest leak-check be conducted, as follows: (1) blow through the pitot impact opening until at least 7.6 cm (3 in.) H_2O velocity pressure registers on the manometer; then, close off the impact opening. The pressure shall remain stable for at least 15 seconds; (2) do the same for the static pressure side, except using suction to obtain the minimum of 7.6 cm (3 in.) H_2O. Other leak-check procedures, subject to the approval of the Administrator, may be used.

3.2 Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse. Record all necessary data as shown in the example data sheet (Figure 2-5).

3.3 Measure the velocity head and temperature at the traverse points specified by Method 1. Ensure that the proper differential pressure gauge is being used for the range of Δp values encountered (see Section 2.2). If it is necessary to change to a more sensitive gauge, do so, and remeasure the Δp and temperature readings at each traverse point. Conduct a post-test leak-check (mandatory), as described in Section 3.1 above, to validate the traverse run.

3.4 Measure the static pressure in the stack. One reading is usually adequate.

3.5 Determine the atmospheric pressure.

PLANT _____

DATE _____ RUN NO. _____

STACK DIAMETER OR DIMENSIONS, m(in.) _____

BAROMETRIC PRESSURE, mm Hg (in. Hg) _____

CROSS SECTIONAL AREA, $m^2(ft^2)$ _____

OPERATORS _____

PITOT TUBE I.D. NO. _____

AVG. COEFFICIENT, C_p = _____

LAST DATE CALIBRATED _____

SCHEMATIC OF STACK CROSS SECTION

Traverse Pt. No.	Vel. Hd., Δp mm (in.) H_2O	Stack Temperature		P_g mm Hg (in. Hg)	$\sqrt{\Delta p}$
		t_s, °C (°F)	T_s, °K (°R)		

3.6 Determine the stack gas dry molecular weight. For combustion processes or processes that emit essentially CO_2, O_2, CO, and N_2, use Method 3. For processes emitting essentially air, an analysis need not be conducted; use a dry molecular weight of 29.0. For other processes, other methods, subject to the approval of the Administrator, must be used.

3.7 Obtain the moisture content from Reference Method 4 (or equivalent) or from Method 5.

3.8 Determine the cross-sectional area of the stack or duct at the sampling location. Whenever possible, physically measure the stack dimensions rather than using blueprints.

4. *Calibration*

4.1 Type S Pitot Tube. Before its initial use, carefully examine the Type S pitot tube in top, side, and end views to verify that the face openings of the tube are aligned within the specifications illustrated in Figure 2-2 or 2-3. The pitot tube shall not be used if it fails to meet these alignment specifications.

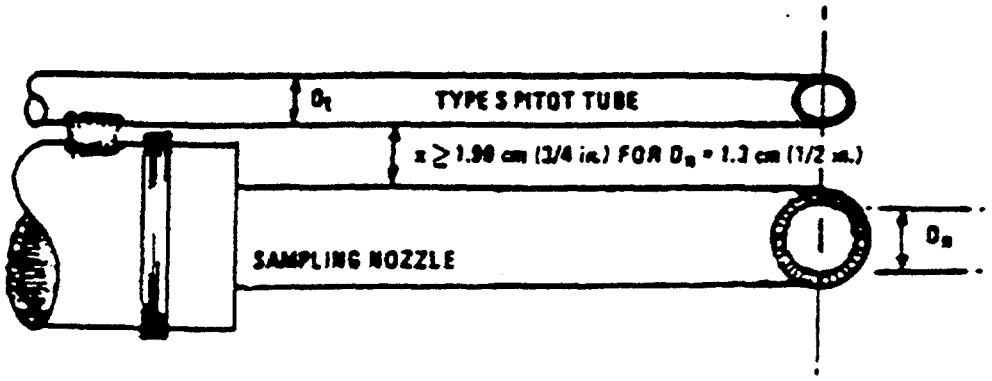
After verifying the face opening alignment, measure and record the following dimensions of the pitot tube: (a) the external tubing diameter (dimension D_t, Figure 2-2b); and (b) the base-to-opening plane distances (dimensions P_A and P_B, Figure 2-2b). If D_t is between 0.48 and 0.95 cm (3/16 and 3/8 in.) and if P_A and P_B are equal and between 1.05 and 1.50 D_t, there are two possible options: (1) the pitot tube may be calibrated according to the procedure outlined in Sections 4.1.2 through 4.1.5 below, or (2) a baseline (isolated tube) coefficient value of 0.84 may be assigned to the pitot tube. Note, however, that if the pitot tube is part of an assembly, calibration may still be required, despite knowledge of the baseline coefficient value (see Section 4.1.1).

If D_t, P_A, and P_B are outside the specified limits, the pitot tube must be calibrated as outlined in 4.1.2 through 4.1.5 below.

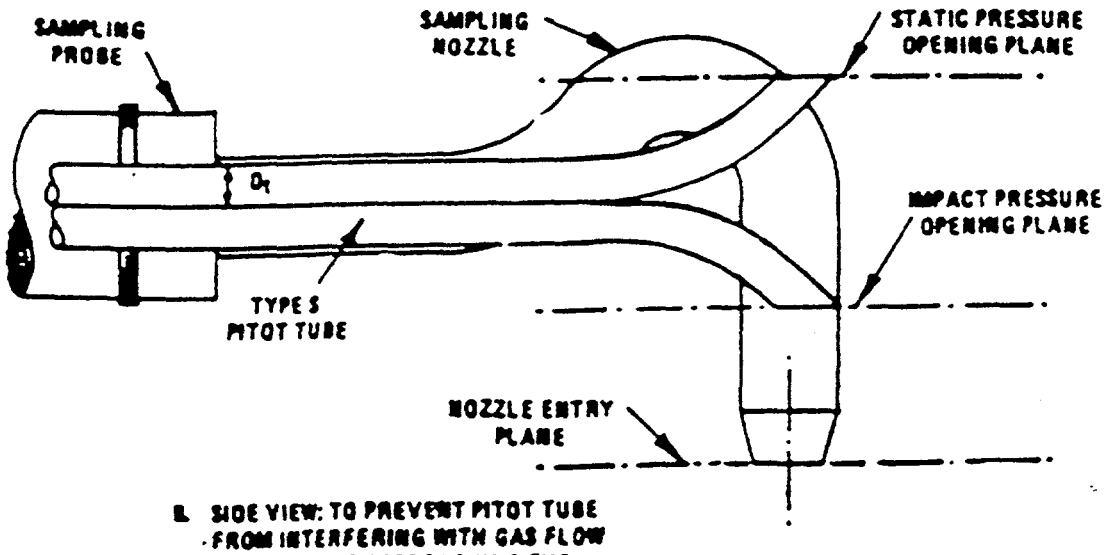
4.1.1 Type S Pitot Tube Assemblies. During sample and velocity traverses, the isolated Type S pitot tube is not always used; in many instances, the pitot tube is used in combination with other source-sampling components (thermocouple, sampling probe, nozzle) as part of an "assembly." The presence of other sampling components can sometimes affect the baseline value of the Type S pitot tube coefficient (Citation 9 in Section 6); therefore an assigned (or otherwise known) baseline coefficient value may or may not be valid for a given assembly. The baseline and assembly coefficient values will be identical only when the relative placement of the components in the assembly is such that aerodynamic interference effects are eliminated. Figures 2-6 through 2-8 illustrate interference-free component arrangements for Type S pitot tubes having external tubing diameters between 0.48 and 0.95 cm (3/16 and 3/8 in.). Type S pitot tube assemblies that fail to meet any or all of the specifications of Figures 2-6 through 2-8 shall be calibrated according to the procedure outlined in Sections 4.1.2 through 4.1.5 below, and prior to calibration, the values of the intercomponent spacings (pitot-nozzle, pitot-thermocouple, pitot-probe sheath) shall be measured and recorded.

NOTE: Do not use any Type S pitot tube assembly which is constructed such that the impact pressure opening plane of the pitot tube is below the entry plane of the nozzle (see Figure 2-6b).

4.1.2 Calibration Setup. If the Type S pitot tube is to be calibrated, one leg of the tube shall be permanently marked A, and the other, B. Calibration shall be done in a flow system having the following essential design features:



A. BOTTOM VIEW: SHOWING MINIMUM PITOT-NOZZLE SEPARATION.



B. SIDE VIEW: TO PREVENT PITOT TUBE FROM INTERFERING WITH GAS FLOW STREAMLINES APPROACHING THE NOZZLE, THE IMPACT PRESSURE OPENING PLANE OF THE PITOT TUBE SHALL BE EVEN WITH OR ABOVE THE NOZZLE ENTRY PLANE.

Figure 2-6. Proper pitot tube-sampling nozzle configuration to prevent aerodynamic interference: buttonhook-type nozzle: centers of nozzle and pitot opening aligned: D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

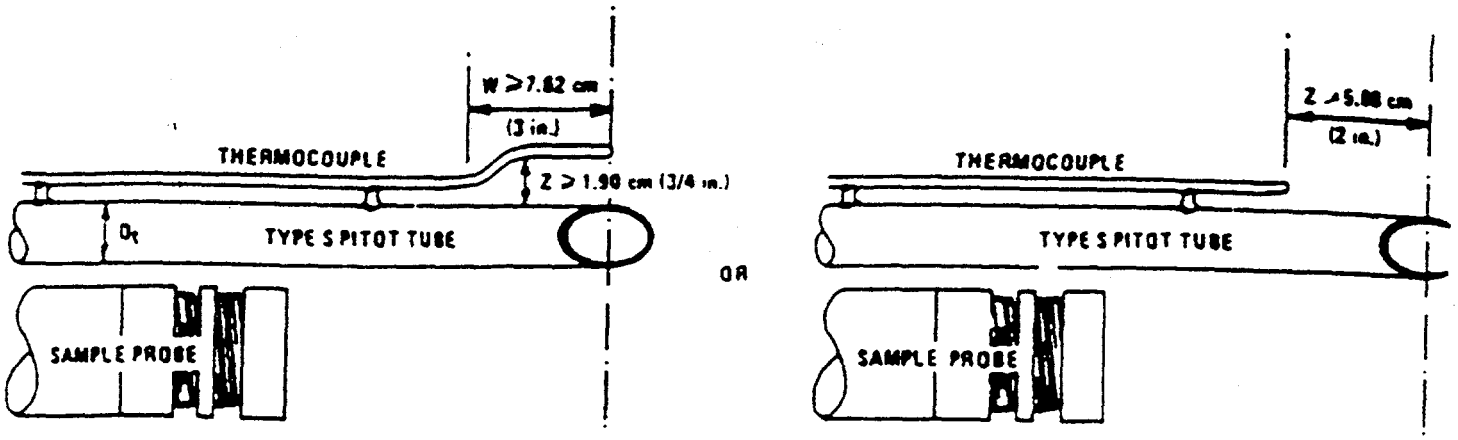


Figure 2 7 Proper thermocouple placement to prevent interference; D_t between 0 48 and 0.95 cm (3/16 and 3/8 in)

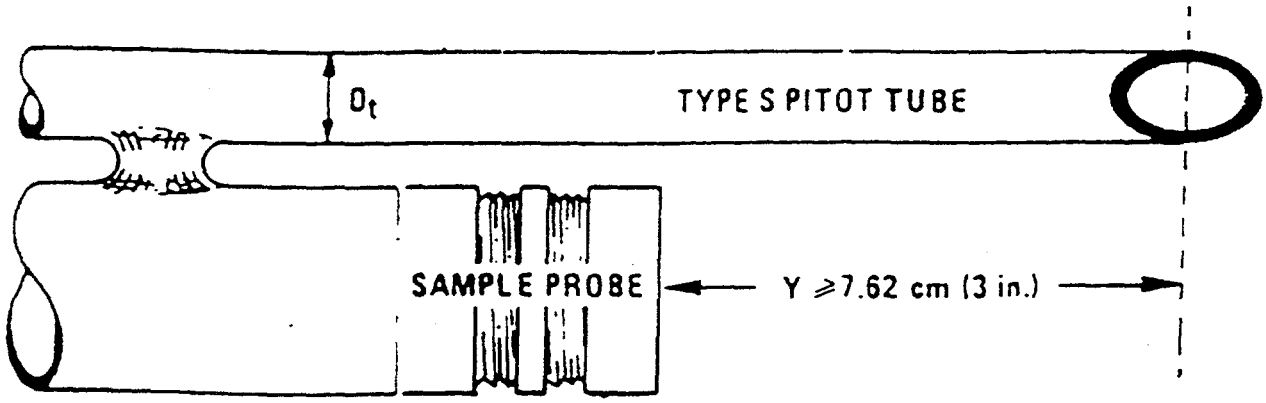


Figure 2-8. Minimum pitot-sample probe separation needed to prevent interference D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

4.1.2.1 The flowing gas stream must be confined to a duct of definite cross-sectional area, either circular or rectangular. For circular cross-sections, the minimum duct diameter shall be 30.5 cm (12 in.); for rectangular cross-sections, the width (shorter side) shall be at least 25.4 cm (10 in.).

4.1.2.2 The cross-sectional area of the calibration duct must be constant over a distance of 10 or more duct diameters. For a rectangular cross-section, use an equivalent diameter, calculated from the following equation, to determine the number of duct diameters:

$$D_e = \frac{2LW}{(L+W)} \qquad \text{Eq. 2-1}$$

Where:
D_e = Equivalent diameter
L = Length
W = Width

To ensure the presence of stable, fully developed flow patterns at the calibration site, or "test section," the site must be located at least eight diameters downstream and two diameters upstream from the nearest disturbances.

NOTE: The eight- and two-diameter criteria are not absolute; other test section locations may be used (subject to approval of the Administrator), provided that the flow at the test site is stable and demonstrably parallel to the duct axis.

4.1.2.3 The flow system shall have the capacity to generate a test-section velocity around 915 m/min (3,000 ft/min). This velocity must be constant with time to guarantee steady flow during calibration. Note that Type S pitot tube coefficients obtained by single-velocity calibration at 915 m/min (3,000 ft/min) will generally be valid to within ±3 percent for the measurement of velocities above 305 m/min (1,000 ft/min) and to within ±5 to 6 percent for the measurement of velocities between 180 and 305 m/min (600 and 1,000 ft/min). If a more precise correlation between C_p and velocity is desired, the flow system shall have the capacity to generate at least four distinct, time-invariant test-section velocities covering the velocity range from 180 to 1,525 m/min (600 to 5,000 ft/min), and calibration data shall be taken at regular velocity intervals over this range (see Citations 9 and 14 in Section 6 for details).

4.1.2.4 Two entry ports, one each for the standard and Type S pitot tubes, shall be cut in the test section; the standard pitot entry port shall be located slightly downstream of the Type S port, so that the standard and Type S impact openings will lie in the same cross-sectional plane during calibration. To facilitate alignment of the pitot tubes during calibration, it is advisable that the test section be constructed of plexiglas or some other transparent material.

4.1.3 Calibration Procedure. Note that this procedure is a general one and must not be used without first referring to the special considerations presented in Section 4.1.5. Note also that this procedure applies only to single-velocity calibration. To obtain calibration data for the A and B sides of the Type S pitot tube, proceed as follows:

4.1.3.1 Make sure that the manometer is properly filled and that the oil is free from contamination and is of the proper density. Inspect and leak-check all pitot lines; repair or replace if necessary.

4.1.3.2 Level and zero the manometer. Turn on the fan and allow the flow to stabilize. Seal the Type S entry port.

4.1.3.3 Ensure that the manometer is level and zeroed. Position the standard pitot tube at the calibration point (determined as outlined in Section 4.1.5.1), and align the tube so that its tip is pointed directly into the flow. Particular care should be taken in aligning the tube to avoid yaw and pitch angles. Make sure that the entry port surrounding the tube is properly sealed.

4.1.3.4 Read Δp_{std} and record its value in a data table similar to the one shown in Figure 2-9. Remove the standard pitot tube from the duct and disconnect it from the manometer. Seal the standard entry port.

4.1.3.5 Connect the Type S pitot tube to the manometer. Open the Type S entry port. Check the manometer level and zero. Insert and align the Type S pitot tube so that its A side impact opening is at the same point as was the standard pitot tube and is pointed directly into the flow. Make sure that the entry port surrounding the tube is properly sealed.

4.1.3.6 Read Δp_s and enter its value in the data table. Remove the Type S pitot tube from the duct and disconnect it from the manometer.

4.1.3.7 Repeat steps 4.1.3.3 through 4.1.3.6 above until three pairs of Δp readings have been obtained.

4.1.3.8 Repeat steps 4.1.3.3 through 4.1.3.7 above for the B side of the Type S pitot tube.

4.1.3.9 Perform calculations, as described in Section 4.1.4 below.

4.1.4 Calculations.

4.1.4.1 For each of the six pairs of Δp readings (i.e., three from side A and three from side B) obtained in Section 4.1.3 above, calculate the value of the Type S pitot tube coefficient as follows:

PITOT TUBE IDENTIFICATION NUMBER: _____ DATE: _____

CALIBRATED BY: _____

"A" SIDE CALIBRATION				
RUN NO.	Δp_{std} cm H_2O (in. H_2O)	$\Delta p_{(s)}$ cm H_2O (in. H_2O)	$C_{p(s)}$	DEVIATION $C_{p(s)} - \bar{C}_p(A)$
1				
2				
3				
		$\bar{C}_p$ (SIDE A)		

"B" SIDE CALIBRATION				
RUN NO.	Δp_{std} cm H_2O (in. H_2O)	$\Delta p_{(s)}$ cm H_2O (in. H_2O)	$C_{p(s)}$	DEVIATION $C_{p(s)} - \bar{C}_p(B)$
1				
2				
3				
		$\bar{C}_p$ (SIDE B)		

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

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

Figure 2-9. Pitot tube calibration data.

$$C_{p(std)} = C_{p(std)} \sqrt{\frac{\overline{\Delta p_{std}}}{\Delta p_s}}$$

Equation 2-2

Where:

$C_{p(std)}$ = Type S pitot tube coefficient

$C_{p(std)}$ = Standard pitot tube coefficient: use 0.99 if the coefficient is unknown and the tube is designed according to the criteria of Sections 2.7.1 to 2.7.5 of this method.

Δp_{std} = Velocity head measured by the standard pitot tube, cm H_2O (in. H_2O)

Δp_s = Velocity head measured by the Type S pitot tube, cm H_2O (in. H_2O)

4.1.4.2 Calculate $\bar{C}_p$ (side A), the mean A-side coefficient, and $\bar{C}_p$ (side B), the mean B-side coefficient; calculate the difference between these two average values.

4.1.4.3 Calculate the deviation of each of the three A-side values of $C_{p(s)}$ from $\bar{C}_p$ (side A), and the deviation of each B-side value of $C_{p(s)}$ from $\bar{C}_p$ (side B). Use the following equation:

$$\text{Deviation} = C_{p(s)} - \bar{C}_p(\text{A or B})$$

Equation 2-3

4.1.4.4 Calculate σ, the average deviation from the mean, for both the A and B sides of the pitot tube. Use the following equation:

$$\sigma\,(\text{side A or B}) = \frac{\sum_{1}^{3} \left| C_{p(s)} - \bar{C}_p(\text{A or B}) \right|}{3}$$

Equation 2-4

4.1.4.5 Use the Type S pitot tube only if the values of σ (side A) and σ (side B) are less than or equal to 0.01 and if the absolute value of the difference between $\bar{C}_p$ (A) and $\bar{C}_p$ (B) is 0.01 or less.

4.1.5 Special considerations.

4.1.5.1 Selection of calibration point.

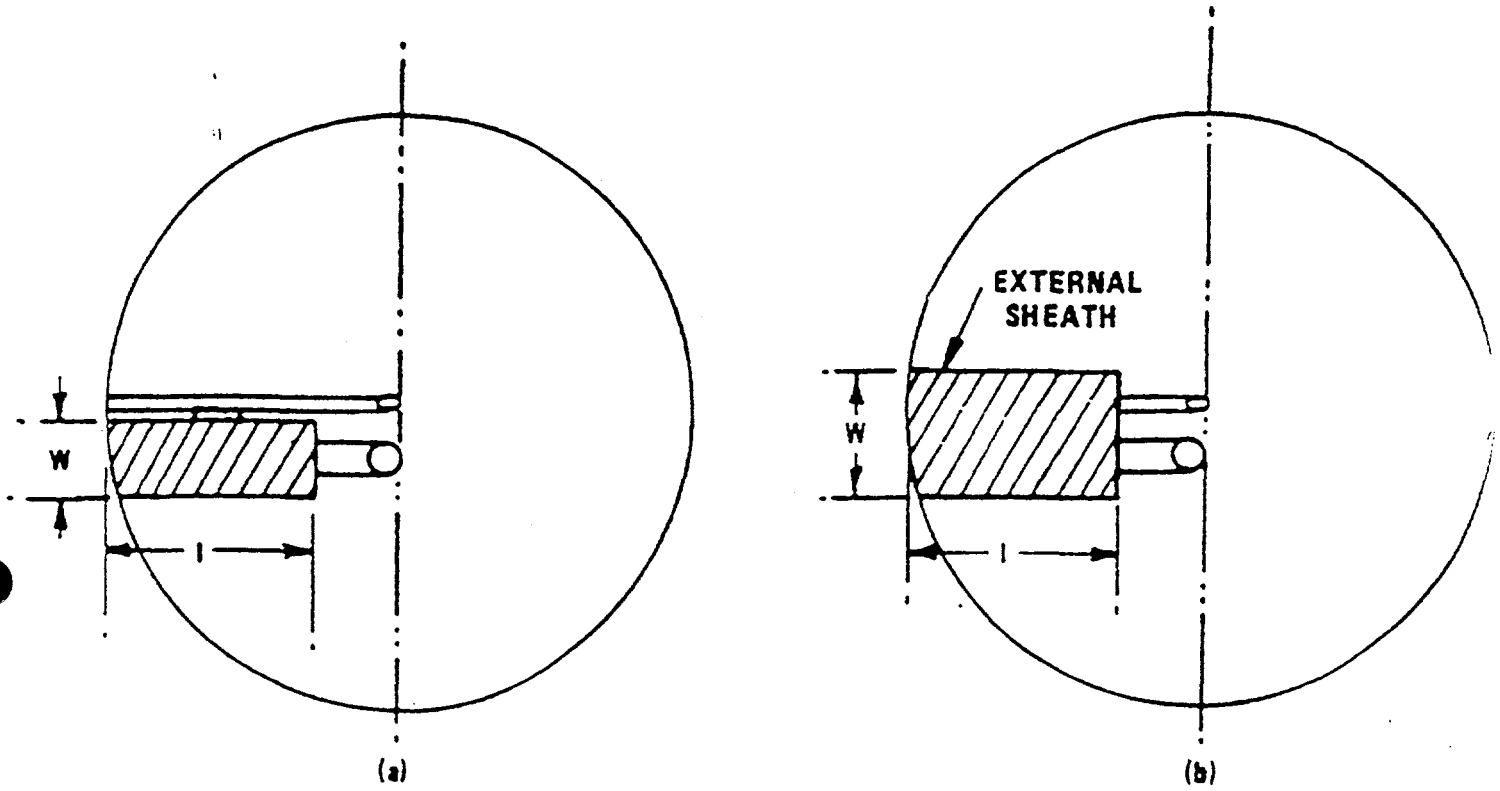
4.1.5.1.1 When an isolated Type S pitot tube is calibrated, select a calibration point at or near the center of the duct, and follow the procedures outlined in Sections 4.1.3 and 4.1.4 above. The Type S pitot coefficients so obtained, i.e., $\bar{C}_p$ (side A) and $\bar{C}_p$ (side B), will be valid, so long as either: (1) the isolated pitot tube is used; or (2) the pitot tube is used with other components (nozzle, thermocouple, sample probe) in an arrangement that is free from aerodynamic interference effects (see Figures 2-6 through 2-8).

4.1.5.1.2 For Type S pitot tube-thermocouple combinations (without sample probe), select a calibration point at or near the center of the duct, and follow the procedures outlined in Sections 4.1.3 and 4.1.4 above. The coefficients so obtained will be valid so long as the pitot tube-thermocouple combination is used by itself or with other components in an interference-free arrangement (Figures 2-6 and 2-8).

4.1.5.1.3 For assemblies with sample probes, the calibration point should be located at or near the center of the duct; however, insertion of a probe sheath into a small duct may cause significant cross-sectional area blockage and yield incorrect coefficient values (Citation 9 in Section 6). Therefore, to minimize the blockage effect, the calibration point may be a few inches off-center if necessary. The actual blockage effect will be negligible when the theoretical blockage, as determined by a projected-area model of the probe sheath, is 2 percent or less of the duct cross-sectional area for assemblies without external sheaths (Figure 2-10a), and 3 percent or less for assemblies with external sheaths (Figure 2-10b).

4.1.5.2 For those probe assemblies in which pitot tube-nozzle interference is a factor (i.e., those in which the pitot-nozzle separation distance fails to meet the specification illustrated in Figure 2-6a), the value of $C_{p(s)}$ depends upon the amount of free-space between the tube and nozzle, and therefore is a function of nozzle size. In these instances, separate calibrations shall be performed with each of the commonly used nozzle sizes in place. Note that the single-velocity calibration technique is acceptable for this purpose, even though the larger nozzle sizes (>0.635 cm or ¼ in.) are not ordinarily used for isokinetic sampling at velocities around 915 m/min (3,000 ft/min), which is the calibration velocity; note also that it is not necessary to draw an isokinetic sample during calibration (see Citation 19 in Section 6).

4.1.5.3 For a probe assembly constructed such that its pitot tube is always used in the same orientation, only one side of the pitot tube need be calibrated (the side which will face the flow). The pitot tube must still meet the alignment specifications of Figure 2-2 or 2-3, however, and must have an average deviation (σ) value of 0.01 or less (see Section 4.1.4.4).



$$\text{ESTIMATED SHEATH BLOCKAGE (\%)} = \left[\frac{l \times W}{\text{DUCT AREA}}\right] \times 100$$

Figure 2-10. Projected-area models for typical pitot tube assemblies.

4.1.6 Field Use and Recalibration.

4.1.6.1 Field Use.

4.1.6.1.1 When a Type S pitot tube (isolated tube or assembly) is used in the field, the appropriate coefficient value (whether assigned or obtained by calibration) shall be used to perform velocity calculations. For calibrated Type S pitot tubes, the A side coefficient shall be used when the A side of the tube faces the flow, and the B side coefficient shall be used when the B side faces the flow; alternatively, the arithmetic average of the A and B side coefficient values may be used, irrespective of which side faces the flow.

4.1.6.1.2 When a probe assembly is used to sample a small duct (12 to 36 in. in diameter), the probe sheath sometimes blocks a significant part of the duct cross-section, causing a reduction in the effective value of C_{pw}. Consult Citation 9 in Section 6 for details. Conventional pitot-sampling probe assemblies are not recommended for use in ducts having inside diameters smaller than 12 inches (Citation 16 in Section 6).

4.1.6.2 Recalibration.

4.1.6.2.1 Isolated Pitot Tubes. After each field use, the pitot tube shall be carefully reexamined in top, side, and end views. If the pitot face openings are still aligned within the specifications illustrated in Figure 2-2 or 2-3, it can be assumed that the baseline coefficient of the pitot tube has not changed. If, however, the tube has been damaged to the extent that it no longer meets the specifications of Figure 2-2 or 2-3, the damage shall either be repaired to restore proper alignment of the face openings or the tube shall be discarded.

4.1.6.2.2 Pitot Tube Assemblies. After each field use, check the face opening alignment of the pitot tube, as in Section 4.1.6.2.1; also, remeasure the intercomponent spacings of the assembly. If the intercomponent spacings have not changed and the face opening alignment is acceptable, it can be assumed that the coefficient of the assembly has not changed. If the face opening alignment is no longer within the specifications of Figures 2-2 or 2-3, either repair the damage or replace the pitot tube (calibrating the new assembly, if necessary). If the intercomponent spacings have changed, restore the original spacings or recalibrate the assembly.

4.2 Standard pitot tube (if applicable). If a standard pitot tube is used for the velocity traverse, the tube shall be constructed according to the criteria of Section 2.7 and shall be assigned a baseline coefficient value of 0.99. If the standard pitot tube is used as part of an assembly, the tube shall be in an interference-free arrangement (subject to the approval of the Administrator).

4.3 Temperature Gauges. After each field use, calibrate dial thermometers, liquid-filled bulb thermometers, thermocouple-potentiometer systems, and other gauges at a temperature within 10 percent of the average absolute stack temperature. For temperatures up to 405° C (761° F), use an ASTM mercury-in-glass reference thermometer, or equivalent, as a reference; alternatively, either a reference thermocouple and potentiometer (calibrated by NBS) or thermometric fixed points, e.g., ice bath and boiling water (corrected for barometric pressure) may be used. For temperatures above 405° C (761° F), use an NBS-calibrated reference thermocouple-potentiometer system or an alternate reference, subject to the approval of the Administrator.

If, during calibration, the absolute temperatures measured with the gauge being calibrated and the reference gauge agree within 1.5 percent, the temperature data taken in the field shall be considered valid. Otherwise, the pollutant emission test shall either be considered invalid or adjustments (if appropriate) of the test results shall be made, subject to the approval of the Administrator.

4.4 Barometer. Calibrate the barometer used against a mercury barometer.

5. *Calculations*

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

5.1 Nomenclature.

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

B_{ws} = Water vapor in the gas stream (from Method 5 or Reference Method 4), proportion by volume.

C_p = Pitot tube coefficient, dimensionless.

K_p = Pitot tube constant,

$$34.97 \frac{m}{sec}\left[\frac{(g/g\text{-mole})(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$$

for the metric system and

$$85.49 \frac{ft}{sec}\left[\frac{(lb/lb\text{-mole})(in.\ Hg)}{(°R)(in.\ H_2O)}\right]^{1/2}$$

for the English system.

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

M_s = Molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole).

$= M_d (1 - B_{ws}) + 18.0\ B_{ws}$ Eq. 2-5

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

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

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

$= P_{bar} + P_g$

Eq. 2-6

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

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

t_s = Stack temperature. °C (°F).

T_s = Absolute stack temperature. °K. (°R).

= 273 + t_s for metric.

Eq. 2-7

= 460 + t_s for English.

Eq. 2-8

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

v_s = Average stack gas velocity. m/sec (ft/sec).

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

3.600 = Conversion factor. sec/hr.

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

5.2 Average Stack Gas Velocity.

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

Equation 2-9

5.3 Average Stack Gas Dry Volumetric Flow Rate.

$$Q_{sd} = 3.600(1 - B_{ws}) v_s A \frac{T_{std}}{T_{s\,avg}} \frac{P_s}{P_{std}}$$

Eq. 2-10

To convert Q_{sd} from dscm/hr (dscf/hr) to dscm/min (dscf/min), divide Q_{sd} by 60.

6. *Bibliography*

1. Mark, L. S. Mechanical Engineers' Handbook. New York. McGraw-Hill Book Co., Inc. 1951.

2. Perry, J. H. Chemical Engineers' Handbook. New York. McGraw-Hill Book Co., Inc. 1960.

3. Shigehara, R. T., W. F. Todd, and W. S. Smith. Significance of Errors in Stack Sampling Measurements. U.S. Environmental Protection Agency, Research Triangle Park, NC (Presented at the Annual Meeting of the Air Pollution Control Association, St. Louis, MO, June 14-19, 1970.)

4. Standard Method for Sampling Stacks for Particulate Matter. In: 1971 Book of ASTM Standards, Part 23. Philadelphia, PA 1971. ASTM Designation D-2928-71.

5. Vennard, J. K. Elementary Fluid Mechanics. New York. John Wiley and Sons, Inc. 1947.

6. Fluid Meters—Their Theory and Application. American Society of Mechanical Engineers. New York, NY 1959.

7. ASHRAE Handbook of Fundamentals. 1972. p. 208.

8. Annual Book of ASTM Standards. Part 26. 1974. p. 648.

9. Vollaro, R. F. Guidelines for Type S Pitot Tube Calibration. U.S. Environmental Protection Agency. Research Triangle Park, NC (Presented at 1st Annual Meeting, Source Evaluation Society, Dayton, OH, September 18, 1975.)

10. Vollaro, R. F. A Type S Pitot Tube Calibration Study. U.S. Environmental Protection Agency, Emission Measurement Branch, Research Triangle Park, NC July 1974.

11. Vollaro, R. F. The Effects of Impact Opening Misalignment on the Value of the Type S Pitot Tube Coefficient. U.S. Environmental Protection Agency. Emission Measurement Branch, Research Triangle Park, NC. October 1976.

12. Vollaro, R. F. Establishment of a Basline Coefficient Value for Properly Constructed Type S Pitot Tubes. U.S. Environmental Protection Agency, Emission Measurement Branch, Research Triangle Park, NC. November 1976.

13. Vollaro, R. F. An Evaluation of Single-Velocity Calibration Technique as a Means of Determining Type S Pitot Tubes Coefficient. U.S. Environmental Protection Agency, Emission Measurement Branch, Research Triangle Park, NC, August 1975.

14. Vollaro, R. F. The Use of Type S Pitot Tubes for the Measurement of Low Velocities. U.S. Environmental Protection Agency, Emission Measurement Branch, Research Triangle Park, NC. November 1976.

15. Smith, Marvin L. Velocity Calibration of EPA Type Source Sampling Probe. United Technologies Corporation, Pratt and Whitney Aircraft Division, East Hartford, CN. 1975.

16. Vollaro, R. F. Recommended Procedure for Sample Traverses in Ducts Smaller than 12 Inches in Diameter. U.S. Environmental Protection Agency, Emission Measurement Branch, Research Triangle Park, NC. November 1976.

17. Ower, E. and R. C. Pankhurst. The Measurement of Air Flow, 4th Ed., London, Pergamon Press, 1966.

18. Vollaro, R. F. A Survey of Commercially Available Instrumentation for the Measurement of Low-Range Gas Velocities. U.S. Environmental Protection Agency, Emission Measurement Branch, Research Triangle Park, NC. November 1976. (Unpublished Paper)

19. Gnyp, A. W., C. C. St. Pierre, D. S. Smith, D. Mozzon, and J. Steiner. An Experimental Investigation of the Effect of Pitot Tube-Sampling Probe Configurations on the Magnitude of the S Type Pitot Tube Coefficient for Commercially Available Source Sampling Probes. Prepared by the University of Windsor for the Ministry of the Environment, Toronto, Canada. February 1975.

APPENDIX C

METHOD 3

GAS ANALYSIS FOR CARBON DIOXIDE, OXYGEN, EXCESS AIR AND DRY MOLECULAR WEIGHT

The Almega Corporation

1. *Principle and Applicability*

1.1 Principle. A gas sample is extracted from a stack, by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent carbon dioxide (CO_2), percent oxygen (O_2), and, if necessary, percent carbon monoxide (CO). If a dry molecular weight determination is to be made, either an Orsat or a Fyrite [1] analyzer may be used for the analysis; for excess air or emission rate correction factor determination, an Orsat analyzer must be used.

1.2 Applicability. This method is applicable for determining CO_2 and O_2 concentrations, excess air, and dry molecular weight of a sample from a gas stream of a fossil-fuel combustion process. The method may also be applicable to other processes where it has been determined that compounds other than CO_2, O_2, CO, and nitrogen (N_2) are not present in concentrations sufficient to affect the results.

Other methods, as well as modifications to the procedure described herein, are also applicable for some or all of the above determinations. Examples of specific methods and modifications include: (1) a multi-point sampling method using an Orsat analyzer to analyze individual grab samples obtained at each point; (2) a method using CO_2 or O_2 and stoichiometric calculations to determine dry molecular weight and excess air; (3) assigning a value of 30.0 for dry molecular weight, in lieu of actual measurements, for processes burning natural gas, coal, or oil. These methods and modifications may be used, but are subject to the approval of the Administrator, U.S. Environmental Protection Agency.

2. *Apparatus*

As an alternative to the sampling apparatus and systems described herein, other sampling systems (e.g., liquid displacement) may be used provided such systems are capable of obtaining a representative sample and maintaining a constant sampling rate, and are otherwise capable of yielding acceptable results. Use of such systems is subject to the approval of the Administrator.

2.1 Grab Sampling (Figure 3-1).

2.1.1 Probe. The probe should be made of stainless steel or borosilicate glass tubing and should be equipped with an in-stack or out-stack filter to remove particulate matter (a plug of glass wool is satisfactory for this purpose). Any other materials inert to O_2, CO_2, CO, and N_2 and resistant to temperature at sampling conditions may be used for the probe; examples of such material are aluminum, copper, quartz glass and Teflon.

2.1.2 Pump. A one-way squeeze bulb, or equivalent, is used to transport the gas sample to the analyzer.

2.2 Integrated Sampling (Figure 3-2).

2.2.1 Probe. A probe such as that described in Section 2.1.1 is suitable.

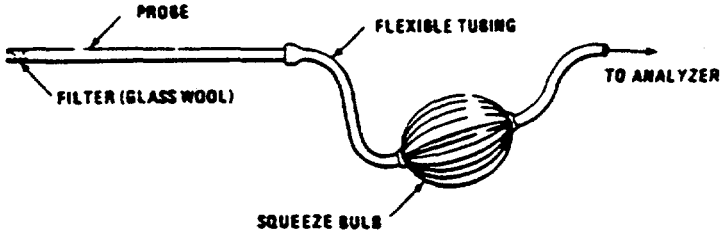


Figure 3-1 Grab sampling train.

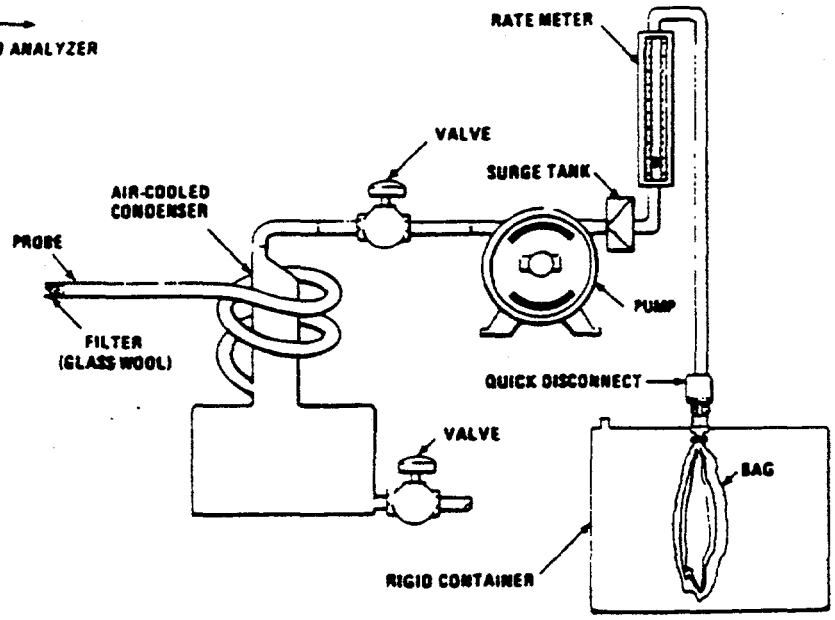


Figure 3-2. Integrated gas-sampling train.

[1] Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

2.2.2 Condenser. An air-cooled or water-cooled condenser, or other condenser that will not remove O_2, CO_2, CO, and N_2, may be used to remove excess moisture which would interfere with the operation of the pump and flow meter.

2.2.3 Valve. A needle valve is used to adjust sample gas flow rate.

2.2.4 Pump. A leak-free, diaphragm-type pump, or equivalent, is used to transport sample gas to the flexible bag. Install a small surge tank between the pump and rate meter to eliminate the pulsation effect of the diaphragm pump on the rotameter.

2.2.5 Rate Meter. The rotameter, or equivalent rate meter, used should be capable of measuring flow rate to within ±2 percent of the selected flow rate. A flow rate range of 500 to 1000 cm^3/min is suggested.

2.2.6 Flexible Bag. Any leak-free plastic (e.g., Tedlar, Mylar, Teflon) or plastic-coated aluminum (e.g., aluminized Mylar) bag, or equivalent, having a capacity consistent with the selected flow rate and time length of the test run, may be used. A capacity in the range of 55 to 90 liters is suggested.

To leak-check the bag, connect it to a water manometer and pressurize the bag to 5 to 10 cm H_2O (2 to 4 in. H_2O). Allow to stand for 10 minutes. Any displacement in the water manometer indicates a leak. An alternative leak-check method is to pressurize the bag to 5 to 10 cm H_2O (2 to 4 in. H_2O) and allow to stand overnight. A deflated bag indicates a leak.

2.2.7 Pressure Gauge. A water-filled U-tube manometer, or equivalent, of about 30 cm (12 in.) is used for the flexible bag leak-check.

2.2.8 Vacuum Gauge. A mercury manometer, or equivalent, of at least 760 mm Hg (30 in. Hg) is used for the sampling train leak-check.

2.3 Analysis. For Orsat and Fyrite analyzer maintenance and operation procedures, follow the instructions recommended by the manufacturer, unless otherwise specified herein.

2.3.1 Dry Molecular Weight Determination. An Orsat analyzer or Fyrite type combustion gas analyzer may be used.

2.3.2 Emission Rate Correction Factor or Excess Air Determination. An Orsat analyzer must be used. For low CO_2 (less than 4.0 percent) or high O_2 (greater that 15.0 percent) concentrations, the measuring burette of the Orsat must have at least 0.1 percent subdivisions.

3. *Dry Molecular Weight Determination*

Any of the three sampling and analytical procedures described below may be used for determining the dry molecular weight.

3.1 Single-Point, Grab Sampling and Analytical Procedure.

3.1.1 The sampling point in the duct shall either be at the centroid of the cross section or at a point no closer to the walls than 1.00 m (3.3 ft), unless otherwise specified by the Administrator.

3.1.2 Set up the equipment as shown in Figure 3-1, making sure all connections ahead of the analyzer are tight and leak-free. If an Orsat analyzer is used, it is recommended that the analyzer be leaked-checked by following the procedure in Section 5; however, the leak-check is optional.

3.1.3 Place the probe in the stack, with the tip of the probe positioned at the sampling point; purge the sampling line. Draw a sample into the analyzer and immediately analyze it for percent CO_2 and percent O_2. Determine the percentage of the gas that is N_2 and CO by subtracting the sum of the percent CO_2 and percent O_2 from 100 percent. Calculate the dry molecular weight as indicated in Section 6.3.

3.1.4 Repeat the sampling, analysis, and calculation procedures, until the dry molecular weights of any three grab samples differ from their mean by no more than 0.3 g/g-mole (0.3 lb/lb-mole). Average these three molecular weights, and report the results to the nearest 0.1 g/g-mole (lb/lb-mole).

3.2 Single-Point, Integrated Sampling and Analytical Procedure.

3.2.1 The sampling point in the duct shall be located as specified in Section 3.1.1.

3.2.2 Leak-check (optional) the flexible bag as in Section 2.2.6. Set up the equipment as shown in Figure 3-2. Just prior to sampling, leak-check (optional) the train by placing a vacuum gauge at the condenser inlet, pulling a vacuum of at least 250 mm Hg (10 in. Hg), plugging the outlet at the quick disconnect, and then turning off the pump. The vacuum should remain stable for at least 0.5 minute. Evacuate the flexible bag. Connect the probe and place it in the stack, with the tip of the probe positioned at the sampling point; purge the sampling line. Next, connect the bag and make sure that all connections are tight and leak free.

3.2.3 Sample at a constant rate. The sampling run should be simultaneous with, and for the same total length of time as, the pollutant emission rate determination. Collection of at least 30 liters (1.00 ft^3) of sample gas is recommended; however, smaller volumes may be collected, if desired.

3.2.4 Obtain one integrated flue gas sample during each pollutant emission rate determination. Within 8 hours after the sample is taken, analyze it for percent CO_2 and percent O_2 using either an Orsat analyzer or a Fyrite-type combustion gas analyzer. If an Orsat analyzer is used, it is recommended that the Orsat leak-check described in Section 5 be performed before this determination; however, the check is optional.

Determine the percentage of the gas that is N_2 and CO by subtracting the sum of the percent CO_2 and percent O_2 from 100 percent. Calculate the dry molecular weight as indicated in Section 6.3.

3.2.5 Repeat the analysis and calculation procedures until the individual dry molecular weights for any three analyses differ from their mean by no more than 0.3 g/g-mole (0.3 lb/lb-mole). Average these three molecular weights, and report the results to the nearest 0.1 g/g-mole (0.1 lb/lb-mole).

3.3 Multi-Point, Integrated Sampling and Analytical Procedure.

3.3.1 Unless otherwise specified by the Administrator, a minimum of eight traverse points shall be used for circular stacks having diameters less than 0.61 m (24 in.), a minimum of nine shall be used for rectangular stacks having equivalent diameters less than 0.61 m (24 in.), and a minimum of twelve traverse points shall be used for all other cases. The traverse points shall be located according to Method 1. The use of fewer points is subject to approval of the Administrator.

3.3.2 Follow the procedures outlined in Sections 3.2.2 through 3.2.5, except for the following: traverse all sampling points and sample at each point for an equal length of time. Record sampling data as shown in Figure 3-3.

4. *Emission Rate Correction Factor or Excess Air Determination*

NOTE: A Fyrite-type combustion gas analyzer is not acceptable for excess air or emission rate correction factor determination, unless approved by the Administrator. If both percent CO_2 and percent O_2 are measured, the analytical results of any of the three procedures given below may also be used for calculating the dry molecular weight.

Each of the three procedures below shall be used only when specified in an applicable subpart of the standards. The use of these procedures for other purposes must have specific prior approval of the Administrator.

4.1 Single-Point, Grab Sampling and Analytical Procedure.

4.1.1 The sampling point in the duct shall either be at the centroid of the cross-section or at a point no closer to the walls than 1.00 m (3.3 ft), unless otherwise specified by the Administrator.

4.1.2 Set up the equipment as shown in Figure 3-1, making sure all connections ahead of the analyzer are tight and leak-free. Leak-check the Orsat analyzer according to the procedure described in Section 5. This leak-check is mandatory.

FIGURE 3-3—SAMPLING RATE DATA

Time	Traverse pt.	Q lpm	% dev.*
Average			

* % Dev. = $(Q - Q_{avg})/Q_{avg} \cdot 100$ (Must be < 10%)

4.1.3 Place the probe in the stack, with the tip of the probe positioned at the sampling point; purge the sampling line. Draw a sample into the analyzer. For emission rate correction factor determination, immediately analyze the sample, as outlined in Sections 4.1.4 and 4.1.5, for percent CO_2 or percent O_2. If excess air is desired, proceed as follows: (1) immediately analyze the sample, as in Sections 4.1.4 and 4.1.5, for percent CO_2, O_2, and CO; (2) determine the percentage of the gas that is N_2 by subtracting the sum of the percent CO_2, percent O_2, and percent CO from 100 percent; and (3) calculate percent excess air as outlined in Section 6.2.

4.1.4 To insure complete absorption of the CO_2, O_2, or if applicable, CO, make repeated passes through each absorbing solution until two consecutive readings are the same. Several passes (three or four) should be made between readings. (If constant readings cannot be obtained after three consecutive readings, replace the absorbing solution.)

4.1.5 After the analysis is completed, leak-check (mandatory) the Orsat analyzer once again, as described in Section 5. For the results of the analysis to be valid, the Orsat analyzer must pass this leak test before and after the analysis.

NOTE: Since this single-point, grab sampling and analytical procedure in normally conducted in conjunction with a single-point, grab sampling and analytical procedure for a pollutant, only one analysis is ordinarily conducted. Therefore, great care must be taken to obtain a valid sample and analysis. Although in most cases only CO_2 or O_2 is required, it is recommended that both CO_2 and O_2 be measured, and that Section 4.4 be used to validate the analytical data.

4.2 Single-Point, Integrated Sampling and Analytical Procedure.

4.2.1 The sampling point in the duct shall be located as specified in Section 4.1.1.

4.2.2 Leak-check (mandatory) the flexible bag as in Section 2.2.6. Set up the equipment as shown in Figure 3-2. Just prior to sampling, leak-check (mandatory) the train

by placing a vacuum gauge at the condenser inlet, pulling a vacuum of a least 250 mm Hg (10 in. Hg), plugging the outlet at the quick disconnect, and then turning off the pump. The vacuum shall remain stable for at least 0.5 minute. Evacuate the flexible bag. Connect the probe and place it in the stack, with the tip of the probe positioned at the sampling point; purge the sampling line. Next, connect the bag and make sure that all connections are tight and leak free.

4.2.3 Sample at a constant rate, or as specified by the Administrator. The sampling run must be simultaneous with, and for the same total length of time as, the pollutant emission rate determination. Collect at least 30 liters (1.00 ft^3) of sample gas. Smaller volumes may be collected, subject to approval of the Administrator.

4.2.4 Obtain one integrated flue gas sample during each pollutant emission rate determination. For emission rate correction factor determination, analyze the sample within 4 hours after it is taken for percent CO_2 or percent O_2 (as outlined in Sections 4.2.5 through 4.2.7). The Orsat analyzer must be leak-checked (see Section 5) before the analysis. If excess air is desired, proceed as follows: (1) within 4 hours after the sample is taken, analyze it (as in Sections 4.2.5 through 4.2.7) for percent CO_2, O_2, and CO; (2) determine the percentage of the gas that is N_2 by subtracting the sum of the percent CO_2, percent O_2, and percent CO from 100 percent; (3) calculate percent excess air, as outlined in Section 6.2.

4.2.5 To insure complete absorption of the CO_2, O_2, or if applicable, CO, make repeated passes through each absorbing solution until two consecutive readings are the same. Several passes (three of four) should be make between readings. (If constant readings cannot be obtained after three consecutive readings, replace the absorbing solution.)

4.2.6 Repeat the analysis until the following criteria are met:

4.2.6.1 For percent CO_2, repeat the analytical procedure until the results of any three analyses differ by no more that (a) 0.3 percent by volume when CO_2 is greater than 4.0 percent or (b) 0.2 percent by volume when CO_2 is less than or equal to 4.0 percent. Average the three acceptable values of percent CO_2 and report the results to the nearest 0.1 percent.

4.2.6.2 For percent O_2, repeat the analytical procedure until the results of any three analyses differ by no more than (a) 0.3 percent by volume when O_2 is less than 15.0 percent or (b) 0.2 percent by volume when O_2 is greater than or equal to 15.0 percent. Average the three acceptable values of percent O_2 and report the results to the nearest 0.1 percent.

4.2.6.3 For percent CO, repeat the analytical procedure until the results of any three analyses differ by no more than 0.3 percent. Average the three acceptable values of percent CO and report the results to the nearest 0.1 percent.

4.2.7 After the analysis is completed, leak-check (mandatory) the Orsat analyzer once again, as described in Section 5. For the results of the analysis to be valid, the Orsat analyzer must pass this leak test before an after the analysis.

NOTE: Although in most instances only CO_2 or O_2 is required, it is recommended that both CO_2 and O_2 be measured, and that Section 4.4.1 be used to validate the analytical data.

4.3 Multi-Point, Integrated Sampling and Analytical Procedure.

4.3.1 Both the minimum number of sampling points and the sampling point location shall be as specified in Section 3.3.1 of this method. The use of fewer points than specified is subject to the approval of the Administrator.

4.3.2 Follow the procedures outlined in Sections 4.2.2 through 4.2.7, except for the following: Traverse all sampling points and sample at each point for an equal length of time. Record sampling data as shown in Figure 3-3.

4.4 Quality Control Procedures.

4.4.1 Data Validation When Both CO_2 and O_2 Are Measured. Although in most instances, only CO_2 or O_2 measurement is required, it is recommended that both CO_2 and O_2 be measured to provide a check on the quality of the data. The following quality control procedure is suggested.

NOTE: Since the method for validating the CO_2 and O_2 analyses is based on combustion of organic and fossil fuels and dilution of the gas stream with air, this method does not apply to sources that (1) remove CO_2 or O_2 through processes other than combustion, (2) add O_2 (e.g., oxygen enrichment) and N_2 in proportions different from that of air, (3) add CO_2 (e.g., cement or lime kilns), or (4) have no fuel factor, F_o, values obtainable (e.g., extremely variable waste mixtures). This method validates the measured proportions of CO_2 and O_2 for the fuel type, but the method does not detect sample dilution resulting from leaks during or after sample collection. The method is applicable for samples collected downstream of most lime or limestone flue-gas desulfurization units as the CO_2 added or removed from the gas stream is not significant in relation to the total CO_2 concentration. The CO_2 concentrations from other types of scrubbers using only water or basic slurry can be significantly affected and would render the F_o check minimally useful.

4.4.1.1 Calculate a fuel factor, F_o, using the following equation:

$$F_o = \frac{20.9 - \%O_2}{\%CO_2}$$

Eq. 3-3

Where:

$\%O_2$ = Percent O_2 by volume (dry basis).
$\%CO_2$ = Percent CO_2 by volume (dry basis).
20.9 = Percent O_2 by volume in ambient air.

If CO is present in quantities measurable by this method, adjust the O_2 and CO_2 values before performing the calculation for F_o as follows:

$$\%CO_2(adj) = \%CO_2 - \%CO$$

$$\%O_2(adj) = \%O_2 - 0.5\ \%CO$$

Where:

$\%CO$ = Percent CO by volume (dry basis).

4.4.1.2 Compare the calculated F_o factor with the expected F_o values. The following table may be used in establishing acceptable ranges for the expected F_o if the fuel being burned is known. When fuels are burned in combination, calculate the combined fuel F_d and F_c factors (as defined in Method 19) according to the procedure in Method 19 Section 5.2.3. Then calculate the F_o factor as follows:

$$F_o = \frac{0.209\ F_d}{F_c}$$

Eq. 3-4

Fuel type	F_o range
Coal:	
Anthracite and lignite	1.016–1.130
Bituminous	1.083–1.230
Oil:	
Distillate	1.260–1.413
Residual	1.210–1.370
Gas:	
Natural	1.600–1.836
Propane	1.434–1.586
Butane	1.405–1.553
Wood	1.000–1.120
Wood bark	1.003–1.130

Calculated F_o values beyond the acceptable ranges shown in this table should be investigated before accepting the test results. For example, the strength of the solutions in the gas analyzer and the analyzing technique should be checked by sampling and analyzing a known concentration, such as air; the fuel factor should be reviewed and verified. An acceptability range of ±12 percent is appropriate for the F_o factor of mixed fuels with variable fuel ratios. The level of the emission rate relative to the compliance level should be considered in determining if a retest is appropriate, i.e., if the measured emissions are much lower or much greater than the compliance limit, repetition of the test would not significantly change the compliance status of the source and would be unnecessarily time-consuming and costly.

5. *Leak-Check Procedure for Orsat Analyzers*

Moving an Orsat analyzer frequently causes it to leak. Therefore, an Orsat analyzer should be throughly leak-checked on site before the flue gas sample is introduced into it. The procedure for leak-checking an Orsat analyzer is:

5.1 Bring the liquid level in each pipette up to the reference mark on the capillary tubing and then close the pipette stopcock.

5.2 Raise the leveling bulb sufficiently to bring the confining liquid meniscus onto the graduated portion of the burette and then close the manifold stopcock.

5.3 Record the meniscus position.

5.4 Observe the menicus in the burette and the liquid level in the pipette for movement over the next 4 minutes.

5.5 For the Orsat analyzer to pass the leak-check, two conditions must be met.

5.5.1 The liquid level in each pipette must not fall below the bottom of the capillary tubing during this 4-minute interval.

5.5.2 The meniscus in the burette must not change by more than 0.2 ml during this 4-minute interval.

5.6 If the analyzer fails the leak-check procedure, all rubber connections and stopcocks should be checked until the cause of the leak is identified. Leaking stopcocks must be disassembled, cleaned, and regreased. Leaking rubber connections must be replaced. After the analyzer is reassembled, the leak-check procedure must be repeated.

6. *Calculations*

6.1 Nomenclature.

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

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

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

Eq. 3-1

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

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

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

Eq. 3-2

NOTE: The above equation does not consider argon in air (about 0.9 percent, molecular weight of 37.7). A negative error of about 0.4 percent is introduced. The tester may opt to include argon in the analysis using procedures subject to approval of the Administrator.

7. *Bibliography*

1. Altshuller, A. P. Storage of Gases and Vapors in Plastic Bags. International Journal of Air and Water Pollution. 6:75-81. 1963.

2. Conner, William D. and J. S. Nader. Air Sampling with Plastic Bags. Journal of the American Industrial Hygiene Association. 25:291-297. 1964.

3. Burrell Manual for Gas Analysts, Seventh edition. Burrell Corporation, 2223 Fifth Avenue, Pittsburgh, PA 15219. 1951.

4. Mitchell, W. J. and M. R. Midgett. Field Reliability of the Orsat Analyzer. Journal of Air Pollution Control Association 26:491-495. May 1976.

5. Shigehara, R. T., R. M. Neulicht, and W. S. Smith. Validating Orsat Analysis Data from Fossil Fuel-Fired Units. Stack Sampling News. 4(2):21-26. August, 1976.

APPENDIX D

METHOD 4

DETERMINATION OF MOISTURE
CONTENT IN STACK GASES

The Almega Corporation

1. *Principle and Applicability*

1.1 Principle. A gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically.

1.2 Applicability. This method is applicable for determining the moisture content of stack gas.

Two procedures are given. The first is a reference method, for accurate determinations of moisture content (such as are needed to calculate emission data). The second is an approximation method, which provides estimates of percent moisture to aid in setting isokinetic sampling rates prior to a pollutant emission measurement run. The approximation method described herein is only a suggested approach; alternative means for approximating the moisture content, e.g., drying tubes, wet bulb-dry bulb techniques, condensation techniques, stoichiometric calculations, previous experience, etc., are also acceptable.

The reference method is often conducted simultaneously with a pollutant emission measurement run; when it is, calculation of percent isokinetic, pollutant emission rate, etc., for the run shall be based upon the results of the reference method or its equivalent; these calculations shall not be based upon the results of the approximation method, unless the approximation method is shown, to the satisfaction of the Administrator, U.S. Environmental Protection Agency, to be capable of yielding results within 1 percent H_2O of the reference method.

NOTE: The reference method may yield questionable results when applied to saturated gas streams or to streams that contain water droplets. Therefore, when these conditions exist or are suspected, a second determination of the moisture content shall be made simultaneously with the reference method, as follows: Assume that the gas stream is saturated. Attach a temperature sensor [capable of measuring to ±1° C (2° F)] to the reference method probe. Measure the stack gas temperature at each traverse point (see Section 2.2.1) during the reference method traverse; calculate the average stack gas temperature. Next, determine the moisture percentage, either by: (1) using a psychrometric chart and making appropriate corrections if stack pressure is different from that of the chart, or (2) using saturation vapor pressure tables. In cases where the psychrometric chart or the saturation vapor pressure tables are not applicable (based on evaluation of the process), alternate methods, subject to the approval of the Administrator, shall be used.

2. *Reference Method*

The procedure described in Method 5 for determining moisture content is acceptable as a reference method.

2.1 Apparatus. A schematic of the sampling train used in this reference method is shown in Figure 4-1. All components shall be maintained and calibrated according to the procedure outlined in Method 5.

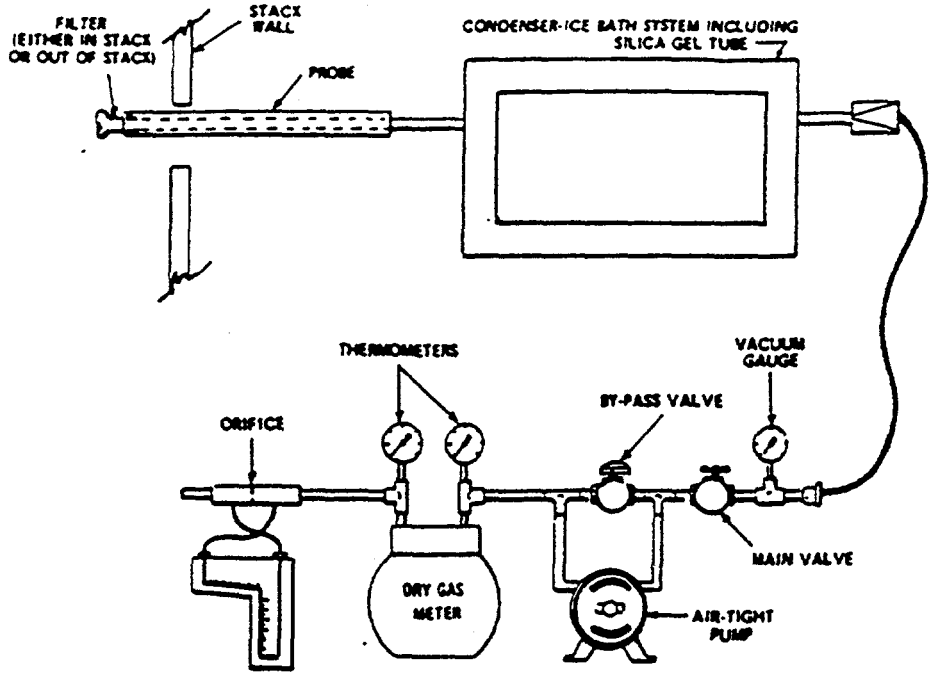


Figure 4-1. Moisture sampling train-reference method

2.1.1 Probe. The probe is constructed of stainless steel or glass tubing, sufficiently heated to prevent water condensation, and is equipped with a filter, either in-stack (e.g., a plug of glass wool inserted into the end of the probe) or heated out-stack (e.g., as described in Method 5), to remove particular matter.

When stack conditions permit, other metals or plastic tubing may be used for the probe, subject to the approval of the Administrator.

2.1.2 Condenser. The condenser consists of four impingers connected in series with ground glass, leak-free fittings or any similarly leak-free non-contaminating fittings. The first, third, and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with a 1.3 centimeter (½ inch) ID glass tube extending to about 1.3 cm (½ in.) from the bottom of the flask. The second impinger shall be of the Greenburg-Smith design with the standard tip. Modifications (e.g., using flexible connections between the impingers, using materials other than glass, or using flexible vacuum lines to connect the filter holder to the condenser) may be used, subject to the approval of the Administrator.

The first two impingers shall contain known volumes of water, the third shall be empty, and the fourth shall contain a known weight of 6- to 16-mesh indicating type silica gel, or equivalent desiccant. If the silica gel has been previously used, dry at 175° C (350° F) for 2 hours. New silica gel may be used as received. A thermometer, capable of measuring temperature to within 1° C (2° F), shall be placed at the outlet of the fourth impinger, for monitoring purposes.

Alternatively, any system may be used (subject to the approval of the Administrator) that cools the sample gas stream and allows measurement of both the water that has been condensed and the moisture leaving the condenser, each to within 1 ml or 1 g. Acceptable means are to measure the condensed water, either gravimetrically or volumetrically, and to measure the moisture leaving the condenser by: (1) monitoring the temperature and pressure at the exit of the condenser and using Dalton's law of partial pressures, or (2) passing the sample gas stream through a tared silica gel (or equivalent desiccant) trap, with exit gases kept below 20° C (68° F), and determining the weight gain.

If means other than silica gel are used to determine the amount of moisture leaving the condenser, it is recommended that silica gel (or equivalent) still be used between the condenser system and pump, to prevent moisture condensation in the pump and metering devices and to avoid the need to make corrections for moisture in the metered volume.

2.1.3 Cooling System. An ice bath container and crushed ice (or equivalent) are used to aid in condensing moisture.

2.1.4 Metering System. This system includes a vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3° C (5.4° F), dry gas meter capable of measuring volume to within 2 percent, and related equipment as shown in Figure 4-1. Other metering systems, capable of maintaining a constant sampling rate and determining sample gas volume, may be used, subject to the approval of the Administrator.

2.1.5 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg) may be used. In many cases, the barometric reading may be obtained from a nearby National Weather Service station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and the sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

2.1.6 Graduated Cylinder and/or Balance. These items are used to measure condensed water and moisture caught in the silica gel to within 1 ml or 0.5 g. Graduated cylinders shall have subdivisions no greater than 2 ml. Most laboratory balances are capable of weighing to the nearest 0.5 g or less. These balances are suitable for use here.

2.2 Procedure. The following procedure is written for a condenser system (such as the impinger system described in Section 2.1.2) incorporating volumetric analysis to measure the condensed moisture, and silica gel and gravimetric analysis to measure the moisture leaving the condenser.

2.2.1 Unless otherwise specified by the Administrator, a minimum of eight traverse points shall be used for circular stacks having diameters less than 0.61 m (24 in.), a minimum of nine points shall be used for rectangular stacks having equivalent diameters less than 0.61 m (24 in.), and a minimum of twelve traverse points shall be used in all other cases. The traverse points shall be located according to Method 1. The use of fewer points is subject to the approval of the Administrator. Select a suitable probe and probe length such that all traverse points can be sampled. Consider sampling from opposite sides of the stack (four total sampling ports) for large stacks, to permit use of shorter probe lengths. Mark the probe with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point. Place known volumes of water in the first two impingers. Weigh and record the

weight of the silica gel to the nearest 0.5 g. and transfer the silica gel to the fourth impinger; alternatively, the silica gel may first be transferred to the impinger, and the weight of the silica gel plus impinger recorded.

2.2.2 Select a total sampling time such that a minimum total gas volume of 0.60 scm (21 scf) will be collected, at a rate no greater than 0.021 m^3/min (0.75 cfm). When both moisture content and pollutant emission rate are to be determined, the moisture determination shall be simultaneous with, and for the same total length of time as, the pollutant emission rate run, unless otherwise specified in an applicable subpart of the standards.

2.2.3 Set up the sampling train as shown in Figure 4-1. Turn on the probe heater and (if applicable) the filter heating system to temperatures of about 120° C (248° F), to prevent water condensation ahead of the condenser; allow time for the temperatures to stabilize. Place crushed ice in the ice bath container. It is recommended, but not required, that a leak check be done, as follows: Disconnect the probe from the first impinger or (if applicable) from the filter holder. Plug the inlet to the first impinger (or filter holder) and pull a 380 mm (15 in.) Hg vacuum; a lower vacuum may be used, provided that it is not exceeded during the test. A leakage rate in excess of 4 percent of the average sampling rate or 0.00057 m^3/min (0.02 cfm), whichever is less, is unacceptable. Following the leak check, reconnect the probe to the sampling train.

2.2.4 During the sampling run, maintain a sampling rate within 10 percent of constant rate, or as specified by the Administrator. For each run, record the data required on the example data sheet shown in Figure 4-2. Be sure to record the dry gas meter reading at the beginning and end of each sampling time increment and whenever sampling is halted. Take other appropriate readings at each sample point, at least once during each time increment.

2.2.5 To begin sampling, position the probe tip at the first traverse point. Immediately start the pump and adjust the flow to the desired rate. Traverse the cross section, sampling at each traverse point for an equal length of time. Add more ice and, if necessary, salt to maintain a temperature of less 20° C (68° F) at the silica gel outlet.

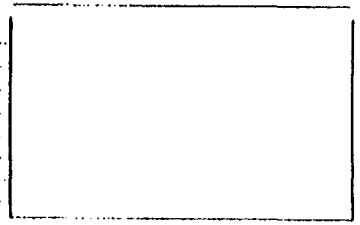
2.2.6 After collecting the sample, disconnect the probe from the filter holder (or from the first impinger) and conduct a leak check (mandatory) as described in Section 2.2.3. Record the leak rate. If the leakage rate exceeds the allowable rate, the tester shall either reject the test results or shall correct the sample volume as in Section 6.3 of Method 5. Next, measure the volume of the moisture condensed to the nearest ml. Determine the increase in weight of the silica gel (or silica gel plus impinger) to the nearest 0.5 g. Record this information (see example data sheet, Figure 4-3) and calculate the moisture percentage, as described in 2.3 below.

2.2.7 A quality control check of the volume metering system at the field site is suggested before collecting the sample following the procedure in Method 5, Section 4.4

2.3 Calculations. Carry out the following calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

FIGURE 4-2—FIELD MOISTURE DETERMINATION REFERENCE METHOD

Plant .....
Location .....
Operator .....
Date .....
Run No. .....
Ambient temperature .....
Barometric pressure .....
Probe length m (ft) .....



SCHEMATIC OF STACK CROSS SECTION

Traverse point number	Sampling time	Stack temperature	Pressure differential across orifice meter ΔH	Meter reading gas sample volume	ΔV_m	Gas Sample temperature at dry gas meter		Temperaturem of gas leaving condenser or last impinger
						Inlet	Outlet	
	(θ), min.	°C (°F)	mm (in.) H_2O	m^3 (ft^3)	m^3 (ft^3)	(Tm_{in}), °C (°F)	(Tm_{out}), °C (°F)	°C (°F)
Total								
Average					Avg	Avg	Avg	

THE ALMEGA CORPORATION

FIGURE 4-3—ANALYTICAL DATA—REFERENCE METHOD

	Impinger volume, ml	Silica gel weight, g
Final		
Initial		
Difference		

2.3.1 Nomenclature.

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

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

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

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

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

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

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

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

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

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

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

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

V_f = Final volume of condenser water, ml.

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

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

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

Y = Dry gas meter calibration factor.

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

2.3.2 Volume of Water Vapor Condensed.

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

$$= K_1 (V_f - V_i)$$

Eq. 4-1

Where:

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

2.3.3 Volume of Water Vapor Collected in Silica Gel.

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

$$= K_2 (W_f - W_i)$$

Eq. 4-2

Where:

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

2.3.4 Sample Gas Volume.

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

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

Eq. 4-3

Where:

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

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

2.3.5 Moisture Content.

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

Eq. 4-4

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

2.3.6 Verification of Constant Sampling Rate: For each time increment, determine the ΔV_m. Calculate the average. If the value for any time increment differs from the average by more than 10 percent, reject the results and repeat the run.

3. *Approximation Method*

The approximation method described below is presented only as a suggested method (see Section 1.2).

3.1 Apparatus.

3.1.1 Probe. Stainless steel glass tubing, sufficiently heated to prevent water condensation and equipped with a filter (either in-stack or heated out-stack) to remove particulate matter. A plug of glass wool, inserted into the end of the probe, is a satisfactory filter.

3.1.2 Impingers. Two midget impingers, each with 30 ml capacity, or equivalent.

3.1.3 Ice Bath. Container and ice, to aid in condensing moisture in impingers.

3.1.4 Drying Tube. Tube packed with new or regenerated 6- to 16-mesh indicating-type silica gel (or equivalent desiccant), to dry the sample gas and to protect the meter and pump.

3.1.5 Valve. Needle valve, to regulate the sample gas flow rate.

3.1.6 Pump. Leak-free, diaphragm type, or equivalent, to pull the gas sample through the train.

3.1.7 Volume Meter. Dry gas meter, sufficiently accurate to measure the sample volume within 2%, and calibrated over the range of flow rates and conditions actually encountered during sampling.

3.1.8 Rate Meter. Rotameter, to measure the flow range from 0 to 3 lpm (0 to 0.11 cfm).

3.1.9 Graduated Cylinder. 25 ml.

3.1.10 Barometer. Mercury, aneroid, or other barometer, as described in Section 2.1.5 above.

3.1.11 Vacuum Gauge. At least 760 mm Hg (30 in. Hg) gauge, to be used for the sampling leak check.

3.2 Procedure.

3.2.1 Place exactly 5 ml distilled water in each impinger.

Leak check the sampling train as follows: Temporarily insert a vacuum gauge at or near the probe inlet; then, plug the probe inlet and pull a vacuum of at least 250 mm Hg (10 in. Hg). Note, the time rate of change of the dry gas meter dial; alternatively, a rotameter (0-40 cc/min) may be temporarily attached to the dry gas meter outlet to determine the leakage rate. A leak rate not in excess of 2 percent of the average sampling rate is acceptable.

NOTE: Carefully release the probe inlet plug before turning off the pump.

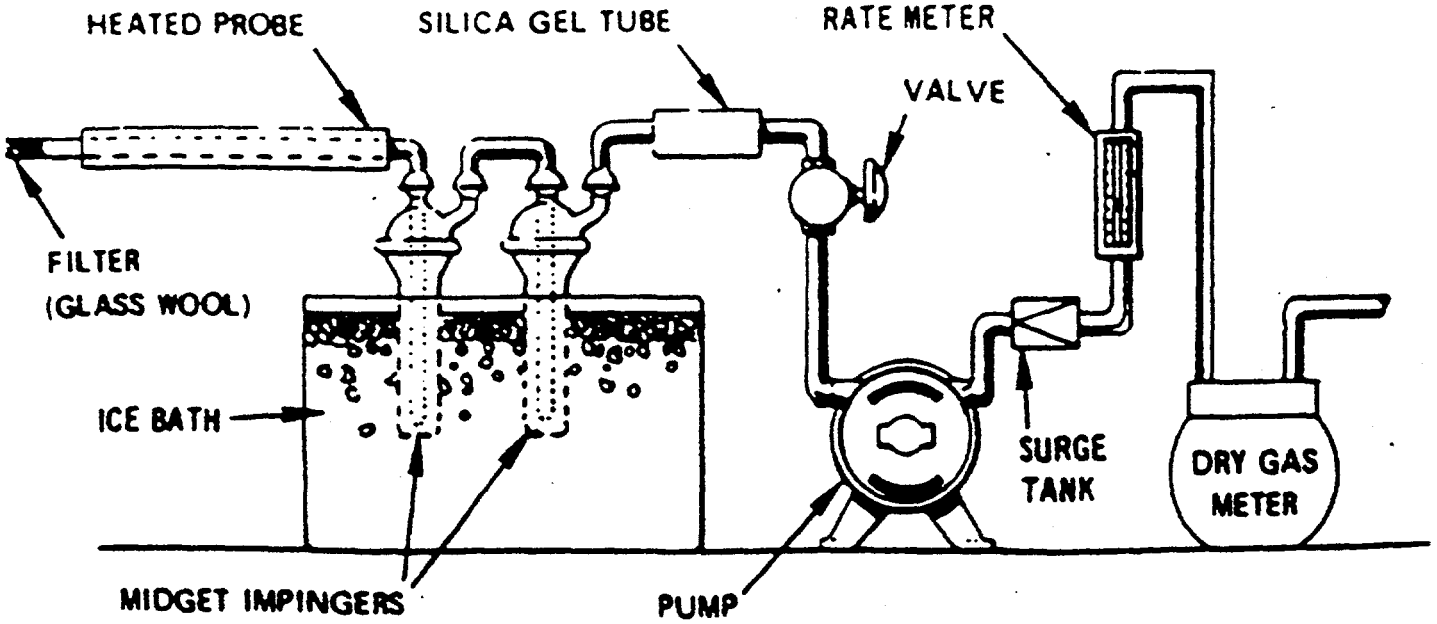


Figure 4-4. Moisture-sampling train - approximation method.

FIGURE 4-5—FIELD MOISTURE DETERMINATION—APPROXIMATION METHOD

Location..... Comments:
Test.....
Date.....
Operator.....
Barometric pressure.....

Clock time	Gas volume through meter, (V_m), m^3 (ft^3)	Rate meter setting m^3/min (ft^3/min)	Meter temperature, °C (°F)

3.2.2 Connect the probe, insert it into the stack, and sample at a constant rate of 2 lpm (0.071 cfm). Continue sampling until the dry gas meter registers about 30 liters (1.1 ft^3) or until visible liquid droplets are carried over from the first impinger to the second. Record temperature, pressure, and dry gas meter readings as required by Figure 4-5.

3.2.3 After collecting the sample, combine the contents of the two impingers and measure the volume to the nearest 0.5 ml.

3.3 Calculations. The calculation method presented is designed to estimate the moisture in the stack gas; therefore, other data, which are only necessary for accurate moisture determinations, are not collected. The following equations adequately estimate the moisture content, for the purpose of determining isokinetic sampling rate settings.

3.3.1 Nomenclature.

B_{wa} = Approximate proportion, by volume, of water vapor in the gas stream leaving the second impinger, 0.025.

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

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

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

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

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

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

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

V_f = Final volume of impinger contents, ml.

V_i = Initial volume of impinger contents, ml.

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

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

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

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

Y = Dry gas meter calibration factor.

3.3.2 Volume of Water Vapor Collected.

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

$$= K_1 (V_f - V_i)$$

Eq. 4-5

Where:

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

3.3.3 Gas Volume.

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

$$= K_2 \frac{V_m P_m}{T_m}$$

Equation 4-6

where:

K_2 = 0.3858 °K/mm Hg for metric units
= 17.64 °R/in. Hg for English units

3.3.4 Approximate Moisture Content.

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

$$= \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}} + (0.025)$$

Equation 4-7

4. *Calibration*

4.1 For the reference method, calibrate equipment as specified in the following sections of Method 5: Section 5.3 (metering system); Section 5.5 (temperature gauges); and Section 5.7 (barometer). The recommended leak check of the metering system (Section 5.6 of Method 5) also applies to the reference method. For the approximation method, use the procedures outlined in Section 5.1.1 of Method 6 to calibrate the metering system, and the procedure of Method 5, Section 5.7 to calibrate the barometer.

5. *Bibliography*

1. Air Pollution Engineering Manual (Second Edition). Danielson, J. A. (ed.). U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. Publication No. AP-40. 1973.

2. Devorkin, Howard, et al. Air Pollution Source Testing Manual. Air Pollution Control District, Los Angeles, CA. November, 1963.

3. Methods for Determination of Velocity, Volume, Dust and Mist Content of Gases. Western Precipitation Division of Joy Manufacturing Co., Los Angeles, CA. Bulletin WP-50. 1968.

APPENDIX E

METHOD 5

DETERMINATION OF PARTICULATE
EMISSIONS FROM STATIONARY SOURCES

The Almega Corporation

1. Principle and Applicability

1.1 Principle. Particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120±14° C (248±25° F) or such other temperature as specified by an applicable subpart of the standards or approved by Administrator, U.S. Environmental Protection Agency, for a particular application. The particulate mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of particulate emissions from stationary sources.

2. Apparatus

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

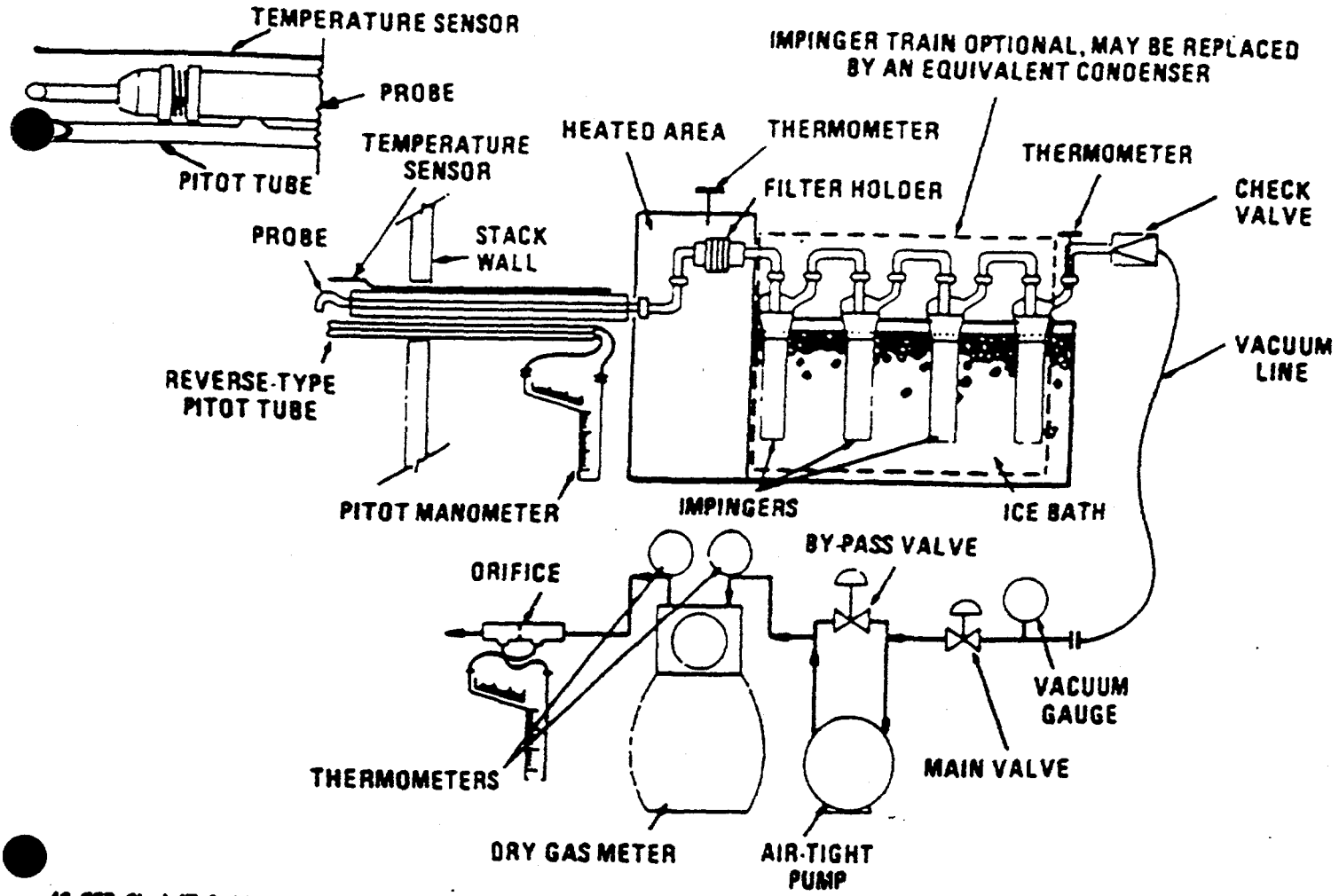


Figure 5-1. Particulate-sampling train.

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30° and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (⅛ to ½ in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

2.1.2 Probe Liner. Borosilicate or quartz glass tubing with a heating system capable of maintaining a gas temperature at the exit end during sampling of 120±14° C (248±25° F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. (The tester may opt to operate the equipment at a temperature lower than that specified.) Since the actual temperature at the outlet of the probe is not usually monitored during sampling, probes constructed according to APTD-0581 and utilizing the calibration curves of APTD-0576 (or calibrated according to the procedure outlined in APTD-0576) will be considered acceptable.

Either borosilicate or quartz glass probe liners may be used for stack temperatures up to about 480° C (900° F) quartz liners shall be used for temperatures between 480 and 900° C (900 and 1,650° F). Both types of liners may be used at higher temperatures than specified for short periods of time, subject to the approval of the Administrator. The softening temperature for borosilicate is 820° C (1,508° F), and for quartz it is 1,500° C (2,732° F).

Whenever practical, every effort should be made to use borosilicate or quartz glass probe liners. Alternatively, metal liners (e.g., 316 stainless steel, Incoloy 825,[1] or other corrosion resistant metals) made of seamless tubing may be used, subject to the approval of the Administrator.

2.1.3 Pitot Tube. Type S, as described in Section 2.1 of Method 2, or other device approved by the Administrator. The pitot tube shall be attached to the probe (as shown in Figure 5-1) to allow constant monitoring of the stack gas velocity. The impact (high pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plane (see Method 2, Figure 2-6b) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in Section 4 of Method 2.

2.1.4 Differential Pressure Gauge. Inclined manometer or equivalent device (two), as described in Section 2.2 of Method 2. One manometer shall be used or velocity head (Δp) readings, and the other, for orifice differential pressure readings.

2.1.5 Filter Holder. Borosilicate glass, with a glass frit filter support and a silicone rubber gasket. Other materials of construction (e.g., stainless steel, Teflon, Viton) may be used, subject to approval of the Administrator. The holder design shall provide a positive seal against leakage from the outside or around the filter. The holder shall be attached immediately at the outlet of the probe (or cyclone, if used).

2.1.6 Filter Heating System. Any heating system capable of maintaining a temperature around the filter holder during sampling of 120±14° C (248±25° F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. Alternatively, the tester may opt to operate the equipment at a temperature lower than that specified. A temperature gauge capable of measuring temperature to within 3° C (5.4° F) shall be installed so that the temperature around the filter holder can be regulated and monitored during sampling. Heating systems other than the one shown in APTD-0581 may be used.

2.1.7 Condenser. The following system shall be used to determine the stack gas moisture content: Four impingers connected in series with leak-free ground glass fittings or any similar leak-free non-contaminating fittings. The first, third, and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with 1.3 cm (½ in.) ID glass tube extending to about 1.3 cm (½ in.) from the bottom of the flask. The second impinger shall be of the Greenburg-Smith design with the standard tip. Modifications (e.g., using flexible connections between the impingers, using materials other than glass, or using flexible vacuum lines to connect the filter holder to the condenser) may be used, subject to the approval of the Administrator. The first and second impingers shall contain known quantities of water (Section 4.1.3), the third shall be empty, and the fourth shall contain a known weight of silica gel, or equivalent desiccant. A thermometer, capable of measuring temperature to within 1° C (2° F) shall be placed at the outlet of the fourth impinger for monitoring purposes.

Alternatively, any system that cools the sample gas stream and allows measurement of the water condensed and moisture leav-

[1] Mention of trade names or specific product does not constitute endorsement by the Environmental Protection Agency.

ing the condenser, each to within 1 ml or 1 g may be used, subject to the approval of the Administrator. Acceptable means are to measure the condensed water either gravimetrically or volumetrically and to measure the moisture leaving the condenser by: (1) monitoring the temperature and pressure at the exit of the condenser and using Dalton's law of partial pressures; or (2) passing the sample has stream through a tared silica gel (or equivalent desiccant) trap with exit gases kept below 20° C (68° F) and determining the weight gain.

If means other than silica gel are used to determine the amount of moisture leaving the condenser, it is recommended that silica gel (or equivalent) still be used between the condenser system and pump to prevent moisture condensation in the pump and metering devices and to avoid the need to make corrections for moisture in the metered volume.

NOTE: If a determination of the particulate matter collected in the impingers is desired in addition to moisture content, the impinger system described above shall be used, without modification. Individual States or control agencies requiring this information shall be contacted as to the sample recovery and analysis of the impinger contents.

2.1.8 Metering System. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3° C (5.4° F), dry gas meter capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 5-1. Other metering systems capable of maintaining sampling rates within 10 percent of isokinetic and of determining sample volumes to within 2 percent may be used, subject to the approval of the Administrator. When the metering system is used in conjunction with a pitot tube, the system shall enable checks of isokinetic rates.

Sampling trains utilizing metering systems designed for higher flow rates than that decribed in APTD-0581 or APDT-0576 may be used provided that the specifications of this method are met.

2.1.9 Barometer. Mercury aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases the barometric reading may be obtained from a nearby National Weather Service station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

2.1.10 Gas Density Determination Equipment. Temperature sensor and pressure gauge, as described in Sections 2.3 and 2.4 of Method 2, and gas analyzer, if necessary, as described in Method 3. The temperature sensor shall, preferably, be permanently attached to the pitot tube or sampling probe in a fixed configuration, such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal. Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type S pitot tube openings (see Method 2, Figure 2-7). As a second alternative, if a difference of not more than 1 percent in the average velocity measurement is to be introduced, the temperature gauge need not be attached to the probe or pitot tube. (This alternative is subject to the approval of the Administrator.)

2.2 Sample Recovery. The following items are needed.

2.2.1 Probe-Liner and Probe-Nozzle Brushes. Nylon bristle brushes with stainless steel wire handles. The probe brush shall have extensions (at least as long as the probe) of stainless steel, Nylon, Teflon, or similarly inert material. The brushes shall be properly sized and shaped to brush out the probe liner and nozzle.

2.2 2 Wash Bottles—Two. Glass wash bottles are recommended; polyethylene wash bottles may be used at the option of the tester. It is recommended that acetone not be stored in polyethylene bottles for longer than a month.

2.2.3 Glass Sample Storage Containers. Chemically resistant, borosilicate glass bottles, for acetone washes, 500 ml or 1000 ml. Screw cap liners shall either be rubber-backed Teflon or shall be constructed so as to be leak-free and resistant to chemical attack by acetone. (Narrow mouth glass bottles have been found to be less prone to leakage.) Alternatively, polyethylene bottles may be used.

2.2.4 Petri Dishes. For filter samples, glass or polyethylene, unless otherwise specified by the Administrator.

2.2.5 Graduated Cylinder and/or Balance. To measure condensed water to within 1 ml or 1 g. Graduated cylinders shall have subdivisions no greater than 2 ml. Most laboratory balances are capable of weighing to the nearest 0.5 g or less. Any of these balances is suitable or use here and in Section 2.3.4.

2.2.6 Plastic Storage Containers. Airtight containers to store silica gel.

2.2.7 Funnel and Rubber Policeman. To aid in transfer of silica gel to container; not necessary if silica gel is weighed in the field.

2.2.8 Funnel. Glass or polyethylene, to aid in sample recovery.

2.3 Analysis. For analysis, the following equipment is needed.

2.3.1 Glass Weighing Dishes.

2.3.2 Desiccator.

2.3.3 Analytical Balance. To measure to within 0.1 mg.

2.3.4 Balance. To measure to within 0.5 g.

2.3.5 Beakers. 250 ml.

2.3.6 Hygrometer. To measure the relative humidity of the laboratory environment.

2.3.7 Temperature Gauge. To measure the temperature of the laboratory environment.

3. *Reagents*

3.1 Sampling. The reagents used in sampling are as follows:

3.1.1 Filters. Glass fiber filters, without organic binder, exhibiting at least 99.95 percent efficiency (<0.05 percent penetration) on 0.3-micron dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM Standard Method D2986-71 (Reapproved 1978) (incorporated by reference—see § 60.17). Test data from the supplier's quality control program are sufficient for this purpose. In sources containing SO_2 or SO_3, the filter material must be of a type that is unreactive to SO_2 or SO_3. Citation 10 in Section 7 Bibliography, may be used to select the appropriate filter.

3.1.2 Silica Gel. Indicating type, 6 to 16 mesh. If previously used, dry at 175° C (350° F) for 2 hours. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

3.1.3 Water. When analysis of the material caught in the impingers is required, distilled water shall be used. Run blanks prior to field use to eliminate a high blank on test samples.

3.1.4 Crushed Ice.

3.1.5 Stopcock Grease. Acetone-insoluble, heat-stable silicone grease. This is not necessary if screw-on connectors with Teflon sleeves, or similar, are used. Alternatively, other types of stopcock grease may be used, subject to the approval of the Administrator.

3.2 Sample Recovery. Acetone-reagent grade, <0.001 percent residue, in glass bottles—is required. Acetone from metal containers generally has a high residue blank and should not be used. Sometimes, suppliers transfer acetone to glass bottles from metal containers; thus, acetone blanks shall be run prior to field use and only acetone with low blank values (<0.001 percent) shall be used. In no case shall a blank value of greater than 0.001 percent of the weight of acetone used be subtracted from the sample weight.

3.3 Analysis. Two reagents are required for the analysis:

3.3.1 Acetone. Same as 3.2.

3.3.2 Desiccant. Anhydrous calcium sulfate, indicating type. Alternatively, other types of desiccants may be used, subject to the approval of the Administrator.

4. *Procedure*

4.1 Sampling. The complexity of this method is such that, in order to obtain reliable results, testers should be trained and experienced with the test procedures.

4.1.1 Pretest Preparation. It is suggested that sampling equipment be maintained according to the procedure described in APTD-0576.

Weigh several 200 to 300 g portions of silica gel in air-tight containers to the nearest 0.5 g. Record the total weight of the silica gel plus container, on each container. As an alternative, the silica gel need not be preweighed, but may be weighed directly in the impinger or sampling holder just prior to train assembly.

Check filters visually against light for irregularities and flaws or pinhole leaks. Label filters of the proper diameter on the back side near the edge using numbering machine ink. As an alternative, label the shipping containers (glass or plastic petri dishes) and keep the filters in these containers at all times except during sampling and weighing.

Desiccate the filters at 20±5.6° C (68±10° F) and ambient pressure for at least 24 hours and weigh at intervals of at least 6 hours to a constant weight, i.e., 0.5 mg change from previous weighing; record results to the nearest 0.1 mg. During each weighing the filter must not be exposed to the laboratory atmosphere for a period greater than 2 minutes and a relative humidity above 50 percent. Alternatively (unless otherwise specified by the Administrator), the filters may be oven dried at 105° C (220° F) for 2 to 3 hours, desiccated for 2 hours, and weighed. Procedures other than those described, which account for relative humidity effects, may be used, subject to the approval of the Administrator.

4.1.2 Preliminary Determinations. Select the sampling site and the minimum number of sampling points according to Method 1 or as specified by the Administrator. Determine the stack pressure, temperature, and the range of velocity heads using Method 2; it is recommended that a leak-check of the pitot lines (see Method 2, Section 3.1) be performed. Determine the moisture content using Approximation Method 4 or its alternatives for the purpose of making isokinetic sampling rate settings. Determine the stack gas dry molecular weight, as described in Method 2, Section 3.6; if integrated Method 3 sampling is used for molecular weight de-

termination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the particulate sample run.

Select a nozzle size based on the range of velocity heads, such that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. During the run, do not change the nozzle size. Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2 of Method 2).

Select a suitable probe liner and probe length such that all traverse points can be sampled. For large stacks, consider sampling from opposite sides of the stack to reduce the length of probes.

Select a total sampling time greater than or equal to the minimum total sampling time specified in the test procedures for the specific industry such that (1) the sampling time per point is not less than 2 min (or some greater time interval as specified by the Administrator), and (2) the sample volume taken (corrected to standard conditions) will exceed the required minimum total gas sample volume. The latter is based on an approximate average sampling rate.

It is recommended that the number of minutes sampled at each point be an integer or an integer plus one-half minute, in order to avoid timekeeping errors. The sampling time at each point shall be the same.

In some circumstances, e.g., batch cycles, it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas sample volumes. In these cases, the Administrator's approval must first be obtained.

4.1.3 Preparation of Collection Train. During preparation and assembly of the sampling train, keep all openings where contamination can occur covered until just prior to assembly or until sampling is about to begin.

Place 100 ml of water in each of the first two impingers, leave the third impinger empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fourth impinger. More silica gel may be used, but care should be taken to ensure that it is not entrained and carried out from the impinger during sampling. Place the container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

Using a tweezer or clean disposable surgical gloves, place a labeled (identified) and weighed filter in the filter holder. Be sure that the filter is properly centered and the gasket properly placed so as to prevent the sample gas stream from circumventing the filter. Check the filter for tears after assembly is completed.

When glass liners are used, install the selected nozzle using a Viton A O-ring when stack temperatures are less than 260° C (500° F) and an asbestos string gasket when temperatures are higher. See APTD-0576 for details. Other connecting systems using either 316 stainless steel or Teflon ferrules may be used. When metal liners are used, install the nozzle as above or by a leak-free direct mechanical connection. Mark the probe with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

Set up the train as in Figure 5-1, using (if necessary) a very light coat of silicone grease on all ground glass joints, greasing only the outer portion (see APTD-0576) to avoid possibility of contamination by the silicone grease. Subject to the approval of the Administrator, a glass cyclone may be used between the probe and filter holder when the total particulate catch is expected to exceed 100 mg or when water droplets are present in the stack gas.

Place crushed ice around the impingers.

4.1.4 Leak-Check Procedures.

4.1.4.1 Pretest Leak-Check. A pretest leak-check is recommended, but not required. If the tester opts to conduct the pretest leak-check, the following procedure shall be used.

After the sampling train has been assembled, turn on and set the filter and probe heating systems at the desired operating temperatures. Allow time for the temperatures to stabilize. If a Viton A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 380 mm Hg (15 in. Hg) vacuum.

NOTE: A lower vacuum may be used, provided that it is not exceeded during the test.

If an asbestos string is used, do not connect the probe to the train during the leak-check. Instead, leak-check the train by first plugging the inlet to the filter holder (cyclone, if applicable) and pulling a 380 mm Hg (15 in. Hg) vacuum (see Note immediately above). Then connect the probe to the train and leak-check at about 25 mm Hg (1 in. Hg) vacuum; alternatively, the probe may be leak-checked with the rest of the sampling train, in one step, at 380 mm Hg (15 in. Hg) vacuum. Leakage rates in excess of 4 percent of the average sampling rate or 0.00057 m^3/min (0.02 cfm), whichever is less, are unacceptable.

The following leak-check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with bypass valve fully open and coarse adjust valve completely closed. Partially open the coarse adjust valve and

slowly close the bypass valve until the desired vacuum is reached. Do not reverse direction of bypass value; this will cause water to back up into the filter holder. If the desired vacuum is exceeded, either leak-check at this higher vacuum or end the leak-check as shown below and start over.

When the leak-check is completed, first slowly remove the plug from the inlet to the probe, filter holder, or cyclone (if applicable) and immediately turn off the vacuum pump. This prevents the water in the impingers from being forced backward into the filter holder and silica gel from being entrained backward into the third impinger.

4.1.4.2 Leak-Checks During Sample Run. If, during the sampling run, a component (e.g., filter assembly or impinger) change becomes unnecessary, a leak-check shall be conducted immediately before the change is made. The leak-check shall be done according to the procedure outlined in Section 4.1.4.1 above, except that it shall be done at a vacuum equal to or greater than the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m³/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction will need to be applied to the total volume of dry gas metered; if, however, a higher leakage rate is obtained, the tester shall either record the leakage rate and plan to correct the sample volume as shown in Section 6.3 of this method, or shall void the sampling run.

Immediately after component changes, leak-checks are optional; if such leak-checks are done, the procedure outlined in Section 4.1.4.1 above shall be used.

4.1.4.3 Post-test Leak-Check. A leak-check is mandatory at the conclusion of each sampling run. The leak-check shall be done in accordance with the procedures outlined in Section 4.1.4.1, except that it shall be conducted at a vacuum equal to or greater than the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m³/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, the tester shall either record the leakage rate and correct the sample volume as shown in Section 6.3 of this method, or shall void the sampling run.

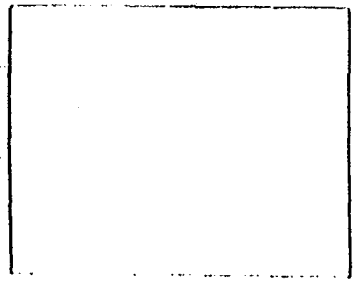
4.1.5 Particulate Train Operation. During the sampling run, maintain an isokinetic sampling rate (within 10 percent of true isokinetic unless otherwise specified by the Administrator) and a temperature around the filter of 120±14° C (248±25° F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator.

For each run, record the data required on a data sheet such as the one shown in Figure 5-2. Be sure to record the initial dry gas meter reading. Record the dry gas meter readings at the beginning and end of each sampling time increment, when changes in flow rates are made, before and after each leak-check, and when sampling is halted. Take other readings required by Figure 5-2 at least once at each sample point during each time increment and additional readings when significant changes (20 percent variation in velocity head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

Clean the portholes prior to the test run to minimize the chance of sampling deposited material. To begin sampling, remove the nozzle cap, verify that the filter and probe heating systems are up to temperature, and that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs are available, which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations. These nomographs are designed for use when the Type S pitot tube coefficient is 0.85±0.02, and the stack gas equivalent density (dry molecular weight) is equal to 29±4. APTD-0576 details the procedure for using the nomographs. If C_p and M_d are outside the above stated ranges do not use the nomographs unless appropriate steps (see Citation 7 in Bibliography) are taken to compensate for the deviations.

FIGURE 5-2—PARTICULATE FIELD DATA

Plant.....
Location.....
Operator.....
Date.....
Run No.....
Sample box No.....
Meter box No.....
Meter ΔH@.....
C factor.....
Pilot tube coefficient, Cp.....



SCHEMATIC OF STACK CROSS SECTION

Ambient temperature
Barometric pressure
Assumed moisture, %
Probe length, m (ft)
Nozzle identification No.
Average calibrated nozzle diameter, cm (in.)
Probe heater setting
Leak rate, m^3/min. (cfm)
Probe liner material
Static pressure, mm Hg (in. Hg)
Filter No.

Traverse point number	Sampling time (θ) min	Vacuum mm Hg (in Hg)	Stack temperature (T_s) °C (° F)	Velocity head (ΔP_s) mm (in.) H_2O	Pressure differential across orifice meter mm H_2O (in H_2O)	Gas sample volume m^3 (ft^3)	Gas sample temperature at dry gas meter		Filter holder temperature °C (° F)	Temperature of gas leaving condenser or last impinger °C (° F)
							Inlet C (° F)	Outlet °C (° F)		
Total							Avg	Avg		
Average							Avg			

THE ALMEGA CORPORATION

When the stack is under significant negative pressure (height of impinger stem), take care to close the coarse adjust valve before inserting the probe into the stack to prevent water from backing into the filter holder. If necessary, the pump may be turned on with the coarse adjust valve closed.

When the probe is in position, block off the openings around the probe and porthole to prevent unrepresentative dilution of the gas stream.

Traverse the stack cross-section, as required by Method 1 or as specified by the Administrator, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the portholes; this minimizes the chance of extracting deposited material.

During the test run, make periodic adjustments to keep the temperature around the filter holder at the proper level; add more ice and, if necessary, salt to maintain a temperature of less than 20° C (68° F) at the condenser/silica gel outlet. Also, periodically check the level and zero of the manometer.

If the pressure drop across the filter becomes too high, making isokinetic sampling difficult to maintain, the filter may be replaced in the midst of a sample run. It is recommended that another complete filter assembly be used rather than attempting to change the filter itself. Before a new filter assembly is installed, conduct a leak-check (see Section 4.1.4.2). The total particulate weight shall include the summation of all filter assembly catches.

A single train shall be used for the entire sample run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or, in cases where equipment failure necessitates a change of trains. In all other situations, the use of two or more trains will be subject to the approval of the Administrator.

Note that when two or more trains are used, separate analyses of the front-half and (if applicable) impinger catches from each train shall be performed, unless identical nozzle sizes were used on all trains, in which case, the front-half catches from the individual trains may be combined (as may the impinger catches) and one analysis of front-half catch and one analysis of impinger catch may be performed. Consult with the Administrator for details concerning the calculation of results when two or more trains are used.

At the end of the sample run, turn off the coarse adjust valve, remove the probe and nozzle from the stack, turn off the pump, record the final dry gas meter reading, and conduct a post-test leak-check, as outlined in Section 4.1.4.3. Also, leak-check the pitot lines as described in Method 2, Section 3.1; the lines must pass this leak-check, in order to validate the velocity head data.

4.1.6 Calculation of Percent Isokinetic. Calculate percent isokinetic (see Calculations, Section 6) to determine whether the run was valid or another test run should be made. If there was difficulty in maintaining isokinetic rates due to source conditions, consult with the Administrator for possible variance on the isokinetic rates.

4.2 Sample Recovery. Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool.

When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over it to prevent losing or gaining particulate matter. Do not cap off the probe tip tightly while the sampling train is cooling down as this would create a vacuum in the filter holder, thus drawing water from the impingers into the filter holder.

Before moving the sample train to the cleanup site, remove the probe from the sample train, wipe off the silicone grease, and cap the open outlet of the probe. Be careful not to lose any condensate that might be present. Wipe off the silicone grease from the filter inlet where the probe was fastened and cap it. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used between the first impinger or condenser and the filter holder, disconnect the line at the filter holder and let any condensed water or liquid drain into the impingers or condenser. After wiping off the silicone grease, cap off the filter holder outlet and impinger inlet. Either ground-glass stoppers, plastic caps, or serum caps may be used to close these openings.

Transfer the probe and filter-impinger assembly to the cleanup area. This area should be clean and protected from the wind so that the chances of contaminating or losing the sample will be minimized.

Save a portion of the acetone used for cleanup as a blank. Take 200 ml of this acetone directly from the wash bottle being used and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the particulate cake is inside the fold. Carefully transfer to the petri dish any particulate matter and/or filter fibers which adhere to the filter holder gasket, by using a dry Nylon

bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover particulate matter or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator: in these cases, save a water blank and follow the Administrator's directions on analysis. Perform the acetone rinses as follows:

Carefully remove the probe nozzle and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid on transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter which is brushed from the probe. Run the brush through the probe three times or more until no visible particulate matter is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped. Rinse the brush with acetone, and quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contaminations.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether or not leakage occured during transport. Label the container to clearly identify its contents.

Container No. 3. Note the color of the indicating silica gel to determine if it has been completely spent and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid which is in the first three impingers to within ± 1 ml by using a graduated cylinder or by weighing it to within ± 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see Note, Section 2.1.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

FIGURE 5-3—ANALYTICAL DATA

Plant _____
Date _____
Run No. _____
Filter No. _____
Amount liquid lost during transport _____
Acetone blank volume, ml _____
Acetone wash volume, ml _____
Acetone blank concentration, mg/mg (Equation 5-4) _____
Acetone wash blank, mg (Equation 5-5) _____

Container number	Weight of particulate collected, mg		
	Final weight	Tare weight	Weight gain
1			
2			
Total			
Less acetone blank			
Weight of particulate matter			

	Volume of liquid water collected	
	Impinger volume, ml	Silica gel weight, g
Final		
Initial		
Liquid collected		
Total volume collected		g* ml

*Convert weight of water to volume by dividing total weight increase by density of water (1 g/ml).

$$\frac{\text{Increase, g}}{(1\ \text{g/ml})} = \text{Volume water, ml}$$

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose particulate from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight and report the results to the nearest 0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105° C (220° F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105° C (220° F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container and confirm on the analysis sheet whether or not leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_2O that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The $\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\ \Delta H \frac{T_m}{P_{bar}} \frac{\Theta^2}{Y^2 V^2_m}$$

Eq. 5-9

Where:

ΔH = Average pressure differential across the orifice meter, in. H_2O.

T_m = Absolute average dry gas meter temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

Θ = Total sampling time, min.

Y = Dry gas meter calibration factor, dimensionless.

V_m = Volume of gas sample as measured by dry gas meter, dcf.

0.0319 = (0.0567 in. Hg/°R) x (0.75 cfm)².

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the dry gas meter temperature, and the barometric pressure. Calculate a dry gas meter calibration check value, Y_c, as follows:

$$Y_c = \frac{10}{V_m}\left[\frac{0.0319\ T_m}{P_{bar}}\right]^{1/2}$$

Eq. 5-10

Where:

Y_c = Dry gas meter calibration check value, dimensionless.

10 = 10 minutes of run time.

Compare the Y_c value with the dry gas meter calibration factor Y to determine that:

$$0.97Y < Y_c < 1.03Y$$

If the Y_c value is not within this range, the volume metering system should be investigated before beginning the test.

4.4.2 Calibrated Critical Orifice. A calibrated critical orifice, calibrated against a wet test meter or spirometer and designed to be inserted at the inlet of the sampling meter box may be used as a quality control check by following the procedure of Section 7.2.

5. *Calibration*

Maintain a laboratory log of all calibrations.

5.1 Probe Nozzle. Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the inside diameter of the nozzle to the nearest 0.025 mm (0.001 in.). Make three separate measurements using different diameters each time, and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in.). When nozzles become nicked, dented, or corroded, they shall be reshaped, sharpened, and recalibrated before use. Each nozzle shall be permanently and uniquely identified.

5.2 Pitot Tube. The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Section 4 of Method 2.

5.3 Metering System.

5.3.1 Calibration Prior to Use. Before its initial use in the field, the metering system shall be calibrated as follows: Connect the metering system inlet to the outlet of a wet test meter that is accurate to within 1 percent. Refer to Figure 5.5. The wet test meter should have a capacity of 30 liters/rev (1 ft^3/rev). A spirometer of 400 liters (14 ft^3) or more capacity, or equivalent, may be used for this calibration, although a wet test meter is usually more practical. The wet test meter should be periodically calibrated with a spirometer or a liquid displacement meter to ensure the accuracy of the wet test meter. Spirometers or wet test meters of other sizes may be used, provided that the specified accuracies of the procedure are maintained. Run the metering system pump for about 15 minutes with the orifice manometer indicating a median reading as expected in field use to allow the pump to warm up and to permit the interior surface of the wet test meter to be thoroughly wetted. Then, at each of a minimum of three orifice manometer settings, pass an exact quantity of gas through the wet test meter and note the gas volume indicated by the dry gas meter. Also note the barometric pressure, and the temperatures of the wet test meter, the inlet of the dry gas meter, and the outlet of the dry gas meter. Select the highest and lowest orifice settings to bracket the expected field operating range of the orifice. Use a minimum volume of 0.15 m^3 (5 cf) at all orifice settings. Record all the data on a form similar to Figure 5.6, and calculate Y, the dry gas meter calibration factor, and $\Delta H_@$, the orifice calibration factor, at each orifice setting as shown on Figure 5.6. Allowable tolerances for individual Y and $\Delta H_@$ values are given in Figure 5.6. Use the average of the Y values in the calculations in Section 6.

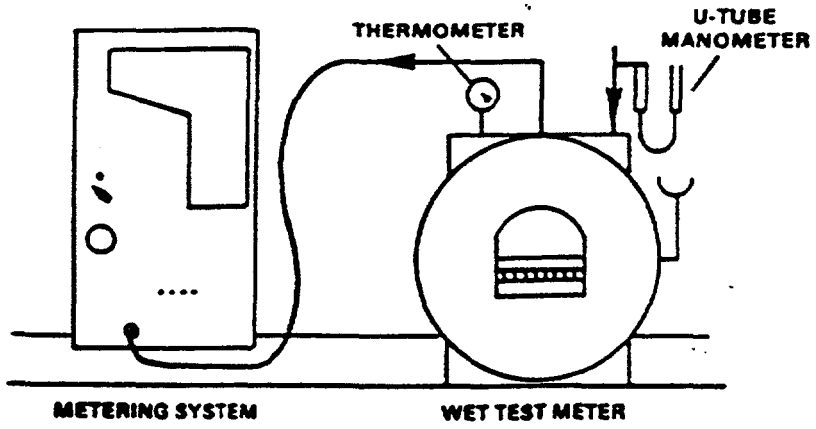


Figure 5.5 Equipment arrangement for metering system calibration.

Date_____ Metering System Identification:_____

Barometric pressure, P_b = _____ in. Hg

Orifice manometer setting ΔH in. H_2O	Spirometer (wet meter) gas volume V_w ft^3	Dry gas meter volume V_m ft^3	Temperatures: Spirometer (wet meter) t_w °F	Temperatures: Dry Gas Meter: Inlet t_i °F	Temperatures: Dry Gas Meter: Outlet t_o °F	Temperatures: Dry Gas Meter: Average t_m °F	Time θ min

Calculations

ΔH in. H_2O	Y $\dfrac{V_w P_b (t_m + 460)}{V_m \left[P_b + \frac{\Delta H}{13.6}\right] (t_w + 460)}$	$\Delta H@$ $\dfrac{0.0317\ \Delta H}{P_b (t_o + 460)} \left[\dfrac{(t_w + 460)\ \theta}{V_w}\right]^2$
Average		

Y = Ratio of reading of wet test meter to dry test meter; tolerance for individual values ±0.02 from average.

$\Delta H@$ = Orifice pressure differential that equates to 0.75 cfm of air @ 68°F and 29.92 inches of mercury, in. H_2O; tolerance for individual values ±0.20 from average.

Figure 5.6. Example data sheet for calibration of metering system (English units).

Before calibrating the metering system, it is suggested that a leak-check be conducted. For metering systems having diaphragm pumps, the normal leak-check procedure will not detect leakages within the pump. For these cases the following leak-check procedure is suggested: make a 10-minute calibration run at 0.00057 m^3/min (0.02 cfm); at the end of the run, take the difference of the measured wet test meter and dry gas meter volumes; divided the difference by 10, to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

5.3.2 Calibration After Use. After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test), with the vacuum set at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet test meter and the inlet of the metering system. Calculate the average value of the dry gas meter calibration factor. If the value has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as previously detailed.

Alternative procedures, e.g., rechecking the orifice meter coefficient may be used, subject to the approval of the Administrator.

5.3.3 Acceptable Variation in Calibration. If the dry gas meter coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

5.4 Probe Heater Calibration. The probe heating system shall be calibrated before its initial use in the field.

Use a heat source to generate air heated to selected temperatures that approximate those expected to occur in the sources to be sampled. Pass this air through the probe at a typical simple flow rate while measuring the probe inlet and outlet temperatures at various probe heater settings. For each air temperature generated, construct a graph of probe heating system setting versus probe outlet temperature. The procedure outlined in APTD-0576 can also be used. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used. Also, probes with outlet temperature monitoring capabilities do not require calibration.

5.5 Temperature Gauges. Use the procedure in Section 4.3 of Method 2 to calibrate in-stack temperature gauges. Dial thermometers, such as are used for the dry gas meter and condenser outlet, shall be calibrated against mercury-in-glass thermometers.

5.6 Leak Check of Metering System Shown in Figure 5-1. That portion of the sampling train from the pump to the orifice meter should be leak checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. The following procedure is suggested (see Figure 5-4): Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing atached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13 to 18 cm (5 to 7 in.) water column by blowing into the rubber tubing. Pinch off the tubing and observe the manometer for one minute. A loss of pressure on the manometer indicates a leak in the meter box; leaks, if present, must be corrected.

5.7 Barometer. Calibrate against a mercury barometer.

6. *Calculations*

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation. Other forms of the equations may be used as long as they give equivalent results.

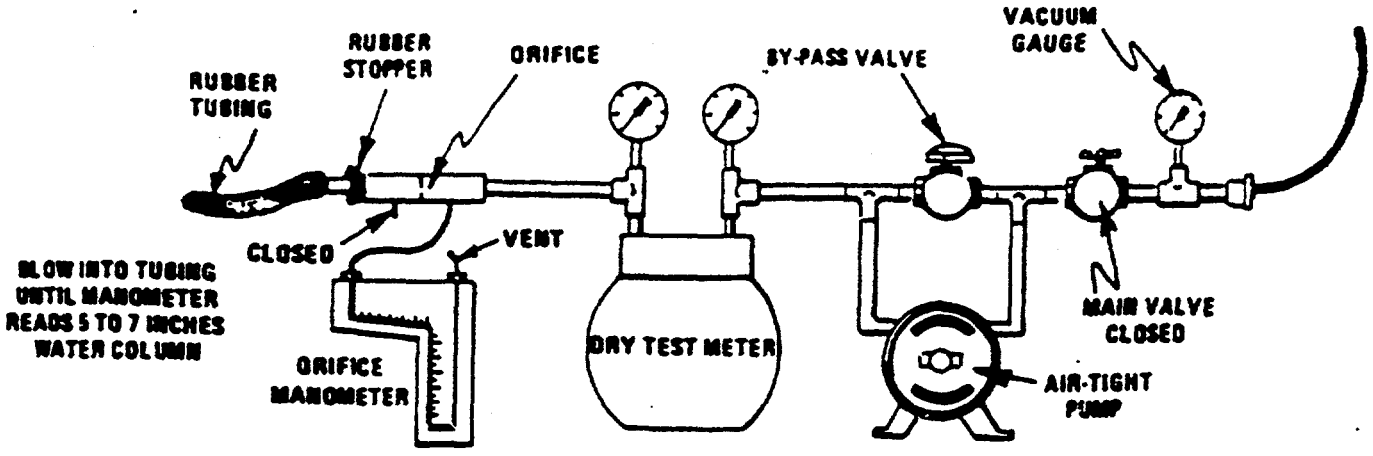


Figure 5-4. Leak check of meter box.

6.1 Nomenclature.

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

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

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

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

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

Equation 5-1

Where:

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

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

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

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

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

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

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

6.4 Volume of Water Vapor.

Equation 5-2

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

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

6.5 Moisture Content.

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

Eq. 5-3

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

6.6 Acetone Blank Concentration.

$$C_a = \frac{m_a}{V_a \rho_a}$$ Eq. 5-4

6.7 Acetone Wash Blank.

$$W_a = C_a V_{aw} \rho_a$$ Eq. 5-5

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

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

6.9 Particulate Concentration.

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

Eq. 5-6

6.10 Conversion Factors:

From	To	Multiply by
scf	m³	0.02832
g	mg	0.001
g/ft³	gr/ft³	15.43
g/ft³	lb/ft³	2.205×10^{-3}
g/ft³	g/m³	35.31

6.11 Isokinetic Variation.

6.11.1 Calculation From Raw Data.

$$I = \frac{100\ T_s[K_3 V_w - (V_m Y / T_m)(P_{bar} - \Delta H/13.6)]}{60\theta v_s P_s A_n}$$

Eq. 5-7

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

6.11.2 Calculation From Intermediate Values.

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

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

Equation 5-8

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

6.12 Acceptable Results. If 90 percent < I < 110 percent, the results are acceptable. If the particulate results are low in comparison to the standard, and I is over 110 percent or less than 90 percent, the Administrator may accept the results. Citation 4 in the bibliography section can be used to make acceptability judgments. If I is judged to be unacceptable, reject the particulate results and repeat the test.

6.13 Stack Gas Velocity and Volumetric Flow Rate. Calculate the average stack gas velocity and volumetric flow rate, if needed, using data obtained in this method and the equations in Sections 5.2 and 5.3 of Method 2.

7. *Alternative Procedures*

7.1 Dry Gas Meter as a Calibration Standard. A dry gas meter may be used as a calibration standard for volume measurements in place of the wet test meter specified in Section 5.3, provided that it is calibrated initially and recalibrated periodically as follows:

7.1.1 Standard Dry Gas Meter Calibration.

7.1.1.1 The dry gas meter to be calibrated and used as a secondary reference meter should be of high quality and have an appropriately sized capacity, e.g., 3 liters/rev (0.1 ft³/rev). A spirometer (400 liters or more capacity), or equivalent, may be used for this calibration, although a wet test meter is usually more practical. The wet test meter should have a capacity of 30 liters/rev (1 ft³/rev) and capable of measuring volume to within ±1.0 percent; wet test meters should be checked against a spirometer or a liquid displacement meter to ensure the accuracy of the wet test meter. Spirometers or wet test meters of other sizes may be used, provided that the specified accuracies of the procedure are maintained.

7.1.1.2 Set up the components as shown in Figure 5.7. A spirometer, or equivalent, may be used in place of the wet test meter in the system. Run the pump for at least 5 minutes at a flow rate of about 10 liters/min (0.35 cfm) to condition the interior surface of the wet test meter. The pressure drop indicated by the manometer at the inlet side of the dry gas meter should be minimized [no greater than 100 mm H_2O (4 in. H_2O) at a flow rate of 30 liters/min (1 cfm)]. This can be accomplished by using large diameter tubing connections and straight pipe fittings.

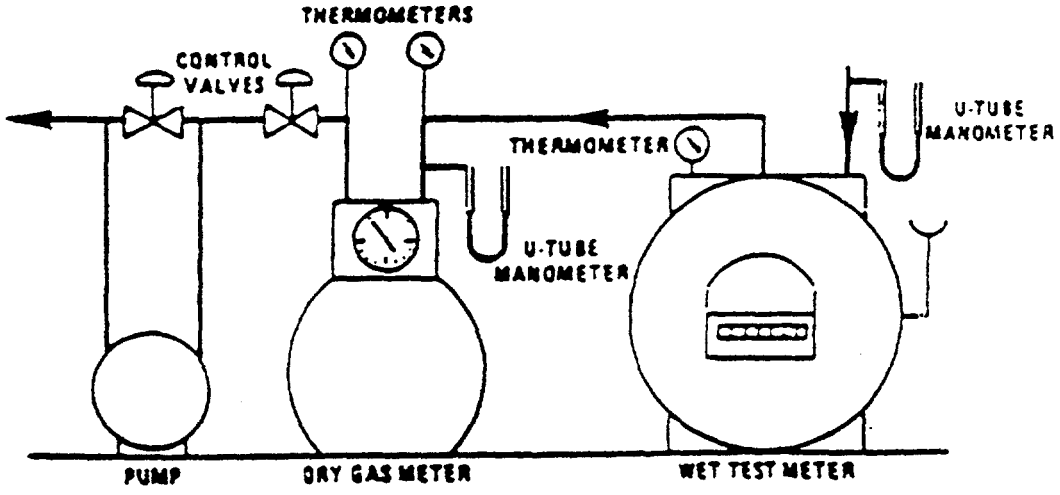


Figure 5.7 . Equipment arrangement for dry-gas meter calibration.

7.1.1.3 Collect the data as shown in the example data sheet (see Figure 5-8). Make triplicate runs at each of the flow rates and at no less than five different flow rates. The range of flow rates should be between 10 and 34 liters/min (0.35 and 1.2 cfm) or over the expected operating range.

DATE _____

DRY GAS METER IDENTIFICATION _____

BAROMETRIC PRESSURE (P_b): _____ in H_g

APPROXIMATE FLOW RATE ($\bar{Q}$) cfm	SPIROMETER (WET METER) GAS VOLUME (V_s) ft^3	DRY GAS METER VOLUME (V_{dg}) ft^3	TEMPERATURES: SPIROMETER (WET METER) (t_s) °F	TEMPERATURES: DRY GAS METER: INLET (t_i) °F	TEMPERATURES: DRY GAS METER: OUTLET (t_o) °F	TEMPERATURES: DRY GAS METER: AVERAGE ($\bar{t}_d$) °F	DRY GAS METER PRESSURE (Δp) in H_2O	TIME (Θ) min.	FLOW RATE (Q) cfm	METER METER COEFFICIENT (Y_{dm})	AVERAGE METER COEFFICIENT ($\bar{Y}_{dm}$)
0.40											
0.60											
0.80											
1.00											
1.20											

$$Q = 1765 \frac{V_s}{\Theta} \frac{P_b}{(t_s + 460)}$$

$$Y_{dm} = \frac{V_s}{V_{dg}} \frac{(\bar{t}_d + 460)}{(t_s + 460)} \frac{P_b}{(P_b + \frac{\Delta p}{13.6})}$$

FIGURE 5.8 EXAMPLE DATA SHEET FOR CALIBRATION OF A STANDARD DRY GAS METER FOR METHOD 5 SAMPLING EQUIPMENT (ENGLISH UNITS)

The Almega Corporation

7.1.1.4 Calculate flow rate, Q, for each run using the wet test meter gas volume, V_w, and the run time, θ. Calculate the dry gas meter coefficient, Y_{dg}, for each run. These calculations are as follows:

$$Q = K_1 \frac{P_{bar}}{t_w - t_{std}} \frac{V_w}{\theta}$$

$$Y_{dg} = \frac{\frac{V_w}{V_{dg}} \frac{(t_{dg} + t_{std})}{(t_w + t_{std})} \frac{P_{bar}}{(P_{bar} - \frac{\Delta p}{13.6})}}{}$$

Where:

$K_1 = 0.3858$ for international system of units (SI); 17.64 for English units.

V_w = Wet test meter volume, liters (ft^3).

V_{dg} = Dry gas meter volume, liters (ft^3).

t_{dg} = Average dry gas meter temperature, °C (°F).

t_{std} = 273° C for SI units; 460° F for English units.

t_w = Average wet test meter temperature, °C (°F).

P_{bar} = Barometric pressure, mm Hg (in. Hg).

Δp = Dry gas meter inlet differential pressure, mm H_2O (in. H_2O).

θ = Run time, min.

7.1.1.5 Compare the three Y_{dg} values at each of the flow rates and determine the maximum and minimum values. The difference between the maximum and minimum values at each flow rate should be no greater than 0.030. Extra sets of triplicate runs may be made in order to complete this requirement. In addition, the meter coefficients should be between 0.95 and 1.05. If these specifications cannot be met in three sets of successive triplicate runs, the meter is not suitable as a calibration standard and should not be used as such. If these specifications are met, average the three Y_{dg} values at each flow rate resulting in five average meter coefficients, Y_{dg}.

7.1.1.6 Prepare a curve of meter coefficient, Y_{dg}, versus flow rate, Q, for the dry gas meter. This curve shall be used as a reference when the meter is used to calibrate other dry gas meters and to determine whether recalibration is required.

7.1.2 Standard Dry Gas Meter Recalibration.

7.1.2.1 Recalibrate the standard dry gas meter against a wet test meter or spirometer annually or after every 200 hours of operation, whichever comes first. This requirement is valid provided the standard dry gas meter is kept in a laboratory and, if transported, cared for as any other laboratory instrument. Abuse to the standard meter may cause a change in the calibration and will require more frequent recalibrations.

7.1.2.2 As an alternative to full recalibration, a two-point calibration check may be made. Follow the same procedure and equipment arrangement as for a full recalibration, but run the meter at only two flow rates [suggested rates are 14 and 28 liters/min (0.5 and 1.0 cfm)]. Calculate the meter coefficients for these two points, and compare the values with the meter calibration curve. If the two coefficients are within ±1.5 percent of the calibration curve values at the same flow rates, the meter need not be recalibrated until the next date for a recalibration check.

7.2 Critical Orifices As Calibration Standards. Critical orifices may be used as calibration standards in place of the wet test meter specified in Section 5.3, provided that they are selected, calibrated, and used as follows:

7.2.1 Section of Critical Orifices.

7.2.1.1 The procedure that follows describes the use of hypodermic needles or stainless steel needle tubings which have been found suitable for use as critical orifices. Other materials and critical orifice designs may be used provided the orifices act as true critical orifices; i.e., a critical vacuum can be obtained, as described in Section 7.2.2.2.3. Select five critical orifices that are appropriately sized to cover the range of flow rates between 10 and 34 liters/min or the expected operating range. Two of the critical orifices should bracket the expected operating range.

A minimum of three critical orifices will be needed to calibrate a Method 5 dry gas meter (DGM); the other two critical orifices can serve as spares and provide better selection for bracketing the range of operating flow rates. The needle sizes and tubing lengths shown below give the following approximate flow rates:

Gauge/cm	Flow rate (liters/min)	Gauge/cm	Flow rate (liters/min)
12/7.6	32.56	14/2.5	19.54
12/10.2	30.02	14/5.1	17.27
13/2.5	25.77	14/7.6	16.14
13/5.1	23.50	15/3.2	14.16
13/7.6	22.37	15/7.6	11.61
13/10.2	20.67	15/10.2	10.48

7.2.1.2 These needles can be adapted to a Method 5 type sampling train as follows: Insert a serum bottle stopper, 13- by 20-mm sleeve type, into a ½-inch Swagelok quick connect. Insert the needle into the stopper as shown in Figure 5-9.

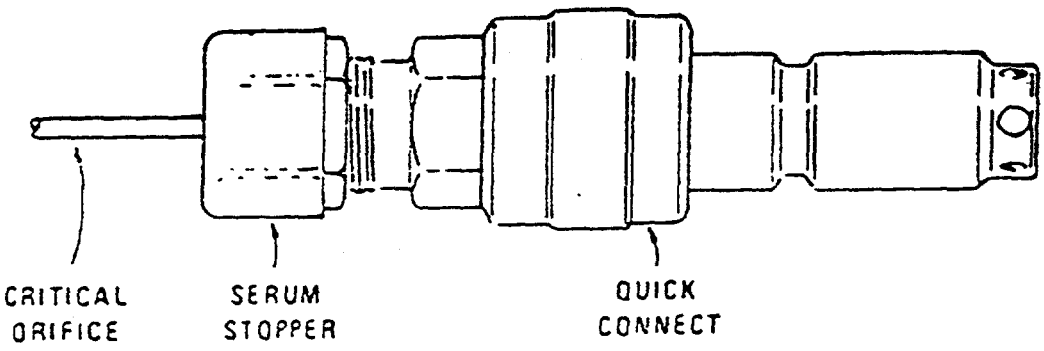


Figure 5-9. Critical orifice adaptation to Method 5 metering system.

7.2.2 Critical Orifice Calibration. The procedure described in this section uses the Method 5 meter box configuration with a DGM as described in Section 2.1.8 to calibrate the critical orifices. Other schemes may be used, subject to the approval of the Administrator.

7.2.2.1 Calibration of Meter Box. The critical orifices must be calibrated in the same configuration as they will be used: i.e., there should be no connections to the inlet of the orifice.

7.2.2.1.1 Before calibrating the meter box, leak check the system as follows: Fully open the coarse adjust valve, and completely close the by-pass valve. Plug the inlet. Then trun on the pump, and determine whether there is any leakage. The leakage rate shall be zero; i.e., no detectable movement of the DGM dial shall be seen for 1 minute.

7.2.2.1.2 Check also for leakages in that portion of the sampling train between the pump and the orifice meter. See Section 5.6 for the procedure: make any corrections, if necessary. If leakage is detected, check for cracked gaskets, loose fittings, worn O-rings, etc., and make the necessary repairs.

7.2.2.1.3 After determining that the meter box is leakless, calibrate the meter box according to the procedure given in Section 5.3. Make sure that the wet test meter meets the requirements stated in Section 7.1.1.1. Check the water level in the wet test meter. Record the DGM calibration factor, Y.

7.2.2.2 Calibration of Critical Orifices. Set up the apparatus as shown in Figure 5-10.

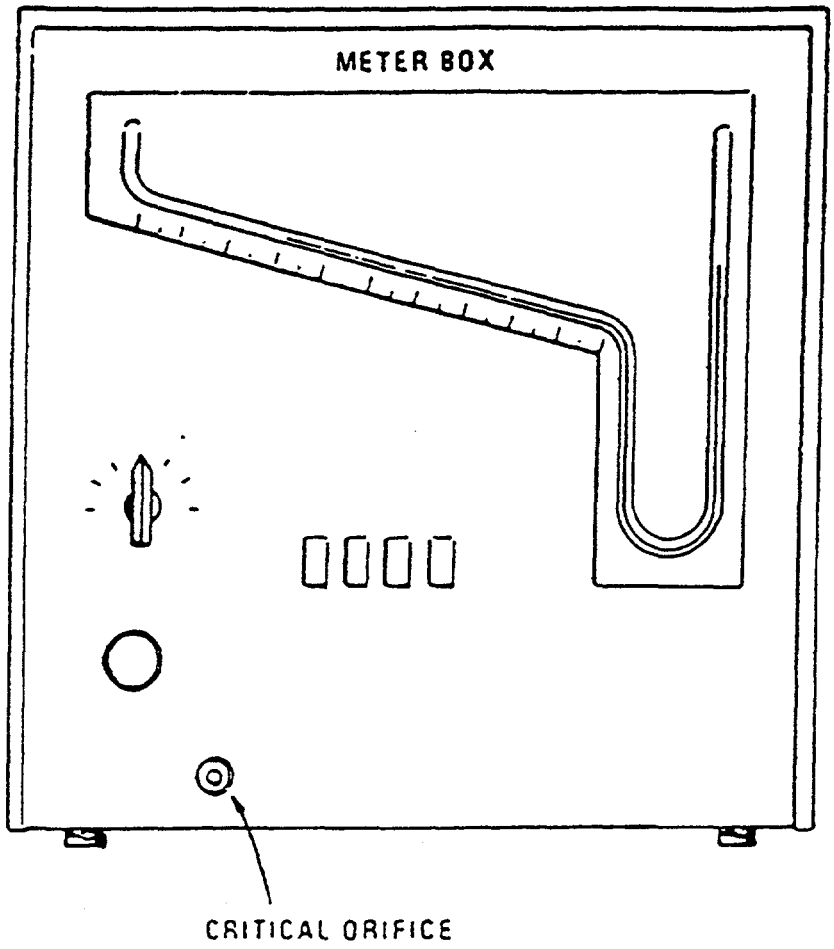


Figure 5-10. Apparatus setup.

7.2.2.2.1 Allow a warm-up time of 15 minutes. This step is important to equilibrate the temperature conditions through the DGM.

7.2.2.2.2 Leak check the system as in Section 7.2.2.1.1. The leakage rate shall be zero.

7.2.2.2.3 Before calibrating the critical orifice, determine its suitability and the appropriate operating vacuum as follows: Turn on the pump, fully open the coarse adjust valve, and adjust the by-pass valve to give a vacuum reading corresponding to about half of atmospheric pressure. Observe the meter box orifice manometer reading, H. Slowly increase the vacuum reading until a stable reading is obtained on the meter box orifice manometer. Record the critical vacuum for each orifice.

Orifices that do not reach a critical value shall not be used.

7.2.2.2.4 Obtain the barometric pressure using a barometer as described in Section 2.1.9. Record the barometric pressure, P_{bar}, in mm Hg (in. Hg).

7.2.2.2.5 Conduct duplicate runs at a vacuum of 25 to 50 mm Hg (1 to 2 in. Hg) above the critical vacuum. The runs shall be at least 5 minutes each. The DGM volume readings shall be in increments of 0.00283 m^3 (0.1 ft^3) or in increments of complete revolutions of the DGM. As a guideline, the times should not differ by more than 3.0 seconds (this includes allowance for changes in the DGM temperatures) to achieve ± 0.5 percent in K'. Record the information listed in Figure 5-11.

7.2.2.2.6 Calculate K' using Equation 5-9.

Where:

$$K' = \frac{K_1 V_m Y (P_{bar} + \Delta H/13.6) \sqrt{T_{amb}}}{P_{bar} T_m \Theta} \qquad \text{Eq. 5-9}$$

K' = Critical orifice coefficient, $\frac{(m^3)(^\circ K)^{1/2}}{(mm.\ Hg)(min)}$ $\left[\frac{(ft^3)(^\circ R)^{1/2}}{(in.\ Hg)(min)}\right]$

T_{amb} = Absolute ambient temperature, °K (°R).

Average the K' values. The individual K' values should not differ by more than ±0.5 percent from the average.

7.2.3 Using the Critical Orifices as Calibration Standards.

7.2.3.1 Record the barometric pressure. Date _____ Train ID _____ DGM cal. factor _____ Critical orifice ID _____

Dry gas meter		Run number 1	Run number 2
Final reading	m^3 (ft^3)		
Initial reading	m^3 (ft^3)		
Difference, V_m	m^3 (ft^3)		
Inlet/Outlet temperatures:			
Initial	°C (°F)	/	/
Final	°C (°F)	/	/
Avg. Temperature, t_m	°C (°F)		
Time, Θ	min/sec	/	/
	min		
Orifice man. rdg., ΔH	mm (in.) H_2O		
Bar. pressure, P_{bar}	mm (in.) Hg		
Ambient temperature, t_{amb}	°C (°F)		
Pump vacuum	mm (in.) Hg		
K' factor			
Average			

Figure 5-11. Data sheet for determining K' factor.

7.2.3.2 Calibrate the metering system according to the procedure outlined in Sections 7.2.2.2.1 to 7.2.2.2.5. Record the information listed in Figure 5.12.

7.2.3.3 Calculate the standard volumes of air passed through the DGM and the critical orifices, and calculate the DGM calibration factor, Y, using the equations below:

$$V_m(std) = K_1 V_m \frac{P_{bar} + (\Delta H/13.6)}{T_m} \qquad \text{Eq. 5-10}$$

$$V_{cr}(std) = K' \frac{P_{bar}\Theta}{T_{amb}} \qquad \text{Eq. 5-11}$$

$$Y = \frac{V_{cr(std)}}{V_{m(std)}} \qquad \text{Eq. 5-12}$$

where:

$V_{cr(std)}$ = Volume of gas sample passed through the critical orifice, corrected to standard conditions, dsm^3 (dscf).

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

7.2.3.4 Average the DGM calibration values for each of the flow rates. The calibration factor, Y, at each of the flow rates should not differ by more than ±2 percent from the average.

7.2.3.5 To determine the need for recalibrating the critical orifices, compare the DGM Y factors obtained from two adjacent orifices each time a DGM is calibrated: for example, when checking 13/2.5, use orifices 12/10.2 and 13/5.1. If any critical orifice yields a DGM Y factor differing by more than 2 percent from the others, recalibrate the critical orifice according to Section 7.2.2.2.

Date _____ Train ID _____ Critical orifice ID _____ Critical orifice K' factor _____

Dry gas meter		Run number 1	Run number 2
Final reading	m^3 (ft^3)		
Initial reading	m^3 (ft^3)		

Dry gas meter		Run number 1	2
Difference, V_m	m^3 (ft^3)		
Inlet/outlet temperatures: Initial	°C (°F)	/	/
Final	°C (°F)	/	/
Avg. Temperature, t_m	°C (°F)		
Time, Θ	min/sec	/	/
	min		
Orifice man. rdg., ΔH	mm (in.) H_2O		
Bar. pressure, P_{bar}	mm (in.) Hg		
Ambient temperature, t_{amb}	°C (°F)		
Pump vacuum	mm (in.) Hg		
$V_{m(std)}$	m^3 (ft^3)		
$V_{w(std)}$	m^3 (ft^3)		
DGM cal. factor, Y			

Figure 5-12. Data sheet for determining DGM Y factor.

8. *Bibliography*

1. Addendum to Specifications for Incinerator Testing at Federal Facilities. PHS, NCAPC. Dec. 6, 1967.

2. Martin, Robert M. Construction Details of Isokinetic Source-Sampling Equipment. Environmental Protection Agency. Research Triangle Park, NC. APTD-0581. April 1971.

3. Rom, Jerome J. Maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment. Environmental Protection Agency. Research Triangle Park, NC. APTD-0576. March, 1972.

4. Smith, W. S., R. T. Shigehara, and W. F. Todd. A Method of Interpreting Stack Sampling Data. Paper Presented at the 63d Annual Meeting of the Air Pollution Control Association, St. Louis, MO, June 14-19, 1970.

5. Smith, W. S., et al. Stack Gas Sampling Improved and Simplified With New Equipment. APCA Paper No. 67-119, 1967.

6. Specifications for Incinerator Testing at Federal Facilities. PHS, NCAPC. 1967.

7. Shigehara, R. T. Adjustments in the EPA Nomograph for Different Pitot Tube Coefficients and Dry Molecular Weights. Stack Sampling News 2:4-11, October, 1974.

8. Vollaro, R. F. A Survey of Commercially Available Instrumentation For the Measurement of Low-Range Gas Velocities. U.S. Environmental Protection Agency, Emission Measurement Branch, Research Triangle Park, NC. November, 1976 (unpublished paper).

9. Annual Book of ASTM Standards, Part 26. Gaseous Fuels; Coal and Coke; Atmospheric Analysis. American Society for Testing and Materials, Philadelphia, PA. 1974. pp. 617-622.

10. Felix, L. G., G. I. Clinard, G. E. Lacey, and J. D. McCain. Inertial Cascade Impactor Substrate Media for Flue Gas Sampling. U.S. Environmental Protection Agency. Research Triangle Park, NC 27711. Publication No. EPA-600/7-77-060. June 1977. 83 p.

11. Westlin, P. R. and R. T. Shigehara. Procedure for Calibrating and Using Dry Gas Volume Meters as Calibration Standards. Source Evaluation Society Newsletter. 3(1):17-30. February 1978.

12. Lodge, J.P., Jr., J.B. Pate, B.E. Ammons, and G.A. Swanson. The Use of Hypodermic Needles as Critical Orifices in Air Sampling. J. Air Pollution Control Association. *16*:197-200. 1966.

APPENDIX F

METHOD 6C

DETERMINATION OF SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES (INSTRUMENTAL ANALYZER PROCEDURE)

THE ALMEGA CORPORATION

1. *Applicability and Principle.*

1.1 *Applicability.* This method is applicable to the determination of sulfur dioxide (SO_2) concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations.

1.2 Principle. A gas sample is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental analyzer for determination of SO_2 gas concentration using an ultraviolet (UV), nondispersive infrared (NDIR), or fluorescence analyzer. Performance specifications and test procedures are provided to ensure reliable data.

2. *Range and Sensitivity*

2.1 Analytical Range. The analytical range is determined by the instrumental design. For this method, a portion of the analytical range is selected by choosing the span of the monitoring system. The span of the monitoring system shall be selected such that the pollutant gas concentration equivalent to the emission standard is not less than 30 percent of the span. If at any time during a run the measured gas concentration exceeds the span, the run shall be considered invalid.

2.2 Sensitivity. The minimum detectable limit depends on the analytical range, span, and signal-to-noise ratio of the measurement system. For a well designed system, the minimum detectable limit should be less than 2 percent of the span.

3. *Definitions*

3.1 Measurement System. The total equipment required for the determination of gas concentration. The measurement system consists of the following major subsystems:

3.1.1 Sample Interface. That portion of a system used for one or more of the following: sample acquisition, sample transport, sample conditioning, or protection of the analyzers from the effects of the stack effluent.

3.1.2 Gas Analyzer. That portion of the system that senses the gas to be measured and generates an output proportional to its concentration.

3.1.3 Data Recorder. A strip chart recorder, analog computer, or digital recorder for recording measurement data from the analyzer output.

3.2 Span. The upper limit of the gas concentration measurement range displayed on the data recorder.

3.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

3.4 Analyzer Calibration Error. The difference between the gas concentration exhibited by the gas analyzer and the known concentration of the calibration gas when the calibration gas is introduced directly to the analyzer.

3.5 Sampling System Bias. The difference between the gas concentrations exhibited by the measurement system when a known concentration gas is introduced at the outlet of the sampling probe and when the same gas is introduced directly to the analyzer.

3.6 Zero Drift. The difference in the measurement system output reading from the initial calibration response at the zero concentration level after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

3.7 Calibration Drift. The difference in the measurement system output reading from the initial calibration response at a mid-range calibration value after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

3.8 Response Time. The amount of time required for the measurement system to display 95 percent of a step change in gas concentration on the data recorder.

3.9 Interference Check. A method for detecting analytical interferences and excessive biases through direct comparison of gas concentrations provided by the measurement system and by a modified Method 6 procedure. For this check, the modified Method 6 samples are acquired at the sample by-pass discharge vent.

3.10 Calibration Curve. A graph or other systematic method of establishing the relationship between the analyzer response and the actual gas concentration introduced to the analyzer.

4. *Measurement System Performance Specifications*

4.1 Analyzer Calibration Error. Less than ±2 percent of the span for the zero, mid-range, and high-range calibration gases.

4.2 Sampling System Bias. Less than ±5 percent of the span for the zero, and mid- or high-range calibration gases.

4.3 Zero Drift. Less than ±3 percent of the span over the period of each run.

4.4 Calibration Drift. Less than ±3 percent of the span over the period of each run.

4.5 Interference Check. Less than ±7 percent of the modified Method 6 result for each run.

5. *Apparatus and Reagents*

5.1 Measurement System. Any measurement system for SO_2 that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1. The essential components of the measurement system are described below:

5.1.1 Sample Probe. Glass, stainless steel, or equivalent, of sufficient length to traverse the sample points. The sampling probe shall be heated to prevent condensation.

5.1.2 Sample Line. Heated (sufficient to prevent condensation) stainless steel or Teflon tubing, to transport the sample gas to the moisture removal system.

5.1.3 Sample Transport Lines. Stainless steel or Teflon tubing, to transport the sample from the moisture removal system to the sample pump, sample flow rate control, and sample gas manifold.

5.1.4 Calibration Valve Assembly. A three-way valve assembly, or equivalent, for blocking the sample gas flow and introducing calibration gases to the measurement system at the outlet of the sampling probe when in the calibration mode.

5.1.5 Moisture Removal System. A refrigerator-type condenser or similar device (e.g., permeation dryer), to remove condensate continuously from the sample gas while maintaining minimal contact between the condensate and the sample gas. The moisture removal system is not necessary for analyzers that can measure gas concentrations on a wet basis; for these analyzers, (1) heat the sample line and all interface components up to the inlet of the analyzer sufficiently to prevent condensation, and (2) determine the moisture content and correct the measured gas concentrations to a dry basis using appropriate methods, subject to the approval of the Administrator. The determination of sample moisture content is not necessary for pollutant analyzers that measure concentrations on a wet basis when (1) a wet basis CO_2 analyzer operated according to Method 3A is used to obtain simultaneous measurements, and (2) the pollutant/CO_2 measurements are used to determine emissions in units of the standard.

5.1.6 Particulate Filter. An in-stack or heated (sufficient to prevent water condensation) out-of-stack filter. The filter shall be borosilicate or quartz glass wool, or glass fiber mat. Additional filters at the inlet or outlet of the moisture removal system and inlet of the analyzer may be used to prevent accumulation of particulate material in the measurement system and extend the useful life of the components. All filters shall be fabricated of materials that are nonreactive to the gas being sampled.

5.1.7 Sample Pump. A leak-free pump, to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. The pump may be constructed of any material that is nonreactive to the gas being sampled.

5.1.8 Sample Flow Rate Control. A sample flow rate control valve and rotameter, or equivalent, to maintain a constant sampling rate within 10 percent.

(NOTE: The tester may elect to install a back-pressure regulator to maintain the sample gas manifold at a constant pressure in order to protect the analyzer(s) from overpressurization, and to minimize the need for flow rate adjustments.)

5.1.9 Sample Gas Manifold. A sample gas manifold, to divert a portion of the sample gas stream to the analyzer, and the remainder to the by-pass discharge vent. The sample gas manifold should also include provisions for introducing calibration gases directly to the analyzer. The manifold may be constructed of any material that is nonreactive to the gas being sampled.

5.1.10 Gas Analyzer. A UV or NDIR absorption or fluorescence analyzer, to determine continuously the SO_2 concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

(NOTE: Housing the analyzer(s) in a clean, thermally-stable, vibration-free environment will minimize drift in the analyzer calibration.)

5.1.11 Data Recorder. A strip chart recorder, analog computer, or digital recorder, for recording measurement data. The data recorder resolution (i.e., readability) shall be 0.5 percent of span. Alternatively, a digital or analog meter having a resolution of 0.5 percent of span may be used to obtain the analyzer responses and the readings may be recorded manually. If this alternative is used, the readings shall be obtained at equally spaced intervals over the duration of the sampling run. For sampling run durations of less than 1 hour, measurements at 1-minute intervals or a minimum of 30 measurements, whichever is less restrictive, shall be obtained. For sampling run durations greater than 1 hour, measurements at 2-minute intervals or a minimum of 96 measurements, whichever is less restrictive, shall be obtained.

5.2 Method 6 Apparatus and Reagents. The apparatus and reagents described in Method 6, and shown by the schematic of the sampling train in Figure 6C-2, to conduct the interference check.

5.3 SO_2 Calibration Gases. The calibration gases for the gas analyzer shall be SO_2 in N_2 or SO_2 in air. Alternatively, SO_2/CO_2, SO_2/O_2, or $SO_2/CO_2/O_2$ gas mixtures in N_2 may be used. For fluorescence-based analyzers, the O_2 and CO_2 concentrations of the calibration gases as introduced to the analyzer shall be within 1 percent (absolute) O_2 and 1 percent (absolute) CO_2 of the O_2 and Co_2 concentrations of the effluent samples as introduced to the analyzer. Alternatively, for fluorescence-based analyzers, use calibration blends of SO_2 in air and the nomographs provided by the vendor to determine the quenching correction factor (the effluent O_2 and CO_2 concentrations must be known). Use three calibration gases as specified below:

5.3.1 High-Range Gas. Concentration equivalent to 80 to 90 percent of the span.

5.3.2 Mid-Range Gas. Concentration equivalent to 50 to 60 percent of the span.

5.3.3 Zero Gas. Concentration of less than 0.25 percent of the span. Purified ambient air may be used for the zero gas by passing air through a charcoal filter, or through one or more impingers containing a solution of 3 percent H_2O_2.

6. *Measurement System Performance Test Procedures*

Perform the following procedures before measurement of emissions (Section 7).

6.1 Calibration Gas Concentration Verification. There are two alternatives for establishing the concentrations of calibration gases. Alternative Number 1 is preferred.

6.1.1 Alternative Number 1—Use of calibration gases that are analyzed following the Environmental Protection Agency Traceability Protocol Number 1 (see Citation 1 in the Bibliography). Obtain a certification from the gas manufacturer that Protocol Number 1 was followed.

6.1.2 Alternative Number 2—Use of calibration gases not prepared according to Protocol Number 1. If this alternative is chosen, obtain gas mixtures with a manufacturer's tolerance not to exceed ±2 percent of the tag value. Within 6 months before the emission test, analyze each of the calibration gases in triplicate using Method 6. Citation 2 in the Bibliography describes procedures and techniques that may be used for this analysis. Record the results on a data sheet (example is shown in Figure 6C-3). Each of the individual SO_2 analytical results for each calibration gas shall be within 5 percent (or 5 ppm, whichever is greater) of the triplicate set average; otherwise, discard the entire set, and repeat the triplicate analyses. If the average of the triplicate analyses is within 5 percent of the calibration gas manufacturer's cylinder tag value, use the tag value; otherwise, conduct at least three additional analyses until the results of six consecutive runs agree with 5 percent (or 5 ppm, whichever is greater) of their average. Then use this average for the cylinder value.

6.2 Measurement System Preparation. Assemble the measurement system by following the manufacturer's written instructions for preparing and preconditioning the gas analyzer and, as applicable, the other system components. Introduce the calibration gases in any sequence, and make all necessary adjustments to calibrate the analyzer and the data recorder. Adjust system components to achieve correct sampling rates.

6.3 Analyzer Calibration Error. Conduct the analyzer calibration error check by introducing calibration gases to the measurement system at any point upstream of the gas analyzer as follows:

6.3.1 After the measurement system has been prepared for use, introduce the zero, mid-range, and high-range gases to the analyzer. During this check, make no adjustments to the system except those necessary to achieve the correct calibration gas flow rate at the analyzer. Record the analyzer responses to each calibration gas on a form similar to Figure 6C-4.

NOTE.—A calibration curve established prior to the analyzer calibration error check may be used to convert the analyzer response to the equivalent gas concentration introduced to the analyzer. However, the same correction procedure shall be used for all effluent and calibration measurements obtained during the test.

6.3.2 The analyzer calibration error check shall be considered invalid if the gas concentration displayed by the analyzer exceeds ±2 percent of the span for any of the calibration gases. If an invalid calibration is exhibited, take corrective action, and repeat the analyzer calibration error check until acceptable performance is achieved.

6.4 Sampling System Bias Check. Perform the sampling system bias check by introducing calibration gases at the calibration valve installed at the outlet of the sampling probe. A zero gas and either the mid-range or high-range gas, whichever most closely approximates the effluent concentrations, shall be used for this check as follows:

6.4.1 Introduce the upscale calibration gas, and record the gas concentration displayed by the analyzer on a form similar to Figure 6C-6. Then introduce zero gas, and record the gas concentration displayed by the analyzer. During the sampling system bias check, operate the system at the normal sampling rate, and make no adjustments to the measurement system other than those necessary to achieve proper calibration gas flow rates at the analyzer. Alternately introduce the zero and upscale gases until a stable response is achieved. The tester shall determine the measurement system response time by observing the times required to achieve a stable response for both the zero and upscale gases. Note the longer of the two times as the response time.

6.4.2 The sampling system bias check shall be considered invalid if the difference between the gas concentrations displayed by the measurement system for the analyzer calibration error check and for the sampling system bias check exceeds ±5 percent of the span for either the zero or upscale calibration gas. If an invalid calibration is exhibited, take corrective action, and repeat the sampling system bias check until acceptable performance is achieved. If adjustment to the analyzer is required, first repeat the analyzer calibration error check, then repeat the sampling system bias check.

7. ***Emission Test Procedure***

7.1 Selection of Sampling Site and Sampling Points. Select a measurement site and sampling points using the same criteria that are applicable to Method 6.

7.2 Interference Check Preparation. For each individual analyzer, conduct an interference check for at least three runs during the initial field test on a particular source category. Retain the results, and report them with each test performed on that source category.

If an interference check is being performed, assemble the modified Method 6 train (flow control valve, two midget impingers containing 3 percent H_2O_2, and dry gas meter) as shown in Figure 6C-2. Install the sampling train to obtain a sample at the measurement system sample by-pass discharge vent. Record the initial dry gas meter reading.

7.3 Sample Collection. Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the sampling system bias check. Maintain constant rate sampling (i.e., ±10 percent) during the entire run. The sampling time per run shall be the same as for Method 6 plus twice the system response time. For each run, use only those measurements obtained after twice response time of the measurement system has elapsed, to determine the average effluent concentration. If an interference check is being performed, open the flow control valve on the modified Method 6 train concurrent with the initiation of the sampling period, and adjust the flow to 1 liter per minute (±10 percent).

(NOTE: If a pump is not used in the modified Method 6 train, caution should be exercised in adjusting the flow rate since overpressurization of the impingers may cause leakage in the impinger train, resulting in positively biased results).

7.4 Zero and Calibration Drift Tests. Immediately preceding and following each run, or if adjustments are necessary for the measurement system during the run, repeat the sampling system bias check procedure described in Section 6.4 (Make no adjustments to the measurement system until after the drift checks are completed.) Record and analyzer's responses on a form similar to Figure 6C-5.

7.4.1 If either the zero or upscale calibration value exceeds the sampling system bias specification, then the run is considered invalid. Repeat both the analyzer calibration error check procedure (Section 6.3) and the sampling system bias check procedure (Section 6.4) before repeating the run.

7.4.2 If both the zero and upscale calibration values are within the sampling system bias specification, then use the average of the initial and final bias check values to calculate the gas concentration for the run. If the zero or upscale calibration drift value exceeds the drift limits, based on the difference between the sampling system bias check responses immediately before and after the run, repeat both the analyzer calibration error check procedure (Section 6.3) and the sampling system bias check procedure (Section 6.4) before conducting additional runs.

7.5 Interference Check (if performed). After completing the run, record the final dry gas meter reading, meter temperature, and barometric pressure. Recover and analyze the contents of the midget impingers, and determine the SO_2 gas concentration using the procedures of Method 6. (It is not necessary to analyze EPA performance audit samples for Method 6.) Determine the average gas concentration exhibited by the analyzer for the run. If the gas concentrations provided by the analyzer and the modified Method 6 differ by more than 7 percent of the modified Method 6 result, the run is invalidated.

8. *Emission Calculation*

The average gas effluent concentration is determined from the average gas concentration displayed by the gas analyzer, and is adjusted for the zero and upscale sampling system bias checks, as determined in accordance with Section 7.4. The average gas concentration displayed by the analyzer may be determined by integration of the area under the curve for chart recorders, or by averaging all of the effluent measurements. Alternatively, the average may be calculated from measurements recorded at equally spaced intervals over the entire duration of the run. For sampling run durations of less than 1 hour, measurements at 1-minute intervals or a minimum of 30 measurements, whichever is less restrictive, shall be used. For sampling run durations greater than 1 hour, measurements at 2-minute intervals or a minimum of 96 measurements, whichever is less restrictive, shall be used. Calculate the effluent gas concentration using Equation 6C-1.

$$C_{gas} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}$$

Eq. 6C-1

Where:

C_{gas} = Effluent gas concentration, dry basis, ppm.

$\bar{C}$ = Average gas concentration indicated by gas analyzer, dry basis, ppm.

C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm.

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm.

C_{ma} = Actual concentration of the upscale calibration gas, ppm.

9. *Bibliography*

1. Traceability Protocol for Establishing True Concentrations of Gases Used for Calibrations and Audits of Continuous Source Emission Monitors: Protocol Number 1. U.S. Environmental Protection Agency, Quality Assurance Division. Research Triangle Park, NC, June 1978.

2. Westlin, Peter R. and J. W. Brown. Methods for Collecting and Analyzing Gas Cylinder Samples. Source Evaluation Society Newsletter. *3*(3):5-15. September 1978.

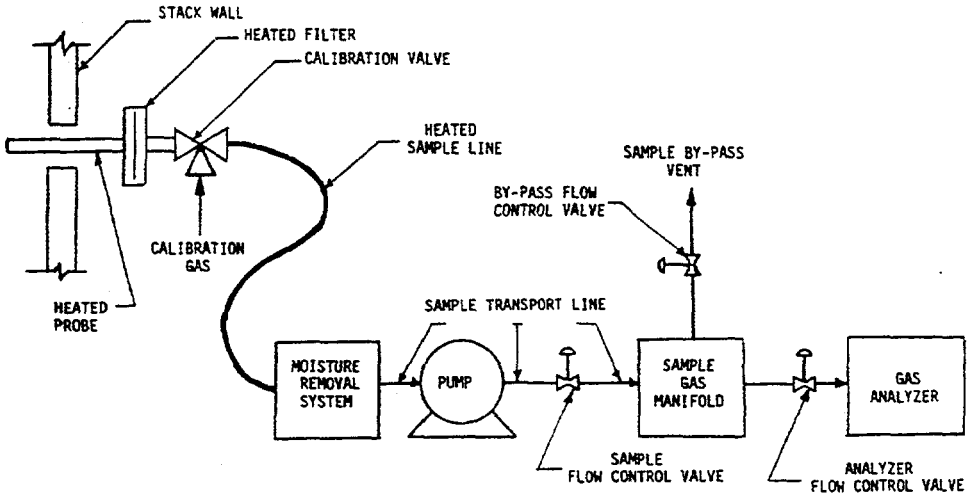


Figure 6C-1. Measurement system schematic.

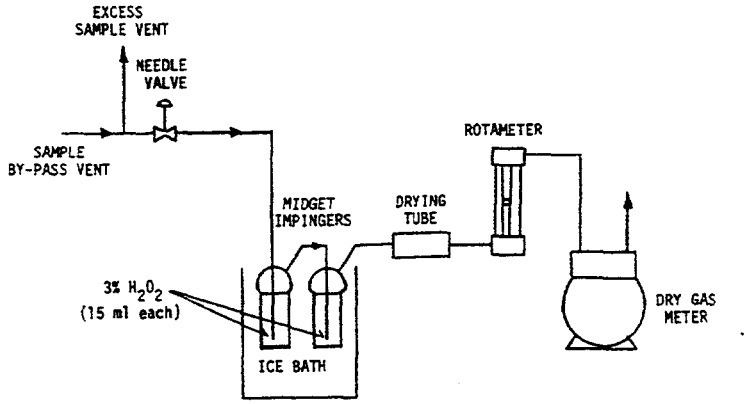


Figure 6C-2. Interference check sampling train.

Date _____
Analytic method used _____

FIGURE 6C–3—ANALYSIS OF CALIBRATION GASES

	Gas concentration (indicate units)		
	Zero [a]	Mid-range [b]	High-range [c]
Sample run:			
1			
2			
3			
Average			
Maximum percent deviation			

[a] Average must be less than 0.25 percent of span.
[b] Average must be 50 to 60 percent of span.
[c] Average must be 80 to 90 percent of span.

Source identification: _____
Test personnel: _____

Date: _____
Analyzer calibration data for sampling runs: _____
Span: _____

FIGURE 6C–4—ANALYZER CALIBRATION DATA

	Cylinder value	Analyzer calibration response (indicate units)	Absolute difference	Difference (percent of span)
Zero gas				
Mid-range gas				
High-range gas				

Source identification: _____
Test personnel: _____
Date: _____
Run number: _____
Span: _____

		Analyzer calibration response	Initial values		Final values	
			System calibration response	System cal. bias (percent of span)	(percent of span)	
					System cal. bias	Drift
Zero gas						
Upscale gas						

$$\text{System Calibration Bias} = \frac{\text{System Cal. Response} - \text{Analyzer Cal. Response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final System Cal. Response} - \text{Initial System Cal. Response}}{\text{Span}} \times 100$$

Figure 6C–5. System calibration bias and drift data.

APPENDIX G

METHOD 7E

DETERMINATION OF NITROGEN OXIDES EMISSIONS FROM STATIONARY SOURCES (INSTRUMENTAL ANALYZER PROCEDURE)

1. *Applicability and Principle*

1.1 Applicability. This method is applicable to the determination of nitrogen oxides (NO_x) concentrations in emissions from stationary sources only when specified within the regulations.

1.2 Principle. A gas simple is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental chemiluminescent analyzer for determination of NO_x concentration. Performance specifications and test procedures are provided to ensure reliable data.

2. *Range and Sensitivity*

Same as Method 6C, Sections 2.1 and 2.2.

3. *Definitions*

3.1 Measurement System. The total equipment required for the determination of NO_x concentration. The measurement system consists of the following major subsystems:

3.1.1 Sample Interface, Gas Analyzer, and Data Recorder. Same as Method 6C, Sections 3.1.1, 3.1.2, and 3.1.3.

3.1.2 NO_2 to NO Converter. A device that converts the nitrogen dioxide (NO_2) in the sample gas to nitrogen oxide (NO).

3.2 Span, Calibration Gas, Analyzer Calibration Error, Sampling System Bias, Zero Drift, Calibration Drift, and Response Time. Same as Method 6C, Sections 3.2 through 3.8.

3.3 Interference Response. The output response of the measurement system to a component in the sample gas, other than the gas component being measured.

4. *Measurement System Performance Specifications*

Same as Method 6C, Sections 4.1 through 4.4.

5. *Apparatus and Reagents*

5.1 Measurement System. Any measurement system for NO_x that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1 of Method 6C. The essential components of the measurement system are described below:

5.1.1 Sample Probe, Sample Line, Calibration Valve Assembly, Moisture Removal System, Particulate Filter, Sample Pump, Sample Flow Rate Control, Sample Gas Manifold, and Data Recorder. Same as Method 6C, Sections 5.1.1 through 5.1.9, and 5.1.11.

5.1.2 NO_2 to NO Converter. That portion of the system that converts the nitrogen dioxide (NO_2) in the sample gas to nitrogen oxide (NO). An NO_2 to NO converter is not necessary if data are presented to demonstrate that the NO_2 portion of the exhaust gas is less than 5 percent of the total NO_x concentration.

5.1.3 NO_x Analyzer. An analyzer based on the principles of chemiluminescence, to determine continuously the NO_x concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

5.2 NO_x Calibration Gases. The calibration gases for the NO_x analyzer shall be NO in N_2. Three calibration gases, as specified in Sections 5.3.1 through 5.3.3. of Method 6C, shall be used. Ambient air may be used for the zero gas.

6. *Measurement System Performance Test Procedures*

Perform the following procedures before measurement of emissions (Section 7).

6.1 Calibration Gas Concentration Verification. Follow Section 6.1 of Method 6C, except if calibration gas analysis is required, use Method 7, and change all 5 percent performance values to 10 percent (or 10 ppm, whichever is greater).

6.2 Interference Response. Conduct an interference response test of the analyzer prior to its initial use in the field. Thereafter, recheck the measurement system if changes are made in the instrumentation that could alter the interference response (e.g., changes in the gas detector). Conduct the interference response in accordance with Section 5.4 of Method 20.

6.3 Measurement System Preparation, Analyzer Calibration Error, and Sample System Bias Check. Follow Sections 6.2 through 6.4 of Method 6C.

6.4 NO_2 to NO Conversion Efficiency. Unless data are presented to demonstrate that the NO_2 concentration within the sample stream is not greater than 5 percent of the NO_x concentration, conduct an NO_2 to NO conversion efficiency test in accordance with Section 5.6 of Method 20.

7. *Emission Test Procedure*

7.1 Selection of Sampling Site and Sampling Points. Select a measurement site and sampling points using the same criteria that are applicable to tests performed using Method 7.

7.2 Sample Collection. Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the system calibration drift test. Maintain constant rate sampling (i.e., ± 10 percent) during the entire run. The sampling time per run shall be the same as the total time required to perform a run using Method 7, plus twice the system response time. For each run, use only those measurements obtained after twice the response time of the measurement system has elapsed, to determine the average effluent concentration.

7.3 Zero and Calibration Drift Test. Follow Section 7.4 of Method 6C.

8. *Emission Calculation*

Follow Section 8 of Method 6C.

9. *Bibliography*

Same as bibliography of Method 6C.

APPENDIX H

METHOD 8

DETERMINATION OF SULFURIC ACID MIST AND SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES

THE ALMEGA CORPORATION

1. *Principle and Applicability*

1.1 Principle. A gas sample is extracted isokinetically from the stack. The sulfuric acid mist (including sulfur trioxide) and the sulfur dioxide are separated, and both fractions are measured separately by the barium-thorin titration method.

1.2 Applicability. This method is applicable for the determination of sulfuric acid mist (including sulfur trioxide, and in the absence of other particulate matter) and sulfur dioxide emissions from stationary sources. Collaborative tests have shown that the minimum detectable limits of the method are 0.05 milligrams/cubic meter ($0.03 > 10^{-7}$ pounds/cubic foot) for sulfur trioxide and 1.2 mg/m³ ($0.74\ 10^{-7}$ lb/ft³) for sulfur dioxide. No upper limits have been established. Based on theoretical calculations for 200 milliters of 3 percent hydrogen peroxide solution, the upper concentration limit for sulfur dioxide in a 1.0 m³ (35.3 ft³) gas sample is about 12,500 mg/m³ (7.7×10^{-4} lb/ft³). The upper limit can be extended by increasing the quantity of peroxide solution in the impingers.

Possible interfering agents of this method are fluorides, free ammonia, and dimethyl aniline. If any of these interfering agents are present (this can be determined by knowledge of the process), alternative methods, subject to the approval of the Administrator, U. S. E. P.A., are required.

Filterable particulate matter may be determined along with SO_3 and SO_2 (subject to the approval of the Administrator) by inserting a heated glass fiber filter between the probe and isopropanol impinger (see Section 2.1 of Method 6.) If this option is chosen, particulate analysis is gravimetric only; H_2SO_4 acid mist is not determined separately.

2. *Apparatus*

2.1 Sampling. A schematic of the sampling train used in this method is shown in Figure 8-1; it is similiar to the Method 5 train except that the filter position is different and the filter holder does not have to be heated. Commercial models of this train are available. For those who desire to build their own, however, complete construction details are described in APTD-0581. Changes from the APTD-0581 document and allowable modifications to Figure 8-1 are discussed in the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576. Since correct usage is important in obtaining valid results, all users should read the APTD-0576 document and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. Further details and guidelines on operation and maintenance are given in Method 5 and should be read and followed whenever they are applicable.

2.1.1 Probe Nozzle. Same as Method 5, Section 2.1.1.

2.1.2 Probe Liner. Borosilicate or quartz glass, with a heating system to prevent visible condensation during sampling. Do not use metal probe liners.

2.1.3 Pitot Tube. Same as Method 5, Section 2.1.3.

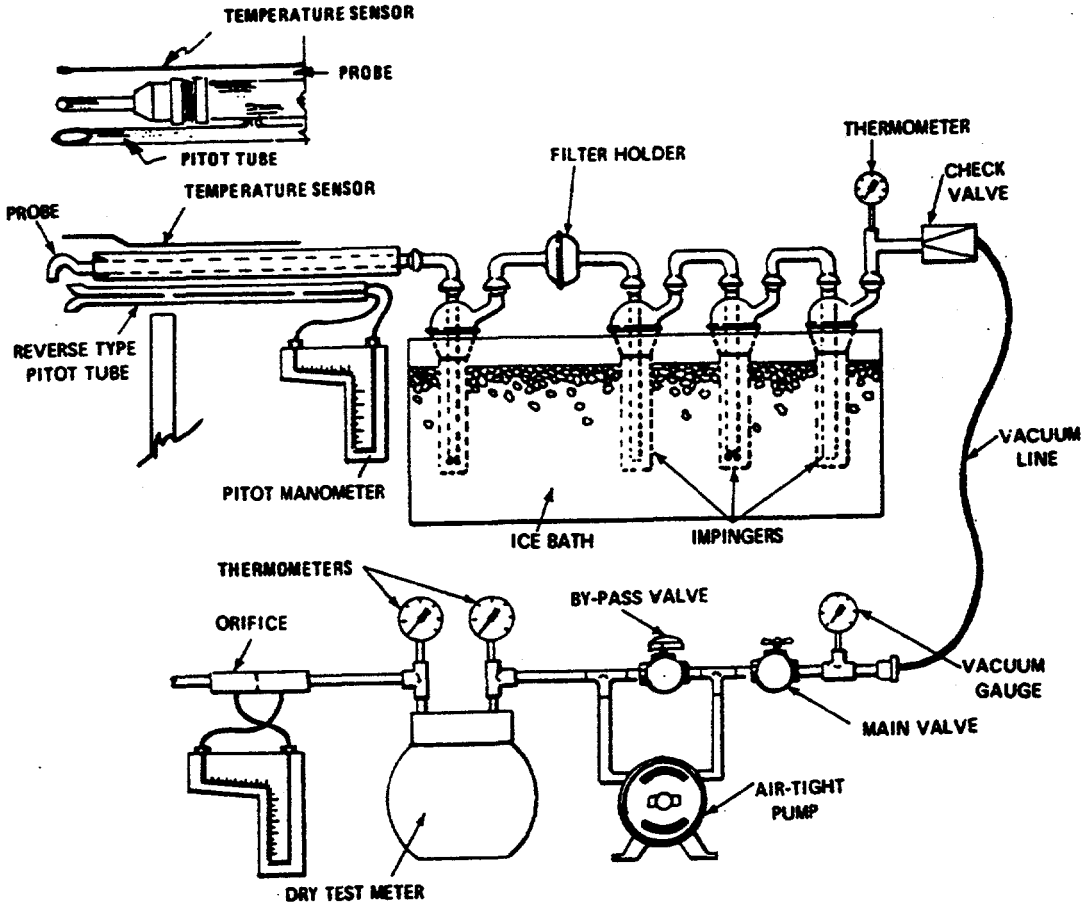


Figure 8-1. Sulfuric acid mist sampling train.

2.1.4 Differential Pressure Gauge. Same as Method 5, Section 2.1.4.

2.1.5 Filter Holder. Borosilicate glass, with a glass frit filter support and a silicone rubber gasket. Other gasket materials, e.g., Teflon or Viton, may be used subject to the approval of the Administrator. The holder design shall provide a positive seal against leakage from the outside or around the filter. The filter holder shall be placed between the first and second impingers. Note: Do not heat the filter holder.

2.1.6 Impingers. Four, as shown in Figure 8-1. The first and third shall be of the Greenburg-Smith design with standard tips. The second and fourth shall be of the Greenburg-Smith design, modified by replacing the insert with an approximately 13 millimeter (0.5 in.) ID glass tube, having an unconstricted tip located 13 mm (0.5 in.) from the bottom of the flask. Similar collection systems, which have been approved by the Administrator, may be used.

2.1.7 Metering System. Same as Method 5, Section 2.1.8.

2.1.8 Barometer. Same as Method 5, Section 2.1.9.

2.1.9 Gas Density Determination Equipment. Same as Method 5, Section 2.1.10.

2.1.10 Temperature Gauge. Thermometer, or equivalent, to measure the temperature of the gas leaving the impinger train to within 1° C (2° F).

2.2 Sample Recovery.

2.2.1 Wash Bottles. Polyethylene or glass, 500 ml. (two).

2.2.2 Graduated Cylinders. 250 ml, 1 liter. (Volumetric flasks may also be used.

2.2.3 Storage Bottles. Leak-free polyethlene bottles, 1000 ml size (two for each sampling run).

2.2.4 Trip Balance. 500-gram capacity, to measure to ±0.5 g (necessary only if a moisture content analysis is to be done).

2.3 Analysis.

2.3.1 Pipettes. Volumetric 25 ml, 100 ml.

2.3.2 Burette, 50 ml.

2.3.3 Erlenmeyer Flask. 250 ml. (one for each sample, blank, and standard).

2.3.4 Graduated Cylinder. 100 ml.

2.3.5 Trip Balance. 500 g capacity, to measure to ±0.5 g.

2.3.6 Dropping Bottle. To add indicator solution, 125-ml size.

3. *Reagents*

Unless otherwise indicated, all reagents are to conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Otherwise, use the best available grade.

3.1 Sampling.

3.1.1 Filters. Same as Method 5, Section 3.1.1.

3.1.2 Silica Gel. Same as Method 5, Section 3.1.2.

3.1.3 Water. Deionized, distilled to conform to ASTM Specification D1193-77, Type 3 (incorporated by reference—see § 60.17). At the option of the analyst, the $KMnO_4$ test for oxidizable organic matter may be omitted when high concentrations of organic matter are not expected to be present.

3.1.4 Isopropanol. 80 Percent. Mix 800 ml of isopropanol with 200 ml of deionized, distilled water.

NOTE: Experience has shown that only A.C.S. grade isopropanol is satisfactory. Tests have shown that isopropanol obtained from commercial sources occasionally has peroxide impurities that will cause erroneously high sulfuric acid mist measurement. Use the following test for detecting peroxides in each lot of isopropanol: Shake 10 ml of the isopropanol with 10 ml of freshly prepared 10 percent potassium iodide solution. Prepare a blank by similarly treating 10 ml of distilled water. After 1 minute, read the absorbance on a spectrophotometer at 352 nanometers. If the absorbance exceeds 0.1, the isopropanol shall not be used. Peroxides may be removed from isopropanol by redistilling, or by passage through a column of activated alumina. However, reagent grade isopropanol with suitably low peroxide levels is readily available from commercial sources; therefore, rejection of contaminated lots may be more efficient than following the peroxide removal procedure.

3.1.5 Hydrogen Peroxide, 3 Percent. Dilute 100 ml of 30 percent hydrogen peroxide to 1 liter with deionized, distilled water. Prepare fresh daily.

3.1.6 Crushed Ice.

3.2 Sample Recovery.

3.2.1 Water. Same as 3.1.3.

3.2.2 Isopropanol, 80 Percent. Same as 3.1.4.

3.3 Analysis.

3.3.1 Water. Same as 3.1.3.

3.3.2 Isopropanol, 100 Percent.

3.3.3 Thorin Indicator. 1-(o-arsonophenylazo) 2-naphthol-3, 6-disulfonic acid, disodium salt, or equivalent. Dissolve 0.20 g in 100 ml of deionized, distilled water.

3.3.4 Barium Perchlorate (0.0100 Normal). Dissolve 1.95 g of barium perchlorate trihydrate ($Ba(ClO_4)_2 \cdot 3H_2O$) in 200 ml deionized, distilled water, and dilute to 1 liter with isopropanol; 1.22 g of barium chloride dihydrate ($BaCl_2 \cdot 2H_2O$) may be used instead of the barium perchlorate. Standardize with sulfuric acid as in Section 5.2. This solution must be protected against evaporation at all times.

3.3.5 Sulfuric Acid Standard (0.0100 N). Purchase or standardize to ±0.0002 N against 0.0100 N NaOH that has previously been standardized against primary standard potassium acid phthalate.

4. *Procedure*

4.1 Sampling.

4.1.1 Pretest Preparation. Follow the procedure outlined in Method 5, Section 4.1.1; filters should be inspected, but need not be desiccated, weighed, or identified. If the effluent gas can be considered dry, i.e., moisture free, the silica gel need not be weighed.

4.1.2 Preliminary Determinations. Follow the procedure outlined in Method 5, Section 4.1.2.

4.1.3 Preparation of Collection Train. Follow the procedure outlined in Method 5, Section 4.1.3 (except for the second paragraph and other obviously inapplicable parts) and use Figure 8-1 instead of Figure 5-1. Replace the second paragraph with: Place 100 ml of 80 percent isopropanol in the first impinger, 100 ml of 3 percent hydrogen peroxide in both the second and third impingers; retain a portion of each reagent for use as a blank solution. Place about 200 g of silica gel in the fourth impinger.

NOTE: If moisture content is to be determined by impinger analysis, weigh each of the first three impingers (plus absorbing solution) to the nearest 0.5 g and record these weights. The weight of the silica gel (or silica gel plus container) must also be determined to the nearest 0.5 g and recorded.

4.1.4 Pretest Leak-Check Procedure. Follow the basic procedure outlined in Method 5, Section 4.1.4.1, noting that the probe heater shall be adjusted to the minimum temperature required to prevent condensation, and also that verbage such as, "... plugging the inlet to the filter holder ..." shall be replaced by, "... plugging the inlet to the first impinger ..." The pretest leak-check is optional.

4.1.5 Train Operation. Follow the basic procedures outlined in Method 5, Section 4.1.5, in conjunction with the following special instructions. Data shall be recorded on a sheet similar to the one in Figure 8-2. The sampling rate shall not exceed 0.030 m^3/min (1.0 cfm) during the run. Periodically during the test, observe the connecting line between the probe and first impinger for signs of condensation. If it does occur, adjust the probe heater setting upward to the minimum temperature required to prevent condensation. If component changes become necessary during a run, a leak-check shall be done immediately before each change, according to the procedure outlined in Section 4.1.4.2 of Method 5 (with appropriate modifications, as mentioned in Section 4.1.4 of this method); record all leak rates. If the leakage rate(s) exceed the specified rate, the tester shall either void the run or shall plan to correct the sample volume as outlined in Section 6.3 of Method 5. Immediately after component changes, leak-checks are optional. If these leak-checks are done, the procedure outlined in Section 4.1.4.1 of Method 5 (with appropriate modifications) shall be used.

After turning off the pump and recording the final readings at the conclusion of each run, remove the probe from the stack. Conduct a post-test (mandatory) leak-check as in Section 4.1.4.3 of Method 5 (with appropriate modification) and record the leak rate. If the post-test leakage rate exceeds the specified acceptable rate, the tester shall either correct the sample volume, as outlined in Section 6.3 of Method 5, or shall void the run.

Drain the ice bath and, with the probe disconnected, purge the remaining part of the train, by drawing clean ambient air through the system for 15 minutes at the average flow rate used for sampling.

NOTE: Clean ambient air can be provided by passing air through a charcoal filter. At the option of the tester, ambient air (without cleaning) may be used.

4.1.6 Calculation of Percent Isokinetic. Follow the procedure outlined in Method 5, Section 4.1.6.

4.2 Sample Recovery.

4.2.1 Container No. 1. If a moisture content analysis is to be done, weigh the first impinger plus contents to the nearest 0.5 g and record this weight.

Transfer the contents of the first impinger to a 250-ml graduated cylinder. Rinse the probe, first impinger, all connecting glassware before the filter, and the front half of the filter holder with 80 percent isopropanol. Add the rinse solution to the cylinder. Dilute to 250 ml with 80 percent isopropanol. Add the filter to the solution, mix, and transfer to the storage container. Protect the solution against evaporation. Mark the level of liquid on the container and identify the sample container.

4.2.2 Container No. 2. If a moisture content analysis is to be done, weigh the second and third impingers (plus contents) to the nearest 0.5 g and record these weights. Also, weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g.

Transfer the solutions from the second and third impingers to a 1000-ml graduated cylinder. Rinse all connecting glassware (including back half of filter holder) between the filter and silica gel impinger with deionized, distilled water, and add this rinse water to the cylinder. Dilute to a volume of 1000 ml with deionized, distilled water. Transfer the solution to a storage container. Mark the level of liquid on the container. Seal and identify the sample container.

4.3 Analysis.

Note the level of liquid in Containers 1 and 2, and confirm whether or not any sample was lost during shipment; note this on the analytical data sheet. If a noticeable amount of leakage has occured, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results.

4.3.1 Container No. 1. Shake the container holding the isopropanol solution and the filter. If the filter breaks up, allow the fragments to settle for a few minutes before removing a sample. Pipette a 100-ml aliquot of this solution into a 250-ml Erlenmeyer flask, add 2 to 4 drops of thorin indicator, and titrate to a pink endpoint using 0.0100 N barium perchlorate. Repeat the titration with a second aliquot of sample and average the titration values. Replicate titrations must agree within 1 percent or 0.2 ml, whichever is greater.

4.3.2 Container No. 2. Thoroughly mix the solution in the container holding the contents of the second and third impingers. Pipette a 10-ml aliquot of sample into a 250-ml Erlenmeyer flask. Add 40 ml of isopropanol, 2 to 4 drops of thorin indicator, and titrate to a pink endpoint using 0.0100 N barium perchlorate. Repeat the titration with a second aliquot of sample and average the titration values. Replicate titrations must agree within 1 percent or 0.2 ml, whichever is greater.

4.3.3 Blanks. Prepare blanks by adding 2 to 4 drops of thorin indicator to 100 ml of 80 percent isopropanol. Titrate the blanks in the same manner as the samples.

5. *Calibration*

5.1 Calibrate equipment using the procedures specified in the following sections of Method 5: Section 5.3 (metering system); Section 5.5 (temperature gauges); Section 5.7 (barometer). Note that the recommended leak-check of the metering system, described in Section 5.6 of Method 5, also applies to this method.

5.2 Standardize the barium perchlorate solution with 25 ml of standard sulfuric acid, to which 100 ml of 100 percent isopropanol has been added.

6. *Calculations*

NOTE: Carry out calculations retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

6.1 Nomenclature.

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

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

$C_{H_2SO_4}$ = Sulfuric acid (including SO_3) concentration, g/dscm (lb/dscf).

C_{SO_2} = Sulfur dioxide concentration, g/dscm (lb/dscf).

I = Percent of isokinetic sampling.

N = Normality of barium perchlorate titrant, g equivalents/liter.

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).

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

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

T_m = Average absolute dry gas meter temperature (see Figure 8-2), °K (°R).

T_s = Average absolute stack gas temperature (see Figure 8-2), °K (°R).

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

V_a = Volume of sample aliquot titrated, 100 ml for H_2SO_4 and 10 ml for SO_2.

V_{lc} = Total volume of liquid collected in impingers and silica gel, ml.

V_m = Volume of gas sample as measured by dry gas meter, dcm (dcf).

FIGURE 8-2—FIELD DATA

Plant .....
Location .....
Operator .....
Date .....
Run No .....
Sample box No .....
Meter box No .....
Meter ΔH@ .....
C factor .....
Pitot tube coefficient, Cp .....

SCHEMATIC OF STACK CROSS SECTION

Static pressure, mm Hg (in. Hg) .....
Ambient temperature .....
Barometer pressure .....
Assumed moisture, % .....
Probe length, m (ft) .....
Nozzle identification No .....
Average calibrated nozzle diameter, cm (in.) .....
Probed heater setting .....
Leak rate, m^3/min, (cfm) .....
Probe liner material .....
Filter No. .....

Traverse point number	Sampling time	Vacuum	Stack temperature (T_s)	Velocity head (ΔP)	Pressure differential-across orifice meter	Gas sample volume	Gas sample temperature at dry gas meter		Temperature of gas leaving condenser or last impinger
							Inlet	Outlet	
	(θ), min.	mm Hg (in. Hg)	°C (°F)	mm H_2O (in H_2O)	mm H_2O (in H_2O)	m^3 (ft^3)	°C (°F)	°C (°F)	°C (°F)
Total							Avg	Avg	
Average							Avg		

$V_{m(std)}$=Volume of gas sample measured by the dry gas meter corrected to standard conditions, dscm (dscf).
v_s=Average stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 8, m/sec (ft/sec).
V_{soln}=Total volume of solution in which the sulfuric acid or sulfur dioxide sample is contained, 250 ml or 1,000 ml, respectively.
V_t=Volume of barium perchlorate titrant used for the sample, ml.
V_{tb}=Volume of barium perchlorate titrant used for the blank, ml.
Y=Dry gas meter calibration factor.
ΔH=Average pressure drop across orifice meter, mm (in.) H_2O.
θ=Total sampling time, min.
13.6=Specific gravity of mercury.
60=sec/min.
100=Conversion to percent.

6.2 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop. See data sheet (Figure 8-2).

6.3 Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20° C and 760 mm Hg or 68° F and 29.92 in. Hg) by using Equation 8-1.

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

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

Equation 8-1

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

NOTE: If the leak rate observed during any mandatory leak-checks exceeds the specified acceptable rate, the tester shall either correct the value of V_m in Equation 8-1 (as described in Section 6.3 of Method 5), or shall invalidate the test run.

6.4 Volume of Water Vapor and Moisture Content. Calculate the volume of water vapor using Equation 5-2 of Method 5; the weight of water collected in the impingers and silica gel can be directly converted to milliliters (the specific gravity of water is 1 g/ml). Calculate the moisture content of the stack gas, using Equation 5-3 of Method 5. The "Note" in Section 6.5 of Method 5 also applies to this method. Note that if the effluent gas stream can be considered dry, the volume of water vapor and moisture content need not be calculated.

6.5 Sulfuric Acid Mist (including SO_3) Concentration.

$$C_{H_2SO_4} = K_2 \frac{N(V_t - V_{tb})\left(\frac{V_{soln}}{V_a}\right)}{V_{m(std)}}$$

Equation 8-2

Where:
K_2=0.04904 g/milliequivalent for metric units.
=1.081×10⁻⁴ lb/meq for English units.

6.6 Sulfur Dioxide Concentration.

$$C_{SO_2} = K_3 \frac{N(V_t - V_{tb})\left(\frac{V_{soln}}{V_a}\right)}{V_{m(std)}}$$

Equation 8-3

Where:
K_3=0.03203 g/meq for metric units.
=7.061×10⁻⁵ lb/meq for English units.

6.7 Isokinetic Variation.

6.7.1 Calculation from Raw Data.

$$I = \frac{100 T_s [K_4 V_{lc} + (V_m/T_m)/P_{bar} + \Delta H/13.6)]}{60\theta v_s P_s A_n}$$

Eq. 8-4

Where:
K_4=0.003464 mm Hg-m³/ml-°K for metric units.
=0.002676 in. Hg-ft³/ml-°R for English units.

6.7.2 Calculation from Intermediate Values.

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

$$= K_5 \frac{T_s V_{m(std)}}{P_s v_s A_n \theta (1-B_{ws})}$$

Equation 8-5

where:
K_5=4.320 for metric units.
=0.09450 for English units

6.8 Acceptable Results. If 90 percent <I <110 percent, the results are acceptable. If the results are low in comparison to the standards and I is beyond the acceptable range, the Administrator may opt to accept the results. Use Citation 4 in the Bibliography of Method 5 to make judgments. Otherwise, reject the results and repeat the test.

7. *Bibliography*

1. Atmospheric Emissions from Sulfuric Acid Manufacturing Processes. U.S. DHEW, PHS, Division of Air Pollution. Public Health Service Publication No. 999-AP-13. Cincinnati, OH. 1965.

2. Corbett, P. F. The Determination of SO_2 and SO_3 in Flue Gases. Journal of the Institute of Fuel. *24*:237-243. 1961.

3. Martin, Robert M. Construction Details of Isokinetic Source Sampling Equipment. Environmental Protection Agency. Research Triangle Park, NC. Air Pollution Control Office Publication No. APTD-0581. April, 1971.

4. Patton, W. F. and J. A. Brink, Jr. New Equipment and Techniques for Sampling Chemical Process Gases. Journal of Air Pollution Control Association. *13*:162. 1963.

5. Rom, J. J. Maintenance, Calibration, and Operation of Isokinetic Source-Sampling Equipment. Office of Air Programs, Environmental Protection Agency. Research Triangle Park, NC. APTD-0576. March, 1972.

6. Hamil, H. F. and D. E. Camann. Collaborative Study of Method for Determination of Sulfur Dioxide Emissions from Stationary Sources (Fossil Fuel-Fired Steam Generators). Environmental Protection Agency. Research Triangle Park, NC. EPA-650/4-74-024. December, 1973.

7. Annual Book of ASTM Standards. Part 31; Water, Atmospheric Analysis. pp. 40-42. American Society for Testing and Materials. Philadelphia, Pa. 1974.

APPENDIX I

METHOD 26A

DETERMINATION OF HYDROGEN HALIDE AND HALOGEN EMISSIONS FROM STATIONARY SOURCES - ISOKINETIC METHOD

7. It is proposed that 40 CFR Part 60 be amended by adding Method 26A to Appendix A as follows:

Appendix A - Test Methods

* * * * *

Method 26A - Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources - Isokinetic Method

1. APPLICABILITY, PRINCIPLE, INTERFERENCES, PRECISION, BIAS, AND STABILITY

1.1 Applicability. This method is applicable for determining emissions of hydrogen halides (HX) [hydrogen chloride (HCl), hydrogen bromide (HBr), and hydrogen fluoride (HF)] and halogens (X_2) [chlorine (Cl_2) and bromine (Br_2)] from stationary sources. This method collects the emission sample isokinetically and is therefore particularly suited for sampling at sources, such as those controlled by wet scrubbers, emitting acid particulate matter (e.g., hydrogen halides dissolved in water droplets). [Note: Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.]

1.2 Principle. Gaseous and particulate pollutants are withdrawn isokinetically from the source and collected in an optional cyclone, on a filter, and in absorbing solutions. The cyclone collects any liquid droplets and is not necessary if the source emissions do not contain them; however, it is preferable to include the cyclone in the sampling train to protect the filter from any moisture present. The filter collects other

particulate matter including halide salts. Acidic and alkaline absorbing solutions collect the gaseous hydrogen halides and halogens, respectively. Following sampling of emissions containing liquid droplets, any halides/halogens dissolved in the liquid in the cyclone and on the filter are vaporized to gas and collected in the impingers by pulling conditioned ambient air through the sampling train. The hydrogen halides are solubilized in the acidic solution and form chloride (Cl^-), bromide (Br^-), and fluoride (F^-) ions. The halogens have a very low solubility in the acidic solution and pass through to the alkaline solution where they are hydrolyzed to form a proton (H^+), the halide ion, and the hypohalous acid (HClO or HBrO). The halide ions in the separate solutions are measured by ion chromatography (IC). If desired, the particulate matter recovered from the filter and the probe is analyzed following the procedures in Method 5.

1.3 Interferences. Volatile materials, such as chlorine dioxide (ClO_2) and ammonium chloride (NH_4Cl), which produce halide ions upon dissolution during sampling are potential interferents. Interferents for the halide measurements are the halogen gases which disproportionate to a hydrogen halide and an hypohalous acid upon dissolution in water. The use of acidic rather than neutral or basic solutions for collection of the hydrogen halides greatly reduces the dissolution of any halogens passing through this solution. High concentrations of nitrogen oxides (NO_x) may produce sufficient nitrate (NO_3^-) to interfere with measurements of very low Br^- levels.

1.4 Precision and Bias. The method has a measurable negative bias below 20 ppm HCl. Similar bias for the other hydrogen halides is possible.

1.5 Sample Stability. The collected Cl^- samples can be stored for up to 4 weeks for analysis for HCl and Cl_2.

1.6 Detection Limit. The in-stack detection limit for HCl is approximately 0.02 μg per liter of stack gas; the analytical detection limit for HCl is 0.1 μg/ml. Detection limits for the other analytes should be similar.

2. APPARATUS

2.1 Sampling. The sampling train is shown in Figure 26A-1; the apparatus is similar to the Method 5 train where noted as follows:

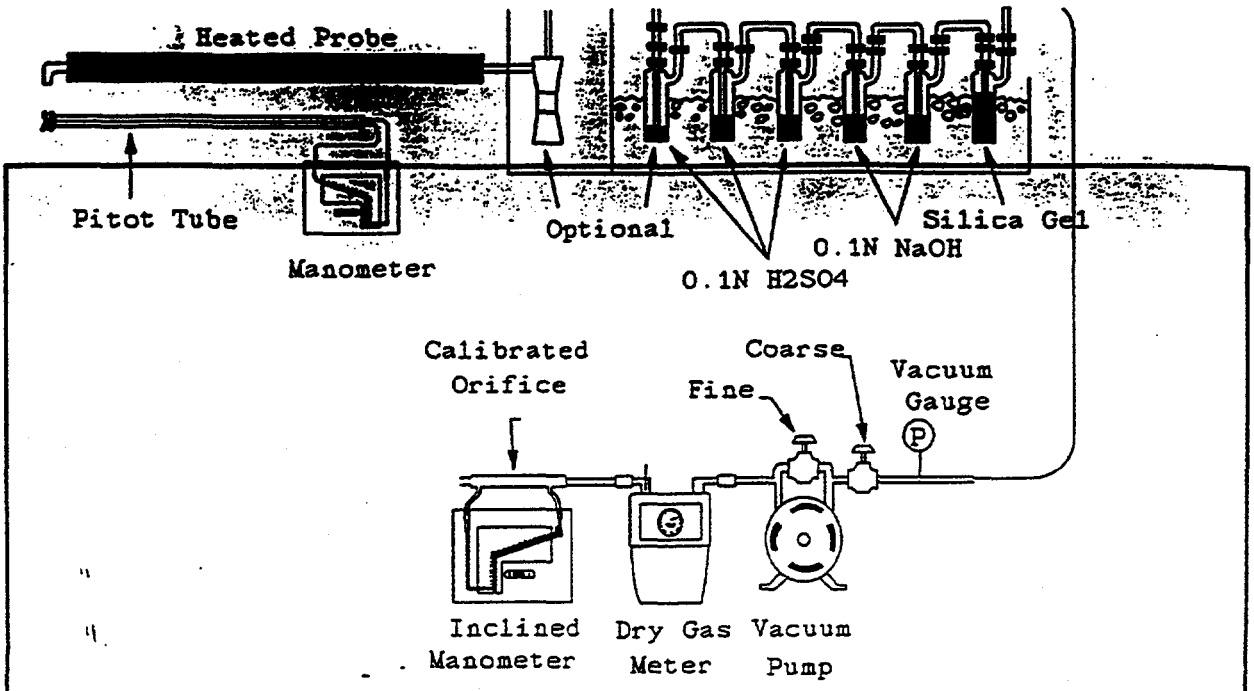


Figure 26A-1. Sampling train.

2.1.1 Probe Nozzle. Borosilicate or quartz glass; constructed and calibrated according to Method 5, Sections 2.1.1 and 5.1, and coupled to the probe liner using a Teflon^{R} union; a stainless steel nut is recommended for this union. When the stack temperature exceeds 210°C (410°F), a one-piece glass nozzle/liner assembly must be used.

2.1.2 Probe Liner. Same as Method 5, Section 2.1.2, except metal liners shall not be used. Water-cooling of the stainless steel sheath is recommended at temperatures exceeding 500°C.

2.1.3 Pitot Tube, Differential Pressure Gauge, Filter Heating System, Metering System, Barometer, Gas Density Determination Equipment. Same as Method 5, Sections 2.1.3, 2.1.4, 2.1.6, 2.1.8, 2.1.9, and 2.1.10.

2.1.4 Cyclone (Optional). Glass. Use of the cyclone is required only when the sample gas stream is saturated with moisture; however, the cyclone is recommended to protect the filler from any moisture droplets present.

2.1.5 Filter Holder. Borosilicate glass, with a Teflon^{R} filter support and a sealing gasket. The sealing gasket shall be constructed of Teflon^{R} or equivalent materials. The holder design shall provide a positive seal against leakage at any point along the filter circumference. The holder shall be attached immediately to the outlet of the cyclone.

2.1.6 Impinger Train. The following system shall be used to determine the stack gas moisture content and to collect the hydrogen halides and halogens: five or six impingers connected

in series with leak-free ground glass fittings or any similar leak-free noncontaminating fittings. The first impinger shown in Figure 26A-1 (knockout or condensate impinger) is optional and is recommended as a water knockout trap for use under high moisture conditions. If used, this impinger should be constructed as described below for the alkaline impingers, but with a shortened stem, and should contain 50 ml of 0.1 N H_2SO_4. The following two impingers (acid impingers which each contain 100 ml of 0.1 N H_2SO_4) shall be of the Greenburg-Smith design with the standard tip (Method 5, Section 2.1.7). The next two impingers (alkaline impingers which each contain 100 ml of 0.1 N NaOH) and the last impinger (containing silica gel) shall be of the modified Greenburg-Smith design (Method 5, Section 2.1.7). The condensate, acid, and alkaline impingers shall contain known quantities of the appropriate absorbing reagents. The last impinger shall contain a known weight of silica gel or equivalent desiccant.

2.1.7 Ambient Air Conditioning Tube (Optional). Tube tightly packed with approximately 150 g of fresh 8 to 20 mesh sodium hydroxide-coated silica, or equivalent, (Ascarite II^R has been found suitable) to dry and remove acid gases from the ambient air used to remove moisture from the filter and cyclone, when the cyclone is used. The inlet and outlet ends of the tube should be packed with at least 1-cm thickness of glass wool or filter material suitable to prevent escape of fines. Fit one end

with flexible tubing, etc. to allow connection to probe nozzle following the test run.

2.2 Sample Recovery. The following items are needed:

2.2.1 Probe-Liner and Probe-Nozzle Brushes, Wash Bottles, Glass Sample Storage Containers, Petri Dishes, Graduated Cylinder or Balance, and Rubber Policeman. Same as Method 5, Sections 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, and 2.2.7.

2.2.2 Plastic Storage Containers. Screw-cap polypropylene or polyethylene containers to store silica gel. High-density polyethylene bottles with Teflon screw cap liners to store impinger reagents, 1-liter.

2.2.3 Funnels. Glass or high-density polyethylene, to aid in sample recovery.

2.3 Analysis. For analysis, the following equipment is needed:

2.3.1 Volumetric Flasks. Class A, various sizes.

2.3.2 Volumetric Pipettes. Class A, assortment, to dilute samples to calibration range of the ion chromatograph (IC).

2.3.3 Ion Chromatograph. Suppressed or nonsuppressed, with a conductivity detector and electronic integrator operating in the peak area mode. Other detectors, a strip chart recorder, and peak heights may be used.

3. REAGENTS

Unless otherwise indicated, all reagents must conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society (ACS reagent grade). When such

specifications are not available, the best available grade shall be used.

3.1 Sampling.

3.1.1 Water. Deionized, distilled water that conforms to American Society of Testing and Materials (ASTM) Specification D1193-77, Type 3.

3.1.2 Acidic Absorbing Solution, 0.1 N Sulfuric Acid (H_2SO_4). To prepare 1 L, slowly add 2.80 ml of concentrated H_2SO_4 to about 900 ml of water while stirring, and adjust the final volume to 1 L using additional water. Shake well to mix the solution.

3.1.3 Alkaline Absorbing Solution, 0.1 N Sodium Hydroxide (NaOH). To prepare 1 L, dissolve 4.00 g of solid NaOH in about 900 ml of water and adjust the final volume to 1 L using additional water. Shake well to mix the solution.

3.1.4 Filter. Quartz-fiber or Teflon^R mat (e.g., Pallflex^R TX40HI45) filter.

3.1.5 Silica Gel, Crushed Ice, and Stopcock Grease. Same as Method 5, Sections 3.1.2, 3.1.4, and 3.1.5, respectively.

3.2 Sample Recovery.

3.2.1 Water. Same as Section 3.1.1.

3.2.2 Acetone. Same as Method 5, Section 3.2.

3.3 Sample Analysis.

3.3.1 Water. Same as Section 3.1.1.

3.3.2 Reagent Blanks. A separate blank solution of each absorbing reagent should be prepared for analysis with the field samples. Dilute 200 ml of each absorbing solution (250 ml of the

acidic absorbing solution, if a condensate impinger is used) to the same final volume as the field samples using the blank sample of rinse water. If a particulate determination is conducted, collect a blank sample of acetone.

3.3.3 Halide Salt Stock Standard Solutions. Prepare concentrated stock solutions from reagent grade sodium chloride (NaCl), sodium bromide (NaBr), and sodium fluoride (NaF). Each must be dried at 110°C for 2 or more hours and then cooled to room temperature in a desiccator immediately before weighing. Accurately weigh 1.6 to 1.7 g of the dried NaCl to within 0.1 mg, dissolve in water, and dilute to 1 liter. Calculate the exact Cl^- concentration using Equation 26A-1.

$$\mu g\ Cl^-/ml = g\ of\ NaCl \times 10^3 \times 35.453/58.44 \qquad \text{Eq. 26A-1}$$

In a similar manner, accurately weigh and solubilize 1.2 to 1.3 g of dried NaBr and 2.2 to 2.3 g of NaF to make 1-liter solutions. Use Equations 26A-2 and 26A-3 to calculate the Br^- and F^- concentrations.

$$\mu g\ Br^-/ml = g\ of\ NaBr \times 10^3 \times 79.904/102.90 \qquad \text{Eq. 26A-2}$$

$$\mu g\ F^-/ml = g\ of\ NaF \times 10^3 \times 18.998/41.99 \qquad \text{Eq. 26A-3}$$

Alternately, solutions containing a nominal certified concentration of 1000 mg/L NaCl are commercially available as convenient stock solutions from which standards can be made by appropriate volumetric dilution. Refrigerate the stock standard solutions and store no longer than 1 month.

3.3.4 Chromatographic Eluent. Effective eluents for nonsuppressed ion chromatography using a resin- or silica-based

weak ion exchange column are a 4 mM potassium hydrogen phthalate solution, adjusted to a pH of 4.0 using a saturated sodium borate solution, and a mM 4-hydroxy benzoate solution, adjusted to a pH of 8.6 using 1 N sodium hydroxide. An effective eluent for suppressed ion chromatography is a solution containing 3 mM sodium bicarbonate and 2.4 mM sodium carbonate. Other dilute solutions buffered to a similar pH that contain no ions interfering with the chromatographic analysis may be used. If, when using suppressed ion chromatography, the "water dip" resulting from sample injection is interfering with the chlorine peak, use a 2 mM sodium hydroxide/2.4 mM sodium bicarbonate eluent.

4. PROCEDURE

Because of the complexity of this method, testers and analysts should be trained and experienced with the procedures to ensure reliable results.

4.1 Sampling.

4.1.1 Pretest Preparation. Follow the general procedure given in Method 5, Section 4.1.1, except the filter need only be desiccated and weighed if a particulate determination will be conducted.

4.1.2 Preliminary Determinations. Same as Method 5, Section 4.1.2.

4.1.3 Preparation of Sampling Train. Follow the general procedure given in Method 5, Section 4.1.3, except for the following variations:

Add 50 ml of 0.1 N H_2SO_4 to the condensate impinger, if used. Place 100 ml of 0.1 N H_2SO_4 in each of the next two impingers. Place 100 ml of 0.1 N NaOH in each of the following two impingers. Finally, transfer approximately 200-300 g of preweighed silica gel from its container to the last impinger. Set up the train as in Figure 26A-1. When used, the optional cyclone is inserted between the probe liner and filter holder and located in the heated filter box.

4.1.4 Leak-Check Procedures. Follow the leak-check procedures given in Method 5, Sections 4.4.1 (Pretest Leak-Check), 4.1.4.2 (Leak-Checks During the Sample Run), and 4.1.4.3 (Post-Test Leak-Check).

4.1.5 Train Operation. Follow the general procedure given in Method 5, Section 4.1.5. Maintain a temperature around the filter and (cyclone, if used) of 120 ± 14°C (248 ± 25°F). For each run, record the data required on a data sheet such as the one shown in Method 5, Figure 5-2. If the condensate impinger becomes too full, it may be emptied, recharged with 50 ml of 0.1 N H_2SO_4, and replaced during the sample run. The condensate emptied must be saved and included in the measurement of the volume of moisture collected and included in the sample for analysis. The additional 50 ml of absorbing reagent must also be considered in calculating the moisture. After the impinger is reinstalled in the train, conduct a leak-check as described in Method 5, Section 4.1.4.2.

4.1.6 Post-Test Moisture Removal (Optional). When a cyclone is included in the sampling train, perform the following procedure. Upon completion of the test run, connect the ambient air conditioning tube at the probe inlet and operate the train with the filter heating system at 120 ± 14°C (248 ± 25°F) at a low flow rate (e.g., ΔH = 1 in. H_2O) to vaporize any liquid and hydrogen halides in the cyclone or on the filter and pull them through the train into the impingers. After 30 minutes, turn off the flow, remove the conditioning tube, and examine the cyclone and filter for any visible moisture. If moisture is visible, repeat this step for 15 minutes.

4.2 Sample Recovery. Allow the probe to cool. When the probe can be handled safely, wipe off all the external surfaces of the tip of the probe nozzle and place a cap loosely over the tip. Do not cap the probe tip tightly while the sampling train is cooling down because this will create a vacuum in the filter holder, drawing water from the impingers into the holder. Before moving the sampling train to the cleanup site, remove the probe, wipe off any silicone grease, and cap the open outlet of the impinger train, being careful not to lose any condensate that might be present. Wipe off any silicone grease and cap the filter or cyclone inlet. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used between the first impinger and the filter holder, disconnect it at the filter holder and let any condensed water drain into the first impinger. Wipe off any silicone grease and cap the filter

holder outlet and the impinger inlet. Ground glass stoppers, plastic caps, serum caps, Teflon^{R} tape, Parafilm^{R}, or aluminum foil may be used to close these openings. Transfer the probe and filter/impinger assembly to the cleanup area. This area should be clean and protected from the weather to minimize sample contamination or loss. Inspect the train prior to and during disassembly and note any abnormal conditions. Treat samples as follows:

4.2.1 Container No. 1 (Optional; Filter Catch for Particulate Determination). Same as Method 5, Section 4.2, Container No. 1.

4.2.2 Container No. 2 (Optional; Front-Half Rinse for Particulate Determination). Same as Method 5, Section 4.2, Container No. 2.

4.2.3 Container No. 3 (Knockout and Acid Impinger Catch for Moisture and Hydrogen Halide Determination). Disconnect the impingers. Measure the liquid in the acid and knockout impingers to ±1 ml by using a graduated cylinder or by weighing it to ±0.5 g by using a balance. Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas. Quantitatively transfer this liquid to a leak-free sample storage container. Rinse these impingers and connecting glassware (and tubing, if used) with water and add these rinses to the storage container. Seal the container, shake to mix, and label. The fluid level should be marked so that if any sample is lost during transport, a correction proportional to

the lost volume can be applied. Retain rinse water and acidic absorbing solution blanks and analyze with the samples.

4.2.4 Container No. 4 (Alkaline Impinger Catch for Halogen and Moisture Determination). Measure and record the liquid in the alkaline impingers as described in Section 4.2.3. Quantitatively transfer this liquid to a leak-free sample storage container. Rinse these two impingers and connecting glassware with water and add these rinses to the container. Seal the container, shake to mix, and label; mark the fluid level. Retain alkaline absorbing solution blank and analyze with the samples.

4.2.5 Container No. 5 (Silica Gel for Moisture Determination). Same as Method 5, Section 4.2, *Container No. 3.*

4.2.6 Container Nos. 6 through 9 (Reagent Blanks). Save portions of the absorbing reagents (0.1 N H_2SO_4 and 0.1 N NaOH) equivalent to the amount used in the sampling train; dilute to the approximate volume of the corresponding samples using rinse water directly from the wash bottle being used. Also, save a portion of the rinse water alone and a portion of the acetone equivalent to the amount used to rinse the front half of the sampling train. Place each in a separate, prelabeled sample container.

4.2.7 Prior to shipment, recheck all sample containers to ensure that the caps are well-secured. Seal the lids of all containers around the circumference with Teflon^R tape. Ship all liquid samples upright and all particulate filters with the particulate catch facing upward.

4.3 Sample Preparation and Analysis. Note the liquid levels in the sample containers and confirm on the analysis sheet whether or not leakage occured during transport. If a noticeable leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results.

4.3.1 Container Nos. 1 and 2 and Acetone Blank (Optional; Particulate Determination). Same as Method 5, Section 4.3.

4.3.2 Container No. 5. Same as Method 5, Section 4.3 for silica gel.

4.3.3 Container Nos. 3 and 4 and Absorbing Solution and Water Blanks. Quantitatively transfer each sample to a volumetric flask or graduated cylinder and dilute with water to a final volume within 50 ml of the largest sample.

4.3.3.1 The IC conditions will depend upon analytical column type and whether suppressed or nonsuppressed IC is used. Prior to calibration and sample analysis, establish a stable baseline. Next, inject a sample of water, and determine if any Cl^-, Br^-, or F^- appears in the chromatogram. If any of these ions are present, repeat the load/injection procedure until they are no longer present. Analysis of the acid and alkaline absorbing solution samples requires separate standard calibration curves; prepare each according to Section 5.2. Ensure adequate baseline separation of the analytes.

4.3.3.2 Between injections of the appropriate series of calibration standards, inject in duplicate the reagent blanks and

the field samples. Measure the areas or heights of the Cl^-, Br^-, and F^- peaks. Use the average response to determine the concentrations of the field samples and reagent blanks using the linear calibration curve. If the values from duplicate injections are not within 5 percent of their mean, the duplicate injection shall be repeated and all four values used to determine the average response. Dilute any sample and the blank with equal volumes of water if the concentration exceeds that of the highest standard.

4.4 Audit Sample Analysis. Audit samples must be analyzed subject to availability.

5. CALIBRATION

Maintain a laboratory log of all calibrations.

5.1 Probe Nozzle, Pitot Tube, Dry Gas Metering System, Probe Heater, Temperature Gauges, Leak-Check of Metering System, and Barometer. Same as Method 5, Sections 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, and 5.7, respectively.

5.2 Ion Chromatograph. To prepare the calibration standards, dilute given amounts (1.0 ml or greater) of the stock standard solutions to convenient volumes, using 0.1 N H_2SO_4 or 0.1 N NaOH, as appropriate. Prepare at least four calibration standards for each absorbing reagent containing the three stock solutions such that they are within the linear range of the field samples. Using one of the standards in each series, ensure adequate baseline separation for the peaks of interest. Inject the appropriate series of calibration standards, starting with

the lowest concentration standard first both before and after injection of the quality control check sample, reagent blanks, and field samples. This allows compensation for any instrument drift occurring during sample analysis. Determine the peak areas, or height, of the standards and plot individual values versus halide ion concentrations in µg/ml. Draw a smooth curve through the points. Use linear regression to calculate a formula describing the resulting linear curve.

6. QUALITY CONTROL

Same as Method 5, Section 4.4.

7. QUALITY ASSURANCE

7.1 Applicability. When the method is used to demonstrate compliance with a regulation, a set of two audit samples shall be analyzed.

7.2 Audit Procedure. The available audit samples are chloride solutions. Concurrently analyze the two audit samples and a set of compliance samples in the same manner to evaluate the technique of the analyst and the standards preparation. The same analyst, analytical reagents, and analytical system shall be used both for compliance samples and the Environmental Protection Agency (EPA) audit samples.

7.3 Audit Sample Availability. Audit samples will be supplied only to enforcement agencies for compliance tests. Audit samples may be obtained by writing the Source Test Audit Coordinator (MD-77B), Quality Assurance Division, Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Laboratory, Research Triangle Park, NC 27711 or by calling the Source Test Audit Coordinator (STAC) at (919) 541-7834. The request for the audit samples should be made at least 30 days prior to the scheduled compliance sample analysis.

7.4 Audit Results. Calculate the concentrations in mg/dscm using the specified sample volume in the audit instructions. Include the results of both audit samples, their identification

numbers, and the analyst's name with the results of the compliance determination samples in appropriate reports to the EPA regional office or the appropriate enforcement agency. (NOTE: Acceptability of results may be obtained immediately by reporting the audit results in mg/dscm and compliance results in total μg HCl/sample to the responsible enforcement agency.) The concentrations of the audit samples obtained by the analyst shall agree within 10 percent of the actual concentrations. If the 10 percent specification is not met, reanalyze the compliance samples and audit samples, and include initial and reanalysis values in the test report. Failure to meet the 10 percent specification may require retests until the audit problems are resolved.

8. CALCULATIONS

Retain at least one extra decimal figure beyond those contained in the available data in intermediate calculations, and round off only the final answer appropriately.

8.1 Nomenclature. Same as Method 5, Section 6.1. In addition:

B_{X^-} = Analysis of reagent blank, μg halide ion (Cl^-, Br^-, F^-)/ml.

C = Concentration of hydrogen halide (HX) or halogen (X_2), dry basis, mg/dscm.

m_{HX} = Mass of HCl, HBr, or HF in sample, ug.

m_{X2} = Mass of Cl_2 or Br_2 in sample, ug.

S_{X^-} = Analysis of sample, ug halide ion (Cl^-, Br^-, F^-)/ml.

V_s = Volume of filtered and diluted sample, ml.

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

8.3 Dry Gas Volume. Calculate $V_{m(std)}$ and adjust for leakage, if necessary, using the equation in Section 6.3 of Method 5.

8.4 Volume of Water Vapor and Moisture Content. Calculate the volume of water vapor $V_{w(std)}$ and moisture content B_{ws} from the data obtained in this method (Figure 5-2 of Method 5); use Equations 5-2 and 5-3 of Method 5.

8.5 Isokinetic Variation and Acceptable Results. Use Method 5, Sections 6.11 and 6.12.

8.6 Acetone Blank Concentration, Acetone Wash Blank Residue Weight, Particulate Weight, and Particulate Concentration. For particulate determination.

8.7 Total μg HCl, HBr, or HF Per Sample.

$$m_{HX} = K\ V_s\ (S_{X^-} - B_{X^-}) \qquad \text{Eq. 26A-4}$$

where: $K_{HCl} = 1.028$ (μg HCl/μg-mole)/(μg Cl^-/μg-mole).

$K_{HBr} = 1.013$ (μg HBr/μg-mole)/(μg Br^-/μg-mole).

$K_{HF} = 1.053$ (μg HF/μg-mole)/(μg F^-/μg-mole).

8.8 Total μg Cl_2 or Br_2 Per Sample.

$$m_{X2} = 2\ V_s\ (S_{X^-} - B_{X^-}) \qquad \text{Eq. 26A-5}$$

8.9 Concentration of Hydrogen Halide or Halogen in Flue Gas.

$$C = K\ m_{HX,X2}/V_{m(std)} \qquad \text{Eq. 26A-6}$$

where: $K = 10^{-3}$ mg/μg

8.10 Stack Gas Velocity and Volumetric Flow Rate. Calculate the average stack gas velocity and volumetric flow rate, if needed, using data obtained in this method and the equations in Sections 5.2 and 5.3 of Method 2.

9. BIBLIOGRAPHY

1. Steinsberger, S. C. and J. H. Margeson. Laboratory and Field Evaluation of a Methodology for Determination of Hydrogen Chloride Emissions from Municipal and Hazardous Waste Incinerators. U.S. Environmental Protection Agency, Office of Research and Development. Publication No. 600/3-89/064. April 1989. Available from National Technical Information Service, Springfield, VA 22161 as PB89220586/AS.

2. State of California Air Resources Board. Method 421 - Determination of Hydrochloric Acid Emissions from Stationary Sources. March 18, 1987.

3. Cheney, J.L. and C.R. Fortune. Improvements in the Methodology for Measuring Hydrochloric Acid in Combustion Source Emissions. J. Environ. Sci. Health. A19(3): 337-350. 1984.

4. Stern, D.A., B.M. Myatt, J.F. Lachowski, and K.T. McGregor. Speciation of Halogen and Hydrogen Halide Compounds in Gaseous Emissions. In: Incineration and Treatment of Hazardous Waste: Proceedings of the 9th Annual Research Symposium, Cincinnati, Ohio, May 2-4, 1983. Publication No. 600/9-84-015. July 1984. Available from National Technical Information Service, Springfield, VA 22161 as PB84-234525.

5. Holm, R.D. and S.A. Barksdale. Analysis of Anions in Combustion Products. In: Ion Chromatographic Analysis of Environmental Pollutants, E. Sawicki, J.D. Mulik, and E. Wittgenstein (eds.). Ann Arbor, Michigan, Ann Arbor Science Publishers. 1978. pp. 99-110.

APPENDIX J

EXAMPLE CALCULATIONS

	A	B
2		Almega Division
3		Air Quality Services
4		
5	Sampling Train Calculations	
6		
7	Client:	Pure Air
8	Project No:	I-7316
9	Date:	34492
10	Source:	FGD Inlet
11		
12	Test No:	T1
13	Start Time	0.413194444444444
14	Finish Time	0.465277777777778
15	Pitot Cal. Factor	0.84
16	Meter Calibration Factor:	1.003
17	Stack Length, inches:	160
18	Stack Width, inches:	408
19	Stack Diameter, inches:	0
20	Nozzle Diameter, inches:	0.185
21	Barometric Pressure, inches Hg:	29.8
22	Static Pressure in Stack, Inches H2O:	6.1
23	Duration of Sample, minutes:	70
24	Meter Start Volume:	183.622
25	Meter Final Volume:	228.807
26	Average Meter Pressure, Inches H2O:	1.11
27	Average Meter Temperature, degrees F:	87
28	Average Sqrt. Velocity Pressure:	1.095
29	Stack Gas Temperature, degrees F:	323.6
30	% Carbon Dioxide:	12.3
31	% Oxygen:	6.4
32	% Carbon Monoxide:	0
33	Liquid Volume Collected, milliliters:	58
34	Total Weight of Particulate, Milligrams:	0
35		
36	Sample Train Calculations	
37		
38	Meter Volume, Actual:	=B25-B24
39	Meter Volume, STP:	=17.64*B38*B16*((B21 + (ROUND(B26,4)/13.6))/(ROUND(B27,1) + 460))
40	Volume of Water Vapor Condensed:	=0.04707*B33
41	Total Gas Sampled:	=B39 + B40
42	% Moisture:	=(ROUND(B40,3)/ROUND(B41,3))*100
43	Area of Stack, Square Feet:	=IF(B17>0,((B17*B18)/144),(PI()*((B19/2)^2)/144))
44	% Excess Air at Test Location:	=B31/((0.264*(100-B30-B31))-B31)*100
45	Molecular Weight dry, lb/lb-Mole:	=0.44*B30 + 0.32*B31 + 0.28*(100-B30-B31)
46	Molecular Weight wet, lb/lb-Mole:	=ROUND(B45,2)*(1-ROUND(B42,2)/100) + 18*(ROUND(B42,2)/100)
47	Absolute Stack Gas Pressure, in Hg:	=B21 + (B22/13.6)
48	Isokinetic, %:	=1.667*(B29 + 460)*(((0.002669*B33) + B38*B16/(B27 + 460)*(B21 + (B26/13.6)))/(B23*ROUND(B52,2)*ROUND(B47,2)*(PI()/5
49		
50	Velocity and Flow Calculations	
51		
52	Average Stack Gas Velocity FPS:	=85.49*B15*B28*SQRT((B29 + 460)/(ROUND(B47,2)*ROUND(B46,2)))
53	Stack Gas Flow Rate, ACFM:	=ROUND(B52,2)*60*ROUND(B43,2)
54	Stack Gas Velocity, SCFM:	=B56/(1-ROUND(B42,2)/100)
55	Stack Gas Velocity, DSCF/HR:	=3600*(1-(ROUND(B42,2)/100))*ROUND(B52,2)*ROUND(B43,2)*((528*ROUND(B47,2))/((B29 + 460)*29.92))
56	Stack Gas Velocity, DSCFM:	=ROUND(B55,0)/60
57		
58	SO3 Results	
59		
60	Vt-Vtb	5.25
61	N	0.0097
62	Vsoln	300
63	Va	10
64	Lbs/scf x 10-6	=0.0000883*((B60)*(B61)*(B62/B63))/B39)
65	ppm	=B64*4.825*1000000
66	lbs/hr	=B55*B64
67	lbs/MBTU	=9780*B64*(20.9/(20.9-B31))
68	SO2 Results	
69	Wet Chemistry Method	
70	Vt-Vtb	26.35
71	N	0.0097
72	Vsoln	1000
73	Va	1
74	Lbs/scf x 10-6	=0.00007061*((B70*B71*(B72/B73))/B39)
75	ppm(dry)	=B74*6.03*1000000
76	lbs/hr	=B55*B74
77	lbs/MBTU	=9780*B74*(20.9/(20.9-B31))
78		
79	SO2 Analyzer	
80	ppm(dry)	2697
81	lb/hr	=((64/386)*B80)*B55/1000000
82	lbs/dscfx10-6	=B80*(64/386)/1000000
83	lbs/MBTU	=9780*B82*(20.9/(20.9-B31))
84		
85	NOx	
86	ppm(dry)	900.8
87	lb/hr	=((46/386)*B86)*B55/1000000
88	lbs/dscfx10-6	=B86*(46/386)/1000000
89	lbs/MBTU	=9780*B88*(20.9/(20.9-B31))
90		

	A	B
1		Environmental Services of America
2		Almega Division
3		Air Quality Services
4		
5	Particulate & HCl Sampling Train Calculations	
6		
7	Client:	Pure Air
8	Project No:	I-7316
9	Date:	34492
10	Source:	FGD INLET
11		
12	Test No:	T1-M26/M5
13	Start Time	0.413194444444444
14	Finish Time	0.4625
15	Pitot Cal. Factor	0.84
16	Meter Calibration Factor:	1.001
17	Stack Length, inches:	408
18	Stack Width, inches:	160
19	Stack Diameter, inches:	0
20	Nozzle Diameter, inches:	0.185
21	Barometric Pressure, inches Hg:	29.85
22	Static Pressure in Stack, inches H2O:	6.4
23	Duration of Sample, minutes:	70
24	Meter Start Volume:	396.549
25	Meter Final Volume:	436.339
26	Average Meter Pressure, inches H2O:	1.138
27	Average Meter Temperature, degrees F:	82
28	Average Sqrt. Velocity Pressure:	1.089
29	Stack Gas Temperature, degrees F:	328.7
30	% Carbon Dioxide:	12.4
31	% Oxygen:	6.3
32	% Carbon Monoxide:	0
33	Liquid Volume Collected, milliliters:	42
34	Particulate Weight HCl, mg:	26.03
35	Particulate Weight HF, mg:	3
36	Particulate Weight, mg	26.5
37	Sample Train Calculations	
38		
39	Meter Volume, Actual:	=B25-B24
40	Meter Volume, STP:	=17.64*B39*B16*((B21+(ROUND(B26,4)/13.6))/(ROUND(B27,1)+460))
41	Volume of Water Vapor Condensed:	=0.04707*B33
42	Total Gas Sampled:	=B40+B41
43	% Moisture:	=(ROUND(B41,3)/ROUND(B42,3))*100
44	Area of Stack, Square Feet:	=IF(B17>0,((B17*B18)/144),(PI()*((B19/2)^2)/144))
45	% Excess Air at Test Location:	=B31/((0.264*(100-B30-B31))-B31)*100
46	Molecular Weight dry, lb/lb-Mole:	=0.44*B30+0.32*B31+0.28*(100-B30-B31)
47	Molecular Weight wet, lb/lb-Mole:	=ROUND(B46,2)*(1-ROUND(B43,2)/100)+18*(ROUND(B43,2)/100)
48	Absolute Stack Gas Pressure, in Hg:	=B21+(B22/13.6)
49	Isokinetic, %:	=1.667*(B29+460)*(((0.002669*B33)+B39*B16/(B27+460)*(B21+(B26/13.6)))/(B23*ROUND(B53,2)*ROUND(B48,2)*(PI()/576*B
50		
51	Velocity and Flow Calculations	
52		
53	Average Stack Gas Velocity FPS:	=85.49*B15*B28*SQRT((B29+460)/(ROUND(B48,2)*ROUND(B47,2)))
54	Stack Gas Flow Rate, ACFM:	=ROUND(B53,2)*60*ROUND(B44,2)
55	Stack Gas Velocity, SCFM:	=B57/(1-ROUND(B43,2)/100)
56	Stack Gas Velocity, DSCF/HR:	=3600*(1-(ROUND(B43,2)/100))*ROUND(B53,2)*ROUND(B44,2)*((528*ROUND(B48,2))/((B29+460)*29.92))
57	Stack Gas Velocity, DSCFM:	=ROUND(B56,0)/60
58		
59	HCl Calculations:	
60	Lbs/scf x 10-6	=(B34/B40)*2.205
61	ppm	=B60*386/18
62	lbs/hr	=B56*B60/1000000
63	Lbs/MBTU	=9780*B60*(20.9/(20.9-B31))/1000000
64		
65	HF Calculations:	
66	Lbs/scf x 10-6	=(B35/B40)*2.205
67	ppm	=B66*386/18
68	lbs/hr	=B56*B66/1000000
69	Lbs/MBTU	=9780*B66*(20.9/(20.9-B31))/1000000
70		
71	Particulate Calculations:	
72	grains/dscf:	=0.01543*(B36/B40)
73	10-6lbs/dscf	=2.205*(B36/B40)
74	lbs/hr:	=B73*B56/1000000
75	lbs/MBTU:	=9780*B73*(20.9/(20.9-B31))/1000000
76		

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/7/94
Source:	FGD Inlet

Test No:	T1	T2	T3
Start Time	9:55 AM	1:23 PM	2:30 PM
Finish Time	11:10 AM	2:40 PM	3:34 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.003	1.003	1.001
Stack Length, inches:	160	160	408
Stack Width, inches:	408	408	160
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.185	0.185	0.185
Barometric Pressure, inches Hg:	29.8	29.8	29.85
Static Pressure in Stack, Inches H2O:	6.1	6.1	6.4
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	183.622	229.101	475.579
Meter Final Volume:	228.81	271.95	518.207
Average Meter Pressure, Inches H2O:	1.11	1.06	1.28
Average Meter Temperature, degrees F:	87	70.5	61
Average Sqrt. Velocity Pressure:	1.095	1.072	1.1650
Stack Gas Temperature, degrees F:	323.6	323.6	326
% Carbon Dioxide:	12.3	12.2	12.4
% Oxygen:	6.4	6.4	6.5
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	58.0	64.0	57
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	45.185	42.847	42.628
Meter Volume, STP:	43.673	42.696	43.262
Volume of Water Vapor Condensed:	2.730	3.012	2.683
Total Gas Sampled:	46.403	45.709	45.945
% Moisture:	5.88	6.59	5.84
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	42.5	42.4	43.6
Molecular Weight dry, lb/lb-Mole:	30.22	30.21	30.24
Molecular Weight wet, lb/lb-Mole:	29.50	29.41	29.53
Absolute Stack Gas Pressure, in Hg:	30.25	30.25	30.32
Isokinetic, %:	118.0	118.5	109.9

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	73.69	72.25	78.39
Stack Gas Flow Rate, ACFM:	2,004,353	1,965,186	2,132,192
Stack Gas Velocity, SCFM:	1,365,456	1,338,773	1,451,461
Stack Gas Velocity, DSCF/HR:	77,110,003	75,032,855	82,001,738
Stack Gas Velocity, DSCFM:	1,285,167	1,250,548	1,366,696

SO3 Results

Vt-Vtb	5.25	4.55	
N	9.70E-03	9.70E-03	
Vsoln	300	336	
Va	10.0	10.0	
Lbs/scf x 10-6	3.09E-06	3.07E-06	
ppm	14.9	14.8	
lbs/hr	238.2	230.1	
lbs/MBTU	0.044	0.043	

SO2 Results

Wet Chemistry Method

Vt-Vtb	26.4	22.0	
N	9.70E-03	9.70E-03	
Vsoln	1000.0	1000.0	
Va	1.0	1.0	
Lbs/scf x 10-6	4.13E-04	3.53E-04	
ppm(dry)	2491.9	2127.1	
lbs/hr	31865.4	26468.2	
lbs/MBTU	5.825	4.973	

SO2 Analyzer

ppm(dry)	2697.0	2660.0	2708.0
lb/hr	34481.4	33092.2	36818.4
lbs/dscfx10-6	4.47E-04	4.41E-04	4.49E-04
lbs/MBTU	6.304	6.217	6.373

NOx

ppm(dry)	900.8	912.4	885.7
lb/hr	8277.7	8158.4	8655.3
lbs/dscfx10-6	1.07E-04	1.09E-04	1.06E-04
lbs/MBTU	1.513	1.533	1.498

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air		
Project No:	I-7316		
Date:	6/8/94		
Source:	FGD Inlet		
Test No:	T1	T2	T3
Start Time	10:05 AM	2:30 PM	1:03 PM
Finish Time	11:25 AM	4:00 PM	2:20 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.007	1.007	1.007
Stack Length, inches:	160	160	160
Stack Width, inches:	408	408	408
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.195	0.195	0.195
Barometric Pressure, inches Hg:	30.05	30.05	30.05
Static Pressure in Stack, Inches H2O:	5.3	5.7	5.6
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	280.913	331.682	565.539
Meter Final Volume:	325.67	375.03	606.85
Average Meter Pressure, Inches H2O:	1.18	1.12	1.19
Average Meter Temperature, degrees F:	59.4	63.9	62.2
Average Sqrt. Velocity Pressure:	1.158	1.13	1.1567
Stack Gas Temperature, degrees F:	330.5	337.1	338.6
% Carbon Dioxide:	12.2	12.1	12.1
% Oxygen:	6.3	6.2	6.2
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	62.0	65.0	68.1
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	44.754	43.344	41.310
Meter Volume, STP:	46.127	44.283	42.350
Volume of Water Vapor Condensed:	2.918	3.060	3.205
Total Gas Sampled:	49.045	47.343	45.555
% Moisture:	5.95	6.46	7.04
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	41.4	40.3	40.3
Molecular Weight dry, lb/lb-Mole:	30.20	30.18	30.18
Molecular Weight wet, lb/lb-Mole:	29.47	29.39	29.32
Absolute Stack Gas Pressure, in Hg:	30.44	30.47	30.46
Isokinetic, %:	106.2	105.3	99.0

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	78.06	76.56	78.55
Stack Gas Flow Rate, ACFM:	2,123,216	2,082,417	2,136,544
Stack Gas Velocity, SCFM:	1,442,811	1,404,752	1,438,086
Stack Gas Velocity, DSCF/HR:	81,417,810	78,840,293	80,210,679
Stack Gas Velocity, DSCFM:	1,356,964	1,314,005	1,336,845

SO3 Results

Vt-Vtb	8.31	6.25
N	9.80E-03	9.80E-03
Vsoln	250	295
Va	10.0	5.0
Lbs/scf x 10-6	3.90E-06	7.21E-06
ppm	18.8	34.8
lbs/hr	317.3	568.1

SO2 Results

Wet Chemistry Method			
Vt-Vtb	28.2	28.6	
N	9.80E-03	9.80E-03	
Vsoln	1000.0	1000.0	
Va	1.0	1.0	
Lbs/scf x 10-6	4.24E-04	4.47E-04	
ppm(dry)	2554.6	2693.9	
lbs/hr	34492.3	35222.1	
lbs/MBTU	5.931	6.212	
SO2 Analyzer			
ppm(dry)	2610.0	2687.0	2785.3
lb/hr	35233.2	35124.4	37042.2
lbs/dscfx10-6	4.33E-04	4.46E-04	4.62E-04
lbs/MBTU	6.059	6.195	6.421
NOx			
ppm(dry)	891.0	902.0	913.0
lb/hr	8645.1	8474.7	8727.2
lbs/dscfx10-6	1.06E-04	1.07E-04	1.09E-04
lbs/MBTU	1.487	1.495	1.513

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air
Project No:	I-7288
Date:	6/9/94
Source:	FGD Inlet

Test No:	T1	T2	T3
Start Time	9:15 AM	11:27 AM	1:17 PM
Finish Time	10:35 AM	12:55 PM	2:30 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.007	1.007	1.001
Stack Length, inches:	160	160	408
Stack Width, inches:	408	408	160
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.195	0.195	0.185
Barometric Pressure, inches Hg:	30.02	30.02	29.85
Static Pressure in Stack, Inches H2O:	5.5	5.6	5.5
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	375.462	418.011	737.283
Meter Final Volume:	415.07	457.94	777.582
Average Meter Pressure, Inches H2O:	1.15	1.16	1.17
Average Meter Temperature, degrees F:	73.2	72.5	68.8
Average Sqrt. Velocity Pressure:	1.1357	1.147	1.1310
Stack Gas Temperature, degrees F:	335.7	336.6	335.8
% Carbon Dioxide:	12.1	12.1	12.3
% Oxygen:	6.2	6.2	6.3
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	60.0	60.0	64
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	39.610	39.930	40.299
Meter Volume, STP:	39.726	40.100	40.283
Volume of Water Vapor Condensed:	2.824	2.824	3.012
Total Gas Sampled:	42.550	42.925	43.296
% Moisture:	6.64	6.58	6.96
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	40.3	40.3	41.5
Molecular Weight dry, lb/lb-Mole:	30.18	30.18	30.22
Molecular Weight wet, lb/lb-Mole:	29.37	29.38	29.37
Absolute Stack Gas Pressure, in Hg:	30.42	30.43	30.25
Isokinetic, %:	94.1	94.1	107.2

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	76.97	77.75	76.87
Stack Gas Flow Rate, ACFM:	2,093,569	2,114,784	2,090,849
Stack Gas Velocity, SCFM:	1,412,438	1,425,608	1,402,544
Stack Gas Velocity, DSCF/HR:	79,119,125	79,908,174	78,295,594
Stack Gas Velocity, DSCFM:	1,318,652	1,331,803	1,304,927

SO3 Results

Vt-Vtb	10.94	9.78	
N	9.80E-03	9.80E-03	
Vsoln	250	250	
Va	10.0	10.0	
Lbs/scf x 10-6	5.96E-06	5.28E-06	
ppm	28.7	25.5	
lbs/hr	471.4	421.6	
	0.083	0.073	

SO2 Results

Wet Chemistry Method			
Vt-Vtb	28.8	25.1	
N	9.80E-03	9.80E-03	
Vsoln	1000.0	1000.0	
Va	1.0	1.0	
Lbs/scf x 10-6	5.02E-04	4.34E-04	
ppm(dry)	3028.2	2614.9	
lbs/hr	39732.3	34651.8	
	6.983	6.030	
SO2 Analyzer			
ppm(dry)	2610.0	2920.0	2958.2
lb/hr	34238.5	38687.1	38402.3
lbs/dscfx10-6	4.33E-04	4.84E-04	4.90E-04
lbs/MBTU	6.017	6.732	6.867
NOx			
ppm(dry)	912.4	927.5	922.3
lb/hr	8602.7	8832.3	8605.6
lbs/dscfx10-6	1.09E-04	1.11E-04	1.10E-04
lbs/MBTU	1.512	1.537	1.539

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air	
Project No:	I-7288	
Date:	6/13/94	
Source:	FGD Inlet	
Test No:	T1	T2
Start Time	10:10 AM	12:36 PM
Finish Time	11:22 AM	1:55 PM
Pitot Cal. Factor	0.84	0.84
Meter Calibration Factor:	1.007	1.007
Stack Length, inches:	160	160
Stack Width, inches:	408	408
Stack Diameter, inches:	0	0
Nozzle Diameter, inches:	0.195	0.195
Barometric Pressure, inches Hg:	29.9	29.9
Static Pressure in Stack, Inches H2O:	5.5	5.6
Duration of Sample, minutes:	70	67.5
Meter Start Volume:	460.113	502.287
Meter Final Volume:	497.81	537.853
Average Meter Pressure, Inches H2O:	0.97	0.88
Average Meter Temperature, degrees F:	85.3	90.5
Average Sqrt. Velocity Pressure:	1.0476	0.9887
Stack Gas Temperature, degrees F:	327	340.5
% Carbon Dioxide:	12.2	12.1
% Oxygen:	6.3	6.2
% Carbon Monoxide:	0.0	0.0
Liquid Volume Collected, milliliters:	62.0	65.0
Total Weight of Particulate, Milligrams:	0	0

Sample Train Calculations

Meter Volume, Actual:	37.696	35.566
Meter Volume, STP:	36.804	34.389
Volume of Water Vapor Condensed:	2.918	3.060
Total Gas Sampled:	39.722	37.448
% Moisture:	7.35	8.17
Area of Stack, Square Feet:	453.33	453.33
% Excess Air at Test Location:	41.4	40.3
Molecular Weight dry, lb/lb-Mole:	30.20	30.18
Molecular Weight wet, lb/lb-Mole:	29.30	29.18
Absolute Stack Gas Pressure, in Hg:	30.30	30.31
Isokinetic, %:	94.8	98.8

Velocity and Flow Calculations		
Average Stack Gas Velocity FPS:	70.83	67.55
Stack Gas Flow Rate, ACFM:	1,926,562	1,837,346
Stack Gas Velocity, SCFM:	1,308,950	1,227,688
Stack Gas Velocity, DSCF/HR:	72,764,551	67,643,151
Stack Gas Velocity, DSCFM:	1,212,743	1,127,386
SO3 Results		
Vt-Vtb	7.22	4.56
N	9.80E-03	9.80E-03
Vsoln	330	250
Va	10.0	10.0
Lbs/scf x 10-6	5.60E-06	2.87E-06
ppm	27.0	13.8
lbs/hr	407.6	194.0
lbs/MBTU	0.078	0.040
SO2 Results		
Wet Chemistry Method		
Vt-Vtb	22.2	22.2
N	9.80E-03	9.80E-03
Vsoln	1000.0	1000.0
Va	1.0	1.0
Lbs/scf x 10-6	4.18E-04	4.47E-04
ppm(dry)	2518.1	2697.3
lbs/hr	30385.8	30258.0
lbs/MBTU	5.846	6.220
SO2 Analyzer		
ppm(dry)	2756.0	2711.0
lb/hr	33250.0	30405.1
lbs/dscf	4.57E-04	4.49E-04
lbs/MBTU	6.397	6.250
NOx		
ppm(dry)	851.4	847.8
lb/hr	7382.8	6834.2
lbs/dscfx10-6	1.01E-04	1.01E-04
lbs/MBTU	1.420	1.405

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/27/94
Source:	FGD Outlet

Test No:	T1	T2	T3
Start Time	10:27 AM	12:20 PM	2:13 PM
Finish Time	12:10 PM	1:44 PM	3:37 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.9931	0.9931	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.312	0.312	0.312
Barometric Pressure, inches Hg:	30.1	30.1	30.1
Static Pressure in Stack, Inches H2O:	0.85	0.85	0.82
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	820.117	875.436	473.39
Meter Final Volume:	865.03	920.69	519.49
Average Meter Pressure, Inches H2O:	2.08	1.97	2.57
Average Meter Temperature, degrees F:	72.7	70.6	76.3
Average Sqrt. Velocity Pressure:	0.5251	0.5125	0.5775
Stack Gas Temperature, degrees F:	132.7	134.2	134.7
% Carbon Dioxide:	12.4	12.5	12.6
% Oxygen:	6.5	6.6	6.7
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	183.0	185.0	167
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	44.908	45.251	46.095
Meter Volume, STP:	44.679	45.186	45.877
Volume of Water Vapor Condensed:	8.614	8.708	7.861
Total Gas Sampled:	53.292	53.894	53.738
% Moisture:	16.16	16.16	14.63
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	43.6	44.7	45.9
Molecular Weight dry, lb/lb-Mole:	30.24	30.26	30.28
Molecular Weight wet, lb/lb-Mole:	28.26	28.28	28.48
Absolute Stack Gas Pressure, in Hg:	30.16	30.16	30.16
Isokinetic, %:	98.8	102.5	91.1

Velocity and Flow Calculations			
Average Stack Gas Velocity FPS:	31.45	30.72	34.51
Stack Gas Flow Rate, ACFM:	1,613,951	1,576,489	1,770,984
Stack Gas Velocity, SCFM:	1,449,303	1,412,089	1,584,968
Stack Gas Velocity, DSCF/HR:	72,905,725	71,033,707	81,185,215
Stack Gas Velocity, DSCFM:	1,215,095	1,183,895	1,353,087
SO3 Results			
Vt-Vtb	3.56	2.62	
N	9.40E-03	9.40E-03	
Vsoln	400	420	
Va	10.0	10.0	
Lbs/scf x 10-6	2.65E-06	2.02E-06	
ppm	12.8	9.8	
lbs/hr	192.9	143.6	
lbs/MbTU	0.038	0.029	
SO2 Results			
Wet Chemistry Method			
Vt-Vtb	21.4	20.6	
N	9.40E-03	9.40E-03	
Vsoln	1000.0	1000.0	
Va	10.0	10.0	
Lbs/scf x 10-6	3.17E-05	3.03E-05	
ppm(dry)	191.3	182.7	
lbs/hr	2313.4	2152.5	
lbs/MbTU	0.450	0.433	
SO2 Analyzer			
ppm(dry)	185.4	187.4	194.5
lb/hr	2241.1	2207.1	2618.1
lbs/dscfx10-6	3.07E-05	3.11E-05	3.22E-05
lbs/MBTU	0.436	0.444	0.464
NOx			
ppm(dry)	834.8	852.5	847.6
lb/hr	7252.9	7216.5	8200.5
lbs/dscfx10-6	9.95E-05	1.02E-04	1.01E-04
lbs/MBTU	1.412	1.452	1.454

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air
Project No:	I-7288
Date:	6/28/94
Source:	FGD Inlet

Test No:	T1	T2	T3
Start Time	10:55 AM	12:30 PM	2:00 PM
Finish Time	12:05 PM	1:39 PM	3:00 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.003	1.003	1.003
Stack Length, inches:	160	160	160
Stack Width, inches:	408	408	408
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.185	0.185	0.185
Barometric Pressure, inches Hg:	29.85	29.85	29.85
Static Pressure in Stack, Inches H2O:	6	5.9	6.2
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	179.66	232.549	3.96
Meter Final Volume:	222.27	273.43	44.75
Average Meter Pressure, Inches H2O:	1.20	1.12	1.16
Average Meter Temperature, degrees F:	90.7	78	92.3
Average Sqrt. Velocity Pressure:	1.149	1.109	1.1156
Stack Gas Temperature, degrees F:	333.4	333.4	328.2
% Carbon Dioxide:	12.2	12.3	12.3
% Oxygen:	6.3	6.2	6.4
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	61.0	57.0	71.0
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	42.605	40.883	40.790
Meter Volume, STP:	40.980	40.244	39.116
Volume of Water Vapor Condensed:	2.871	2.683	3.342
Total Gas Sampled:	43.851	42.927	42.458
% Moisture:	6.55	6.25	7.87
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	41.4	40.5	42.5
Molecular Weight dry, lb/lb-Mole:	30.20	30.22	30.22
Molecular Weight wet, lb/lb-Mole:	29.40	29.46	29.26
Absolute Stack Gas Pressure, in Hg:	30.29	30.28	30.31
Isokinetic, %:	106.7	108.3	105.7

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	77.88	75.11	75.53
Stack Gas Flow Rate, ACFM:	2,118,320	2,042,977	2,054,401
Stack Gas Velocity, SCFM:	1,427,155	1,375,940	1,394,142
Stack Gas Velocity, DSCF/HR:	80,020,566	77,396,622	77,065,386
Stack Gas Velocity, DSCFM:	1,333,676	1,289,944	1,284,423

SO3 Results

Vt-Vtb	5.14	6.80
N	9.40E-03	9.40E-03
Vsoln	250	250
Va	10.0	10.0
Lbs/scf x 10-6	2.60E-06	3.51E-06
ppm	12.6	16.9
lbs/hr	208.3	271.4
lbs/MBTU	0.036	0.049

SO2 Results

Wet Chemistry Method

Vt-Vtb	27.8	27.4
N	9.40E-03	9.40E-03
Vsoln	1000.0	1000.0
Va	1.0	1.0
Lbs/scf x 10-6	4.50E-04	4.52E-04
ppm(dry)	2713.1	2727.9
lbs/hr	36004.5	35013.6
lbs/MBTU	6.299	6.290

SO2 Analyzer

ppm(dry)	2808.0	2815.0	2820.0
lb/hr	37255.6	36123.8	36033.1
lbs/dscfx10-6	4.66E-04	4.67E-04	4.68E-04
lbs/MBTU	6.518	6.490	6.591

NOx

ppm(dry)	826.5	876.4	878.2
lb/hr	7881.6	8083.4	8065.4
lbs/dscfx10-6	9.85E-05	1.04E-04	1.05E-04
lbs/MBTU	1.379	1.452	1.475

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/29/94
Source:	FGD Inlet

Test No:	T1	T2	T3
Start Time	8:30 AM	11:25 AM	11:55 AM
Finish Time	9:47 AM	12:42 PM	1:10 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.003	1.003	1.003
Stack Length, inches:	160	160	160
Stack Width, inches:	408	408	408
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.185	0.185	0.185
Barometric Pressure, inches Hg:	29.8	29.8	29.8
Static Pressure in Stack, Inches H2O:	6.1	5.9	6.1
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	280.034	324.887	129.052
Meter Final Volume:	319.83	365.66	171.71
Average Meter Pressure, Inches H2O:	1.15	1.12	1.24
Average Meter Temperature, degrees F:	79.9	79.7	79.8
Average Sqrt. Velocity Pressure:	1.122	1.112	1.157
Stack Gas Temperature, degrees F:	335.7	332	330.5
% Carbon Dioxide:	12.3	12.2	12.3
% Oxygen:	6.4	6.5	6.4
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	62.0	55.0	73.0
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	39.793	40.771	42.661
Meter Volume, STP:	38.970	39.941	41.796
Volume of Water Vapor Condensed:	2.918	2.589	3.436
Total Gas Sampled:	41.889	42.530	45.232
% Moisture:	6.97	6.09	7.60
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	42.5	43.4	42.5
Molecular Weight dry, lb/lb-Mole:	30.22	30.21	30.22
Molecular Weight wet, lb/lb-Mole:	29.37	29.47	29.29
Absolute Stack Gas Pressure, in Hg:	30.25	30.23	30.25
Isokinetic, %:	104.5	107.0	108.9

Velocity and Flow Calculations			
Average Stack Gas Velocity FPS:	76.25	75.29	78.48
Stack Gas Flow Rate, ACFM:	2,073,985	2,047,873	2,134,640
Stack Gas Velocity, SCFM:	1,391,406	1,379,394	1,441,520
Stack Gas Velocity, DSCF/HR:	77,665,507	77,723,330	79,917,845
Stack Gas Velocity, DSCFM:	1,294,425	1,295,389	1,331,964
SO3 Results			
Vt-Vtb	5.03	4.92	
N	1.02E-02	1.02E-02	
Vsoln	255	270	
Va	10.0	10.0	
Lbs/scf x 10-6	2.96E-06	3.00E-06	
ppm	14.3	14.5	
lbs/hr	230.2	232.8	
lbs/MBTU	0.042	0.043	
SO2 Results			
Wet Chemistry Method			
Vt-Vtb	22.9	26.1	
N	1.02E-02	1.02E-02	
Vsoln	1000.0	1000.0	
Va	1.0	1.0	
Lbs/scf x 10-6	4.23E-04	4.71E-04	
ppm(dry)	2549.8	2839.1	
lbs/hr	32840.9	36593.9	
lbs/MBTU	5.961	6.683	
SO2 Analyzer			
ppm(dry)	2773.0	2805.0	2789.0
lb/hr	35708.4	36147.4	36956.0
lbs/dscfx10-6	4.60E-04	4.65E-04	4.62E-04
lbs/MBTU	6.481	6.602	6.519
NOx			
ppm(dry)	830.2	872.5	868.5
lb/hr	7683.9	8081.4	8271.5
lbs/dscfx10-6	9.89E-05	1.04E-04	1.04E-04
lbs/MBTU	1.395	1.476	1.459

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/7/94
Source:	FGD INLET

Test No:	T1-M26/M5	T2-M26/M5	T3 - M5
Start Time	9:55 AM	12:20 PM	2:30 PM
Finish Time	11:06 AM	1:44 PM	3:34 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.001	1.001	1.001
Stack Length, inches:	408	408	408
Stack Width, inches:	160	160	160
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.185	0.185	0.185
Barometric Pressure, inches Hg:	29.85	29.85	29.85
Static Pressure in Stack, Inches H2O:	6.4	5.7	6.4
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	396.549	436.896	475.579
Meter Final Volume:	436.339	475.498	518.207
Average Meter Pressure, Inches H2O:	1.14	1.15	1.28
Average Meter Temperature, degrees F:	82	70.5	61
Average Sqrt. Velocity Pressure:	1.0890	1.0912	1.1650
Stack Gas Temperature, degrees F:	328.7	323.7	326
% Carbon Dioxide:	12.4	12.3	12.4
% Oxygen:	6.3	6.4	6.5
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	42	57	57
Particulate Weight HCl, mg:	26.03	14.46	NA
Particulate Weight HF, mg:	3	ND	NA
Particulate Weight, mg	26.5	26	33.3

Sample Train Calculations

Meter Volume, Actual:	39.790	38.602	42.628
Meter Volume, STP:	38.803	38.462	43.262
Volume of Water Vapor Condensed:	1.977	2.683	2.683
Total Gas Sampled:	40.780	41.145	45.945
% Moisture:	4.85	6.52	5.84
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	41.5	42.5	43.6
Molecular Weight dry, lb/lb-Mole:	30.24	30.22	30.24
Molecular Weight wet, lb/lb-Mole:	29.65	29.42	29.53
Absolute Stack Gas Pressure, in Hg:	30.32	30.27	30.32
Isokinetic, %:	104.7	104.8	109.9

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	73.25	73.51	78.39
Stack Gas Flow Rate, ACFM:	1,992,385	1,999,457	2,132,192
Stack Gas Velocity, SCFM:	1,351,646	1,362,847	1,451,461
Stack Gas Velocity, DSCF/HR:	77,165,482	76,439,352	82,001,738
Stack Gas Velocity, DSCFM:	1,286,091	1,273,989	1,366,696
HCl Calculations:			
Lbs/scf x 10-6	1.48	0.83	
ppm	31.7	17.8	
lbs/hr	114.1	63.4	
Lbs/MBTU	0.021	0.012	
HF Calculations:			
Lbs/scf x 10-6	0.17	ND	
ppm	3.7	ND	
lbs/hr	13.2	ND	
Lbs/MBTU	0.002	ND	
Particulate Calculations:			
grains/dscf:	0.0105	0.0104	0.0119
10-6lbs/dscf	1.5059	1.4906	1.6973
lbs/hr:	116.20	113.94	139.18
lbs/MBTU:	0.021	0.021	0.024

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/8/94
Source:	FGD INLET

Test No:	T1-M26/M5	T2-M26/M5	T3 - M5
Start Time	10:05 AM	1:03 PM	2:38 PM
Finish Time	11:25 AM	2:13 PM	3:50 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.001	1.001	1.001
Stack Length, inches:	408	408	408
Stack Width, inches:	160	160	160
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.185	0.185	0.185
Barometric Pressure, inches Hg:	29.85	29.85	29.85
Static Pressure in Stack, Inches H2O:	5.3	5.3	5.5
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	519.854	565.539	607.210
Meter Final Volume:	560.317	606.849	648.408
Average Meter Pressure, Inches H2O:	1.20	1.19	1.22
Average Meter Temperature, degrees F:	61.3	62.2	60.9
Average Sqrt. Velocity Pressure:	1.1530	1.1567	1.1723
Stack Gas Temperature, degrees F:	331.2	338.6	339.2
% Carbon Dioxide:	12.2	12.3	12.2
% Oxygen:	6.3	6.2	6.2
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	55	66	61
Particulate Weight HCl, mg:	20.24	16.48	NA
Particulate Weight HF, mg:	0.24	ND	NA
Particulate Weight, mg	24.8	25.3	23.6

Sample Train Calculations

Meter Volume, Actual:	40.463	41.310	41.198
Meter Volume, STP:	41.033	41.818	41.812
Volume of Water Vapor Condensed:	2.589	3.107	2.871
Total Gas Sampled:	43.621	44.925	44.683
% Moisture:	5.94	6.92	6.43
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	41.4	40.5	40.4
Molecular Weight dry, lb/lb-Mole:	30.20	30.22	30.20
Molecular Weight wet, lb/lb-Mole:	29.48	29.37	29.42
Absolute Stack Gas Pressure, in Hg:	30.24	30.24	30.25
Isokinetic, %:	105.8	108.9	107.0

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	78.00	78.77	79.78
Stack Gas Flow Rate, ACFM:	2,121,584	2,142,528	2,170,000
Stack Gas Velocity, SCFM:	1,430,962	1,431,698	1,449,446
Stack Gas Velocity, DSCF/HR:	80,757,781	79,957,461	81,374,786
Stack Gas Velocity, DSCFM:	1,345,963	1,332,624	1,356,246
HCl Calculations:			
Lbs/scf x 10-6	1.09	0.87	
ppm	23.3	18.6	
lbs/hr	87.8	69.5	
Lbs/MBTU	0.015	0.012	
HF Calculations:			
Lbs/scf x 10-6	0.01	ND	
ppm	0.3	ND	
lbs/hr	1.0	ND	
Lbs/MBTU	0.0002	ND	
Particulate Calculations:			
grains/dscf:	0.0093	0.0093	0.0087
10-6lbs/dscf	1.3327	1.3340	1.2446
lbs/hr:	107.63	106.67	101.28
lbs/MBTU:	0.019	0.019	0.017

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/9/94
Source:	FGD INLET

Test No:	T1-M26/M5	T2-M26/M5	T3 - M5
Start Time	9:29 AM	11:27 AM	1:17 PM
Finish Time	10:35 AM	12:55 PM	2:30 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.001	1.001	1.001
Stack Length, inches:	408	408	408
Stack Width, inches:	160	160	160
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.185	0.185	0.185
Barometric Pressure, inches Hg:	29.85	29.85	29.85
Static Pressure in Stack, Inches H2O:	5.5	5.6	5.5
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	655.951	696.772	737.283
Meter Final Volume:	696.404	736.718	777.582
Average Meter Pressure, Inches H2O:	1.18	1.17	1.17
Average Meter Temperature, degrees F:	68.4	68.8	68.8
Average Sqrt. Velocity Pressure:	1.1363	1.1340	1.1310
Stack Gas Temperature, degrees F:	336	336.9	335.8
% Carbon Dioxide:	12.3	12.2	12.3
% Oxygen:	6.4	6.3	6.3
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	52	52.4	64
Particulate Weight HCl, mg:	18.74	12.02	NA
Particulate Weight HF, mg:	0.12	0.07	NA
Particulate Weight, mg	18.1	19.7	17.5

Sample Train Calculations

Meter Volume, Actual:	40.453	39.946	40.299
Meter Volume, STP:	40.470	39.931	40.283
Volume of Water Vapor Condensed:	2.448	2.466	3.012
Total Gas Sampled:	42.917	42.397	43.296
% Moisture:	5.70	5.82	6.96
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	42.5	41.4	41.5
Molecular Weight dry, lb/lb-Mole:	30.22	30.20	30.22
Molecular Weight wet, lb/lb-Mole:	29.52	29.49	29.37
Absolute Stack Gas Pressure, in Hg:	30.25	30.26	30.25
Isokinetic, %:	106.0	104.9	107.2

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	77.04	76.96	76.87
Stack Gas Flow Rate, ACFM:	2,095,473	2,093,297	2,090,849
Stack Gas Velocity, SCFM:	1,405,292	1,402,711	1,402,544
Stack Gas Velocity, DSCF/HR:	79,511,432	79,264,393	78,295,594
Stack Gas Velocity, DSCFM:	1,325,191	1,321,073	1,304,927
HCl Calculations:			
Lbs/scf x 10-6	1.02	0.66	
ppm	21.9	14.2	
lbs/hr	81.2	52.6	
Lbs/MBTU	0.014	0.009	
HF Calculations:			
Lbs/scf x 10-6	0.01	0.00	
ppm	0.1	0.1	
lbs/hr	0.5	0.3	
Lbs/MBTU	0.0001	0.0001	
Particulate Calculations:			
grains/dscf:	0.0069	0.0076	0.0067
10-6lbs/dscf	0.9862	1.0878	0.9579
lbs/hr:	78.41	86.23	75.00
lbs/MBTU:	0.014	0.015	0.013

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air	
Project No:	I-7316	
Date:	6/13/94	
Source:	FGD INLET	
Test No:	T1-M26/M5	T2-M26/M5
Start Time	10:13 AM	12:34 PM
Finish Time	11:25 AM	1:40 PM
Pitot Cal. Factor	0.84	0.84
Meter Calibration Factor:	0.9993	0.9993
Stack Length, inches:	408	408
Stack Width, inches:	160	160
Stack Diameter, inches:	0	0
Nozzle Diameter, inches:	0.185	0.185
Barometric Pressure, inches Hg:	29.9	29.9
Static Pressure in Stack, Inches H2O:	5.6	5.6
Duration of Sample, minutes:	70	67.5
Meter Start Volume:	714.062	759.650
Meter Final Volume:	750.875	796.487
Average Meter Pressure, Inches H2O:	0.83	0.90
Average Meter Temperature, degrees F:	84.6	89.3
Average Sqrt. Velocity Pressure:	1.0260	1.0270
Stack Gas Temperature, degrees F:	335	334.4
% Carbon Dioxide:	12.4	12.5
% Oxygen:	6.4	6.3
% Carbon Monoxide:	0.0	0.0
Liquid Volume Collected, milliliters:	46	55
Particulate Weight HCl, mg:	3	24.4
Particulate Weight HF, mg:	0.51	ND
Particulate Weight, mg	34.1	36.6

Sample Train Calculations

Meter Volume, Actual:	36.813	36.837
Meter Volume, STP:	35.700	35.425
Volume of Water Vapor Condensed:	2.165	2.589
Total Gas Sampled:	37.866	38.013
% Moisture:	5.72	6.81
Area of Stack, Square Feet:	453.33	453.33
% Excess Air at Test Location:	42.6	41.6
Molecular Weight dry, lb/lb-Mole:	30.24	30.25
Molecular Weight wet, lb/lb-Mole:	29.54	29.42
Absolute Stack Gas Pressure, in Hg:	30.31	30.31
Isokinetic, %:	103.5	107.3

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	69.43	69.61
Stack Gas Flow Rate, ACFM:	1,888,482	1,893,378
Stack Gas Velocity, SCFM:	1,270,586	1,274,842
Stack Gas Velocity, DSCF/HR:	71,874,501	71,281,518
Stack Gas Velocity, DSCFM:	1,197,908	1,188,025
HCl Calculations:		
Lbs/scf x 10-6	0.19	1.52
ppm	4.0	32.6
lbs/hr	13.3	108.3
Lbs/MBTU	0.003	0.021
HF Calculations:		
Lbs/scf x 10-6	0.03	ND
ppm	0.7	ND
lbs/hr	2.3	ND
Lbs/MBTU	0.0004	ND
Particulate Calculations:		
grains/dscf:	0.0147	0.0159
10-6lbs/dscf	2.1062	2.2782
lbs/hr:	151.38	162.39
lbs/MBTU:	0.030	0.032

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/27/94
Source:	FGD INLET

Test No:	T1-M26/M5	T2-M26/M5	T3-M5
Start Time	10:17 AM	12:30 PM	2:13 PM
Finish Time	11:43 AM	1:39 PM	3:37 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.001	1.001	1.001
Stack Length, inches:	408	408	408
Stack Width, inches:	160	160	160
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.185	0.185	0.185
Barometric Pressure, inches Hg:	30.1	30.1	30.1
Static Pressure in Stack, Inches H2O:	6.2	6.2	6.2
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	791.456	831.711	872.080
Meter Final Volume:	830.329	870.288	913.780
Average Meter Pressure, Inches H2O:	1.05	1.07	1.23
Average Meter Temperature, degrees F:	84.1	74.3	75.7
Average Sqrt. Velocity Pressure:	1.0650	1.0710	1.1540
Stack Gas Temperature, degrees F:	337	335	332
% Carbon Dioxide:	12.4	12.4	12.5
% Oxygen:	6.3	6.2	6.2
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	53.5	57	71
Particulate Weight HCl, mg:	15.7	27.2	NA
Particulate Weight HF, mg:	ND	2.4	NA
Particulate Weight, mg	35.3	32.4	56.4

Sample Train Calculations

Meter Volume, Actual:	38.873	38.577	41.700
Meter Volume, STP:	38.070	38.474	41.497
Volume of Water Vapor Condensed:	2.518	2.683	3.342
Total Gas Sampled:	40.588	41.157	44.839
% Moisture:	6.20	6.52	7.45
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	41.5	40.6	40.6
Molecular Weight dry, lb/lb-Mole:	30.24	30.23	30.25
Molecular Weight wet, lb/lb-Mole:	29.48	29.43	29.34
Absolute Stack Gas Pressure, in Hg:	30.56	30.56	30.56
Isokinetic, %:	106.4	107.1	107.9

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	71.93	72.31	77.89
Stack Gas Flow Rate, ACFM:	1,956,482	1,966,818	2,118,592
Stack Gas Velocity, SCFM:	1,323,863	1,334,205	1,442,607
Stack Gas Velocity, DSCF/HR:	74,507,025	74,832,901	80,107,945
Stack Gas Velocity, DSCFM:	1,241,784	1,247,215	1,335,132
HCl Calculations:			
Lbs/scf x 10-6	0.91	1.56	
ppm	19.5	33.4	
lbs/hr	67.8	116.7	
Lbs/MBTU	0.013	0.022	
HF Calculations:			
Lbs/scf x 10-6	ND	0.14	
ppm	ND	2.9	
lbs/hr	ND	10.3	
Lbs/MBTU	ND	0.002	
Particulate Calculations:			
grains/dscf:	0.0143	0.0130	0.0210
10-6lbs/dscf	2.0446	1.8569	2.9969
lbs/hr:	152.34	138.95	240.08
lbs/MBTU:	0.029	0.026	0.042

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/28/94
Source:	FGD Inlet

Test No:	T1-M26/M5	T2-M26/M5	T3-M5
Start Time	10:40 AM	12:36 PM	2:00 PM
Finish Time	11:55 AM	1:45 PM	3:10 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.001	1.001	1.001
Stack Length, inches:	160	160	160
Stack Width, inches:	408	408	408
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.185	0.185	0.185
Barometric Pressure, inches Hg:	29.85	29.85	29.85
Static Pressure in Stack, Inches H2O:	6.2	6.2	6.2
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	913.80	965.71	3.96
Meter Final Volume:	955.64	1003.95	44.75
Average Meter Pressure, Inches H2O:	1.1989	0.9843	1.155
Average Meter Temperature, degrees F:	89.3	92.6	92.3
Average Sqrt. Velocity Pressure:	1.141	1.0326	1.1156
Stack Gas Temperature, degrees F:	333.4	333.4	328.2
% Carbon Dioxide:	12.3	12.3	12.3
% Oxygen:	6.4	6.4	6.4
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	61	57	71
Particulate Weight HCl, mg:	26.1	22.9	NA
Particulate Weight HF, mg:	2.45	ND	NA
Particulate Weight, mg	24.5	40.2	49.1

Sample Train Calculations

Meter Volume, Actual:	41.839	38.240	40.790
Meter Volume, STP:	40.265	36.562	39.038
Volume of Water Vapor Condensed:	2.871	2.683	3.342
Total Gas Sampled:	43.136	39.245	42.380
% Moisture:	6.66	6.84	7.89
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	42.5	42.5	42.5
Molecular Weight dry, lb/lb-Mole:	30.22	30.22	30.22
Molecular Weight wet, lb/lb-Mole:	29.41	29.38	29.26
Absolute Stack Gas Pressure, in Hg:	30.31	30.31	30.31
Isokinetic, %:	105.6	106.2	105.5

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	77.30	69.99	75.53
Stack Gas Flow Rate, ACFM:	2,102,545	1,903,714	2,054,401
Stack Gas Velocity, SCFM:	1,417,462	1,283,417	1,394,142
Stack Gas Velocity, DSCF/HR:	79,383,515	71,737,875	77,048,656
Stack Gas Velocity, DSCFM:	1,323,059	1,195,631	1,284,144
HCl Calculations:			
Lbs/scf x 10-6	1.43	1.38	
ppm	30.7	29.6	
lbs/hr	113.5	99.1	
Lbs/MBTU	0.020	0.019	
HF Calculations:			
Lbs/scf x 10-6	0.13	ND	
ppm	2.9	ND	
lbs/hr	10.7	ND	
Lbs/MBTU	0.0019	ND	
Particulate Calculations:			
grains/dscf:	0.0094	0.0170	0.0194
10-6lbs/dscf	1.3417	2.4244	2.7733
lbs/hr:	106.51	173.92	213.68
lbs/MBTU:	0.019	0.034	0.039

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/29/94
Source:	FGD Inlet

Test No:	T1-M26/M5	T2-M26/M5	T3-M5
Start Time	8:30 AM	10:20 AM	12:00 PM
Finish Time	9:50 AM	11:37 AM	1:10 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	1.001	1.001	1.001
Stack Length, inches:	160	160	160
Stack Width, inches:	408	408	408
Stack Diameter, inches:	0	0	0
Nozzle Diameter, inches:	0.185	0.185	0.185
Barometric Pressure, inches Hg:	29.8	29.8	29.8
Static Pressure in Stack, Inches H2O:	6.1	6.1	6.1
Duration of Sample, minutes:	70	70	70
Meter Start Volume:	44.78	87.21	129.05
Meter Final Volume:	84.80	129.05	171.71
Average Meter Pressure, Inches H2O:	1.236	1.231	1.237
Average Meter Temperature, degrees F:	75	76.5	79.8
Average Sqrt. Velocity Pressure:	1.1613	1.154	1.157
Stack Gas Temperature, degrees F:	335.7	332	330.5
% Carbon Dioxide:	12.3	12.4	12.3
% Oxygen:	6.3	6.4	6.4
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	62	55	73
Particulate Weight HCl, mg:	24.7	36.4	ND
Particulate Weight HF, mg:	1.79	4.35	ND
Particulate Weight, mg	45.8	55.8	24.6

Sample Train Calculations

Meter Volume, Actual:	40.020	41.842	42.661
Meter Volume, STP:	39.482	41.163	41.713
Volume of Water Vapor Condensed:	2.918	2.589	3.436
Total Gas Sampled:	42.400	43.752	45.149
% Moisture:	6.88	5.92	7.61
Area of Stack, Square Feet:	453.33	453.33	453.33
% Excess Air at Test Location:	41.5	42.6	42.5
Molecular Weight dry, lb/lb-Mole:	30.22	30.24	30.22
Molecular Weight wet, lb/lb-Mole:	29.38	29.52	29.29
Absolute Stack Gas Pressure, in Hg:	30.25	30.25	30.25
Isokinetic, %:	102.2	106.2	108.7

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	78.91	78.04	78.48
Stack Gas Flow Rate, ACFM:	2,146,336	2,122,672	2,134,640
Stack Gas Velocity, SCFM:	1,439,946	1,430,723	1,441,520
Stack Gas Velocity, DSCF/HR:	80,452,645	80,761,441	79,909,196
Stack Gas Velocity, DSCFM:	1,340,877	1,346,024	1,331,820
HCl Calculations:			
Lbs/scf x 10-6	1.38	1.95	
ppm	29.6	41.8	
lbs/hr	111.0	157.5	
Lbs/MBTU	0.019	0.027	
HF Calculations:			
Lbs/scf x 10-6	0.10	0.23	
ppm	2.1	5.0	
lbs/hr	8.0	18.8	
Lbs/MBTU	0.0014	0.0033	
Particulate Calculations:			
grains/dscf:	0.0179	0.0209	0.0091
10-6lbs/dscf	2.5579	2.9891	1.3004
lbs/hr:	205.79	241.40	103.91
lbs/MBTU:	0.036	0.042	0.018

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air		
Project No:	I-7316		
Date:	6/7/94		
Source:	FGD Outlet		
Test No:	T1	T2	T3
Start Time	9:55 AM	1:23 PM	2:30 PM
Finish Time	11:10 AM	2:40 PM	3:34 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.997	0.997	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.312	0.312	0.31
Barometric Pressure, inches Hg:	29.9	29.9	29.9
Static Pressure in Stack, Inches H2O:	0.5	0.5	0.5
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	53.216	122.04	940.24
Meter Final Volume:	105.92	170.41	987.07
Average Meter Pressure, Inches H2O:	2.41	2.02	2.43
Average Meter Temperature, degrees F:	78.7	64	63
Average Sqrt. Velocity Pressure:	0.594	0.543	0.565
Stack Gas Temperature, degrees F:	127.8	131.5	130
% Carbon Dioxide:	12.3	12.4	12.5
% Oxygen:	6.7	6.7	6.3
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	165.0	158.0	179
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	52.705	48.365	46.830
Meter Volume, STP:	51.753	48.777	47.462
Volume of Water Vapor Condensed:	7.767	7.437	8.426
Total Gas Sampled:	59.520	56.214	55.887
% Moisture:	13.05	13.23	15.08
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	45.6	45.7	41.6
Molecular Weight dry, lb/lb-Mole:	30.24	30.25	30.25
Molecular Weight wet, lb/lb-Mole:	28.64	28.63	28.40
Absolute Stack Gas Pressure, in Hg:	29.94	29.94	29.94
Isokinetic, %:	98.1	101.7	97.9

Velocity and Flow Calculations			
Average Stack Gas Velocity FPS:	35.32	32.39	33.80
Stack Gas Flow Rate, ACFM:	1,812,552	1,662,190	1,734,548
Stack Gas Velocity, SCFM:	1,629,240	1,484,739	1,553,311
Stack Gas Velocity, DSCF/HR:	84,997,431	77,298,470	79,144,324
Stack Gas Velocity, DSCFM:	1,416,624	1,288,308	1,319,072
SO3 Results			
Vt-Vtb	10.86	2.96	
N	9.70E-03	9.70E-03	
Vsoln	250	266	
Va	10.0	20.0	
Lbs/scf x 10-6	4.49E-06	6.91E-07	
ppm	21.7	3.3	
lbs/hr	381.9	53.4	
lbs/MBTU	0.065	0.010	
SO2 Results			
Wet Chemistry Method			
Vt-Vtb	25.9	27.0	
N	9.70E-03	9.70E-03	
Vsoln	1000.0	1000.0	
Va	10.0	10.0	
Lbs/scf x 10-6	3.42E-05	3.80E-05	
ppm(dry)	206.4	228.9	
lbs/hr	2908.9	2933.9	
lbs/MBTU	0.493	0.546	
SO2 Analyzer			
ppm(dry)	195.2	198.2	199.5
lb/hr	2750.9	2540.2	2617.9
lbs/dscfx10-6	3.24E-05	3.29E-05	3.31E-05
lbs/MBTU	0.466	0.473	0.463
NOx			
ppm(dry)	867.4	876.4	882.6
lb/hr	8786.1	8073.2	8324.4
lbs/dscfx10-6	1.03E-04	1.04E-04	1.05E-04
lbs/MBTU	1.488	1.503	1.473

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/8/94
Source:	FGD Outlet

Test No:	T1	T2	T3
Start Time	10:05 AM	1:08 PM	2:40 PM
Finish Time	11:25 AM	2:20 PM	3:50 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.999	0.999	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.312	0.312	0.312
Barometric Pressure, inches Hg:	29.8	29.8	29.7
Static Pressure in Stack, Inches H2O:	0.5	0.5	0.5
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	177.716	232.365	82.66
Meter Final Volume:	227.03	279.13	129.23
Average Meter Pressure, Inches H2O:	2.24	1.99	2.33
Average Meter Temperature, degrees F:	62	64	71.1
Average Sqrt. Velocity Pressure:	0.5756	0.5391	0.554
Stack Gas Temperature, degrees F:	129.7	131.1	129.1
% Carbon Dioxide:	12.3	12.4	12.6
% Oxygen:	6.6	6.7	6.5
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	164.0	175.0	166.9
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	49.309	46.764	46.570
Meter Volume, STP:	49.880	47.097	46.158
Volume of Water Vapor Condensed:	7.719	8.237	7.856
Total Gas Sampled:	57.600	55.334	54.014
% Moisture:	13.40	14.89	14.54
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	44.6	45.7	43.7
Molecular Weight dry, lb/lb-Mole:	30.23	30.25	30.28
Molecular Weight wet, lb/lb-Mole:	28.59	28.43	28.49
Absolute Stack Gas Pressure, in Hg:	29.84	29.84	29.74
Isokinetic, %:	98.3	100.6	95.7

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	34.37	32.32	33.17
Stack Gas Flow Rate, ACFM:	1,763,800	1,658,598	1,702,218
Stack Gas Velocity, SCFM:	1,575,032	1,477,581	1,516,490
Stack Gas Velocity, DSCF/HR:	81,838,643	75,454,146	77,759,527
Stack Gas Velocity, DSCFM:	1,363,977	1,257,569	1,295,992

SO3 Results

Vt-Vtb	3.93	5.37	
N	9.80E-03	9.80E-03	
Vsoln	266	250	
Va	10.0	10.0	
Lbs/scf x 10-6	1.81E-06	2.47E-06	
ppm	8.8	11.9	
lbs/hr	148.4	186.1	
lbs/MBTU	0.026	0.036	

SO2 Results

Wet Chemistry Method			
Vt-Vtb	23.4	23.6	
N	9.80E-03	9.80E-03	
Vsoln	1000.0	1000.0	
Va	10.0	10.0	
Lbs/scf x 10-6	3.25E-05	3.46E-05	
ppm(dry)	196.1	208.6	
lbs/hr	2661.2	2610.8	
lbs/MBTU	0.465	0.498	
SO2 Analyzer			
ppm(dry)	174.0	206.5	211.4
lb/hr	2361.0	2583.4	2725.5
lbs/dscfx10-6	2.88E-05	3.42E-05	3.51E-05
lbs/MBTU	0.412	0.493	0.498
NOx			
ppm(dry)	835.7	843.8	862.5
lb/hr	8150.4	7587.4	7992.5
lbs/dscfx10-6	9.96E-05	1.01E-04	1.03E-04
lbs/MBTU	1.424	1.447	1.459

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air		
Project No:	I-7316		
Date:	6/9/94		
Source:	FGD Outlet		
Test No:	T1	T2	T3
Start Time	9:15 AM	11:30 AM	1:17 PM
Finish Time	10:35 AM	12:45 PM	2:30 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.999	0.999	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.312	0.312	0.312
Barometric Pressure, inches Hg:	29.8	29.8	29.8
Static Pressure in Stack, Inches H2O:	0.5	0.5	0.5
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	288.972	354.591	235.67
Meter Final Volume:	338.85	406.88	282.03
Average Meter Pressure, Inches H2O:	2.21	2.37	2.36
Average Meter Temperature, degrees F:	66.7	63.5	65.5
Average Sqrt. Velocity Pressure:	0.5685	0.593	0.5568
Stack Gas Temperature, degrees F:	130.5	132.2	129.1
% Carbon Dioxide:	12.5	12.4	12.6
% Oxygen:	6.6	6.6	6.6
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	167.0	167.0	156.0
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	49.874	52.287	46.360
Meter Volume, STP:	49.998	52.758	46.599
Volume of Water Vapor Condensed:	7.861	7.861	7.343
Total Gas Sampled:	57.858	60.619	53.941
% Moisture:	13.59	12.97	13.61
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	44.7	44.6	44.8
Molecular Weight dry, lb/lb-Mole:	30.26	30.25	30.28
Molecular Weight wet, lb/lb-Mole:	28.59	28.66	28.61
Absolute Stack Gas Pressure, in Hg:	29.84	29.84	29.84
Isokinetic, %:	100.0	100.7	95.1

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	33.96	35.44	33.21
Stack Gas Flow Rate, ACFM:	1,742,759	1,818,710	1,704,271
Stack Gas Velocity, SCFM:	1,554,135	1,617,209	1,523,424
Stack Gas Velocity, DSCF/HR:	80,575,667	84,447,426	78,965,148
Stack Gas Velocity, DSCFM:	1,342,928	1,407,457	1,316,086

SO3 Results

Vt-Vtb	4.02	6.76	
N	9.80E-03	9.80E-03	
Vsoln	280	300	
Va	10.0	10.0	
Lbs/scf x 10-6	1.95E-06	3.33E-06	
ppm	9.4	16.0	
lbs/hr	157.0	280.9	
lbs/MBTU	0.028	0.048	

SO2 Results

Wet Chemistry Method

Vt-Vtb	22.2	36.7	
N	9.80E-03	9.80E-03	
Vsoln	1000.0	1000.0	
Va	10.0	10.0	
Lbs/scf x 10-6	3.07E-05	4.81E-05	
ppm(dry)	185.1	290.3	
lbs/hr	2473.5	4064.9	
lbs/MBTU	0.439	0.688	

SO2 Analyzer

ppm(dry)	221.5	260.5	265.5
lb/hr	2959.2	3647.4	3476.1
lbs/dscfx10-6	3.67E-05	4.32E-05	4.40E-05
lbs/MBTU	0.525	0.617	0.629

NOx

ppm(dry)	890.2	871.2	890.4
lb/hr	8548.0	8767.5	8379.0
lbs/dscfx10-6	1.06E-04	1.04E-04	1.06E-04
lbs/MBTU	1.516	1.484	1.517

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air	
Project No:	I-7316	
Date:	6/13/94	
Source:	FGD Outlet	
Test No:	T1	T2
Start Time	10:13 AM	12:34 PM
Finish Time	11:25 AM	1:55 PM
Pitot Cal. Factor	0.84	0.84
Meter Calibration Factor:	0.999	0.999
Stack Length, inches:	0	0
Stack Width, inches:	0	0
Stack Diameter, inches:	396	396
Nozzle Diameter, inches:	0.312	0.312
Barometric Pressure, inches Hg:	29.8	29.8
Static Pressure in Stack, Inches H2O:	0.5	0.5
Duration of Sample, minutes:	60	60
Meter Start Volume:	420.293	484.144
Meter Final Volume:	475.26	538.19
Average Meter Pressure, Inches H2O:	2.51	2.43
Average Meter Temperature, degrees F:	83.8	88.5
Average Sqrt. Velocity Pressure:	0.607	0.598
Stack Gas Temperature, degrees F:	129	130
% Carbon Dioxide:	12.6	12.5
% Oxygen:	6.7	6.6
% Carbon Monoxide:	0.0	0.0
Liquid Volume Collected, milliliters:	175.0	177.0
Total Weight of Particulate, Milligrams:	0	0

Sample Train Calculations

Meter Volume, Actual:	54.969	54.049
Meter Volume, STP:	53.412	52.058
Volume of Water Vapor Condensed:	8.237	8.331
Total Gas Sampled:	61.649	60.389
% Moisture:	13.36	13.80
Area of Stack, Square Feet:	855.30	855.30
% Excess Air at Test Location:	45.9	44.7
Molecular Weight dry, lb/lb-Mole:	30.28	30.26
Molecular Weight wet, lb/lb-Mole:	28.64	28.57
Absolute Stack Gas Pressure, in Hg:	29.84	29.84
Isokinetic, %:	99.8	99.2

Velocity and Flow Calculations		
Average Stack Gas Velocity FPS:	36.19	35.72
Stack Gas Flow Rate, ACFM:	1,857,198	1,833,079
Stack Gas Velocity, SCFM:	1,660,405	1,636,064
Stack Gas Velocity, DSCF/HR:	86,314,519	84,617,235
Stack Gas Velocity, DSCFM:	1,438,575	1,410,287
SO3 Results		
Vt-Vtb	3.14	3.17
N	9.80E-03	9.80E-03
Vsoln	400	250
Va	10.0	10.0
Lbs/scf x 10-6	2.03E-06	1.32E-06
ppm	9.8	6.4
lbs/hr	175.6	111.5
lbs/MBTU	0.029	0.019
SO2 Results		
Wet Chemistry Method		
Vt-Vtb	14.5	15.4
N	9.80E-03	9.80E-03
Vsoln	1000.0	1000.0
Va	10.0	10.0
Lbs/scf x 10-6	1.88E-05	2.04E-05
ppm(dry)	113.5	123.2
lbs/hr	1624.8	1728.8
lbs/MBTU	0.271	0.292
SO2 Analyzer		
ppm(dry)	173.5	177.8
lb/hr	2483.0	2494.5
lbs/dscfx10-6	2.88E-05	2.95E-05
lbs/MBTU	0.414	0.421
NOx		
ppm(dry)	826.2	825.3
lb/hr	8498.4	8322.3
lbs/dscfx10-6	9.85E-05	9.84E-05
lbs/MBTU	1.417	1.406

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air		
Project No:	I-7288		
Date:	6/28/94		
Source:	FGD Outlet		
Test No:	T1	T2	T3
Start Time	10:55 AM	12:30 PM	2:00 PM
Finish Time	12:05 PM	1:39 PM	3:10 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.993	0.993	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.312	0.312	0.312
Barometric Pressure, inches Hg:	29.85	29.85	29.85
Static Pressure in Stack, Inches H2O:	0.85	0.85	0.85
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	927.766	997.936	618.75
Meter Final Volume:	976.61	1047.51	667.79
Average Meter Pressure, Inches H2O:	2.24	2.33	2.51
Average Meter Temperature, degrees F:	80.5	88.3	95.3
Average Sqrt. Velocity Pressure:	0.5453	0.5594	0.5708
Stack Gas Temperature, degrees F:	132.8	133.6	124.7
% Carbon Dioxide:	12.5	12.6	12.6
% Oxygen:	6.5	6.6	7.0
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	180.0	168.0	174
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	48.839	49.578	49.040
Meter Volume, STP:	47.506	47.549	46.742
Volume of Water Vapor Condensed:	8.473	7.908	8.190
Total Gas Sampled:	55.979	55.457	54.932
% Moisture:	15.14	14.26	14.91
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	43.7	44.8	49.2
Molecular Weight dry, lb/lb-Mole:	30.26	30.28	30.30
Molecular Weight wet, lb/lb-Mole:	28.40	28.53	28.47
Absolute Stack Gas Pressure, in Hg:	29.91	29.91	29.91
Isokinetic, %:	100.6	97.5	93.8

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	32.71	33.50	33.97
Stack Gas Flow Rate, ACFM:	1,678,612	1,719,153	1,743,272
Stack Gas Velocity, SCFM:	1,494,620	1,528,655	1,573,696
Stack Gas Velocity, DSCF/HR:	76,100,077	78,640,110	80,343,491
Stack Gas Velocity, DSCFM:	1,268,335	1,310,669	1,339,058

SO3 Results

Vt-Vtb	2.54	4.54
N	9.40E-03	9.40E-03
Vsoln	400	300
Va	10.0	10.0
Lbs/scf x 10-6	1.78E-06	2.38E-06
ppm	8.6	11.5
lbs/hr	135.1	187.0
lbs/MbTU	0.025	0.034

SO2 Results

Wet Chemistry Method

Vt-Vtb	16.6	15.9
N	9.40E-03	9.40E-03
Vsoln	1000.0	1000.0
Va	10.0	10.0
Lbs/scf x 10-6	2.32E-05	2.23E-05
ppm(dry)	139.9	134.2
lbs/hr	1765.0	1749.8
lbs/MbTU	0.329	0.318

SO2 Analyzer

ppm(dry)	120.5	115.8	117.3
lb/hr	1520.4	1509.9	1562.6
lbs/dscfx10-6	2.00E-05	1.92E-05	1.94E-05
lbs/MBTU	0.284	0.274	0.286

NOx

ppm(dry)	820.1	850.3	842.4
lb/hr	7437.4	7968.7	8065.7
lbs/dscfx10-6	9.77E-05	1.01E-04	1.00E-04
lbs/MBTU	1.387	1.448	1.476

Environmental Services of America
Almega Division
Air Quality Services

Sampling Train Calculations

Client:	Pure Air		
Project No:	I-7316		
Date:	6/29/94		
Source:	FGD Outlet		
Test No:	T1	T2	T3
Start Time	8:30 AM	10:20 AM	12:00 PM
Finish Time	9:45 AM	11:37 AM	1:10 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.993	0.993	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.312	0.312	0.312
Barometric Pressure, inches Hg:	29.8	29.8	29.85
Static Pressure in Stack, Inches H2O:	0.85	0.85	0.85
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	48.254	97.98	767.16
Meter Final Volume:	97.47	148.71	814.16
Average Meter Pressure, Inches H2O:	2.39	2.33	2.4625
Average Meter Temperature, degrees F:	71	99.2	74.1
Average Sqrt. Velocity Pressure:	0.5631	0.5559	0.5657
Stack Gas Temperature, degrees F:	134.1	133.5	131.1
% Carbon Dioxide:	12.5	12.5	12.5
% Oxygen:	6.9	7.0	6.9
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	175.0	173.0	175
Total Weight of Particulate, Milligrams:	0	0	0

Sample Train Calculations

Meter Volume, Actual:	49.217	50.725	47.001
Meter Volume, STP:	48.667	47.622	46.571
Volume of Water Vapor Condensed:	8.237	8.143	8.237
Total Gas Sampled:	56.905	55.765	54.809
% Moisture:	14.48	14.60	15.03
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	48.0	49.1	48.0
Molecular Weight dry, lb/lb-Mole:	30.28	30.28	30.28
Molecular Weight wet, lb/lb-Mole:	28.50	28.49	28.43
Absolute Stack Gas Pressure, in Hg:	29.86	29.86	29.91
Isokinetic, %:	99.4	98.6	94.9

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	33.79	33.34	33.87
Stack Gas Flow Rate, ACFM:	1,734,035	1,710,942	1,738,141
Stack Gas Velocity, SCFM:	1,538,015	1,519,066	1,552,075
Stack Gas Velocity, DSCF/HR:	78,918,612	77,836,958	79,127,888
Stack Gas Velocity, DSCFM:	1,315,310	1,297,283	1,318,798

SO3 Results

Vt-Vtb	5.80	5.87
N	1.02E-02	1.02E-02
Vsoln	450	375
Va	20.0	20.0
Lbs/scf x 10-6	2.42E-06	2.08E-06
ppm	11.7	10.0
lbs/hr	190.6	162.0
lbs/MbTU	0.035	0.031

SO2 Results

Wet Chemistry Method

Vt-Vtb	19.0	20.2
N	1.02E-02	1.02E-02
Vsoln	1000.0	1000.0
Va	10.0	10.0
Lbs/scf x 10-6	2.82E-05	3.05E-05
ppm(dry)	169.9	183.9
lbs/hr	2223.7	2374.4
lbs/MbTU	0.411	0.449

SO2 Analyzer

ppm(dry)	149.5	155.4	161.5
lb/hr	1956.2	2005.5	2118.8
lbs/dscfx10-6	2.48E-05	2.58E-05	2.68E-05
lbs/MBTU	0.362	0.379	0.391

NOx

ppm(dry)	818.4	854.0	852.9
lb/hr	7696.9	7921.6	8042.6
lbs/dscfx10-6	9.75E-05	1.02E-04	1.02E-04
lbs/MBTU	1.424	1.497	1.484

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/7/94
Source:	FGD Outlet

Test No:	T1-M26/M5	T2-M26/M5	T3 - M5
Start Time	9:55 AM	12:20 PM	2:30 PM
Finish Time	11:06 AM	1:44 PM	3:34 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.999	0.999	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.31	0.31	0.31
Barometric Pressure, inches Hg:	29.9	29.9	29.9
Static Pressure in Stack, Inches H2O:	0.5	0.5	0.5
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	841.23	892.20	940.24
Meter Final Volume:	890.84	939.04	987.07
Average Meter Pressure, Inches H2O:	2.61	2.39	2.43
Average Meter Temperature, degrees F:	75	66.8	63
Average Sqrt. Velocity Pressure:	0.586	0.559	0.565
Stack Gas Temperature, degrees F:	131	131	130
% Carbon Dioxide:	12.4	12.5	12.5
% Oxygen:	6.5	6.3	6.3
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	168	173	179
Particulate Weight HCl, mg:	0.279	0.136	NA
Particulate Weight HF, mg:	ND	ND	NA
Particulate Weight, mg	14.2	9.3	18.3

Sample Train Calculations

Meter Volume, Actual:	49.613	46.842	46.830
Meter Volume, STP:	49.176	47.127	47.462
Volume of Water Vapor Condensed:	7.908	8.143	8.426
Total Gas Sampled:	57.084	55.270	55.887
% Moisture:	13.85	14.73	15.08
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	43.6	41.6	41.6
Molecular Weight dry, lb/lb-Mole:	30.24	30.25	30.25
Molecular Weight wet, lb/lb-Mole:	28.54	28.45	28.40
Absolute Stack Gas Pressure, in Hg:	29.94	29.94	29.94
Isokinetic, %:	96.7	98.0	97.9

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	35.00	33.44	33.80
Stack Gas Flow Rate, ACFM:	1,796,130	1,716,074	1,734,548
Stack Gas Velocity, SCFM:	1,605,737	1,534,167	1,553,311
Stack Gas Velocity, DSCF/HR:	83,000,546	78,491,053	79,144,324
Stack Gas Velocity, DSCFM:	1,383,342	1,308,184	1,319,072
HCl Calculations:			
Lbs/scf x 10-6	0.01	0.01	
ppm	0.3	0.1	
lbs/hr	1.0	0.5	
Lbs/MBTU	0.0002	0.0001	
HF Calculations:			
Lbs/scf x 10-6	ND	ND	
ppm	ND	ND	
lbs/hr	ND	ND	
Lbs/MBTU	ND	ND	
Particulate Calculations:			
grains/dscf:	0.0045	0.0030	0.0059
10-6lbs/dscf	0.6367	0.4351	0.8502
lbs/hr:	52.85	34.15	67.29
lbs/MBTU:	0.009	0.006	0.012

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/8/94
Source:	FGD Outlet

Test No:	T1-M26/M5	T2-M26/M5	T3 - M5
Start Time	10:05 AM	1:03 PM	2:38 PM
Finish Time	11:25 AM	2:13 PM	3:50 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.999	0.999	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.31	0.31	0.31
Barometric Pressure, inches Hg:	29.7	29.7	29.7
Static Pressure in Stack, Inches H2O:	0.5	0.5	0.5
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	988.15	34.58	82.66
Meter Final Volume:	1034.43	82.51	129.23
Average Meter Pressure, Inches H2O:	2.351	2.5	2.325
Average Meter Temperature, degrees F:	61.7	67.1	71.1
Average Sqrt. Velocity Pressure:	0.5557	0.5727	0.554
Stack Gas Temperature, degrees F:	128.6	128.9	129.1
% Carbon Dioxide:	12.5	12.5	12.6
% Oxygen:	6.6	6.5	6.5
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	164	167	166.9
Particulate Weight HCl, mg:	0.111	0.101	NA
Particulate Weight HF, mg:	ND	ND	NA
Particulate Weight, mg	14.7	19.7	14.9

Sample Train Calculations

Meter Volume, Actual:	46.279	47.925	46.570
Meter Volume, STP:	46.699	47.882	46.158
Volume of Water Vapor Condensed:	7.719	7.861	7.856
Total Gas Sampled:	54.418	55.742	54.014
% Moisture:	14.18	14.10	14.54
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	44.7	43.7	43.7
Molecular Weight dry, lb/lb-Mole:	30.26	30.26	30.28
Molecular Weight wet, lb/lb-Mole:	28.52	28.53	28.49
Absolute Stack Gas Pressure, in Hg:	29.74	29.74	29.74
Isokinetic, %:	97.4	96.8	96.9

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	33.24	34.26	33.17
Stack Gas Flow Rate, ACFM:	1,705,810	1,758,155	1,702,218
Stack Gas Velocity, SCFM:	1,520,981	1,566,855	1,516,490
Stack Gas Velocity, DSCF/HR:	78,318,352	80,755,710	77,759,527
Stack Gas Velocity, DSCFM:	1,305,306	1,345,929	1,295,992
HCl Calculations:			
Lbs/scf x 10-6	0.01	0.00	
ppm	0.1	0.1	
lbs/hr	0.4	0.4	
Lbs/MBTU	0.0001	0.0001	
HF Calculations:			
Lbs/scf x 10-6	ND	ND	
ppm	ND	ND	
lbs/hr	ND	ND	
Lbs/MBTU	ND	ND	
Particulate Calculations:			
grains/dscf:	0.0049	0.0063	0.0050
10-6lbs/dscf	0.6941	0.9072	0.7118
lbs/hr:	54.36	73.26	55.35
lbs/MBTU:	0.010	0.013	0.010

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/9/94
Source:	FGD Outlet

Test No:	T1-M26/M5	T2-M26/M5	T3 - M5
Start Time	9:29 AM	11:27 AM	1:17 PM
Finish Time	10:35 AM	12:55 PM	2:30 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.999	0.999	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.31	0.31	0.31
Barometric Pressure, inches Hg:	29.8	29.8	29.7
Static Pressure in Stack, Inches H2O:	0.58	0.61	0.5
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	129.37	188.65	235.67
Meter Final Volume:	176.14	235.48	282.03
Average Meter Pressure, Inches H2O:	2.375	2.38	2.36
Average Meter Temperature, degrees F:	70.2	68.9	65.5
Average Sqrt. Velocity Pressure:	0.5568	0.559	0.5568
Stack Gas Temperature, degrees F:	129.1	128.3	129.1
% Carbon Dioxide:	12.6	12.6	12.6
% Oxygen:	6.6	6.7	6.6
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	154	186	156
Particulate Weight HCl, mg:	0.26	0.128	NA
Particulate Weight HF, mg:	0.04	ND	NA
Particulate Weight, mg	14.5	17.5	15.7

Sample Train Calculations

Meter Volume, Actual:	46.772	46.828	46.365
Meter Volume, STP:	46.598	46.769	46.448
Volume of Water Vapor Condensed:	7.249	8.755	7.343
Total Gas Sampled:	53.846	55.524	53.791
% Moisture:	13.46	15.77	13.65
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	44.8	45.9	44.8
Molecular Weight dry, lb/lb-Mole:	30.28	30.28	30.28
Molecular Weight wet, lb/lb-Mole:	28.63	28.34	28.60
Absolute Stack Gas Pressure, in Hg:	29.84	29.84	29.74
Isokinetic, %:	96.2	98.3	96.2

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	33.20	33.48	33.28
Stack Gas Flow Rate, ACFM:	1,703,758	1,718,127	1,707,863
Stack Gas Velocity, SCFM:	1,522,965	1,537,898	1,521,519
Stack Gas Velocity, DSCF/HR:	79,078,437	77,722,279	78,829,888
Stack Gas Velocity, DSCFM:	1,317,974	1,295,371	1,313,831
HCl Calculations:			
Lbs/scf x 10-6	0.01	0.01	
ppm	0.3	0.1	
lbs/hr	1.0	0.5	
Lbs/MBTU	0.000	0.000	
HF Calculations:			
Lbs/scf x 10-6	0.00	ND	
ppm	0.0	ND	
lbs/hr	0.1	ND	
Lbs/MBTU	0.0000	ND	
Particulate Calculations:			
grains/dscf:	0.0048	0.0058	0.0052
10-6lbs/dscf	0.6861	0.8251	0.7453
lbs/hr:	54.26	64.13	58.75
lbs/MBTU:	0.010	0.012	0.011

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air	
Project No:	I-7316	
Date:	6/13/94	
Source:	FGD Outlet	
Test No:	T1-M26/M5	T2-M26/M5
Start Time	10:13 AM	12:34 PM
Finish Time	11:25 AM	1:40 PM
Pitot Cal. Factor	0.84	0.84
Meter Calibration Factor:	0.999	0.999
Stack Length, inches:	0	0
Stack Width, inches:	0	0
Stack Diameter, inches:	396	396
Nozzle Diameter, inches:	0.312	0.312
Barometric Pressure, inches Hg:	29.9	29.9
Static Pressure in Stack, Inches H2O:	0.65	0.65
Duration of Sample, minutes:	60	60
Meter Start Volume:	283.671	331.669
Meter Final Volume:	331.536	371.989
Average Meter Pressure, Inches H2O:	2.51	2.21
Average Meter Temperature, degrees F:	84.3	90
Average Sqrt. Velocity Pressure:	0.5699	0.5400
Stack Gas Temperature, degrees F:	133.8	137
% Carbon Dioxide:	12.6	12.5
% Oxygen:	6.8	6.9
% Carbon Monoxide:	0.0	0.0
Liquid Volume Collected, milliliters:	168	152
Particulate Weight HCl, mg:	0.946	0.393
Particulate Weight HF, mg:	0.06	ND
Particulate Weight, mg	20.1	7.3

Sample Train Calculations

Meter Volume, Actual:	47.865	40.320
Meter Volume, STP:	46.622	38.837
Volume of Water Vapor Condensed:	7.908	7.155
Total Gas Sampled:	54.530	45.992
% Moisture:	14.50	15.56
Area of Stack, Square Feet:	855.30	855.30
% Excess Air at Test Location:	47.0	48.0
Molecular Weight dry, lb/lb-Mole:	30.29	30.28
Molecular Weight wet, lb/lb-Mole:	28.51	28.37
Absolute Stack Gas Pressure, in Hg:	29.95	29.95
Isokinetic, %:	94.0	83.7

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	34.13	32.50
Stack Gas Flow Rate, ACFM:	1,751,483	1,667,835
Stack Gas Velocity, SCFM:	1,558,960	1,476,549
Stack Gas Velocity, DSCF/HR:	79,974,649	74,807,887
Stack Gas Velocity, DSCFM:	1,332,911	1,246,798
HCl Calculations:		
Lbs/scf x 10-6	0.04	0.02
ppm	1.0	0.5
lbs/hr	3.6	1.7
Lbs/MBTU	0.001	0.000
HF Calculations:		
Lbs/scf x 10-6	0.00	ND
ppm	0.1	ND
lbs/hr	0.2	ND
Lbs/MBTU	0.0000	ND
Particulate Calculations:		
grains/dscf:	0.0067	0.0029
10-6lbs/dscf	0.9506	0.4145
lbs/hr:	76.03	31.01
lbs/MBTU:	0.014	0.006

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/27/94
Source:	FGD Outlet

Test No:	T1-M26/M5	T2-M26/M5	T3-M5
Start Time	10:17 AM	12:30 PM	2:13 PM
Finish Time	11:43 AM	1:39 PM	3:37 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.999	0.999	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.312	0.312	0.312
Barometric Pressure, inches Hg:	30.1	30.1	30.1
Static Pressure in Stack, Inches H2O:	0.85	0.82	0.82
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	375.13	423.89	473.39
Meter Final Volume:	423.79	473.39	519.49
Average Meter Pressure, Inches H2O:	2.58	2.67	2.57
Average Meter Temperature, degrees F:	80.5	70.7	76.3
Average Sqrt. Velocity Pressure:	0.5793	0.5878	0.5775
Stack Gas Temperature, degrees F:	132.2	131.8	134.7
% Carbon Dioxide:	12.5	12.6	12.6
% Oxygen:	6.6	6.6	6.7
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	183	189	167
Particulate Weight HCl, mg:	ND	5.75	NA
Particulate Weight HF, mg:	ND	ND	NA
Particulate Weight, mg	14.5	14.5	14.5

Sample Train Calculations

Meter Volume, Actual:	48.658	49.502	46.095
Meter Volume, STP:	48.053	49.800	45.877
Volume of Water Vapor Condensed:	8.614	8.896	7.861
Total Gas Sampled:	56.666	58.696	53.738
% Moisture:	15.20	15.16	14.63
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	44.7	44.8	45.9
Molecular Weight dry, lb/lb-Mole:	30.26	30.28	30.28
Molecular Weight wet, lb/lb-Mole:	28.40	28.42	28.48
Absolute Stack Gas Pressure, in Hg:	30.16	30.16	30.16
Isokinetic, %:	95.4	97.4	91.1

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	34.59	35.07	34.51
Stack Gas Flow Rate, ACFM:	1,775,090	1,799,722	1,770,984
Stack Gas Velocity, SCFM:	1,595,348	1,618,580	1,584,968
Stack Gas Velocity, DSCF/HR:	81,171,329	82,392,202	81,185,215
Stack Gas Velocity, DSCFM:	1,352,855	1,373,203	1,353,087
HCl Calculations:			
Lbs/scf x 10-6	ND	0.25	
ppm	ND	5.5	
lbs/hr	ND	21.0	
Lbs/MBTU	ND	0.004	
HF Calculations:			
Lbs/scf x 10-6	ND	ND	
ppm	ND	ND	
lbs/hr	ND	ND	
Lbs/MBTU	ND	ND	
Particulate Calculations:			
grains/dscf:	0.0047	0.0045	0.0049
10-6lbs/dscf	0.6654	0.6420	0.6969
lbs/hr:	54.01	52.90	56.58
lbs/MBTU:	0.010	0.009	0.010

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/28/94
Source:	FGD Outlet

Test No:	T1-M26/M5	T2-M26/M5	T3-M5
Start Time	10:40 AM	12:36 PM	2:00 PM
Finish Time	11:55 AM	1:45 PM	3:10 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.999	0.999	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.312	0.312	0.312
Barometric Pressure, inches Hg:	29.85	29.85	29.85
Static Pressure in Stack, Inches H2O:	0.85	0.85	0.85
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	519.84	569.21	618.75
Meter Final Volume:	569.14	618.55	667.79
Average Meter Pressure, Inches H2O:	2.53	2.567	2.51
Average Meter Temperature, degrees F:	91.6	95	95.3
Average Sqrt. Velocity Pressure:	0.5735	0.5773	0.5708
Stack Gas Temperature, degrees F:	124.1	124.3	124.7
% Carbon Dioxide:	12.6	12.6	12.6
% Oxygen:	7.0	7.0	7.0
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	179	168	174
Particulate Weight HCl, mg:	ND	5.76	NA
Particulate Weight HF, mg:	ND	ND	NA
Particulate Weight, mg	20.7	17.6	18.9

Sample Train Calculations

Meter Volume, Actual:	49.297	49.339	49.040
Meter Volume, STP:	47.305	47.059	46.742
Volume of Water Vapor Condensed:	8.426	7.908	8.190
Total Gas Sampled:	55.730	54.967	54.932
% Moisture:	15.12	14.39	14.91
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	49.2	49.2	49.2
Molecular Weight dry, lb/lb-Mole:	30.30	30.30	30.30
Molecular Weight wet, lb/lb-Mole:	28.44	28.53	28.47
Absolute Stack Gas Pressure, in Hg:	29.91	29.91	29.91
Isokinetic, %:	94.6	92.9	93.8

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	34.13	34.30	33.97
Stack Gas Flow Rate, ACFM:	1,751,483	1,760,207	1,743,272
Stack Gas Velocity, SCFM:	1,582,733	1,590,072	1,573,696
Stack Gas Velocity, DSCF/HR:	80,605,406	81,675,622	80,343,491
Stack Gas Velocity, DSCFM:	1,343,423	1,361,260	1,339,058
HCl Calculations:			
Lbs/scf x 10-6	ND	0.27	
ppm	ND	5.8	
lbs/hr	ND	22.0	
Lbs/MBTU	ND	0.004	
HF Calculations:			
Lbs/scf x 10-6	ND	ND	
ppm	ND	ND	
lbs/hr	ND	ND	
Lbs/MBTU	ND	ND	
Particulate Calculations:			
grains/dscf:	0.0068	0.0058	0.0062
10-6lbs/dscf	0.9649	0.8247	0.8916
lbs/hr:	77.78	67.36	71.63
lbs/MBTU:	0.014	0.012	0.013

Environmental Services of America
Almega Division
Air Quality Services

Particulate & HCl Sampling Train Calculations

Client:	Pure Air
Project No:	I-7316
Date:	6/29/94
Source:	FGD Outlet

Test No:	T1-M26/M5	T2-M26/M5	T3-M5
Start Time	8:30 AM	10:20 AM	12:00 PM
Finish Time	9:50 AM	11:37 AM	1:10 PM
Pitot Cal. Factor	0.84	0.84	0.84
Meter Calibration Factor:	0.999	0.999	0.999
Stack Length, inches:	0	0	0
Stack Width, inches:	0	0	0
Stack Diameter, inches:	396	396	396
Nozzle Diameter, inches:	0.312	0.312	0.312
Barometric Pressure, inches Hg:	29.85	29.85	29.85
Static Pressure in Stack, Inches H2O:	0.85	0.85	0.85
Duration of Sample, minutes:	60	60	60
Meter Start Volume:	669.05	717.75	767.16
Meter Final Volume:	717.44	767.14	814.16
Average Meter Pressure, Inches H2O:	2.5467	2.5517	2.4625
Average Meter Temperature, degrees F:	73.4	74.1	74.1
Average Sqrt. Velocity Pressure:	0.5751	0.5799	0.5657
Stack Gas Temperature, degrees F:	129.3	131	131.1
% Carbon Dioxide:	12.4	12.6	12.5
% Oxygen:	6.9	7.0	6.9
% Carbon Monoxide:	0.0	0.0	0.0
Liquid Volume Collected, milliliters:	175	186	175
Particulate Weight HCl, mg:	ND	ND	NA
Particulate Weight HF, mg:	ND	ND	NA
Particulate Weight, mg	20.4	20.8	17.4

Sample Train Calculations

Meter Volume, Actual:	48.393	49.388	47.001
Meter Volume, STP:	48.024	48.947	46.571
Volume of Water Vapor Condensed:	8.237	8.755	8.237
Total Gas Sampled:	56.261	57.702	54.809
% Moisture:	14.64	15.17	15.03
Area of Stack, Square Feet:	855.30	855.30	855.30
% Excess Air at Test Location:	47.9	49.2	48.0
Molecular Weight dry, lb/lb-Mole:	30.26	30.30	30.28
Molecular Weight wet, lb/lb-Mole:	28.47	28.43	28.43
Absolute Stack Gas Pressure, in Hg:	29.91	29.91	29.91
Isokinetic, %:	95.7	97.4	94.9

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	34.36	34.72	33.87
Stack Gas Flow Rate, ACFM:	1,763,286	1,781,761	1,738,141
Stack Gas Velocity, SCFM:	1,579,338	1,591,295	1,552,075
Stack Gas Velocity, DSCF/HR:	80,887,393	80,993,734	79,127,888
Stack Gas Velocity, DSCFM:	1,348,123	1,349,896	1,318,798
HCl Calculations:			
Lbs/scf x 10-6	ND	ND	
ppm	ND	ND	
lbs/hr	ND	ND	
Lbs/MBTU	ND	ND	
HF Calculations:			
Lbs/scf x 10-6	ND	ND	
ppm	ND	ND	
lbs/hr	ND	ND	
Lbs/MBTU	ND	ND	
Particulate Calculations:			
grains/dscf:	0.0066	0.0066	0.0058
10-6lbs/dscf	0.9367	0.9370	0.8238
lbs/hr:	75.76	75.89	65.19
lbs/MBTU:	0.014	0.014	0.012

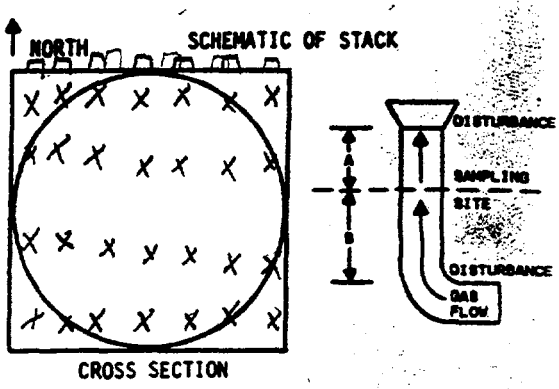
APPENDIX K

FIELD DATA SHEETS

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/7/94
LOCATION Portage Ind
OPERATOR TS
STACK NO. FGD Inlet
RUN NO. 1 Hcl/M5
SAMPLE BOX NO. ~~A2~~
METER BOX NO. ~~1.903~~ A2
METER ΔH @ ~~1.001~~ 1.903
Y = 1.001
TIME START = _____

AMBIENT TEMPERATURE 75°F
BAROMETRIC PRESSURE 29.80
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 160 x 408"
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR 0.84
FILTER NO. _____
FILTER TARE WEIGHT _____ mg.



K = .92

PRE TEST LEAK CHECKS
METER .005 @ 15 in. Hg
PITOTS ✓ @ ✓ in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm (ft³) 396549	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	2.5		314	1.2		1.10	398.11	74	77			~~5~~
2	5		310	1.4		1.29	394.54	82	77			~~5~~
3	7.5		311	1.5		1.38	46141	84	77			~~5~~
4	10		313	1.6		1.47	402.85	85	77			~~5~~
B 1	12.5		314	1.1		1.01	404.25	85	78			5
2	15.0		315	1.3		1.20	405.64	84	78			4
3	17.5		320	1.6		1.47	407.15	85	78			~~5~~
4	20		322	1.6		1.47	408.8	85	79			5
C 1	22.5		320	1.5		1.38	410.19	83	79			5
2	25		324	1.6		1.47	411.94	84	79			5
3	27.5		329	1.6		1.47	413.56	84	79			5
4	30		328	1.6		1.47	415.32	84	79			5
D 1	32.5		341	1.9		1.75	416.97	84	79			6
2	35		343	1.9		1.75	419.75	84	79			6
3	37.5		341	2.1		1.93	420.75	79	~~78~~			6
4	40		337	1.0		.92	422.15	81	78			2
E 1	42.5		338	1.4		1.29	423.51	83	78			4
2	45		337	1.1		1.01	424.96	84	78			3
3	47.5		337	1.0		.92	426.20	84	78			2.5
4	50		332	1.3		1.20	427.87	95	79			4
F 1	52.5		329	~~1.0~~ .8		.75	429.11	85	79			2.5
2	55		332	~~1.3~~ .65		.60	430.10	85	79			2
3	57.5		333	~~.9~~ .44		.40	431.03	85	79			1
4	60		339	.25		.23	431.68	85	79			1
Av			328.1	1.089		1.138			82			

TIME END = _____

POST TEST LEAK CHECKS
METER >01 @ 7 in. Hg
PITOTS ✓ @ ✓ in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

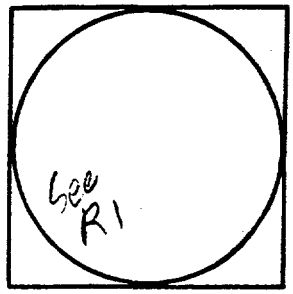
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/7/94
LOCATION Portage Ind
OPERATOR TS
STACK NO. FGD Inlet
RUN NO. 1 HCL/M5
SAMPLE BOX NO. _____
METER BOX NO. A2
METER ΔH @ 1.403
Y = 1.001
TIME START = _____

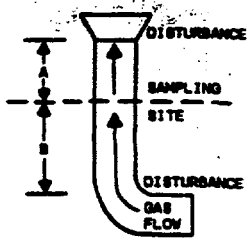
AMBIENT TEMPERATURE 75
BAROMETRIC PRESSURE 3
ASSUMED MOISTURE, % _____
PROBE LENGTH, in. _____
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. _____
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR _____
FILTER NO. _____
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .005 @ 15 in. Hg
PITOTS _____ @ _____ in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δp	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
G1	62.5		328	.71		1.01	432.96	84	79			4
2	65		331	.97		.89	434.29	85	79			3
3	67.5		332	.66		.63	435.941	85	79			2
4	70		333	.45		.41	436.339	84	60			2
Av												

TIME END = 1039 AM

POST TEST LEAK CHECKS

METER .009 @ 15 in. Hg
PITOTS _____ @ _____ in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	120/120	105	0		284.7
INITIAL	100	100	0	56	261.5
LIQUID COLLECTED					17.2
TOTAL VOLUME COLLECTED					

42 total

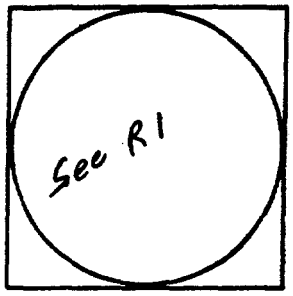
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.4	6.3		
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-7-94
LOCATION ECO Inlet
OPERATOR TS
STACK NO. FGD Inlet
RUN NO. 2 HCL /M5
SAMPLE BOX NO. ____
METER BOX NO. A2
METER ΔH @ 1.903
Y = 1.001
TIME START = 12:20

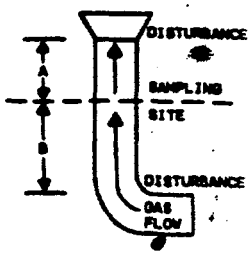
AMBIENT TEMPERATURE 75
BAROMETRIC PRESSURE ____
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. ____
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. ____
PROBE HEATER SETTING ____
HEATER BOX SETTING ____
Δ Cp FACTOR ____
FILTER NO. ____
FILTER TARE WEIGHT ____ mg.

NORTH



CROSS SECTION

SCHEMATIC OF STACK



K=.92

PRE TEST LEAK CHECKS
METER 005 @ 10 in. Hg
PITOTS ____ @ ____ in. H,O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm cf 436.646	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A-1	2.5		311	1.4		1.2	438.69	74	73			6
2	5		314	1.2		1.1	439.90	74	73			5
3	7.5		315	1.4		1.3	441.43	74	72			5
4	10		313	1.6		1.47	442.95	75	71			6
B-1	12.5		317	1.1		1.01	444.34	75	71			4
2	15		320	1.5		1.4	445.76	75	71			5
3	17.5		322	1.3		1.2	447.27	75	71			5
4	20		318	1.6		1.47	448.81	75	70			6
C-1	22.5		321	1.6		1.47	449.98	73	70			6
2	25		317	1.5		1.38	451.93	73	69			6
3	27.5		325	1.4		1.28	453.52	71	69			6
4	30		331	1.6		1.47	454.95	70	68			6
D-1	32.5		335	1.9		1.75	456.65	71	68			7
2	35		328	1.9		1.75	458.26	70	67			7
3	37.5		329	2.1		1.93	460.01	65	66			8
4	40		336	1.0		.92	461.50	66	65			4
E-1	42.5		332	1.4		1.28	463.11	67	65			5
2	45		335	1.1		1.01	464.14	68	65			5
3	47.5		337	1.3		1.19	465.61	67	64			5
4	50		336	1.0		.92	466.97	67	64			4
F-1	52.5		319	.85		.782	468.17	67	64			3
2	55		316	.63		.58	469.35	67	64			2
3	57.5		317	.99		.45	470.10	66	63			1
4	60		325	.35		.24	470.89	66	63			1
Av			323.7					70.5				

TIME END = ____

POST TEST LEAK CHECKS
METER ____ @ ____ in. Hg
PITOTS ____ @ ____ in. H,O
ORSAT ____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME H_2SO_4 ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	120	132			332
INITIAL	100	100			303.1
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

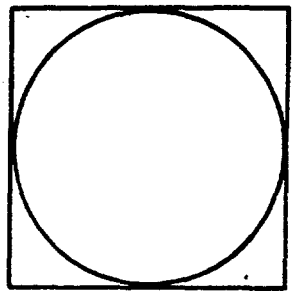
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/7/94
LOCATION Portage Ind
OPERATOR ~~TS~~ TS
STACK NO. FGD Inlet
RUN NO. R2 HCl/MS
SAMPLE BOX NO. _____
METER BOX NO. A2
METER ΔH @ _____
Y = _____
TIME START = _____

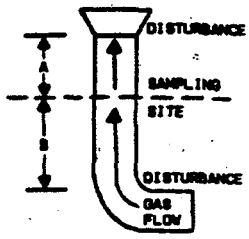
AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % _____
PROBE LENGTH, in. _____
NOZZLE DIAMETER, in. _____
STACK DIAMETER, in. _____
PROBE HEATER SETTING _____
HEATER BOX SETTING _____
Δ Cp FACTOR _____
FILTER NO. _____
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER _____ @ _____ in. Hg
PITOTS _____ @ _____ in. H₂O
ORSAT _____

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δp / ΔH	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
G 1	625		316	1.3	1.19		472.17	65	63			6
2	65		325	.98	.90		473.42	67	63			4
3	675		329	.70	.644		474.54	66	63			3
4	70		324	.51	.46		475.498	66	63			2
Av												

TIME END = _____

POST TEST LEAK CHECKS

METER 0 @ 5 in. Hg
PITOTS _____ @ _____ in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

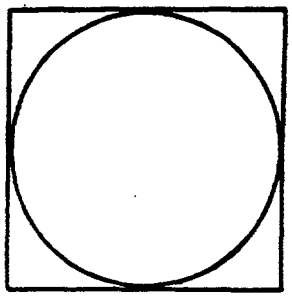
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-7-94
LOCATION FGD Inlet
OPERATOR
STACK NO.
RUN NO. 3 HCL
SAMPLE BOX NO.
METER BOX NO. A2
METER ΔH @ 1.903
Y = 1.001
TIME START = 14:30

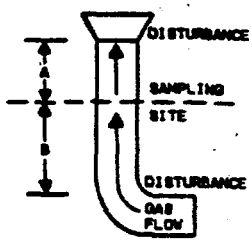
AMBIENT TEMPERATURE 74
BAROMETRIC PRESSURE 29.80
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 16
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



K=.92

PRE TEST LEAK CHECKS

METER .000 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
							475.579					
A 1	2.5	+6.4	330	1.8		~~1.66~~	477.3	63	59			7
2	5.0		328	1.7		1.56	478.97	64	59			7
3	7.5		325	1.7		1.56	480.65	64	59			7
4	10.0		328	1.7		1.56	482.33	64	59			7
B 1	12.5		319	.95		.87	483.66	63	59			7
2	15.0		316	1.30		1.20	485.11	63	59			7
3	17.5		322	1.90		1.75	486.90	63	59			8
4	20.0		320	1.80		1.66	488.50	64	59			7
C 1	22.5		315	1.50		1.38	490.00	63	59			6
2	25.0		319	1.80		1.66	491.90	63	59			6
3	27.5		319	1.60		1.47	493.60	63	59			6
4	30.0		321	1.70		1.56	495.83	63	59			6
D 1	32.5		320	1.80		1.66	496.83	63	59			7
2	35		325	1.60		1.47	498.48	63	59			7
3	37.5		307	1.90		1.75	500.16	61	58			7
4	40		329	.88		.81	501.87	60	58			6
E 1	42.5		335	1.30		1.2	503.35	57	57			6
2	45		338	1.10		1.01	504.72	58	57			4
3	47.5		334	1.10		1.01	506.09	59	57			4
4	50		339	1.10		1.01	507.43	59	57			4
F 1	52.5		340	1.70		1.56	509.1	60	59			7
2	55		338	1.60		1.47	510.7	60	57			6
3	57.5		330	1.20		1.10	512.13	60	57			5
4	60		331	1.00		.92	513.44	60	57			4
Av			326.0	1.16		1.082						

TIME END = —

POST TEST LEAK CHECKS

METER .005 @ 5 in. Hg
PITOTS @ in. H₂O
ORSAT

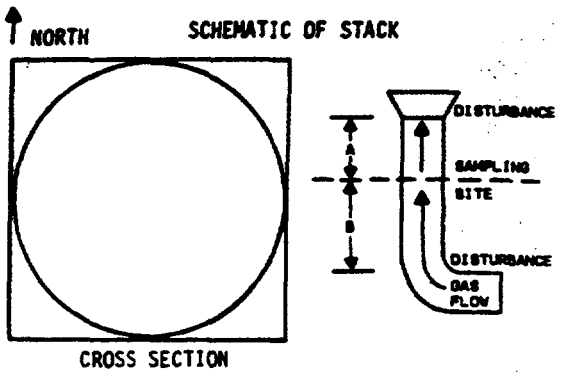
VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1 H2O	2	3	4	SILICA GEL WEIGHT g
FINAL	130	110			250.1
INITIAL	100	100			242.6
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-7-94
LOCATION EGD Inlet
OPERATOR
STACK NO.
RUN NO. 3 HCL
SAMPLE BOX NO.
METER BOX NO. A2
METER ΔH @ 1.903
Y = 1.001
TIME START =

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.



PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H,O
ORSAT

P #	θ	STATIC PRESSURE +/- in H_2O	Ts °F	Δ P in H_2O	$\sqrt{\Delta P}$	Δ H in H_2O	Vm ft^3	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
G1	67.5		330	.75		.69	514.59	60	57			3
2	65		318	.85		.78	515.78	60	57			3
3	67.5		317	.87		.80	517.0	60	57			3
4	70		315	.87		.80	518.207	60	57			3
												4
												5
												6
												10
Av												

TIME END =

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H,O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml				SILICA GEL WEIGHT g
	1	2	3	4	
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

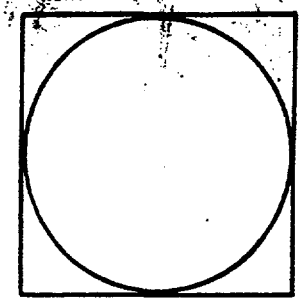
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-7-94
LOCATION FGD Inlet
OPERATOR BF
STACK NO.
RUN NO. 1 M-8
SAMPLE BOX NO. 1
METER BOX NO. A1
METER ΔH @ 1.855
Y = 1.007
TIME START =

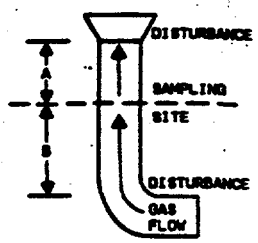
AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 29.80
ASSUMED MOISTURE, % ~~8~~ 4%
PROBE LENGTH, in. 11'
NOZZLE DIAMETER, in. ~~.247~~ .185
STACK DIAMETER, in. 13'4" x 39"
PROBE HEATER SETTING ~~NA~~
HEATER BOX SETTING NA
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



K = ~~2.50~~ .89

PRE TEST LEAK CHECKS

METER .005 @ 65 in. Hg
PITOTS @ in. H,O
ORSAT

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm (ft³) 183.622	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	2.5		332	.81		.72	185.45	82	79			
2	5		327	.65		.58	186.63	85	80			
3	7.5		326	.44		.39	187.81	86	80			
4	10		320	.25		.22	189.0	88	80			
B 1	12.5		321	.97		.86	190.4	89	80			
2	15		330	.68		.61	191.61	89	81			
3	17.5		335	1.1		.98	193.12	89	81			
4	20		319	.48		.43	194.2	89	81			
C 1	22.5		323	1.3		1.16	195.78	90	81			
2	25		325	1.0		.89	197.24	90	82			
3	27.5		336	1.1		.98	198.78	90	82			
4	30		331	1.4		1.25	200.44	89	82			
D 1	32.5		335	1.6		1.42	202.25	89	82			
2	35		318	2.1		1.87	204.29	89	82			
3	37.5		319	1.9		1.69	206.21	82	82			
4	40		320	1.8		1.60	208.13	86	81			
E 1	42.5		317	1.5		1.34	209.98	87	82			
2	45		315	1.5		1.34	211.66	89	82			
3	47.5		320	1.5		1.34	213.45	90	82			
4	50		321	1.5		1.34	215.16	91	83			
F 1	52.5		325	1.6		1.42	216.97	91	83			
2	55		327	1.6		1.42	218.77	91	83			
3	57.5		321	1.3		1.16	220.4	91	83			
4	60		304	1.2		1.07	221.99	91	84			
Av			323.6	1.095		1.11		87				

TIME END =

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H,O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.3	6.9		
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Purge Air

DATE 6-7-94

LOCATION

OPERATOR

STACK NO. FLD Inlet

RUN NO. 1 M-8

SAMPLE BOX NO.

METER BOX NO.

METER ΔH @

Y =

TIME START =

AMBIENT TEMPERATURE

BAROMETRIC PRESSURE

ASSUMED MOISTURE, %

PROBE LENGTH, in.

NOZZLE DIAMETER, in.

STACK DIAMETER, in.

PROBE HEATER SETTING

HEATER BOX SETTING

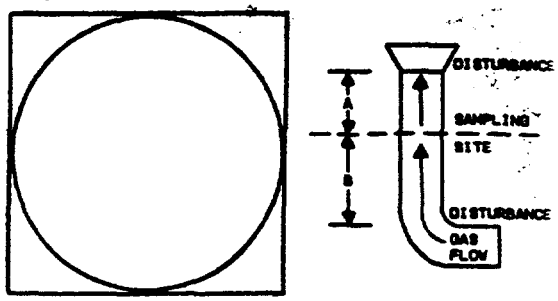
Δ Cp FACTOR

FILTER NO.

FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER @ in. Hg

PITOTS @ in. H₂O

ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ p	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5			1.3		1.16	223.61	91	84			
2	65			1.3		1.16	225.26	91	84			
3	67.5			1.5		1.34	227.0	91	84			
4	70			1.6		1.42	228.07	90	84			
Av												

TIME END =

POST TEST LEAK CHECKS

METER 6 @ 00 in. Hg

PITOTS @ in. H₂O

ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT 9
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

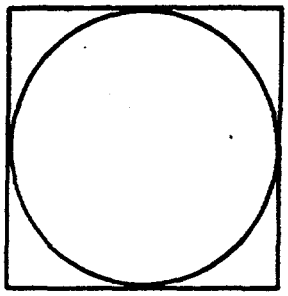
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-7-94
LOCATION EGD Inlet
OPERATOR MJR
STACK NO. —
RUN NO. 2 - MS
SAMPLE BOX NO. —
METER BOX NO. A1
METER ΔH @ 1.855
Y = 1.007
TIME START = 1323

AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE —
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .155
STACK DIAMETER, in. 135
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

K = .89

PRE TEST LEAK CHECKS

METER 0 @ 15 in. Hg
PITOTS 0 @ ? in. H₂O
ORSAT N/A

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A-1	2.5		330	.85		.76	234.700	73	73		65	2
2	5.0		328	.62		.55	232.800	74	73		65	2
3	7.5		325	.45		.40	232.900	75	72		64	1
4	10.0		320	.28		.25	233.000	75	71		63	1
B 1	12.5		321	.99		.88	235.100	76	71		63	3
2	15.0		325	.65		.58	236.300	77	71		63	3
3	17.5		316	1.2		1.07	237.900	78	71		63	3
4	20.0		319	.51		.45	238.700	78	71		63	3
C 1	22.5		331	1.2		1.07	240.300	76	70		63	3
2	25.0		325	1.0		.89	241.600	75	70		63	3
3	27.5		328	1.3		1.16	243.400	74	69		63	3
4	30.0		317	1.1		.98	244.900	74	69		64	3
D 1	32.5		319	1.7		1.51	246.700	74	69		64	4
2	35.0		322	2.0		1.78	248.700	74	68		64	5
3	37.5		335	1.9		1.69	250.600	74	68		65	5
4	40.0		330	1.8		1.60	253.800	76	67		65	5
E 1	42.5		318	1.5		1.33	254.500	72	66		65	5
2	45.0		321	1.6		1.42	255.700	72	66		65	4
3	42.5		325	1.5		1.34	257.310	72	66		66	4
4	50.0		335	1.5		1.34	259.800	72	65		66	4
F 1	52.5		330	1.6		1.42	261.600	72	65		67	4
2	55.0		318	1.5		1.34	262.900	72	65		66	4
3	52.5		320	1.3		1.16	264.500	71	65		64	4
4	60.0		319	1.2		1.07	266.100	71	65		66	4
Av			323.6	1.072		1.064		70.5				

TIME END = 1440

POST TEST LEAK CHECKS

METER .004 @ 7 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT —

VOLUME OF LIQUID WATER COLLECTED	80% IPA	IMPINGER VOLUME ml H2O2 2	3	4	SILICA GEL WEIGHT g
FINAL	126	220			263.6
INITIAL	100	200			245.6
LIQUID COLLECTED	26	20			
TOTAL VOLUME COLLECTED					

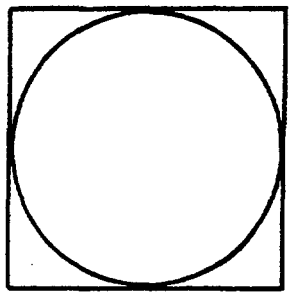
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.2	6.4		
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-7-94
LOCATION 1
OPERATOR MJR
STACK NO. FGD Inlet
RUN NO. 2 - M5
SAMPLE BOX NO. _____
METER BOX NO. _____
METER ΔH @ _____
Y = _____
TIME START = _____

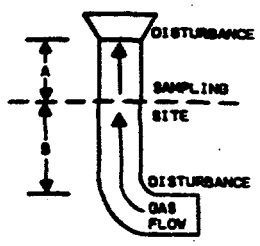
AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % _____
PROBE LENGTH, in. _____
NOZZLE DIAMETER, in. _____
STACK DIAMETER, in. _____
PROBE HEATER SETTING _____
HEATER BOX SETTING _____
Δ Cp FACTOR _____
FILTER NO. _____
FILTER TARE WEIGHT _____ mg.

NORTH



CROSS SECTION

SCHEMATIC OF STACK



PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT _____

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		320	1.0		.89	267.500	70	65		67	3
2	65.0		320	1.0		.89	269.000	70	65		62	3
3	67.5		321	1.1		.98	270.400	71	65		66	3
4	70.0		324	1.1		.98	271.948	71	65		66	3
Av												

TIME END = _____

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

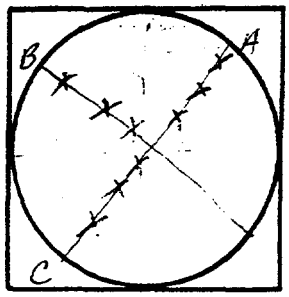
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-7-94
LOCATION Porter, IN
OPERATOR TR, GB
STACK NO. EGU OUTLET
RUN NO. R1 Rn 26F/5B
SAMPLE BOX NO. Adex
METER BOX NO. #3
METER ΔH @ 1.875
Y = .900
TIME START = 6:56

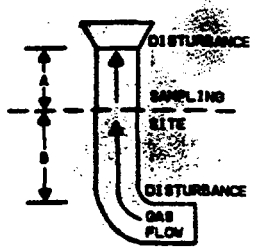
AMBIENT TEMPERATURE 75
BAROMETRIC PRESSURE 29.90
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in.
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320±25
Δ Cp FACTOR .84
FILTER NO. 825
FILTER TARE WEIGHT 595.4 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .002 @ 12 in. Hg
PITOTS 0.0 @ 5 in. H,O
ORSAT OK

K=7.6

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5		124	.40		3.0	842.6	75	75	315		6
2	10		128	.35		2.3	849.1	80	76	312		5
3	15		131	.30		2.3	853.4	83	76	312		5
4	20		131	.28		2.9	857.9	81	76	314		6
5	25		134	.35		2.7	862.9	86	77	312		5
6	30		131	.35		2.7	868.1	84	77	312		5
7	35		129	.35		2.7	873.4	84	77	310		5
8	40		130	.32		2.4	877.7	86	77	310		5
9	45		132	.30		2.5	882.4	84	78	312		5
10	50		134	.30		2.5	887.4	85	79	312		5
1	55		145	.30		2.6	892.5	87	79	312		5
2	60		147	.30		2.6	897.6	87	75	315		6
Av			131	.586		2.61		80.4				

TIME END = 11:06

POST TEST LEAK CHECKS

METER .002 @ 12 in. Hg
PITOTS 0.0 @ 5 in. H,O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	236	130			212
INITIAL	100	100	—	56	200
LIQUID COLLECTED	136	30			12
TOTAL VOLUME COLLECTED	168 total				

ORSAT MEASUREMENT	TIME	CO,	O,	CO	N,
1					
2					
3					
4					

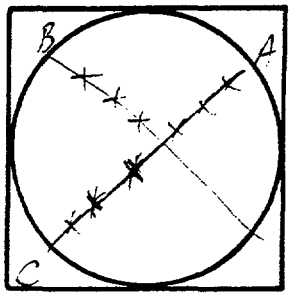
PARTICULATE FIELD DATA

PLANT PURE AIR
DATE 6-7-94
LOCATION PORTER IN
OPERATOR GS TZ
STACK NO. FGD OUTLET
RUN NO. K2 Run 5B, 26A
SAMPLE BOX NO. FOX
METER BOX NO. #3
METER ΔH @ 1.75
Y = .995
TIME START = 1324

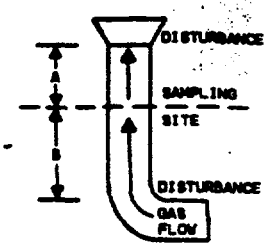
AMBIENT TEMPERATURE 62
BAROMETRIC PRESSURE 29.90
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 12
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 216
PROBE HEATER SETTING 320 ± 25
HEATER BOX SETTING 320 ± 25
Δ Cp FACTOR .84
FILTER NO. 0220
FILTER TARE WEIGHT 1.0000 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .003 @ 10 in. Hg
PITOTS 2.0 @ 5 in. H₂O
ORSAT OK

K=7.0

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 892.200	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
	5		24	30		2.3	896.0	72	62	300		4
	10		135	.30		2.3	899.2	72	62	310		4
	15		136	.32		2.4	903.7	72	63	310		4
	20		128	.32		2.4	907.7	70	62	308		4
	25		128	.31		2.4	911.6	72	62	306		4
	30		120	.33		2.5	915.6	72	62	310		4
	35		129	.31		2.1	919.6	67	62	305		4
	40		135	.34		2.6	923.6	71	62	315		5
	45		143	.32		2.4	927.5	70	62	309		4
	50		141	.31		2.4	931.4	70	62	311		4
	55		129	.30		2.2	935.2	70	62	311		4
	60		126	.29		2.2	939.0	70	63	311		4
Av			(131)	(.559)		2.39		(66.8)				

TIME END = 1344

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	140	120			213
INITIAL	100	100	—	0	200
LIQUID COLLECTED	140	20			13
TOTAL VOLUME COLLECTED			173		

ORSAT MEASUREMENT	TIME	$\overline{CO_2}$	$\overline{O_2}$	CO	N_2
1					
2					
3					
4					

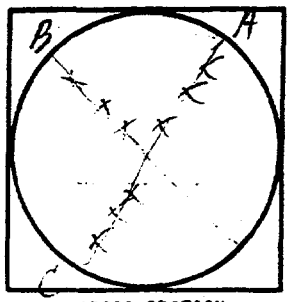
PARTICULATE FIELD DATA

PLANT Ingot Fab
DATE 6-7-94
LOCATION Boiler (1)
OPERATOR [illegible]
STACK NO. [illegible]
RUN NO. 55 thru 55
SAMPLE BOX NO.
METER BOX NO. A3
METER ΔH @ [illegible]
Y = 999
TIME START = 1320

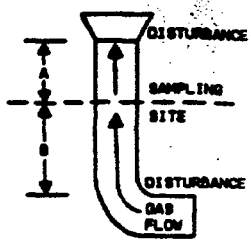
AMBIENT TEMPERATURE 55
BAROMETRIC PRESSURE 29.90
ASSUMED MOISTURE, % 2
PROBE LENGTH, in. 181
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31'
PROBE HEATER SETTING 321 ± 25
HEATER BOX SETTING 321 ± 25
Δ Cp FACTOR .84
FILTER NO. 0322
FILTER TARE WEIGHT 391.4 mg.
940.238

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER [illegible] @ 9 in. Hg
PITOTS [illegible] @ 5 in. H,O
ORSAT CK

K = 7.6

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5		125	.30		[illegible]	[illegible]	59	54	301		5
2	10		129	.32		2.4	947.9	62	56	320		5
3	15		130	.29		2.2	[illegible]	63	55	320		5
4	20		127	.34		[illegible]	[illegible]	60	56	302		5
5	25		[illegible]	.30		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
6	30		[illegible]	[illegible]		[illegible]	[illegible]	63	56	[illegible]		[illegible]
7	35		130	.34		2.6	[illegible]	60	56	300		5
8	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
9	45		130	[illegible]		2.4	[illegible]	65	57	312		5
10	50		[illegible]	.30		2.3	[illegible]	65	58	311		5
11	55		129	[illegible]		[illegible]	[illegible]	[illegible]	59	311		[illegible]
12	60		129	.36		2.7	[illegible]	67	59	312		6
Av			129.2	.565		2.43		63				

TIME END = 1534

POST TEST LEAK CHECKS

METER @ / in. Hg
PITOTS @ in. H,O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	245	119	0		215
INITIAL	100	100	—	56	200
LIQUID COLLECTED	145	19			15
TOTAL VOLUME COLLECTED			179		

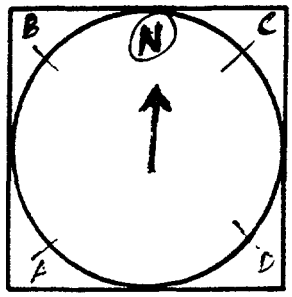
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.4	6.3		
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Air Products
DATE 6-7-94
LOCATION Porter, IN
OPERATOR E.K
STACK NO. FGD Outlet (Stack)
RUN NO. 2 - M8
SAMPLE BOX NO. A3
METER BOX NO. A4
METER ΔH @ 1.73'
Y = 0.997
TIME START = 12:25

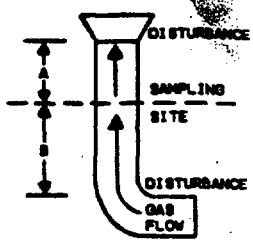
AMBIENT TEMPERATURE 62
BAROMETRIC PRESSURE 29.90
ASSUMED MOISTURE, % _____
PROBE LENGTH, in. _____
NOZZLE DIAMETER, in. 0.312
STACK DIAMETER, in. _____
PROBE HEATER SETTING _____
HEATER BOX SETTING 150
Δ Cp FACTOR 0.84
FILTER NO. _____
FILTER TARE WEIGHT _____ mg.

NORTH



CROSS SECTION

SCHEMATIC OF STACK



PRE TEST LEAK CHECKS

METER 0.001 @ 15 in. Hg
PITOTS 0.0 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	0		132	0.30		2.05	122.040	60	60	148	57	3
2	5		130	0.32		2.20	126.0	61	66	149	55	3
3	10		129	0.32		2.20	130.2	61	69	150	53	3
B 1	0/15		135	0.28		1.90	134.5	60	68	150	51	2
2	20		134	0.25		1.70	138.5	61	68	147	56	2
3	25		131	0.30		2.05	142.2	61	70	149	53	3
C 1	0/30		132	0.31		2.10	146.1	61	63	154	51	3
2	35		129	0.34		2.30	150.2	61	65	151	52	3
3	40		128	0.29		2.00	154.6	61	67	146	50	3
D 1	0/45		137	0.29		2.00	158.7	60	61	149	49	3
2	50		133	0.29		2.00	162.6	60	64	150	51	3
3	55		123	0.25		1.70	166.8	60	68	152	50	3
	60						170.405					
Av			131.5	.543		202		64				

TIME END = 1:46

POST TEST LEAK CHECKS

METER 0.001 @ 13 in. Hg
PITOTS 0.0 @ 3 in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml				SILICA GEL WEIGHT
	IPA 1	H_2O_2 2	H_2O 3	4	g
FINAL	146	167	109		
INITIAL	100	100	100		200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

M8

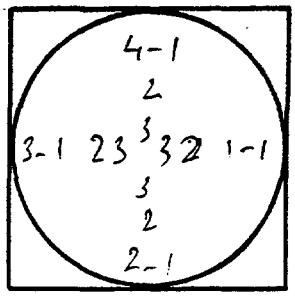
PARTICULATE FIELD DATA M8

PLANT NIPSCO/Mirproducts
DATE 6/7/94
LOCATION Stack
OPERATOR C.T.
STACK NO. FGD outlet
RUN NO. 1 RM 8
SAMPLE BOX NO. A 4
METER BOX NO. A-4
METER ΔH @ 1.731
Y = 0.997
TIME START = 9:55

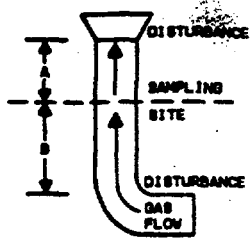
AMBIENT TEMPERATURE 75
BAROMETRIC PRESSURE 29.90
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. 0.312
STACK DIAMETER, in. 33'
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR 0.84
FILTER NO. 0815
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



7.05

PRE TEST LEAK CHECKS

METER 0.007 @ 15 in. Hg
PITOTS ✓ @ .5 in. H₂O
ORSAT

K = 6.77

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1-1	0		145	0.35		2.31	53.216	73	73	—	52	1.8
2	5		120	0.34		2.70	57.80	73	79	—	53	5.5
3	10		123	0.39		2.70	62.32	74	86	—	55	7.5
2-1	15/0		138	0.35		2.36	67.03	75	80	—	57	7.2
2	5		131	0.40		2.71	71.52	78	93	—	57	8.0
3	10		116	0.38		2.68	76.00	79	94	—	55	8.0
3-1	15/0		132	0.34		2.32	80.65	78	79	—	50	8.0
2	5		130	0.31		2.12	84.82	78	79	—	53	7.5
3	10		125	0.28		1.93	88.93	80	89	—	54	7.5
4-1	15/0		128	0.36		2.36	93.24	75	74	—	55	7.8
2	5		130	0.35		2.36	97.42	73	76	—	57	7.0
3	10		136	0.35		2.36	101.52	74	76	—	58	8.0
	15						105.921			—		
Av			127.8	.594		2.41			78.7			

TIME END = 11:10

POST TEST LEAK CHECKS

METER .008 @ 14 ✓ in. Hg
PITOTS ✓ @ ✓ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	100	192	42		
INITIAL	100	100	100		200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

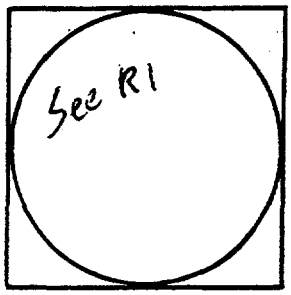
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/8/94
LOCATION FGD Inlet
OPERATOR TS
STACK NO. FGD Inlet
RUN NO. R1 HCL/M5
SAMPLE BOX NO. A
METER BOX NO. A2
METER ΔH @ 1.903
Y = 1.001
TIME START = 10:15

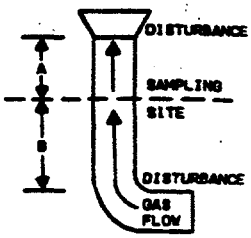
AMBIENT TEMPERATURE 70
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in.
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in.
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH



CROSS SECTION

SCHEMATIC OF STACK



K = .87

PRE TEST LEAK CHECKS
METER .006 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

P /	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 519.854	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	2.5	+5.3	330	1.6		1.39	521.43	62	56			3
2	5		331	1.6		1.39	522.81	62	56			3
3	7.5		334	1.7		1.48	524.60	62	56			3
4	10		331	1.5		1.57	526.01	65	57			4
B 1	12.5		320	1.2		1.04	527.49	65	57			3
2	15		318	1.4		1.22	528.90	65	57			3
3	17.5		318	1.6		1.39	530.30	66	57			3
4	20		317	1.5		1.31	532.00	66	58			3
C 1	22.5		340	1.2		1.04	533.28	65	58			3
2	25		348	1.5		1.31	534.81	65	58			3
3	27.5		347	1.6		1.57	536.49	65	58			4
4	30		348	1.6		1.57	538.35	65	58			4
D 1	32.5		321	.00		.70	539.38	65	58			1
2	35		335	2.3		2.00	541.15	65	59			6
3	37.5		345	2.0		1.74	542.91	61	59			4
4	40		340	1.8		1.57	544.31	61	59			4
E 1	42.5		323	1.5		1.31	545.88	62	59			3
2	45		327	1.2		1.04	547.28	63	59			3
3	47.5		329	1.4		1.22	548.80	64	59			3
4	50		332	1.7		1.48	550.35	65	59			4
F 1	52.5		331	.65		.57	551.49	65	59			1
2	55		334	.88		.77	552.62	65	59			2
3	57.5		335	.90		.78	553.81	65	59			2
4	60		331	.90		.78	555.04	66	59			2
Av			331.2	1.153		1.20		61.3				

TIME END = _____

POST TEST LEAK CHECKS
METER .005 @ 10 in. Hg
PITOTS ⌂ @ 3 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	130	120		—	
INITIAL	100	100			
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

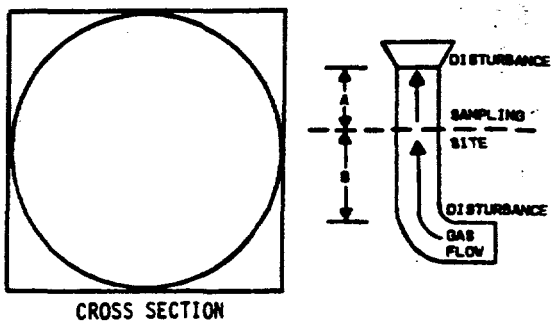
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/8/94
LOCATION Portage Ind
OPERATOR TS
STACK NO. FGD Inlet
RUN NO. R1 HCL/M5
SAMPLE BOX NO. -
METER BOX NO. A2
METER ΔH @ 1.907
Y = 1.001
TIME START = 10:15

AMBIENT TEMPERATURE 70
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in.
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in.
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



PRE TEST LEAK CHECKS

METER 0.006 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
G 1	62.5		321	1.1		.96	556.43	67	59			2
2	65		322	1.1		.96	557.65	67	60			2
3	67.5		332	.92		.80	559.01	68	60			3
4	70		333	.88		.77	560.317	67	60			2
Av												

TIME END =

POST TEST LEAK CHECKS

METER 0.005 @ 10 in. Hg
PITOTS 0 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	—				256.6
INITIAL	—			56	244.6
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

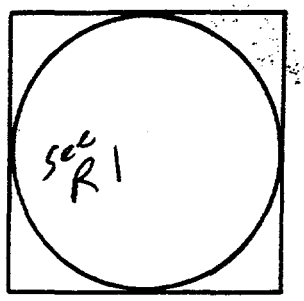
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-8-94
LOCATION FGD Inlet
OPERATOR TS
STACK NO. ~~TS~~ FGD Inlet
RUN NO. ~~8 Hex~~ 2 PART
SAMPLE BOX NO. —
METER BOX NO. A2
METER ΔH @ 1.903
Y = 1.001
TIME START = 13:03

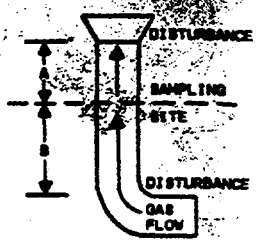
AMBIENT TEMPERATURE 54
BAROMETRIC PRESSURE —
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 135'
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT ~ mg.

NORTH



CROSS SECTION

SCHEMATIC OF STACK



K=.87

PRE TEST LEAK CHECKS

METER .005 @ 25 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ (565.539 ~~565.539~~)	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A1	2.5		326	1.7		1.48	567.42	62	59			5
2	5		326	1.7		1.48	568.93	63	59			5
3	7.5		328	1.7		1.48	570.66	63	59			5
4	10		328	1.8		1.57	572.49	63	59			6
B1	12.5		342	1.3		1.13	573.85	64	60			5
2	15		340	1.3		1.13	575.42	64	60			5
3	17.5		344	1.5		1.31	576.95	64	60			5
4	20		345	1.5	[illegible]	1.31	578.56	64	60			5
C1	22.5		347	1.3		1.13	580.03	64	60			5
2	25		348	1.3		1.13	581.53	64	60			5
3	27.5		350	1.7		1.48	583.27	65	60			5
4	30		350	1.7		1.48	584.72	65	61			5
D1	32.5		348	.85		.74	585.98	65	61			3
2	35		345	2.2		1.91	587.61	65	61			6
3	37.5		346	2.2		1.91	589.55	65	61			6
4	40		346	1.8		1.57	591.05	65	61			6
E1	42.5		340	1.3		1.13	592.61	65	61			5
2	45		342	1.3		1.13	594.11	65	62			5
3	47.5		346	1.4		1.22	595.50	64	62			5
4	50		347	1.4		1.22	597.08	63	61			5
F1	52.5		331	.66		.57	598.21	63	61			2
2	55		331	.89		.77	599.43	62	61			3
3	57.5		332	.89		.77	600.56	62	61			3
4	60		332	.89		.77	601.73	63	60			3
Av												

TIME END = —

POST TEST LEAK CHECKS

METER — @ — in. Hg
PITOTS — @ — in. H₂O
ORSAT —

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	254	—			236.6
INITIAL	200	—			221.5
LIQUID COLLECTED	54				
TOTAL VOLUME COLLECTED	54 ml				15.1

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

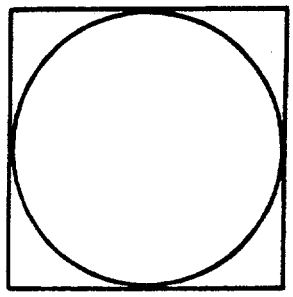
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-8-94
LOCATION FGD Inlet
OPERATOR TS
STACK NO. _____
RUN NO. ~~3 Part~~ 2 Part
SAMPLE BOX NO. _____
METER BOX NO. A2
METER ΔH @ 1.903
Y = 1.001
TIME START = 13:03

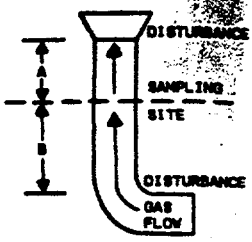
AMBIENT TEMPERATURE 54
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 141
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5'
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .841
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .005 @ 25 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
01	62.5		330	1.1		.96	603.19	63	61			4
2	65		330	1.0		.87	604.39	64	61			4
3	67.5		331	1.0		.87	605.64	64	61			4
4	70		331	.90		.78	606.819	64	61			3
Av			338.6		1.1567	1.1893	41,360		62.2			

TIME END = _____

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

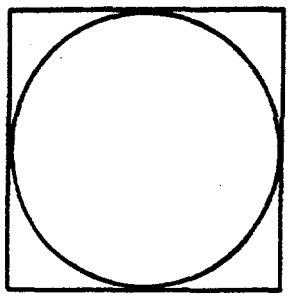
PARTICULATE FIELD DATA

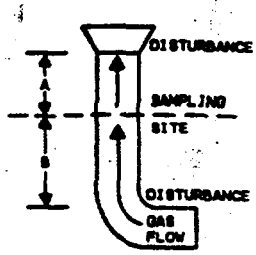
PLANT Pure Air
DATE 6-8-94
LOCATION FGD Inlet
OPERATOR MJR
STACK NO. —
RUN NO. 3 PART HCl
SAMPLE BOX NO. —
METER BOX NO. A2
METER ΔH @ 1.908
Y = 1.001
TIME START = 1430

AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE —
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5'
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK





CROSS SECTION

K=.87

PRE TEST LEAK CHECKS

METER .002 @ 18 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT —

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 607.210	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	25	+5.5	325	1.8		1.57	608.800	60	60	—	—	3
2	5.0		326	1.8		1.57	610.400	61	60			3
3	7.5		326	1.7		1.48	612.100	61	60			3
4	10.0		327	1.7		1.48	613.700	62	60			3
B 1	12.5		340	1.4		1.22	615.200	63	60			2
2	15.0		340	1.4		1.22	616.600	63	60			2
3	17.5		343	1.5		1.31	618.200	63	60			3
4	20.0		345	1.5		1.31	619.800	63	60			2
C 1	22.5		347	1.4		1.22	621.300	63	60			2
2	25.0		348	1.6		1.39	622.800	63	60			2
3	27.5		352	1.6		1.39	624.400	63	60			2
4	30.0		350	1.7		1.48	626.000	64	60			2
D 1	32.5		347	.87		.76	627.300	64	60			2
2	35.0		348	2.0		1.74	629.900	63	60			4
3	37.5		350	2.1		1.83	630.900	60	60			3
4	40.0		350	1.9		1.65	632.700	61	60			3
E 1	42.5		343	1.4		1.22	634.100	61	59			2
2	45.0		344	1.4		1.22	655.800	62	59			2
3	47.5		344	1.3		1.13	637.100	62	60			2
4	50.0		344	1.5		1.31	638.600	63	60			2
F 1	52.5		330	.65		.57	639.700	63	60			2
2	55.0		332	.88		.77	640.900	62	60			1
3	57.5		332	.90		.78	642.100	62	60			1
4	60.0		332	.90		.78	643.300	61	59			1
Av												

TIME END = —

POST TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT —

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					

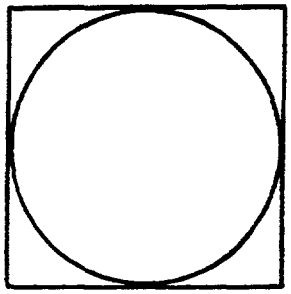
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-8-94
LOCATION FGD Inlet
OPERATOR
STACK NO.
RUN NO. 3 Part HCl
SAMPLE BOX NO.
METER BOX NO. A2
METER ΔH @ 1.903
Y = 1.001
TIME START = 14:30

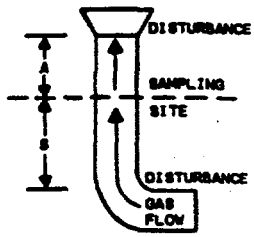
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, %
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in.
STACK DIAMETER, in. —
PROBE HEATER SETTING —
HEATER BOX SETTING
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
G 1	62.5		331	1.2		1.04	644.500	61	59	—	—	1
2	65.0		332	1.1		.96	645.800	61	59			1
3	67.5		335	1.1		.96	647.100	61	59			1
4	70.0		335	.92		.80	648.408	61	59			1
Av		+5.5	339.2		1.1723	1.2200	41.198		60.9			

TIME END =

POST TEST LEAK CHECKS

METER .065 @ 7 in. Hg
PITOTS @ in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					205.5
INITIAL				56	200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					

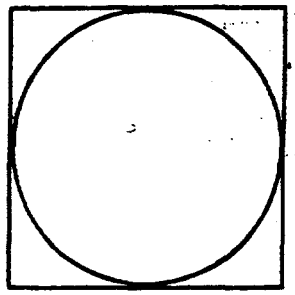
PARTICULATE FIELD DATA

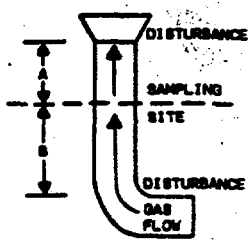
PLANT Pure Air
DATE 6-8-94
LOCATION FGD Inlet
OPERATOR B.F.
STACK NO. —
RUN NO. 1 M8
SAMPLE BOX NO.
METER BOX NO. A1
METER ΔH @ 1.855
Y = 4007
TIME START =

AMBIENT TEMPERATURE 65
BAROMETRIC PRESSURE 30.05
ASSUMED MOISTURE, % 6%
PROBE LENGTH, in. 11'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13'4" X 34'
PROBE HEATER SETTING NA
HEATER BOX SETTING NA
Δ Cp FACTOR 0.84
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK





CROSS SECTION

Ka .85

PRE TEST LEAK CHECKS

METER 0.01 @ 15 in. Hg
PITOTS @ in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 280.913	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A1	2.5	+5.3	330	1.0		.85	282.32	58	56			6
2	5.0		333	1.1		.94	283.76	61	56			
3	7.5		334	.93		.79	285.09	63	57			
4	10		331	.80		.68	286.32	64	57			
B1	12.5		326	.90		.77	287.63	65	57			
2	15		315	.90		.77	288.95	65	58			
3	17.5		318	.88		.75	290.3	65	58			
4	20		317	.65		.55	291.39	65	58			
C1	22.5		340	1.70		1.45	293.0	66	59			
2	25		338	1.4		1.19	294.84	67	59			
3	27.5		342	1.2		1.02	296.35	67	59			
4	30		348	1.5		1.28	297.99	67	59			
D1	32.5		321	1.8		1.53	299.82	68	59			
2	35		335	2.00		1.7	301.68	68	60			7
3	37.5		345	2.50		2.13	303.5	62	60			8
4	40		340	.80		.68	305.36	65	60			
E1	42.5		323	1.80		1.53	307.12	66	60			6
2	45		327	1.80		1.53	308.98	68	66			
3	47.5		329	1.50		1.28	310.63	68	60			6
4	50		332	1.00		1.02	312.15	68	61			
F1	52.5		331	1.40		1.19	313.66	68	61			
2	55		334	1.10		.94	315.14	69	61			6
3	57.5		335	1.60		1.36	316.82	69	61			
4	60		331	1.50		1.28	318.48	70	61			
Av												

TIME END =

POST TEST LEAK CHECKS

METER .01 @ 10 in. Hg.
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT _____

DATE 6-8-94

LOCATION _____

OPERATOR _____

STACK NO. _____

RUN NO. 1 M-8

SAMPLE BOX NO. _____

METER BOX NO. _____

METER ΔH @ _____

Y = _____

TIME START = _____

AMBIENT TEMPERATURE _____

BAROMETRIC PRESSURE _____

ASSUMED MOISTURE, % _____

PROBE LENGTH, in. _____

NOZZLE DIAMETER, in. _____

STACK DIAMETER, in. _____

PROBE HEATER SETTING _____

HEATER BOX SETTING _____

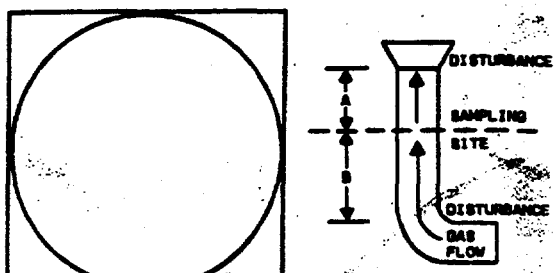
Δ Cp FACTOR _____

FILTER NO. _____

FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT _____

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
G 1			321	1.60		1.36	320.21	71	61			
2			322	1.60		1.36	322.99	71	61			
3			332	1.80		1.53	293.8	71	62			
4			333	1.70		1.45	325.66	72	62			6
Av			330.5	1.34		1.18	44.75		59.4			

1.158

TIME END = _____

POST TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

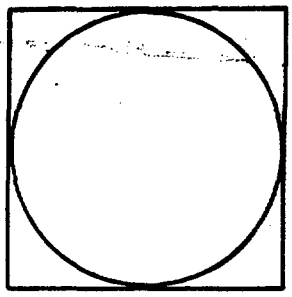
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-8-94
LOCATION FGD Inlet
OPERATOR MTR
STACK NO.
RUN NO. 2 M8
SAMPLE BOX NO.
METER BOX NO. A1
METER ΔH @ 1.855
Y = 1.007
TIME START = 14:30

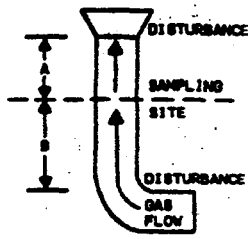
AMBIENT TEMPERATURE 54
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 141
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5'
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



K = .85

PRE TEST LEAK CHECKS
METER 0.020 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	2.5	+5.7	325	1.60		1.37	331.662	65	62			3
2	5		327	1.7		1.45	335.1	65	62			3
3	7.5		328	1.7		1.45	336.91	69	62			3
4	10		328	1.7		1.45	338.72	70	60			8
B 1	12.5		331	1.0		.85	340.68	70	61			3
2	15		333	1.1		.94	341.52	69	61			3
3	17.5		333	.94		.80	342.91	67	61			3
4	20		333	.82		.70	344.21	67	61			3
C 1	22.5		330	.90		.77	345.44	67	61			3
2	25		330	.90		.77	346.775	67	61			3
3	27.5		330	.88		.75	347.91	67	61			3
4	30		335	.66		.56	349.22	67	61			3
D 1	32.5		341	1.2		1.45	350.99	68	61			3
2	35		340	1.4		1.19	352.629	66	61			3
3	37.5		342	1.2		1.02	354.100	63	61			3
4	40		343	1.5		1.28	355.800	65	61			3
E 1	42.5		347	1.8		1.53	357.700	66	61			3
2	45		347	2.0		1.70	359.500	67	61			3
3	47.5		349	2.3		1.96	361.800	67	61			3
4	50		350	.80		.68	362.800	68	61			3
F 1	52.5		345	1.8		1.53	364.700	66	61			3
2	55		346	1.8		1.53	366.100	66	61			3
3	57.5		345	1.5		1.28	365.100	66	61			3
4	60		350	1.2		1.02	369.600	66	61			3
Av												

TIME END = _____

POST TEST LEAK CHECKS
METER 0 @ 5 in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

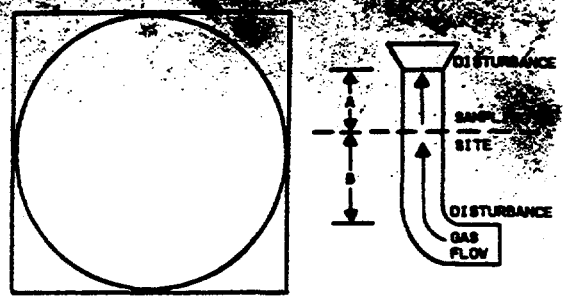
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-8-94
LOCATION FGD Inlet
OPERATOR
STACK NO.
RUN NO. 2 M8
SAMPLE BOX NO.
METER BOX NO. A1
METER ΔH @ 1.855
Y = 1.007
TIME START =

AMBIENT TEMPERATURE 54
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 141
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.51
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
G1	G2.5		331	1.0		.85	371.100	G5	G1			3
2	G5.0		332	1.1		.94	378.400	G5	G1			3
3	G7.5		334	.94		.80	373.700	G5	G1			3
4	700		334	.82		.70	375.026	G5	G1			3
Av			337.1		1.1303	1.1186	43.344		63.9			

TIME END =

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					263.6
INITIAL				56	245.6
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

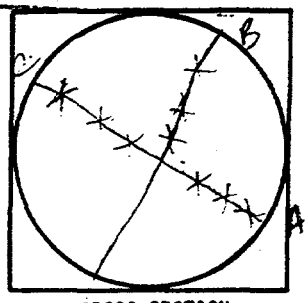
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-[illegible]
LOCATION FGD SE
OPERATOR [illegible]
STACK NO. FGD SE
RUN NO. R1 Run 2 of 4,5,6
SAMPLE BOX NO. Probe
METER BOX NO. A3
METER ΔH @ 1.875
Y = .999
TIME START = 10:05

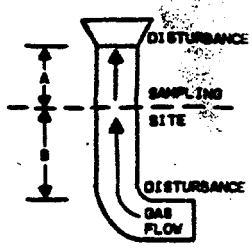
AMBIENT TEMPERATURE 58
BAROMETRIC PRESSURE 29.7
ASSUMED MOISTURE, % 10
PROBE LENGTH, in. 18"
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 33"
PROBE HEATER SETTING [illegible]
HEATER BOX SETTING [illegible]
Δ Cp FACTOR [illegible]
FILTER NO. [illegible]
FILTER TARE WEIGHT [illegible] mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .002 @ 10 in. Hg
PITOTS 0.0 @ 5 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A	5		129	.31		2.36	992.7	54	54	315	60	5
	10		131	.28		2.13	995.8	60	54	312	57	4
	15		123	.30		2.28	999.6	63	55	317	57	5
B			128	.35		2.66	3.8	63	56	317	56	5
			130	.32		2.43	7.5	68	57	320	56	5
	30		132	.35		2.66	11.6	69	58	320	56	5
C	35		132	.27		2.05	15.2	60	59	320	56	5
	40		130	.30		2.28	18.9	70	55	325	56	5
	45		128	.30		2.28	22.8	70	60	315	56	5
			127	.31		2.36	26.7	71	60	319	56	5
	55		125	.31		2.36	30.5	71	61	320	56	5
A	60		128	.31		2.36	34.425	72	61	322	55	5
Av			(128.6)		(.5557)	(2.3508)	(46.279)		(61.7)			

TIME END = 11:25

POST TEST LEAK CHECKS

METER 0.003 @ 10 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	230	120	0	—	214
INITIAL	100	100	—	56	200
LIQUID COLLECTED	130	20	0	—	14
TOTAL VOLUME COLLECTED	164				

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					

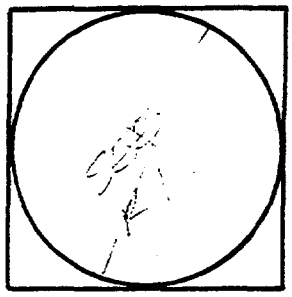
PARTICULATE FIELD DATA

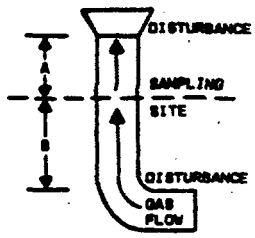
PLANT PURE AIR
DATE 10-8-92
LOCATION PORTER, IN
OPERATOR GB, TR
STACK NO. FGD OUTLET
RUN NO. R2, Run 5B
SAMPLE BOX NO. Apex
METER BOX NO. A3
METER ΔH @ 1.875
Y = .995
TIME START = 1303

AMBIENT TEMPERATURE 70
BAROMETRIC PRESSURE 29.70
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 33'
PROBE HEATER SETTING 320 F
HEATER BOX SETTING 320 F
Δ Cp FACTOR .84
FILTER NO. 676
FILTER TARE WEIGHT 597.2 mg.

NORTH

SCHEMATIC OF STACK





CROSS SECTION

PRE TEST LEAK CHECKS

METER .007 @ 7 in. Hg
PITOTS OK @ = in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE (+)- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm (ft³)	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	5	+.5	128	.28		2.1	038.3	70	59	310		5
2	10		130	.31		2.4	045.2	64	59	311		5
3	15		130	.32		2.4	046.1	67	60	311		5
B 4	20		130	.32		2.4	050.0	69	61	306		5
5	25		129	.31		2.3	053.7	72	61	306		5
6	30		128	.33		2.5	057.8	70	62	310		5
7	35		129	.34		2.6	061.9	69	63	308		5
8	40		131	.35		2.7	066.0	75	64	310		5
9	45		132	.35		2.7	070.2	76	64	310		5
10	50		130	.35		2.7	074.2	77	65	311		5
11	55		127	.31		2.3	078.5	77	65	311		5
12	60		128	.32		2.4	082.509	77	64	311		5
Av			(128.9)	(.5727)		(2.500)	(47.925)		(67.1)			

TIME END = 1413

POST TEST LEAK CHECKS

METER .004 @ 12 in. Hg
PITOTS OK @ 5 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	230	124	—		293.9
INITIAL	100	100	—	56	282.0
LIQUID COLLECTED	130	24			
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					

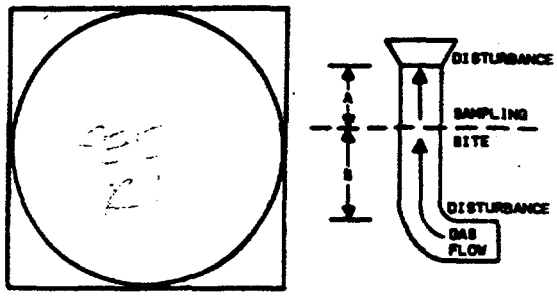
PARTICULATE FIELD DATA

PLANT PURE AIR
DATE 6-8-94
LOCATION PORTER, IN
OPERATOR GB, TR
STACK NO. FGD OUTLET
RUN NO. 2, RM5B/26A
SAMPLE BOX NO. Apex
METER BOX NO. A3
METER ΔH @ 1.85
Y = .979
TIME START = 14:38

AMBIENT TEMPERATURE 64
BAROMETRIC PRESSURE 29.7
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 9'
PROBE HEATER SETTING 320 ± 25
HEATER BOX SETTING 320 ± 25
Δ Cp FACTOR .84
FILTER NO. 548
FILTER TARE WEIGHT 395.1 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER 0.001 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δp	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	5	+.5	127	.33		2.5	80.7	64	64	312	60	5
2	10		129	.28		2.1	90.4	72	64	315	57	4
3	15		131	.29		2.2	94.2	76	64	319	57	4
B 4	20		125	.29		2.2	97.9	77	66	319	57	4
5	25		128	.30		2.3	101.7	77	66	315	57	4
6	30		128	.28		2.1	105.5	77	67	320	57	4
7	35		130	.32		2.4	109.1	72	67	322	57	4
8	40		127	.33		2.5	113.2	78	67	324	57	5
9	45		131	.37		2.8	117.6	79	68	321	57	5
10	50		132	.32		2.4	121.1	75	68	315	57	5
11	55		129	.30		2.3	125.4	75	68	314	57	5
12	60		128	.28		2.1	129.225	81	75	317	57	4
Av			129.1		.5540	2.3250	46.570		71.1			

TIME END = 15:50

POST TEST LEAK CHECKS

METER 0.003 @ 10 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	736	118			213.9
INITIAL	100	100	—	56	200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

48

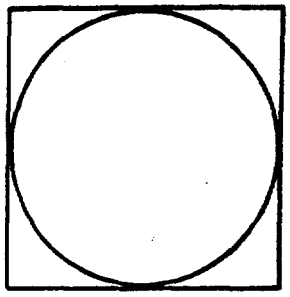
PARTICULATE FIELD DATA

PLANT Pure Air / NIPSCo
DATE 6/8/94
LOCATION Stack
OPERATOR C.T
STACK NO. FGD outlet
RUN NO. 1 / M8
SAMPLE BOX NO. A4
METER BOX NO. A4
METER ΔH @ 1.731
Y = 0.997
TIME START = 1010 AM

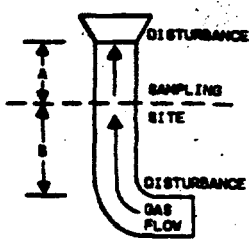
AMBIENT TEMPERATURE 58
BAROMETRIC PRESSURE 29.
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. 0.312
STACK DIAMETER, in. 33'
PROBE HEATER SETTING 200
HEATER BOX SETTING 200
Δ Cp FACTOR 0.84
FILTER NO. 1050
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.005 @ 20 in. Hg
PITOTS ✓ @ 0.4 in. H₂O
ORSAT _____

K = 6.75

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1-1	0		127	0.32		2.16	177.716	53	53	180	50	2.0
2	5		130	0.35		2.36	181.71	53	63	175	50	2.0
3	10		131	0.37		2.50	185.94	55	67	177	51	2.0
2-1	15/0		125	0.33		2.23	190.16	56	69	185	52	2.0
2	5		129	0.33		2.23	194.40	58	71	182	52	2.0
3	10		135	0.29		1.96	198.33	59	72	180	53	2.0
3-1	15/0		132	0.32		2.16	202.27	59	59	180	53	2.0
2	5		138	0.35		2.36	206.30	59	68	182	55	2.2
3	10		133	0.31		2.09	210.56	59	70	183	55	2.1
4-1	15/0		125	0.34		2.30	214.50	59	60	183	55	2.2
2	5		129	0.33		2.36	218.69	59	67	179	57	2.2
3	10		122	0.32		2.16	222.97	60	69	166	57	2.2
	15						227.025					
Av			129.7		.5756	2.2392	49.309		61.5			

TIME END = 1135 AM

POST TEST LEAK CHECKS

METER 0.008 @ 21 in. Hg
PITOTS ✓ @ 0.4 in. H₂O
ORSAT _____

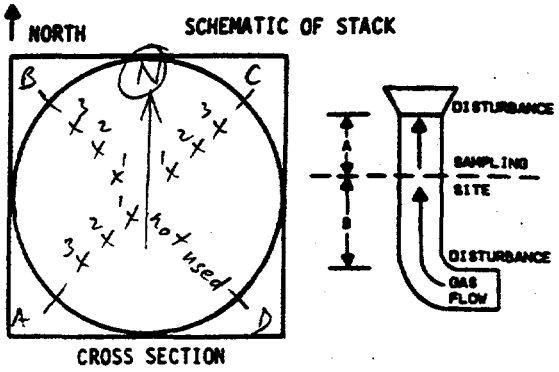
VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml				SILICA GEL WEIGHT g
	1 Dry	2 H_2O_2	3 H_2O_2	4	
FINAL	112	140	134		
INITIAL	100	100	100		200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Air Products
DATE Porter, IN
LOCATION 6-8-94
OPERATOR EJK
STACK NO. FGD Exhaust
RUN NO. 2 — M8
SAMPLE BOX NO. A3
METER BOX NO. A4
METER ΔH @ ~~0.99~~ 1.731
Y = 0.997
TIME START = 2:49

AMBIENT TEMPERATURE 29.70" Hg
BAROMETRIC PRESSURE 59°F
ASSUMED MOISTURE, % 15
PROBE LENGTH, ~~in.~~ 18 ft
NOZZLE DIAMETER, in. 0.312
STACK DIAMETER, ~~in.~~ 33 ft
PROBE HEATER SETTING —
HEATER BOX SETTING 150°F
Δ Cp FACTOR 0.84
FILTER NO. —
FILTER TARE WEIGHT — mg.



PRE TEST LEAK CHECKS
METER 0.000 @ 16 in. Hg
PITOTS 0.00 @ 3 in. H,O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
C 1	0	+0.5	126	0.26		1.80	232.365	59	59		54	2
2	5		128	0.32		2.20	235.6	59	64		52	2
3	10		131	0.29		2.00	239.4	60	67		50	2
B 1	0/15		134	0.28		1.90	243.4	61	67		53	2
2	20		133	0.30		2.05	247.2	61	68		51	2
3	25		135	0.29		2.00	251.2	61	71		50	2
B 1	0/30		134	0.29		2.00	255.2	62	62		53	5
2	35		129	0.27		1.85	259.2	67	69		51	5
3	40		129	0.28		1.90	263.1	63	73		49	5
A 1	0/45		128	0.30		2.05	266.7	63	65		48	9
2	50		131	0.30		2.05	270.6	63	67		49	10
3	55		135	0.31		2.10	274.6	63	68		49	4
	60						279.129					
Av		1.50	131.1		.5391	1.9917	46.764		64.0			

TIME END = 3:58

POST TEST LEAK CHECKS
METER 0.000 @ 10 in. Hg
PITOTS 0.00 @ 3 in. H,O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1 (IPA)	2 (H_2O_2)	3	4	SILICA GEL WEIGHT g
FINAL	138	142	128		232.6
INITIAL	100	100	100		200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

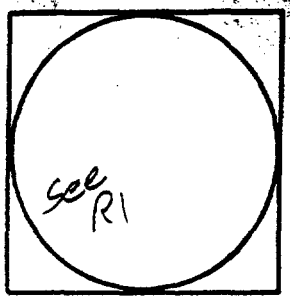
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

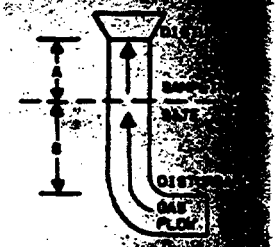
PLANT Pure Air
DATE 6-9-94
LOCATION FGD Inlet
OPERATOR TS
STACK NO.
RUN NO. 1 HCL/MS
SAMPLE BOX NO.
METER BOX NO. A2
METER ΔH @ 1.
Y = 1.001
TIME START = 9:23 AM

AMBIENT TEMPERATURE 70
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5'
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH — SCHEMATIC OF STACK



CROSS SECTION



K = .87

PRE TEST LEAK CHECKS
METER .015 @ 16 in. Hg
PITOTS @ in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	655.951 Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	2.5	+.55	320	1.5		1.31	657.500	63	66			4
2	5.0		321	1.7		1.48	659.010	72	67			4
3	7.5		322	1.8		1.57	660.42	74	67			5
4	10.0		325	2.0		1.74	662.23	74	68			6
B 1	12.5		328	1.4		1.22	663.67	74	68			6
2	15.0		329	1.5		1.31	665.28	74	68			5
3	17.5		330	1.7		1.48	666.79	73	69			5
4	20.0		337	1.9		1.65	668.61	72	69			5
C 1	22.5		335	1.7		1.48	670.21	72	69			5
2	25.0		338	1.7		1.48	671.79	73	64			5
3	27.5		340	1.6		1.39	673.39	73	69			5
4	30.0		338	1.9		1.65	675.15	73	69			5
D 1	32.5		342	2.0		1.74	676.90	72	69			6
2	35.0		344	2.1		1.83	678.66	72	69			6
3	37.5		344	2.2		1.91	680.51	68	68			5
4	40.0		348	1.5		1.38	682.31	67	67			4
E 1	42.5		342	1.4		1.22	683.96	67	67			4
2	45.0		344	1.1		.96	685.31	66	67			4
3	47.5		345	1.0		.87	687.29	68	66			3
4	50.0		345	1.1		.96	688.20	67	66			3
F 1	52.5		340	.60		.52	689.92	67	66			1
2	55		342	.65		.57	690.41	67	66			1
3	57.5		343	.45		.39	691.42	67	65			1
4	60		345	.35		.30	692.10	67	65			1
Av												

TIME END = 10:40

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	152	84			260.5
INITIAL	100	100			245.2
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

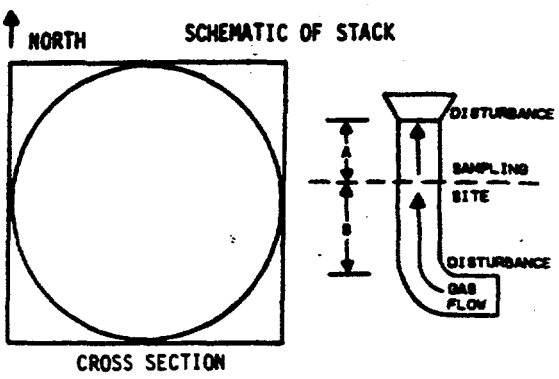
POST TEST LEAK CHECKS
METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-9-94
LOCATION FGD Inlet
OPERATOR BF
STACK NO. FGD inlet
RUN NO. 2 PART HCL
SAMPLE BOX NO. —
METER BOX NO. A2
METER ΔH @ 1.903
Y = 1.001
TIME START = 11:27

AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE —
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.



K=.87

PRE TEST LEAK CHECKS
METER .004 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 696.772	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	2.5	+5.6	322	1.5		1.31	698.36	68	67			2
2	5.0		321	1.6		1.39	699.97	69	67			2
3	7.5		321	1.8		1.57	701.65	69	68			4
4	10		322	2.0		1.74	703.43	69	68			5
B 1	12.5		330	1.4		1.22	704.96	69	67			2
2	15		330	1.6		1.39	706.52	69	67			2
3	17.5		331	1.6		1.39	708.09	69	67			2
4	20		333	1.8		1.57	709.77	69	67			3
C 1	22.5		335	1.6		1.39	711.34	68	66			2
2	25		335	1.7		1.48	712.91	68	66			3
3	27.5		336	1.8		1.57	714.59	68	66			4
4	30		338	2.0		1.74	716.34	68	66			4
D 1	32.5		341	2.1		1.83	718.11	68	66			4
2	35		344	2.2		1.91	719.91	68	66			4
3	37.5		345	1.6		1.39	721.48	67	66			2
4	40		346	1.5		1.31	723.04	67	66			2
E 1	42.5		342	1.3		1.13	724.53	68	66			2
2	45		343	1.2		1.04	725.91	69	66			2
3	47.5		344	1.0		.87	727.21	70	67			2
4	50		346	1.0		.87	728.47	71	67			2
F 1	52.5		349	.65		.57	729.55	71	67			2
2	55		348	.60		.52	730.54	71	68			2
3	57.5		349	.45		.39	731.41	71	68			2
4	60		350	.38		.33	732.2	71	68			2
Av												

TIME END = 1255

POST TEST LEAK CHECKS
METER .000 @ 5 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT 9
FINAL	120	120			~~254.2~~ 265.4
INITIAL	100	100			~~229.5~~ 253.0
LIQUID COLLECTED	20	20			12.4
TOTAL VOLUME COLLECTED				40	52.4

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

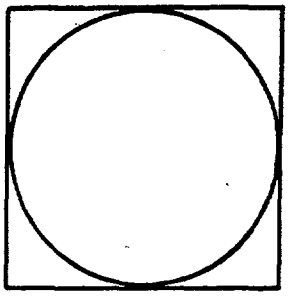
PARTICULATE FIELD DATA

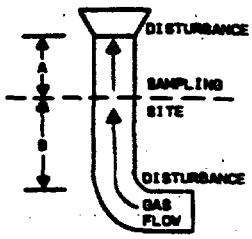
PLANT Pure Air
DATE 6-9-94
LOCATION FGD Inlet
OPERATOR BF
STACK NO. FGD inlet
RUN NO. 3 M-5
SAMPLE BOX NO. ___
METER BOX NO. A2
METER ΔH @ 1.903
Y = 1.001
TIME START = 13:19

AMBIENT TEMPERATURE ___
BAROMETRIC PRESSURE ___
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK





CROSS SECTION

K = .87

PRE TEST LEAK CHECKS

METER .005 @ 15 in. Hg
PITOTS ___ @ ___ in. H₂O
ORSAT ___

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 737.283	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	2.5		320	1.4		1.22	738.80	67	66			2
2	5		320	1.7		1.48	740.42	67	66			2
3	7.5		322	1.8		1.57	742.14	68	67			2
4	10		322	2.0		1.74	743.91	68	67			2
C 1	12.5		330	1.3		1.13	745.4	68	67			2
2	15		328	1.6		1.39	746.95	68	66			2
3	17.5		331	1.6		1.39	748.47	68	66			2
4	20		333	1.8		1.57	750.2	69	66			2
E 1	22.5		334	1.7		1.48	751.78	69	67			2
2	25		335	1.7		1.48	753.45	70	67			2
3	27.5		335	1.8		1.57	755.16	71	68			2
4	30		336	2.0		1.74	756.94	72	68			3
D 1	32.5		340	2.1		1.83	758.76	72	68			3
2	35		345	2.1		1.83	760.58	73	69			3
3	37.5		345	1.5		1.31	762.18	72	70			2
4	40		348	1.5		1.31	763.75	74	71			2
G 1	42.5		341	1.4		1.22	765.35	76	71			2
2	45		342	1.1		.96	766.74	77	72			2
3	47.5		344	1.0		.87	768.02	79	72			2
4	50		344	1.0		.87	769.32	79	72			2
F 1	52.5		345	.62		.54	770.35	80	72			2
2	55		349	.64		.56	771.35	78	72			2
3	57.5		350	.48		.42	772.21	78	72			2
4	60		350	.40		.35	773.01	76	72			2
Av												

TIME END = ___

POST TEST LEAK CHECKS

METER 0.01 @ 5 in. Hg
PITOTS ___ @ ___ in. H₂O
ORSAT ___

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	120	136			276.10
INITIAL	100	100			265.81
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT _____

DATE 6-9-94

LOCATION _____

OPERATOR BF

STACK NO. FGD inlet

RUN NO. 1-3 PART

SAMPLE BOX NO. _____

METER BOX NO. A2

METER ΔH @ _____

Y = _____

TIME START = _____

AMBIENT TEMPERATURE _____

BAROMETRIC PRESSURE _____

ASSUMED MOISTURE, % _____

PROBE LENGTH, in. _____

NOZZLE DIAMETER, in. _____

STACK DIAMETER, in. _____

PROBE HEATER SETTING _____

HEATER BOX SETTING _____

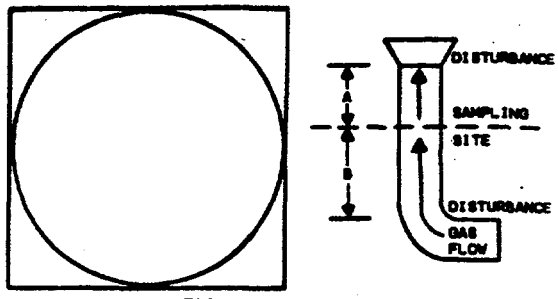
Δ Cp FACTOR _____

FILTER NO. _____

FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER _____ @ _____ in. Hg

PITOTS _____ @ _____ in. H₂O

ORSAT _____

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		330	1.1		.96	774.31	76	71			2
2	65		330	1.1		.96	775.66	75	71			2
3	67.5		331	.61		.53	776.67	73	70			2
4	70		331	.46		.40	777.582	72	70			2
Av			335.8	1.131		1.167		68.8				

TIME END = 14:40

POST TEST LEAK CHECKS

METER _____ @ _____ in. Hg

PITOTS _____ @ _____ in. H₂O

ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

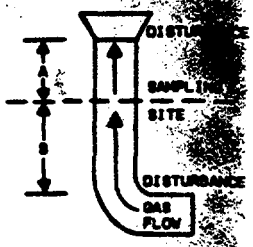
PLANT Pure Air
DATE 6-9-94
LOCATION E6D ZN of A
OPERATOR MTR
STACK NO. N
RUN NO. 1 M5
SAMPLE BOX NO. —
METER BOX NO. A1
METER ΔH @ 1.885
Y = 1.007
TIME START = 9:15

AMBIENT TEMPERATURE —
BAROMETRIC PRESSURE 29.75
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 141
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

CROSS SECTION

SCHEMATIC OF STACK



K=.85

PRE TEST LEAK CHECKS
METER .010 @ 16 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT —

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 375.462	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A1	2.5	+5.5	321	1.6		1.36	376.88	75	69			4"
2	5		321	1.6		1.36	378.51	75	70			4
3	7.5		323	1.8		1.53	380.14	79	70			4
4	10		324	1.9		1.62	381.84	80	71			4
B1	12.5		327	1.4		1.19	383.27	80	71			4
2	15		328	1.6		1.36	384.62	80	71			4
3	17.5		330	1.6		1.36	386.45	81	72			4
4	20		333	1.9		1.62	386.21	80	71			4
C1	22.5		336	1.6		1.36	389.761	80	72			5
2	25		337	1.6		1.36	391.38	79	72			5
3	27.5		335	1.7		1.45	392.98	80	72			5
4	30		338	1.9		1.62	394.91	81	72			6
D1	32.5		332	2.1		1.78	396.8	81	73			6
2	35		335	2.1		1.78	398.93	81	73			6
3	37.5		336	2.1		1.78	400.15	72	70			6
4	40		339	1.6		1.36	401.75	73	70			6
E1	42.5		344	1.4		1.19	403.3	74	69			6
2	45		344	1.2		1.02	404.63	74	69			4
3	47.5		348	1.0		.85	405.91	74	69			4
4	50		350	1.0		.85	407.15	74	69			3
F1	52.5		344	.62		.527	408.110	73	69			3
2	55		348	.65		.55	409.15	73	69			3
3	57.5		352	.45		.38	410.971	72	68			
4	60		355	.35		.28	410.67	72	68			
Av												

TIME END = —

POST TEST LEAK CHECKS
METER 0 @ 6 in. Hg
PITOTS — @ — in. H₂O
ORSAT —

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL	100	100	100		
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

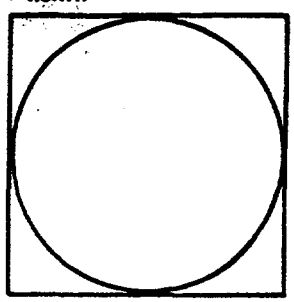
PARTICULATE FIELD DATA

PLANT Pace Air
DATE 6-9-94
LOCATION FGD Inlet
OPERATOR MTR
STACK NO.
RUN NO. 1 MG Sheet 2
SAMPLE BOX NO. A
METER BOX NO. A1
METER ΔH @ 1.855
Y = 1.007
TIME START =

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

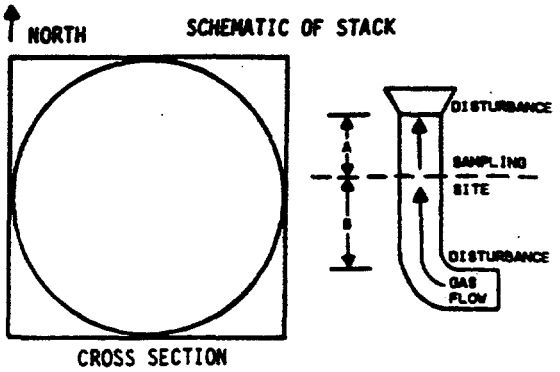
METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
G 1	C2.5		331	1.0		.85	411.9	68	68			4.5
2	65		331	1.0		.85	413.12	74	68			4
3	67.5		332	.65		.55	414.16	74	68			4
4	76		333	.48		.41	415.07	74	68			4

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-9-94
LOCATION EGD Inlet
OPERATOR MAR
STACK NO. EGD
RUN NO. 2 M8
SAMPLE BOX NO. —
METER BOX NO. A1
METER ΔH @ 1.855
Y = 1.007
TIME START = 1127

AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE —
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5'
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.



K=.85

PRE TEST LEAK CHECKS
METER .010 @ 15 in. Hg
PITOTS 0 @ 3 in. H,O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm ft³ 418.011	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	2.5	+5.6	316	1.6		1.36	419700	72	70	—	65	3
2	5.0		320	1.6		1.36	421.300	76	70	—	64	3
3	7.5		321	1.8		1.53	422.900	77	71	—	63	3
4	10.0		322	2.0		1.70	424.700	78	70	—	63	3
B 1	12.5		328	1.4		1.19	426.400	77	70	—	63	3
2	15.0		331	1.6		1.36	427.800	76	70	—	62	3
3	17.5		331	1.6		1.36	429.300	76	70	—	62	3
4	20.0		331	1.8		1.53	431.200	76	70	—	62	3
C 1	22.5		332	1.6		1.36	432.600	75	70	—	62	3
2	25.0		334	1.7		1.45	434.300	75	70	—	63	3
3	27.5		333	1.7		1.45	435.900	75	69	—	64	3
4	30.0		335	2.1		1.79	437.800	76	69	—	64	4
D 1	32.5		342	2.1		1.79	439.500	76	69	—	65	4
2	35.0		344	2.1		1.79	441.300	76	69	—	65	4
3	37.5		345	1.6		1.36	442.800	74	69	—	66	3
4	40.0		345	1.6		1.36	444.500	75	69	—	66	3
E 1	42.5		343	1.5		1.28	446.000	76	69	—	66	3
2	45.0		342	1.2		1.02	447.600	78	70	—	66	3
3	47.5		344	1.0		.85	448.700	79	70	—	66	3
4	50.0		344	1.1		.94	450.000	78	71	—	66	3
F 1	52.5		345	.65		.55	451.000	79	71	—	65	2
2	55.0		350	.68		.58	452.000	77	71	—	65	2
3	57.5		349	.45		.38	452.800	77	71	—	64	2
4	60.0		350	.35		.30	453.500	76	71	—	64	2
Av			336.6	1.147		1.159		72.5				

TIME END = 1255

POST TEST LEAK CHECKS
METER .005 @ 5 in. Hg
PITOTS 0 @ 3 in. H,O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					254.2
INITIAL					229.5
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

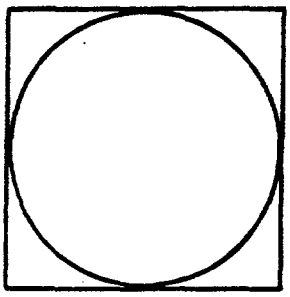
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-9-94
LOCATION FGD Inlet
OPERATOR MJR
STACK NO. FGD
RUN NO. 2 M 8
SAMPLE BOX NO. —
METER BOX NO. A1
METER ΔH @ 1.855
Y = 1.007
TIME START = 1227

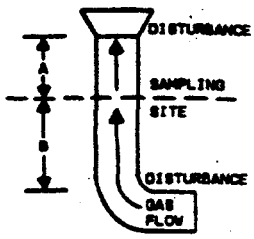
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 14
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 13.5
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		335	1.1		.94	454.800	76	71	—	65	3
2	65.0		336	1.1		.94	456.100	77	71	—	65	3
3	67.5		338	.65		.55	457.100	77	71	—	65	2
4	70.0		336	.45		.38	457.941	77	71	—	65	2
Av												

TIME END =

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

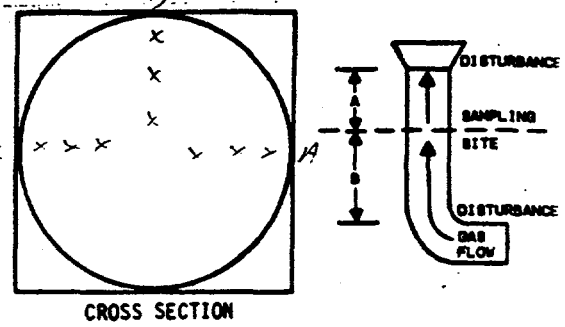
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/9/94
LOCATION Chesterton, IN
OPERATOR TR/GB
STACK NO. FGD OUTLET
RUN NO. R1 RM 5B/26A
SAMPLE BOX NO. Apex
METER BOX NO. A3
METER ΔH @ 1.875
Y = .999
TIME START = 9:19

AMBIENT TEMPERATURE 61
BAROMETRIC PRESSURE 29.80
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 33'
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320±25
Δ Cp FACTOR .84
FILTER NO. 675
FILTER TARE WEIGHT 596.3 mg.

NORTH B SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER 0.001 @ 12 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 129.367	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	5	+0.58	130	.30		2.3	133.4	69	69	305		5
2	10		128	.30		2.3	137.1	72	69	305		5
3	15		128	.29		2.2	140.8	75	69	305		5
B 4	20		129	.32		2.4	144.3	72	67	305		5
5	25		130	.37		2.8	149.0	75	68	308		5
6	30		132	.35		2.7	153.1	75	68	310		5
C 7	35		130	.31		2.4	157.1	77	67	318		5
8	40		128	.31		2.4	161.0	74	67	318		5
9	45		128	.30		2.3	164.9	74	66	318		5
10	50		128	.27		2.0	168.5	74	67	320		5
11	55		130	.26		2.0	172.3	73	69	320		5
12	60		128	.35		2.7	176.139	73	66	320		5
Av			129.08		.5568	2.375	146.772		70.21			

TIME END = 10:35

POST TEST LEAK CHECKS

METER .002 @ 10 in. Hg
PITOTS 0.0 @ 5 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	210	127		—	
INITIAL	100	100	0	56	200
LIQUID COLLECTED				—	
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

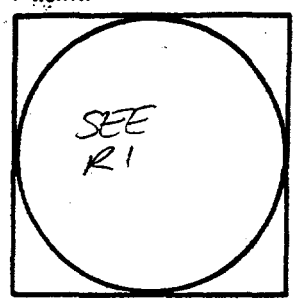
PARTICULATE FIELD DATA

PLANT PURE AIR
DATE 6-9-94
LOCATION PORTER, IN
OPERATOR GB, TR
STACK NO. FGD OUTLET
RUN NO. R2, MS-M26
SAMPLE BOX NO. Apex
METER BOX NO. A3
METER ΔH @ 1.875
Y = .999
TIME START = 11:27

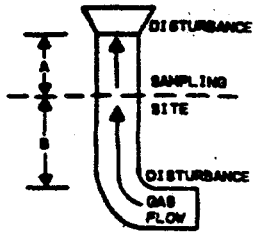
AMBIENT TEMPERATURE 65°F
BAROMETRIC PRESSURE 29.80
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 33'
PROBE HEATER SETTING 320 ± 25
HEATER BOX SETTING 320 ± 25
Δ Cp FACTOR .84
FILTER NO. 750
FILTER TARE WEIGHT 592.3 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.002 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm (ft³) 188.650	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5	+.61	131	.33		2.51	192.9	62	63	321	61	5
2	10		130	.34		2.58	197.0	67	63	319	60	5
3	15		126	.30		2.28	200.6	74	65	317	59	5
4	20		128	.32		2.43	204.5	67	65	312	59	5
5	25		127	.30		2.28	208.3	75	66	321	58	5
6	30		126	.30		2.28	212.2	76	67	319	58	5
7	35		129	.31		2.36	216.3	68	68	323	59	5
8	40		130	.32		2.43	220.0	75	67	312	58	5
9	45		130	.32		2.43	223.9	75	67	314	58	5
10	50		126	.30		2.28	227.8	74	68	319	58	5
11	55		128	.28		2.13	231.4	75	66	320	57	4
12	60		128	.34		2.58	235.478	73	67	320	57	5
Av			128.3	.559		2.38		68.9				

TIME END = 1250

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	250	126			
INITIAL	100	100	0	56	200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

POST TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

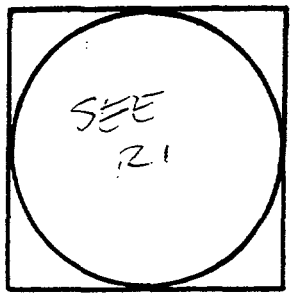
PARTICULATE FIELD DATA

PLANT PURE AIR
DATE 6-9-94
LOCATION PORTER, IN
OPERATOR GB, TR
STACK NO. FGD OUTLET
RUN NO. R3, RM5B
SAMPLE BOX NO. ACON
METER BOX NO. #3
METER ΔH @ 1.875
Y = 1.009
TIME START = 1317

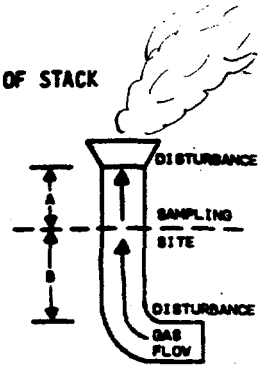
AMBIENT TEMPERATURE 61°
BAROMETRIC PRESSURE 29.80
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 33'
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320 ± 25
Δ Cp FACTOR .84
FILTER NO. 0709
FILTER TARE WEIGHT 600.1 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .002 @ 13 in. Hg
PITOTS OK @ 5 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm (ft³) 235.665	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5		128	.31		2.36	239.6	65	61	310		5
2	10		128	.38		2.89	243.8	69	61	312		5
3	15		130	.31		2.36	247.7	71	61	312		5
4	20		130	.30		2.28	251.6	69	62	315		4
5	25		129	.32		2.43	255.5	70	62	313		4
6	30		129	.27		2.05	259.1	70	62	310		4
7	35		130	.25		1.90	262.4	69	61	310		3
8	40		128	.31		2.36	266.3	69	61	312		5
9	45		129	.31		2.36	270.2	71	62	315		5
10	50		131	.32		2.43	274.1	72	62	315		5
11	55		130	.30		2.28	277.9	73	63	312		5
12	60		128	.35		2.66	282.033	73	63	312		5
Av			129.1	.5568		2.36		65.5				

TIME END = 1430

POST TEST LEAK CHECKS

METER .002 @ 10 in. Hg
PITOTS OK @ 5 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	214	122			
INITIAL	100	100	—	56	
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

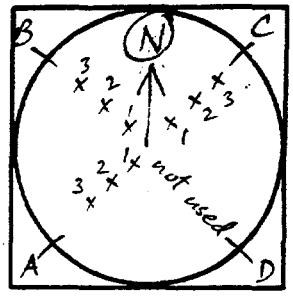
PARTICULATE FIELD DATA

PLANT Air Products
DATE 6-9-94
LOCATION Porter, IN
OPERATOR EJK
STACK NO. FGD Exhaust (Stack)
RUN NO. 1 - M8
SAMPLE BOX NO. A3
METER BOX NO. A4
METER ΔH @ 1.731
Y = 0.997
TIME START = 9:25

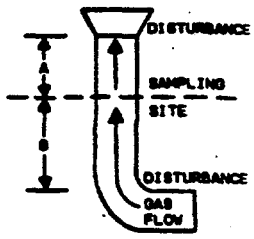
AMBIENT TEMPERATURE 58 °F
BAROMETRIC PRESSURE 29.80" Hg
ASSUMED MOISTURE, % 15
PROBE LENGTH, ~~in.~~ 18 ft
NOZZLE DIAMETER, in. 0.312
STACK DIAMETER, ~~in.~~ 33 ft
PROBE HEATER SETTING —
HEATER BOX SETTING 150 °F
Δ Cp FACTOR 0.84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.000 @ 12 in. Hg
PITOTS 0.00 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	0	+0.5	127	0.32		2.20	288.972	61	61	154	57	3
2	5		132	0.33		2.25	293.3	61	67	156	56	3
3	10		129	0.32		2.20	297.5	62	74	155	56	3
A 1	15		129	0.34		2.30	301.7	63	77	153	55	3
2	20		129	0.33		2.25	306.0	64	78	155	54	4
3	25		131	0.31		2.10	310.0	65	78	153	53	7
C 1	30		133	0.32		2.20	314.1	64	72	150	55	9
2	35		134	0.31		2.10	318.2	64	73	151	54	10
3	40		131	0.33		2.25	322.1	64	71	154	52	12
B 1	45		133	0.32		2.20	326.2	63	64	152	55	14
2	50		130	0.35		2.40	330.7	63	64	156	54	15
3	55		128	0.30		2.05	334.6	63	64	159	53	16
	60						338.846					
Av		+.50	130.5		.5685	2.268	49.874		66.7			

TIME END = 10:38

POST TEST LEAK CHECKS

METER 0.001 @ 19 in. Hg
PITOTS 0.00 @ 3 in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1 (IPA)	2 (H_2O_2)	3	4	SILICA GEL WEIGHT g
FINAL	100	140	146		
INITIAL	100	100	100		200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

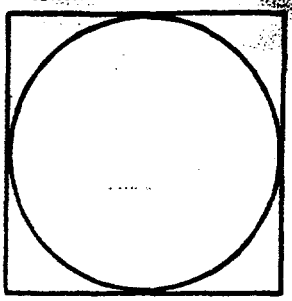
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-13-94
LOCATION
OPERATOR
STACK NO. Inlet
RUN NO. Test 1 M2/5
SAMPLE BOX NO.
METER BOX NO.
METER ΔH @
Y =
TIME START =

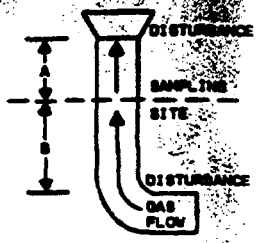
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
C1	625			0.70	.83666	.55	747.900	86	89			1
2	650			0.70	"	.55	749.100	86	89			1
3	675			0.56	.74833	.44	749.900	86	89			1
4	700			0.40	.63246	.31	750.875	86	89			1
					28.72724			84.6				
					1.02599	.828						
Av												

TIME END =

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Air Products — AMBIENT TEMPERATURE 89

DATE 6-13-96 — BAROMETRIC PRESSURE 29.90

LOCATION Portland, TN — ASSUMED MOISTURE, % 3

OPERATOR EJK — PROBE LENGTH, in. 16'

STACK NO. RCO Inlet — NOZZLE DIAMETER, in. 0.185

RUN NO. 2-HCL — STACK DIAMETER, ~~in.~~ 13.5' X

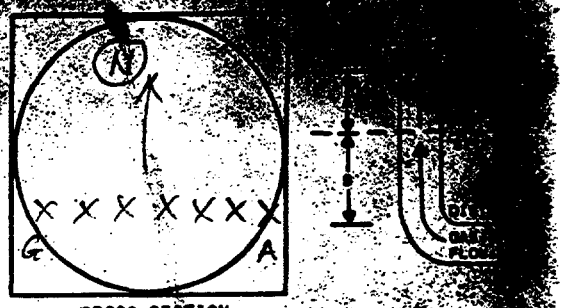
SAMPLE BOX NO. — PROBE HEATER SETTING —

METER BOX NO. RAC 9 — HEATER BOX SETTING —

METER ΔH @ 1.7771 — Δ Cp FACTOR 0.84

Y = 0.9993 — FILTER NO. —

TIME START = 12:36 — FILTER TARE WEIGHT _____ mg.



CROSS SECTION

PRE-TEST LEAK CHECKS

METER 0.001 @ 11 in. Hg

PITOTS 0.00 @ 2 in. H₂O

ORSAT OK

K = .78

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	ΔP in H₂O	√ΔP / Δp	ΔH in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in. Hg)
A 1	0	+5.6	340		1.3	1.01	759.650	88	88	—	—	4
2	2.5		339		1.3	1.01	761.35	89	88			4
3	5		337		1.4	1.09	763.02	90	89			5
4	7.5		336		1.4	1.09	764.73	91	89			5
B 1	10		342		1.5	1.17	766.45	92	90			6
2	12.5		345		1.5	1.17	768.24	93	91			6
3	15		346		1.4	1.09	769.98	93	92			7
4	17.5		342		1.1	0.86	771.78	94	92			8
C 1	20		336		1.3	1.01	773.59	90	90			6
2	22.5		339		1.3	1.01	775.1	91	90			6
3	25		341		1.4	1.09	776.7	92	91			8
4	27.5		341		1.4	1.09	778.4	93	91			9
D 1	30		344		1.7	1.33	779.7	91	90			5
2	32.5		346		1.7	1.33	781.4	91	90			5
3	35		344		0.85	0.66	783.50	92	90			4
4	37.5		342		1.50	1.17	784.9	93	91			5
G 1	40		343		.85	0.66	786.1	90	89			6
2	42.5		341		0.95	0.74	787.1	91	89			6
3	45		340		1.10	0.86	788.3	92	90			5
4	47.5		340		1.00	0.78	790.1	92	90			5
E 1	50		335		0.80	0.62	791.5	89	89			7
2	52.5		336		0.96	0.90	793.9	91	90			8
3	55		335		0.96	0.90	796.0	92	90			9
4	57.5		334		0.26	0.20	798.2	93	91			9
Av	60		334.9				8003	89.3				

TIME END = _____

POST TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME 1 HCl	2 HCl	3	4	SILICA GEL WEIGHT
	ml				g
FINAL	244				211
INITIAL	100	100			200
LIQUID COLLECTED	144				11
TOTAL VOLUME COLLECTED			55		

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2 &
1		6.3	12.5		
2					
3					
4					

g2d2

PARTICULATE FIELD DATA

PLANT Air Products

DATE 6-13-94

LOCATION Porter, IN

OPERATOR EJK

STACK NO. _____

RUN NO. 2-HCl

SAMPLE BOX NO. _____

METER BOX NO. _____

METER ΔH @ _____

Y = _____

TIME START = _____

AMBIENT TEMPERATURE _____

BAROMETRIC PRESSURE _____

ASSUMED MOISTURE, % _____

PROBE LENGTH, in. _____

NOZZLE DIAMETER, in. _____

STACK DIAMETER, in. _____

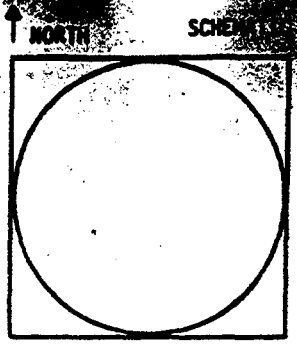
PROBE HEATER SETTING _____

HEATER BOX SETTING _____

Δ Cp FACTOR _____

FILTER NO. _____

FILTER TARE WEIGHT _____ mg.



PRE TEST LEAK CHECKS

METER _____ @ _____ in. Hg

PITOTS _____ @ _____ in. H₂O

ORSAT _____

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ p	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
C1	60	6		.72		.56	800.3	90	90	~	—	10
2	62.5			.70		.55	802.4	91	90			10
3	65			.58		.45	804.16	91	90			10
4	67.5			~~.48~~		.37	806.467					
IN	~~70~~											
				1.027		.904						
Av												

TIME END = _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

POST TEST LEAK CHECKS

METER _____ @ _____ in. Hg

PITOTS _____ @ _____ in. H₂O

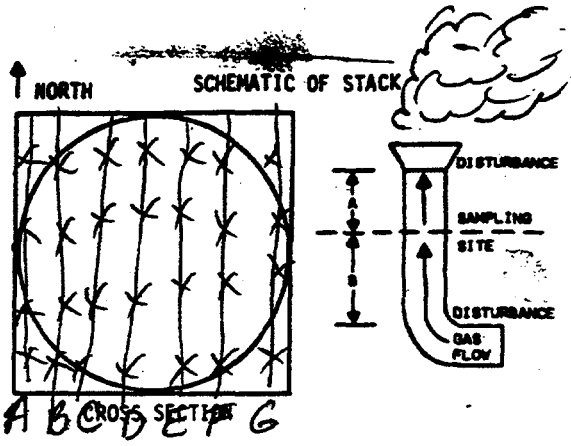
ORSAT _____

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-13-94
LOCATION PORTER, IN
OPERATOR EK, GB, MR, GE
STACK NO. FGD INLET
RUN NO. R1, Rm 8
SAMPLE BOX NO. —
METER BOX NO. A1
METER ΔH @ 1.855
Y = 1.007
TIME START = 10.10

AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.90
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 16'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 135' x ?
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg. 460.113



PRE TEST LEAK CHECKS
METER .004 @ 10 in. Hg
PITOTS 0.0 @ 5 in. H₂O
ORSAT OK

K = .85

	P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A	1	2.5		327	1.2		1.02	461.5	86	82			4
	2	5			1.4		1.19	463.1	87	83			4
	3	7.5			1.4		1.19	464.5	87	83			4
	4	10			1.3		1.11	466.0	86	83			4
B	5	12.5			1.4		1.19	467.5	86	83			4
	6	15			1.2		1.02	468.9	86	82			4
	7	17.5			1.2		1.02	470.3	86	81			4
	8	20			1.3		1.11	471.8	86	81			4
C	9	22.5			1.4		1.19	473.2	86	81			4
	10	25			1.4		1.19	474.7	86	81			4
	11	27.5			1.5		1.28	476.9	88	81			5
	12	30			1.8		1.53	478.0	88	81			5
D	13	32.5			1.5		1.28	479.6	89	82			5
	14	35			1.6		1.36	481.2	86	83			5
	15	37.5			1.5		1.28	482.8	86	83			5
	16	40			1.5		1.28	484.3	89	83			3
E	17	42.5			1.0		.85	485.7	89	83			3
	18	45			1.0		.85	487.0	89	83			3
	19	47.5			1.0		.85	488.3	89	84			3
	20	50			1.1		.94	489.7	90	84			4
F	21	52.5			1.0		.85	490.9	89	84			4
	22	55			.90		.77	492.2	89	84			3
	23	57.5			.52		.44	493.1	89	84			2
	24	60			.31		.26	493.8	89	84			2
	Av												

TIME END = _____

POST TEST LEAK CHECKS
METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL	100	100	100	86	200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

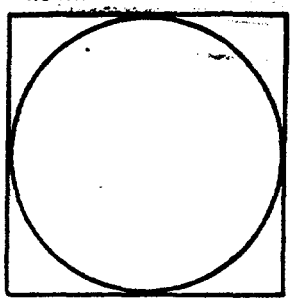
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-13-94
LOCATION Porter IN
OPERATOR GB, MR, GE, EK
STACK NO. FD inlet
RUN NO. R1, Rm 8
SAMPLE BOX NO. —
METER BOX NO. A1
METER ΔH @ 1.007
Y = 1.885
TIME START = _____

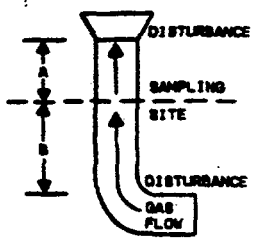
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.90
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 16'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 135"?
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER _____ @ _____ in. Hg
PITOTS _____ @ _____ in. H₂O
ORSAT _____

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ p	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
6												
25	67.5			.59	[illegible]	.50	494.8	89	84			3
26	65			.68	[illegible]	.58	495.9	89	84			3
27	67.5			.71	[illegible]	.61	497.0	89	84			3
28	70			.40	[illegible]	.34	497.809	89	84			2
Av			327		1.0476	.9671	37.696		85.29			

TIME END = 11:22

POST TEST LEAK CHECKS

METER _____ @ _____ in. Hg
PITOTS _____ @ _____ in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO₂	O₂	CO	N₂
1					
2					
3					
4					

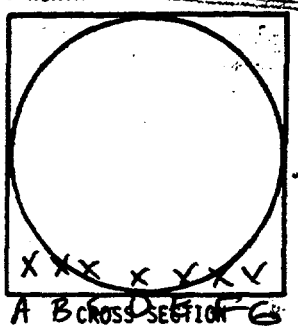
PARTICULATE FIELD DATA

PLANT DUBE AIR
DATE 6-13-94
LOCATION PORTER, IN
OPERATOR BL, GB, GE, MR
STACK NO. FGD INLET
RUN NO. R2, Rm8
SAMPLE BOX NO. —
METER BOX NO. A1
METER ΔH @ 1.855
Y = 1.007
TIME START = 12:36

AMBIENT TEMPERATURE 80 °F
BAROMETRIC PRESSURE 29.50
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 16'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 135' x ?
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.
502.287

NORTH

SCHEMATIC OF STACK



PRE TEST LEAK CHECKS

METER .003 @ 8 in. Hg
PITOTS OK @ 5 in. H₂O
ORSAT OK

.85

	P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A	1	2.5		340	1.2		1.02	503.70	88	88			2
	2	5		341	1.3		1.1	505.00	89	88			3
	3	7.5		339	1.3		1.1	506.42	90	88			4
	4	10		340	1.4		1.2	507.87	92	88			4
B	5	12.5		340	1.4		1.2	509.35	93	89			5
	6	15		343	1.5		1.27	510.86	94	89			5
	7	17.5		341	1.4		1.2	512.44	94	89			5
	8	20		340	1.2		1.02	513.99	94	89			5
C	9	22.5		338	1.4		1.2	515.45	94	89			5
	10	25		340	1.3		1.1	516.96	94	90			5
	11	27.5		340	1.4		1.2	518.46	94	89			5
	12	30		343	1.3		1.1	519.96	94	89			5
D	13	32.5		341	1.6		1.36	521.46	94	90			5
	14	35		341	1.8		1.53	523.07	93	90			5
	15	37.5		340	.91		.76	524.71	93	89			[redacted]3
	16	40		339	1.4		1.2	525.92	93	90			5
E	17	42.5		337	.90		.76	527.4	92	88			3.5
	18	45		340	.94		.80	528.71	92	88			3.5
	19	47.5		341	1.0		.85	529.90	92	88			4
	20	50		343	1.0		.85	531.29	92	88			4
F	21	52.5		340	.41		.35	532.62	94	88			2
	22	55		340	.38		.32	533.64	94	88			2
	23	57.5		343	.36		.30	534.42	92	88			2
	24	60		341	.30		.25	535.170	93	89			2
	Av												

TIME END = —

POST TEST LEAK CHECKS

METER .002 @ 7 in. Hg
PITOTS OK @ 5 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT PURE AIR

DATE 6-13-94

LOCATION _____

OPERATOR _____

STACK NO. _____

RUN NO. R2, Rm 8

SAMPLE BOX NO. _____

METER BOX NO. _____

METER ΔH @ _____

Y = _____

TIME START = _____

AMBIENT TEMPERATURE _____

BAROMETRIC PRESSURE _____

ASSUMED MOISTURE, % _____

PROBE LENGTH, in. _____

NOZZLE DIAMETER, in. _____

STACK DIAMETER, in. _____

PROBE HEATER SETTING _____

HEATER BOX SETTING _____

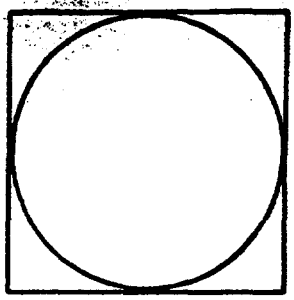
Δ Cp FACTOR _____

FILTER NO. _____

FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER @ in. Hg

PITOTS @ in. H₂O

ORSAT .85

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 535.170	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
25	62.5		340	.62		.52		91	88			3
26	65		342	.56		.47	536.87	91	88			3
27	67.5		340	.39		.33	537.853	90	88			3
28	70		344	.32		.27		92	88			3
Av			340.5		0.7887	0.3796	35.566		90.5			

TIME END = _____

POST TEST LEAK CHECKS

METER @ in. Hg

PITOTS @ in. H₂O

ORSAT _____

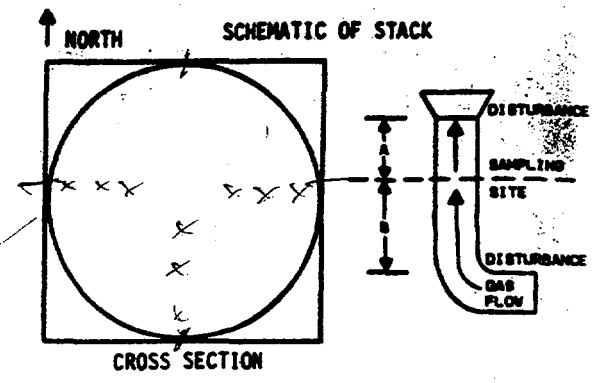
VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/13/94
LOCATION Portage Ind
OPERATOR TR/TS
STACK NO. Stack
RUN NO. 1 RM5B/26A
SAMPLE BOX NO. A3
METER BOX NO. A3
METER ΔH @ 1.675
Y = .999
TIME START = 10:13

AMBIENT TEMPERATURE 73
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 16'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31'
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320 ± 25
Δ Cp FACTOR .84
FILTER NO. # 693
FILTER TARE WEIGHT 597.2 mg.



7.6

PRE TEST LEAK CHECKS
METER 0.001 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1 1	5	+.65	128	.34		283.671 287.91	2.58	83	77	325		6
2	10		130	.32		291.62	2.50	82	77	326		6
3	15		131	.34		295.66	2.58	84	77	327		6
2 1	20		134	.34		297.81	2.58	85	78	328		5
2	25		134	.33		301.69	2.57	88	79	328		5
3	30		134	.33		307.99	2.57	84	80	328		5
3 1	35		134	.31		312.98	2.42	90	81	330		5
2	40		135	.30		316.05	2.38	91	82	330		5
3	45		136	.29		319.97	2.26	91	82	328		5
	50		136	.34		323.61	2.58	92	83	328		5
	55		136	.33		327.71	2.57	93	83	328		5
	60		137	.33		331.53	2.57	92	84	329		5
Av			(133.8)		(.5699)	(47.865)	2.513		(84.3)			5.25

.5699 V_m $\sqrt{\Delta H}$

TIME END = 11:25

POST TEST LEAK CHECKS
METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT

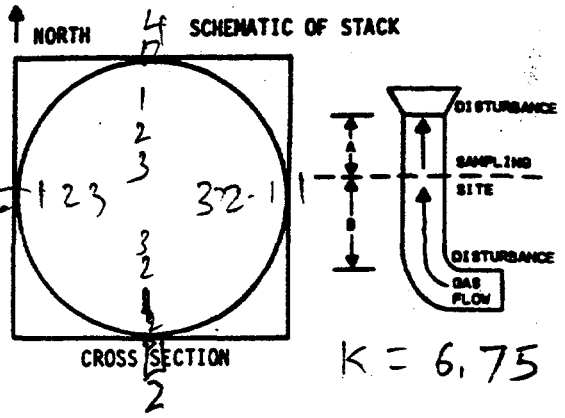
VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	220	120	20		208
INITIAL	100	100	000		200
LIQUID COLLECTED	120	20	20		8
TOTAL VOLUME COLLECTED	168 total				

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.6	6.8		
2					
3					
4					

PARTICULATE FIELD DATA (M8)

PLANT PWR A'Y / NIPSCO
DATE 6/9/94
LOCATION Stack Ind
OPERATOR C.T
STACK NO. FGD Out
RUN NO. 2 / M8
SAMPLE BOX NO. A3
METER BOX NO. A4
METER ΔH @ 1.731
Y = 0.997
TIME START = 11:30

AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 29.8
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. 0.312
STACK DIAMETER, in. 33
PROBE HEATER SETTING —
HEATER BOX SETTING 180
Δ Cp FACTOR 0.84
FILTER NO. —
FILTER TARE WEIGHT — mg.



K = 6.75

PRE TEST LEAK CHECKS
METER 0.002 @ 17 in. Hg
PITOTS ✓ @ 0.5 in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1-1	0	+05	135	0.36		2.43	354.591	59	59	168	51	4.5
2	5		132	0.35		2.36	359.03	59	69	175	51	4.0
3	10		124	0.33		2.23	363.38	60	73	177	53	4.0
2-1	15/0		141	0.38		2.57	367.62	59	62	175	53	4.5
2	5		138	0.35		2.36	372.09	62	77	178	53	5.0
3	10		129	0.33		2.23	376.48	63	78	177	53	5.0
3-1	15/0		125	0.42		2.84	380.50	63	63	170	53	5.0
2	5		127	0.33		2.23	385.28	63	69	175	55	5.7
3	10		128	0.33		2.23	389.41	64	76	176	55	4.6
4-1	15/0		133	0.35		2.36	393.79	64	65	170	57	4.5
2	5		135	0.35		2.36	398.18	64	70	169	57	4.6
3	10		129	0.34		2.30	402.54	64	72	174	58	4.6
	15						406.878					
Av			132.2	.593		~~2.59~~ 2.37		63.5				

TIME END = 12:45

POST TEST LEAK CHECKS
METER 0.002 @ 18 in. Hg
PITOTS 0.0 @ 2 in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME 80% IPA	32 ml H_2O_2	32 H_2O_2	4	SILICA GEL WEIGHT g
FINAL	147	150	124		
INITIAL	100	100	100		200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

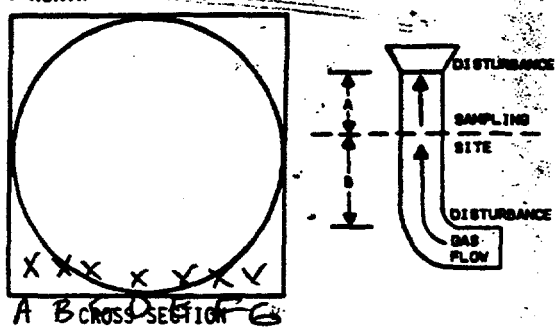
PARTICULATE FIELD DATA

PLANT: PURE AIR
DATE: 6-13-94
LOCATION: PORTER, IN
OPERATOR: EK, GB, GE, MR
STACK NO.: FGD INLET
RUN NO.: R2, Rm8
SAMPLE BOX NO.: —
METER BOX NO.: A1
METER ΔH @: 1.855
Y = 1.007
TIME START = 12:36

AMBIENT TEMPERATURE: 80
BAROMETRIC PRESSURE: 29.50
ASSUMED MOISTURE, %: 3
PROBE LENGTH, in.: 16'
NOZZLE DIAMETER, in.: .185
STACK DIAMETER, in.: 135' x ?
PROBE HEATER SETTING: —
HEATER BOX SETTING: —
Δ Cp FACTOR: .84
FILTER NO.: —
FILTER TARE WEIGHT: — mg. 502.287

NORTH

SCHEMATIC OF STACK



PRE TEST LEAK CHECKS

METER .003 @ 8 in. Hg
PITOTS 0.0 @ 5 in. H₂O
ORSAT OK

.85

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δp	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	2.5		340	1.2		1.02	503.70	88	88			2
2	5		341	1.3		1.1	505.00	89	88			3
3	7.5		339	1.3		1.1	506.42	90	88			4
4	10		340	1.4		1.2	507.87	92	88			4
B 5	12.5		340	1.4		1.2	509.35	93	89			5
6	15		343	1.5		1.27	510.86	94	89			5
7	17.5		341	1.4		1.2	512.44	94	89			5
8	20		340	1.2		1.02	513.99	94	89			5
C 9	22.5		338	1.4		1.2	515.45	94	89			5
10	25		340	1.3		1.1	516.96	94	90			5
11	27.5		340	1.4		1.2	518.46	94	89			5
12	30		343	1.3		1.1	519.96	94	89			5
D 13	32.5		341	1.6		1.36	521.46	94	90			5
14	35		341	1.8		1.53	523.07	93	90			5
15	37.5		340	.91		.76	524.71	93	89			[redacted]3
16	40		335	1.4		1.2	525.92	93	90			5
E 17	42.5		339	.90		.76	527.4	92	88			3.5
18	45		340	.94		.80	529.71	92	88			3.5
19	47.5		341	1.0		.85	529.90	92	88			4
20	50		343	1.0		.85	531.29	92	88			4
F 21	52.5		340	.41		.35	532.62	94	88			2
22	55		340	.38		.32	533.64	94	88			2
23	57.5		343	.36		.30	534.42	92	88			2
24	60		341	.30		.25	535.170	93	89			2
Av												

TIME END = —

POST TEST LEAK CHECKS

METER .002 @ 7 in. Hg
PITOTS .02 @ 5 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

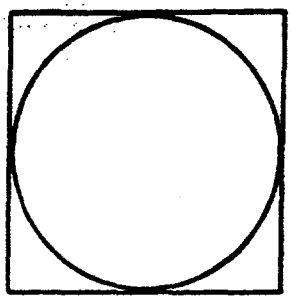
PARTICULATE FIELD DATA

PLANT PURE AIR
DATE 6-13-94
LOCATION
OPERATOR
STACK NO.
RUN NO. R2, Rm 8
SAMPLE BOX NO.
METER BOX NO.
METER ΔH @
Y =
TIME START =

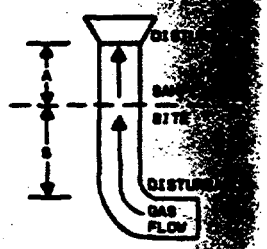
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT .05

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
25	62.5		340	.62		.52	535.170	91	88			3
26	65		342	.56		.47	536.87	91	88			3
27	67.5		340	.39		.33	537.853	90	88			3
28	70		344	.32		.27		92	88			3
Av			(340.5)		0.7887	(0.8796)	(35.566)		(90.5)			

TIME END =

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

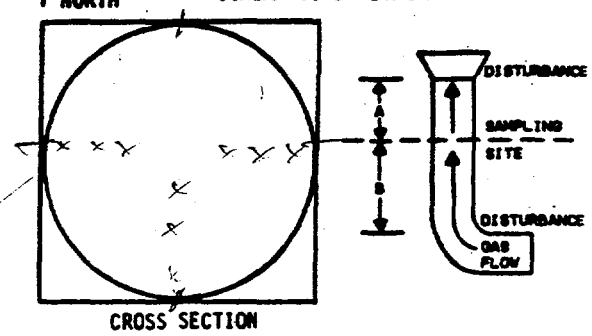
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/13/94
LOCATION Portage Ind
OPERATOR TR/TS
STACK NO. Stack
RUN NO. 1 RM5B/26A
SAMPLE BOX NO. A3
METER BOX NO. A3
METER ΔH @ 1.475
Y = .999
TIME START = 10:13

AMBIENT TEMPERATURE 73
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 16'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31'
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320 ± 25
Δ Cp FACTOR .84
FILTER NO. # 693
FILTER TARE WEIGHT 597.2 mg.

SCHEMATIC OF STACK



7.6

PRE TEST LEAK CHECKS

METER 0 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

283.671

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1 1	5	+.65	128	.34		287.91	2.58	83	77	325		6
2	10		130	.32		291.62	2.50	82	77	326		6
3	15		131	.34		295.66	2.58	84	77	327		6
2 1	20		134	.34		297.81	2.58	85	78	328		5
2	25		134	.33		301.69	2.57	88	79	328		5
3	30		134	.33		307.99	2.57	84	80	328		5
3 1	35		134	.31		312.98	2.42	90	81	330		5
2	40		135	.30		316.65	2.38	91	82	330		5
3	45		136	.29		319.97	2.26	91	82	328		5
	50		136	.34		323.61	2.58	92	83	328		5
	55		136	.33		327.71	2.59	93	83	328		5
	60		137	.33		331.53	2.57	92	84	329		5
Av			(133.8)	.327	(.5699)	(47.865)	2.513		(84.3)			5.5

TIME END = 11:25

.5699 V_m $\sqrt{\Delta H}$

POST TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	220	120	20		208
INITIAL	100	100	000		200
LIQUID COLLECTED	120	20	20		8
TOTAL VOLUME COLLECTED	168 total				

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.6	6.8	-	
2					
3					
4					-

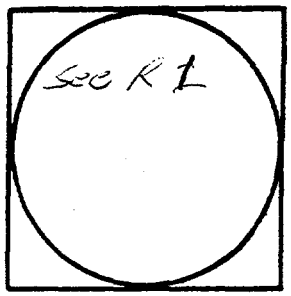
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-13-94
LOCATION Portage Ind
OPERATOR TR/TS
STACK NO. FCD outlet
RUN NO. R2 M5B/26A
SAMPLE BOX NO. _____
METER BOX NO. A3
METER ΔH @ 1.875
Y = .994
TIME START = 1234 AM

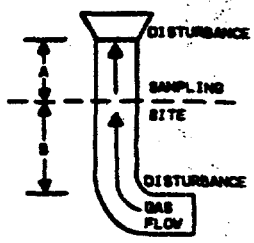
AMBIENT TEMPERATURE 75
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. 1.0"
STACK DIAMETER, in. 31.5"
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320±25
Δ Cp FACTOR _____
FILTER NO. _____
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



K' 7.6

PRE TEST LEAK CHECKS

METER 0.6001 @ 15 in. Hg
PITOTS _____ @ _____ in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 331.669	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5	+65	135	.25		1.90	335.21	85	85	325		7
	10		136	.24		1.82	338.69	91	85	326		6
	15		135	.24		1.82	342.11	94	86	326		6
2	20		135	.30		2.28	345.71	88	86	326		7
	25		136	.38		2.88	349.71	94	87	326		8
	30		136	.27		2.05	353.67	95	87	326		10
3	35		136	.26		1.98	357.37	92	87	326		7
	40		139	.29		2.20	360.99	96	87	326		7
	45		139	.35		2.66	364.69	96	87	326		7
	50		139	.30		2.28	368.44	97	88	326		7
	55		139	.32		2.43	361.98	97	88	326		7
	60											
Av			137		.54	2.21			90			

TIME END = _____

POST TEST LEAK CHECKS

METER _____ @ _____ in. Hg
PITOTS _____ @ _____ in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	208	116	D		228
INITIAL	100	100	0	56	200
LIQUID COLLECTED	108	16			28
TOTAL VOLUME COLLECTED	152 total				

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.5	6.9		
2					
3					
4					

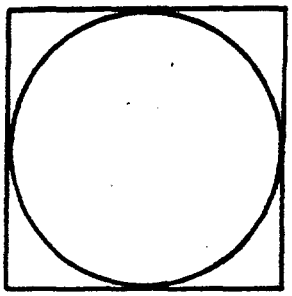
PARTICULATE FIELD DATA

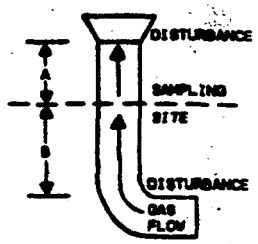
PLANT Pure Air
DATE 6-13-94
LOCATION Outlet
OPERATOR MTR
STACK NO.
RUN NO. 1 M-8
SAMPLE BOX NO.
METER BOX NO. A4
METER ΔH @
Y = .
TIME START = 10:13

AMBIENT TEMPERATURE 75
BAROMETRIC PRESSURE 29.5
ASSUMED MOISTURE, % 15
PROBE LENGTH, ~~in.~~ 18'
NOZZLE DIAMETER, in.
STACK DIAMETER, ~~in~~ 35'
PROBE HEATER SETTING 248 ± 25
HEATER BOX SETTING 248 ± 25
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK





CROSS SECTION

.65

K = 6.8

PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS ○ @ in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 420.293	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
A 1	5	+.65	128	.35	2.38	2.38	429.85	77	81	250	68	=
2	10		130	.35		2.38	428.98	77	81	230	68	2
3	15			.37		2.52	433.62	79	90	250		
B 1	20			.38		2.58	438.27	79	90	227		
2	25			.41		2.79	443.15	80	92	234		
3	30			.40		2.72	447.91	81	93	232		
C 1	35			.37		2.51	452.58	81	86	249		
2	40			.37		2.51	456.9	82	94	251		
3	45			.35		2.38	461.63	82	93	250		
D 1	50			.34		2.31	466.04	82	92	227		
2	55			.37		2.52	470.69	83	95	235		
3	60			.37		2.52	475.762	82	95	240		
Av			129.0	.607		2.51		83.8				

TIME END =

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	100				
INITIAL	100	100			
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

ASSUMED MOISTURE, % 12

PROBE LENGTH, in. 18

NOZZLE DIAMETER, in.

STACK DIAMETER, in. 35

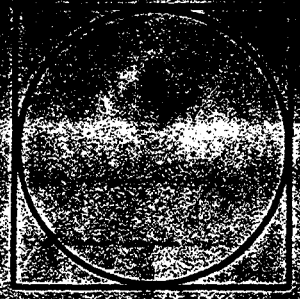
PROBE HEATER SETTING 248 ± 25

HEATER BOX SETTING 240 ± 25

ΔCp FACTOR

FILTER NO.

FILTER TARE WEIGHT mg



CROSS SECTION

k = 6.8

PRE TEST LEAK CHECK

METER 0

PITOTS ✓

ORSAT

	θ	STATIC PRESSURE in H₂O	Ts °F	ΔP in H₂O	√ΔP	ΔH in H₂O	Vm (Std)	Tm INLET °F	Tm OUTLET °F	CHECK TEMP		
1	5		130	.32	.56	2.17	498.76	84	90			
	10		128	.33		2.24	498.91	85	94			
	15		129	.37		2.51	497.57	86				
	20		131	.35		2.38	501.83	80				
2	25		130	.38		2.58	506.93	86				
3	30		128	.40		2.72	511.56	86				
C.1			132	.45		3.06	516.4	86				
2	40		130	.36		2.45	520.94	87				
3	45		132	.33		2.24	525.[illegible]	87				
D1	50		131	.32		2.17	529.21	87				
2	55		130	.36		2.45	533.71	87				
3	60		130	.33		2.24	538.13	87				

PARTICULATE FIELD DATA

PLANT [illegible] SCHEMATIC OF STACK

DATE 6/2/83

LOCATION Michigan City ASSUMED MOISTURE, % 3

OPERATOR A.S. PROBE LENGTH, in. 12

STACK NO. FGD inlet NOZZLE DIAMETER, in. .185

RUN NO. 1 12N28A STACK DIAMETER, in. 186X84

CROSS SECTION

SAMPLE BOX NO. — PROBE HEATER SETTING —

METER BOX NO. — HEATER BOX SETTING —

METER ΔH@ 1.903 Δ Cp-FACTOR .84

Y = 1.001 FILTER NO. Gelman #154

TIME START = 10:45 A.M. FILTER TARE WEIGHT 46,733.1 mg.

PRE TEST LEAK CHECK

METER 0.00 @ 4 in. Hg

PITOTS 0.00 @ 3 in. H₂O

ORSAT OK

K = .92

P #	Θ	STATIC PRESSURE (+/-) in H₂O	Ts °F	ΔP in H₂O	√ΔP	ΔH in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1 1	25	6.2	325	1.3		1.20	[illegible]	79	79	—	58	4
2	5		327	1.2		1.1	795.1	79	79		58	4
3	25		342	.95		.87	796.2	80	79		58	2
4	10		346	1.5		1.38	797.4	82	79		59	4
1 2	12.5		339	1.4		1.28	798.9	84	79		59	4
2	15		341	1.3		1.19	800.4	85	79		59	4
3			345	1.1		1.01	801.9	86	80		59	4
4	20		328	.87		.80	803.1	87	80		59	2
3 1			333	1.15		1.06	804.5	87	80		59	4
2	25		335	1.0		.92	805.9	87	80		59	4
3			330	.95		.87	807.3	87	81		59	[illegible]
4	30		338	1.0		.92	808.7	87	81		59	[illegible]
4 1			341	1.3		1.19	810.2	88	81		59	4
2	35		343	1.25		1.15	811.0	88	81		59	[illegible]
3			339	1.15		1.06	812.6	89	81		59	[illegible]
4	40		[illegible]	.90		.83	[illegible]	89	81		59	[illegible]
5 1			[illegible]	1.40		1.28	[illegible]	89	81		60	[illegible]
2	45		[illegible]	[illegible]		1.45	[illegible]	89	81		[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]		1.01	[illegible]	90	82		[illegible]	[illegible]
4	50		344	.95		.87	818.4	90	82		60	2
6 1			341	1.3		1.19	820.3	90	82		60	[illegible]
2	55		342	[illegible]		1.15	821.2	90	82		60	[illegible]
3	[illegible]		343	[illegible]		.92	823.5	90	82		60	[illegible]
4	60		[illegible]	[illegible]		1.01	824.9	90	82		[illegible]	[illegible]
Av												

TIME END =

POST TEST LEAK CHECK

METER [illegible] @ [illegible] in. Hg

PITOTS [illegible] @ [illegible] in. H₂O

ORSAT [illegible]

[illegible]	[illegible]	SILICA GEL WEIGHT
		[illegible] g
		[illegible]
		[illegible]
		[illegible]

Page 2

PARTICULATE FIELD DATA

PLANT Zeeland Mich.

DATE 6/27/95

LOCATION Michigan City

OPERATOR [illegible]

STACK NO. FGD inlet

RUN NO. 1 2 3 4

SAMPLE BOX NO.

METER BOX NO.

METER ΔH @ 1.903

Y = 1.001

TIME START =

AMBIENT TEMPERATURE

BAROMETRIC PRESSURE

ASSUMED MOISTURE, %

PROBE LENGTH, in.

NOZZLE DIAMETER, in.

STACK DIAMETER, in.

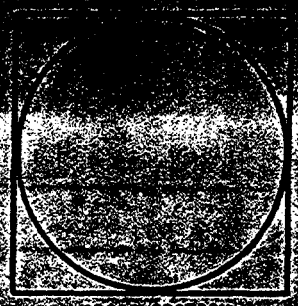
PROBE HEATER SETTING

HEATER BOX SETTING

Δ Cp FACTOR

FILTER NO.

FILTER TARE WEIGHT mg.



PRE-TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		342	1.35		1.24	826.4	91	82		61	6
2	65		328	1.20		1.10	827.4	91	82		61	6
3	67.5		336	.95		.87	829.0	91	82		61	5
4	70		340	.80		.74	830.329	91	82		61	2
Av			337.0	1.0525	1.0260	30.813		91	82		61	5

POST TEST LEAK CHECK

METER

PITOTS

ORSAT

PARTICULATE FIELD DATA

PLANT [illegible] TEMPERATURE [illegible]

DATE 6/2/87 BAROMETRIC PRESSURE [illegible]

LOCATION Nucla #1 Stack ASSUMED MOISTURE, % 3

OPERATOR [illegible] PROBE LENGTH, in. 12

STACK NO. FGD outlet NOZZLE DIAMETER, in. .185

RUN NO. 2 RUN 1 STACK DIAMETER, in. 136 X 34

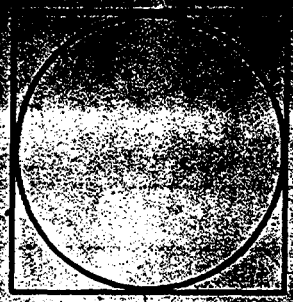
SAMPLE BOX NO. [illegible] PROBE HEATER SETTING [illegible]

METER BOX NO. [illegible] HEATER BOX SETTING [illegible]

METER ΔH@ 1.903 ΔCp FACTOR .84

Y = 1.001 FILTER NO. 181

TIME START 12:30 PM FILTER TARE WEIGHT 325.3480 mg. 331.711



CROSS SECTION

PRE TEST LEAK CHECKS

METER 0.000 @ 18 in. Hg

PITOTS 0.000 @ 3 in. H2O

ORSAT OK

P #	Θ	STATIC PRESSURE +/- in H2O	Ts °F	ΔP in H2O	√ΔP	ΔH in H2O	Vm (f³)	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	1		335	1.45		1.33	833.2	73	71	—	59	2
	2			1.3		1.19	834.7	75	71			2
	3	75		1.15		1.06	836.4	77	71			2
	Y	70		.95		.87	837.7	78	71			1
2	1			1.35		1.24	838.8	78	72			2
	2	15		1.20		1.10	840.3	78	72			2
	3			1.15		1.06	841.6	77	72			2
	Y	20		.90		.83	843.0	76	72			1
3	1			1.20		1.10	844.3	76	72			2
	2	25		1.10		1.01	845.6	76	72			2
	3			.95		.87	847.0	76	72			1
	Y	30		.80		.74	848.3	76	71			1
Y	1	35		1.35		1.24	849.4	77	71			2
	2	35		1.15		1.06	851.1	78	71			2
	3			1.0		.92	852.4	78	71			2
	Y	40		.95		.87	853.7	78	71			1
5	1			1.30		1.19	854.9	78	71			2
	2	45		1.20		1.06	856.1	78	71			2
	3			1.05		0.97	857.8	78	71			2
	Y	50		.90		.83	859.1	76	71			1
6	1			1.20		1.20	860.2	77	71			2
	2	55		1.30		1.19	861.8	78	71			2
	3			1.20		1.0	863.3	78				2
	Y	60		1.0		.92	864.6					1
AV												

TIME END [illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

PARTICULATE FIELD DATA

DATE 6/22/11 — BAROMETRIC PRESSURE

LOCATION Pasadena, Tx — ASSUMED MOISTURE, %

OPERATOR AS — PROBE LENGTH, in.

STACK NO. FGD Inlet — NOZZLE DIAMETER, in.

RUN NO. 2 2A — STACK DIAMETER, in.

SAMPLE BOX NO. — PROBE HEATER SETTING

METER BOX NO. — HEATER BOX SETTING

METER ΔH@ — Δ Cp FACTOR

Y = — FILTER NO.

TIME START = — FILTER TARE WEIGHT mg.

SCHEMATIC OF STACK

CROSS SECTION

PRE TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT

P#	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP °F	VACUUM (in Hg)
1	62.5			1.40		1.30	866.2	78	77	—	60	2
2	65			1.30		1.19	867.4	78	76		↓	2
3	67.5			1.25		1.15	868.7	78	77			2
4	70			1.1		1.19	870.288	78	77			
Av												

TIME END = —

POST TEST LEAK CHECKS

METER

PITOTS

ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME	SILICA GEL WEIGHT
TOTAL VOLUME COLLECTED		

PARTICULATE FIELD DATA

PLANT [illegible] PLANT TEMP. [illegible] °C

DATE 3/6 & 7/94 BAROMETRIC PRESSURE 30.0

LOCATION Portage IN ASSUMED MOISTURE, % 8%

OPERATOR A. Vis PROBE LENGTH, in. 14

STACK NO. FGD mid NOZZLE DIAMETER, in. .196

RUN NO. 3 & M 17 STACK DIAMETER, in. [illegible]

SAMPLE BOX NO. — PROBE HEATER SETTING —

METER BOX NO. A2 HEATER BOX SETTING —

METER ΔH @ 1.903 Δ Cp FACTOR .84

Y = 1.001 FILTER NO. 2413

TIME START = 2:15 FILTER TARE WEIGHT 509.50 mg.

CROSS SECTION

PRE TEST LEAK CHECKS

METER .004 @ 20 in. Hg

PITOTS .00 @ 3 in. H₂O

ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm cf	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
							B9 2.058					
1	2.5		326	1.4		1.246	893.6	72	69			7
2	5.0		330	1.4		1.288	895.0	74	69			8
3	7.5		335	1.3		1.196	896.5	74	69			8
4	10.0		338	1.0		.92	897.9	75	69			7
1	12.5			1.6		1.472	899.2	76	69			10
2	15			1.6		1.472	880.8	75	69			10
3	17.5			1.5		1.38	882.4	74	69			10
4	20			1.3		1.19	883.9	74	70			10
1	22.5			1.6		1.47	885.4	75	70			10
2	25			1.4		1.28	887.1	76	70			10
3	27.5			1.2		1.104	888.6	78	70			9
4	30			.98		.901	890.0	79	71			8
1	32.5			1.5		1.38	891.3	81	71			10
2	35			1.3		1.196	892.8	82	72			10
3	37.5			1.2		1.104	894.3	82	72			10
4	40			1.1		1.012	895.8	83	73			9
1	42.5			1.5		1.38	897.2	84	73			11
2	45			1.4		1.28	898.7	84	74			10
3	47.5			1.4		1.28	900.2	83	74			10
4	50			1.3		1.196	901.8	83	75			10
1	52.5			1.4		1.28	903.2	83	75			10
2	55			1.3		1.196	904.8	83	74			10
3	57.5			1.3		1.196	906.3	83	76			10
4	60			.95		.910	907.8	83	76			9
Av			(332.3)			(1.543)	1.777	(1.730)		(75.7)		

TIME END = [illegible]

VOLUME OF H₂O(l) WATER COLLECTED	VOLUME WATER SILICA GEL	SILICA GEL WEIGHT
TOTAL		

PARTICU[illegible] FIELD DATA

PLANT [illegible]

DATE [illegible]

LOCATION [illegible]

OPERATOR [illegible]

STACK NO. FGD Inlet

RUN NO. 3 Run

SAMPLE BOX NO. [illegible]

METER BOX NO. [illegible]

METER ΔH @ [illegible]

Y = [illegible]

TIME START = [illegible]

BAROMETRIC PRESSURE [illegible]

ASSUMED MOISTURE, % [illegible]

PROBE LENGTH, in. [illegible]

NOZZLE DIAMETER, in. [illegible]

STACK DIAMETER, in. [illegible]

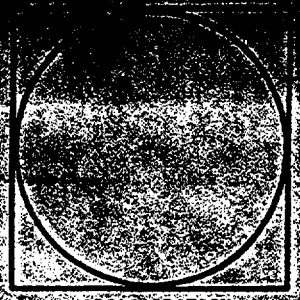
PROBE HEATER SETTING [illegible]

HEATER BOX SETTING [illegible]

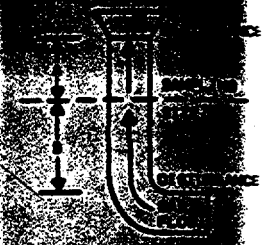
Δ Cp FACTOR [illegible]

FILTER NO. [illegible]

FILTER TARE WEIGHT [illegible] mg.



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT [illegible]

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		335	1.5		1.38	909.1	83	76			10
2	65		340	1.5		1.38	910.6	82	76			10
3	67.5		341	1.3		1.19	912.2	81	75			10
4	70.0		334	1.2		1.10	913.780	79	75			10
Av.												

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			
[illegible]			
[illegible]			
[illegible]			

DATE 6-29-94 BAROMETRIC PRESSURE

LOCATION ASSUMED MOISTURE, %

OPERATOR PROBE LENGTH, in. 17

STACK NO. NEW NOZZLE DIAMETER, in. .485

RUN NO. STACK DIAMETER, in. 136X84

SAMPLE BOX NO. PROBE HEATER SETTING

METER BOX NO. HEATER BOX SETTING

METER ΔH@ 1.892 ΔCp FACTOR .84

Y = .9 1.003 FILTER NO.

TIME START 10:45 FILTER TARE WEIGHT mg.

CROSS SECTION

PRE TEST LEAK CHECKS

METER 1.00 @ 19 in. Hg

PITOTS 0.00 @ 3 in. H2O

ORSAT OK

908

P #	θ	STATIC PRESSURE in H2O	Ts °F	ΔP in H2O	√ΔP	ΔH in H2O	Vm ft³ 86.467	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in. Hg)
2.5	2.5		330	1.4		1.27	88.05	83	74	—		4
2	5		325	1.6		1.45	89.47	83	74			
2.5	7.5		340	1.6		1.45	91.01	84	74			5
4	10		341	1.5		1.36	92.55	84	74			5
1	12.5		338	1.3		1.18	94.05	85	75			4
2	15		329	1.4		1.27	95.53	88	76			5
3	17.5		332	1.6		1.45	97.12	88	76			6
4	20		340	1.6		1.45	98.70	88	76			6
1	22.5		341	1.4		1.27	100.38	89	76			5
2	25		329	.98		.88	101.64	89	76			4
3	27.5		335	.95		.86	102.92	89	77			3
4	30		335	1.4		1.27	104.30	90	77			5
1	32.5		341	1.6		1.45	106.00	90	77			6
2	35		331	1.4		1.27	107.56	91	78			5
3	37.5		335	.98		.88	108.96	91	78			4
4	40		336	.96		.87	110.20	91	78			3
1	42.5		340	1.4		1.27	111.67	91	79			5
2	45		342	1.4		1.27	113.19	92	80			5
3	47.5		339	1.6		1.45	114.85	92	80			6
4	50		329	1.3		1.18	116.23	92	81			4
1	52.5		341	1.6		1.45	117.84	93	82			6
2	55		330	1.4		1.27	119.36	93	82			5
3	57.5			1.2		1.09	120.71					
4	60			1.0		.90	121.98					
AV												

TIME END

PARTICULATE FIELD DATA

PLANT [illegible] | AMBIENT TEMPERATURE

DATE 6-10-94 | BAROMETRIC PRESSURE

LOCATION Hell | ASSUMED MOISTURE, %

OPERATOR | PROBE LENGTH, in.

STACK NO. | NOZZLE DIAMETER, in.

RUN NO. R1 RMB (cont'd) | STACK DIAMETER, in.

SAMPLE BOX NO. | PROBE HEATER SETTING

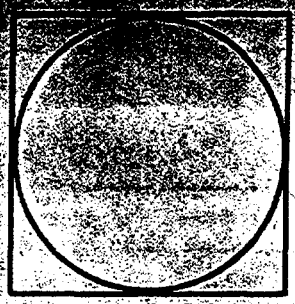
METER BOX NO. | HEATER BOX SETTING

METER ΔH @ | Δ Cp FACTOR

Y = | FILTER NO.

12 TIME START = | FILTER TARE WEIGHT mg.

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT

.908

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		329	1.3		1.18	123.40	94	82			4
2	65		330	1.4		1.27	[illegible]	94	82			5
3	67.5		335	1.4		1.27	126.46	94	82			5
4	70		333	1.40		.90	127.773	94	82			4
Av			334.6			1.1775	419.30					

TIME END =

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
[illegible]					
[illegible]					
[illegible]					
TOTAL VOLUME COLLECTED					

POST TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT

ORSAT MEASUREMENTS	TIME	CO_2	O_2	CO	N_2

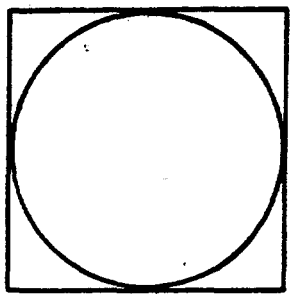
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-27-84
LOCATION IN
OPERATOR BE, C.C, AS
STACK NO. FGD inlet
RUN NO. 2 RMB
SAMPLE BOX NO. —
METER BOX NO. A6
METER ΔH @ 1.892
Y = 1.003
TIME START = 12:30 225-240

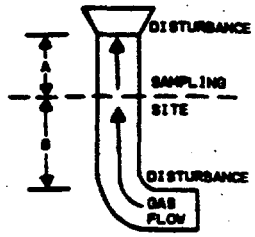
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 30.5
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 17
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 136x3"
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.00 @ 18 in. Hg
PITOTS 0.00 @ " in. H₂O
ORSAT OK

135.070 .908

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	2.5		335	1.5		1.362	136.6	76	72	—	59	4
2	5			1.35		1.225	138.2	79	73			4
3	2.5			1.25		1.135	139.7	81	73			4
4	10			1.0		.908	141.1	82	73			4
1				1.4		1.271	142.5	83	73			4
2	15			1.7		.998	143.9	82	73			4
3				1.0		.908	145.2	82	73			4
4	20			.85		.780	146.6	82	73			3
1				1.3		1.180	147.8	82	73			4
2	25			1.20		1.08	149.2	82	73			4
3				1.10		.998	150.6	82	73			4
4	30			1.0		.908	152.0	82	73			4
1				.95		.862	153.3	82	73			4
2	35			1.3		1.181	154.5	83	73			4
3				1.2		1.089	156.0	83	73			4
4	40			1.1		.998	157.5	83	73			4
1				.88		.799	158.8	83	73			3
2	45			1.35		1.225	[illegible]	83	73			4
3				1.15		1.044	161.5	83	73			4
4	50			1.10		.998	162.9	84	73			4
1				.95		.862	164.2	84	73			4
2	55			1.40		1.271	166.5	84	73			4
3				1.2		1.089	166.9	84	74			4
4	60			1.0		.908	168.3	84	74			4
Av			335.0			1.0839	1.0545	38.814	78.0			

TIME END = —

POST TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT —

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1 (IPA)	2	3 (H₂O₂)	4	SILICA GEL WEIGHT g
FINAL					
INITIAL	100	100	100	SG	200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT _____ AMBIENT TEMPERATURE _____

DATE _____ BAROMETRIC PRESSURE _____

LOCATION _____ ASSUMED MOISTURE, % _____

OPERATOR _____ PROBE LENGTH, in. _____

STACK NO. FGC inlet NOZZLE DIAMETER, in. _____

RUN NO. 2. RM 8 STACK DIAMETER, in. _____

SAMPLE BOX NO. _____ PROBE HEATER SETTING _____

METER BOX NO. _____ HEATER BOX SETTING _____

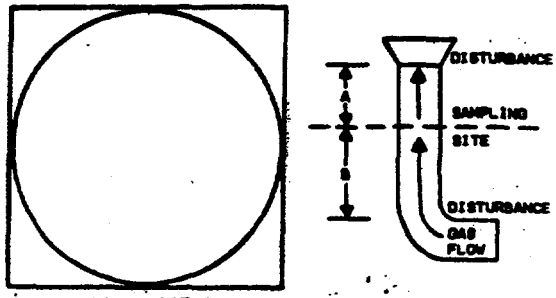
METER ΔH @ _____ Δ Cp FACTOR _____

Y = _____ FILTER NO. _____

TIME START = _____ FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER @ in. Hg

PITOTS @ in. H₂O

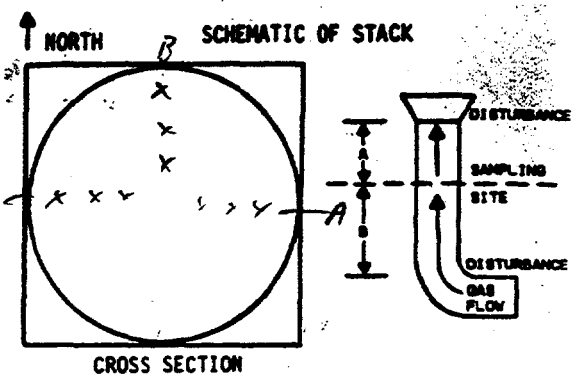
ORSAT _____

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5			1.4		1.271	169.2	84	74	—	59	4
2	65			1.35		1.225	171.0	84	74		1	4
3	67.5			1.15		1.044	172.5	84	74		↓	4
4	70			1.0		.908	173.334	84	74			4

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/27/94
LOCATION Chesterton, IN
OPERATOR TR/TS/ES
STACK NO. 1
RUN NO. R1 RM5B/26A
SAMPLE BOX NO. A3
METER BOX NO. A3
METER ΔH @ 1.875
Y = 0.999
TIME START = 10:17

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 30.10
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320±25
Δ Cp FACTOR .84
FILTER NO. 872
FILTER TARE WEIGHT 588.0 mg.



PRE TEST LEAK CHECKS
METER 0.001 @ 15 in. Hg
PITOTS 0 @ ? in. H₂O
ORSAT OK

K= 7.7

P #	θ	STATIC PRESSURE (+)- in H₂O	Ts °F	Δ P in H₂O	√Δ p	Δ H in H₂O	Vm ft³ 375.132	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5	+0.85	132	.34		2.62	379.5	68	68	310	62	6
2	10		126	.34		2.62	383.5	78	70	315	62	6
3	15		127	.32		2.46	388.0	82	71	316	62	6
4	20		128	.35		2.70	391.1	86	73	315	62	6
5	25		132	.37		2.85	395.4	90	74	315	62	6
6	30		133	.32		2.46	400.0	92	75	315	62	6
7	35		135	.32		2.46	403.5	82	76	315	62	6
8	40		132	.36		2.77	407.6	92	77	312	62	6
9	45		135	.33		2.54	411.9	92	78	315	62	6
10	50		134	.31		2.39	415.6	91	78	315	62	6
11	55		132	.35		2.70	419.7	91	79	319	62	6
12	60		130	.32		2.46	423.790	90	79	320	62	6
Av		+.85	132.2		.5793	2.5858	48.658		80.5			

TIME END = 11:43

POST TEST LEAK CHECKS
METER 0.002 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	215	145	3		220
INITIAL	100	100	0	56	200
LIQUID COLLECTED	115	45	3		20
TOTAL VOLUME COLLECTED			163		

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

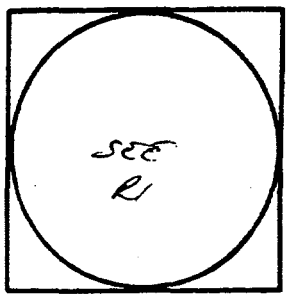
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/27/94
LOCATION CHESTERTON, IN
OPERATOR TR/TS/CS
STACK NO. 1
RUN NO. R2 RM5B/26A
SAMPLE BOX NO. A3
METER BOX NO. A3
METER ΔH @ 1.875
Y = 0.999
TIME START = 12:30

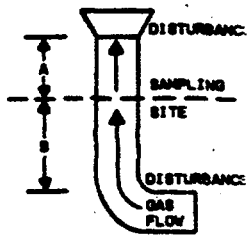
AMBIENT TEMPERATURE 63
BAROMETRIC PRESSURE 30.10
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 48'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320±25
Δ Cp FACTOR 84
FILTER NO. 904
FILTER TARE WEIGHT 592.8 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.002 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

K = 7.7

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ p	Δ H in H₂O	Vm ft³ 423.890	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5	1.82	120	.34		2.62	427.9	67	67	310	61	5
2	10		132	.37		2.85	432	70	65	310	61	6
3	15		131	.35		2.70	436.7	74	65	315	61	6
4	20		132	.35		2.70	440.6	69	65	315	61	6
5	25		135	.35		2.70	444.50	73	65	310	61	6
6	30		137	.35		2.70	448.5	73	66	312	61	6
7	35		132	.32		2.46	452.7	74	65	312	61	6
8	40		133	.37		2.85	457.1	78	66	315	61	6
9	45		130	.37		2.85	461.5	78	67	315	61	6
10	50		128	.31		2.39	465.2	79	67	315	61	6
11	55		128	.31		2.39	469.2	79	67	310	61	5
12	60		132	.35		2.70	473.392	79	68	310	61	6
Av		1.82	131.8		.1587B	2.665	44.502		70.7			

TIME END = 13:39

POST TEST LEAK CHECKS

METER 0.002 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	245	128	2		214
INITIAL	100	100	0	56	200
LIQUID COLLECTED	145	28	2		14
TOTAL VOLUME COLLECTED			(189)		

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

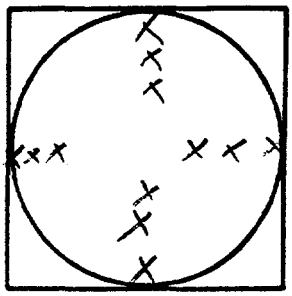
PARTICULATE FIELD DATA

PLANT Pure Air
DATE June 27 1944
LOCATION Portage Ind
OPERATOR JS/TR/CG
STACK NO. FGD outlet
RUN NO. R3 RMS/B
SAMPLE BOX NO. A6
METER BOX NO. A3
METER ΔH @ 1.875
Y = .997
TIME START = 2:13

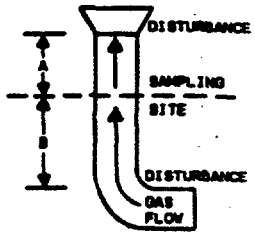
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31
PROBE HEATER SETTING 250 ± 25
HEATER BOX SETTING 350 ± 25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.001 @ 15 in. Hg
PITOTS 000 @ 3 in. H,O
ORSAT OK

K 7.7

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm ft³ (473.393)	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
5			134	.32		2.46	477.10	64	64	250	54	5
10			135	.34		2.62	480.90	72	65	326	54	5
15			135	.33		2.54	484.80	75	65	325	60	5
20			135	.33		2.54	488.70	73	68	325	60	5
25			136	.36		2.77	492.50	83	69	325	60	5
30			135	.42		3.23	497.90	86	71	325	60	5
35			136	.32		2.46	500.34	84	73	324	60	5
40			134	.30		2.31	504.00	80	74	323	60	5
45			135	.33		2.54	507.88	90	75	323	60	5
50			134	.29		2.23	511.75	84	76	322	60	5
55			134	.34		2.61	515.67	90	77	321	60	5
60			133	.33		2.54	519.488	90	77	321	60	5
Av		+.83	134.7		.5775	2.570	46.045		76.3			

TIME END = 15:37

POST TEST LEAK CHECKS

METER _____ @ _____ in. Hg
PITOTS _____ @ _____ in. H,O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	160	150	130		227
INITIAL	100	100	100	200	200
LIQUID COLLECTED	60	50	30		27
TOTAL VOLUME COLLECTED				167	

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

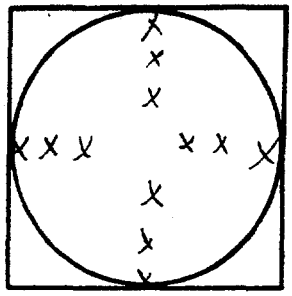
PARTICULATE FIELD DATA

PLANT Pure Air
DATE June 27 1994
LOCATION Portage Ind
OPERATOR TS/TR/CS
STACK NO. Outlet Fan
RUN NO. R1 IRM8
SAMPLE BOX NO. A6
METER BOX NO. A7
METER ΔH @ 1.839
Y = .9931
TIME START = 10:27

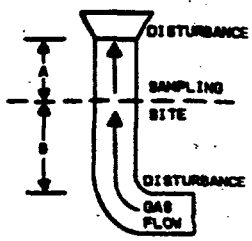
AMBIENT TEMPERATURE 85
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 15%
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 231" 25
PROBE HEATER SETTING 246±25
HEATER BOX SETTING 246±25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.001 @ 15 in. Hg
PITOTS 000 @ 3 in. H₂O
ORSAT OK

K = 7.52

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 820.117	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
5		.065	132	.35		2.52	822.70	63	63	332	59	2
10			133	.30		2.26	826.90	74	63	325	54	2
15			133	.27		2.03	830.6	77	64	327	59	2
20			134	.24		2.14	834.80	82	66	327	54	2
25			132	.31		2.37	839.00	42	67	322	59	2
30			132	.24		2.18	842.25	84	67	323	60	2
35			132	.23		1.73	846.36	64	67	320	10	2
40			132	.25		1.88	850.0	83	68	324	60	2
45			132	.23		1.73	853.69	82	68	324	60	2
50			132	.28		2.11	857.50	78	66	304	60	2
55			134	.25		1.84	861.20	81	68	316	60	2
60			134	.27		2.03	865.025	81	68	320	60	2
Av		+.85	132.7		.5251	2.0808	44.908		72.7			

TIME END = 12:10

POST TEST LEAK CHECKS

METER 0.001 @ 10 in. Hg
PITOTS @ in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME mT 1	2	3	4	SILICA GEL WEIGHT g
FINAL	160	139	119	35	208
INITIAL	100	100	100	0	200
LIQUID COLLECTED	60	39	19		
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

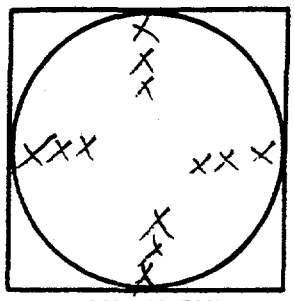
PARTICULATE FIELD DATA

PLANT Pure Air
DATE June 27 1994
LOCATION Portage Ind
OPERATOR TS/TRPCS
STACK NO. FGD Outlet
RUN NO. R2 M8
SAMPLE BOX NO. #A6
METER BOX NO. A7
METER ΔH @ 1.839
Y = .993
TIME START = 12:20

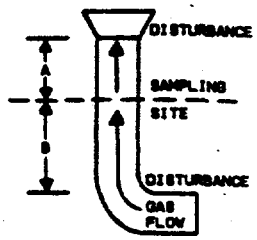
AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18"
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31"
PROBE HEATER SETTING 330 ± 25
HEATER BOX SETTING 330 ± 25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.001 @ 15 in. Hg
PITOTS 000 @ 3 in. H₂O
ORSAT OK

K = 7.52

P / θ	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
							875.436					
5		.85	134	.25		1.85	879.48	63	63	301	59	4
10			134	.26		1.96	883.0	70	63	314	59	5
15			134	.26		1.96	886.70	74	64	324	59	6
20			134	.24		1.80	890.30	76	64	322	59	6
25			134	.23		1.73	893.60	77	65	327	59	6
30			134	.23		1.73	897.40	78	65	323	59	6
35			134	.26		1.96	901.70	73	65	323	59	6
40			136	.25		1.88	905.30	81	67	324	59	6
45			134	.27		1.95	909.60	82	68	325	59	6
50			134	.29		2.18	912.60	76	69	325	59	6
55			134	.31		2.33	916.70	76	69	323	59	6
60			134	.31		2.33	920.68	78	68	320	60	6
Av		4.85	134.2		1.5125	1.974	45.25		70.6			

TIME END = 13:44

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

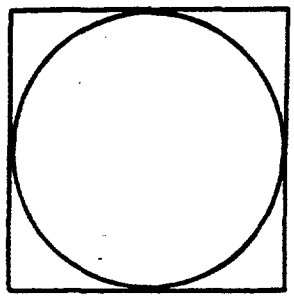
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/28/94
LOCATION Portage IN.
OPERATOR
STACK NO. FGD inlet
RUN NO. R1 RM 5/26A
SAMPLE BOX NO. —
METER BOX NO. A2
METER ΔH @ 1.93
Y = 1.001
TIME START = 10:55

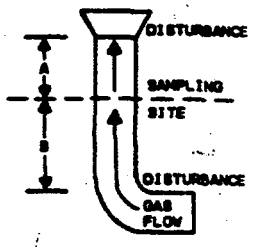
AMBIENT TEMPERATURE 80 f°
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3%
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. 1.185
STACK DIAMETER, in.
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. 12
FILTER TARE WEIGHT 44882.3 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H,O
ORSAT

K = .92

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm ft³ 913.801	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	2.5			1.3		1.19	915.3	85	84			6
2	5			1.4		1.28	916.8	87	84			6
3				1.3		1.19	918.4	88	84			6
4	10			1.5		1.38	919.9	90	85			7
1				1.2		1.10	921.4	90	85			6
2	15			1.2		1.10	922.9	90	85			6
3				1.1		1.01	924.4	91	85			6
4	20			1.4		1.28	925.7	92	86			7
1				1.0		.92	927.3	92	86			6
2	25			1.2		1.10	928.7	93	86			6
3				1.2		1.10	930.1	93	86			6
4	30			1.3		1.19	931.5	93	87			7
1				1.6		1.47	933.0	93	87			8
2	35			1.5		1.38	934.6	92	87			8
3				1.5		1.38	936.2	91	87			8
4	40			1.2		1.10	937.8	91	88			7
1				1.4		1.28	939.2	92	88			8
2	45			1.1		1.01	940.7	92	88			7
3				1.3		1.19	942.1	93	88			7
4	50			1.1		1.01	943.6	94	88			7
1				1.1		1.01	945.0	94	88			7
2	55			1.0		.92	946.5	94	88			7
3				1.4		1.28	947.8	95	89			8
4	60			1.5		1.38	949.3	94	89			8
Av			333.4		1.1408	1.1989	41.839		89.3			

TIME END = 12:00 PM

POST TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H,O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	148	102	0		211
INITIAL	100	100	0		200
LIQUID COLLECTED	48	2	0		11
TOTAL VOLUME COLLECTED	61				

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

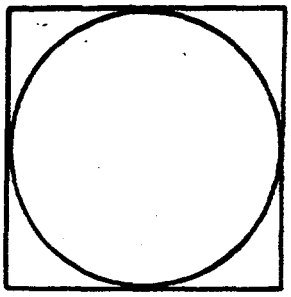
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-28-94
LOCATION Portage, In
OPERATOR
STACK NO. FGD Inlet
RUN NO. R1 M5/26A
SAMPLE BOX NO.
METER BOX NO.
METER ΔH @
Y =
TIME START =

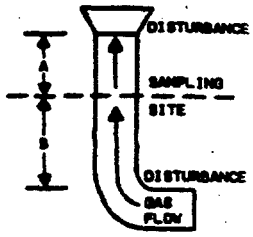
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	60			1.5		1.38	950.8	93	89			8
2	65			1.6		1.47	952.4	92	89			10
3	67.5			1.4		1.28	954.1	92	89			9
4	70			.3		1.19	955.640	92	89			9
Av												

TIME END =

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

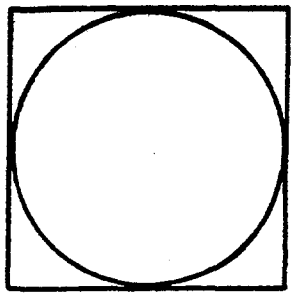
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/28/94
LOCATION Portage IN.
OPERATOR Tony Weber
STACK NO. FGD inlet
RUN NO. 2 M 26A
SAMPLE BOX NO. —
METER BOX NO. FY
METER ΔH @ 1.908
Y = 1.001
TIME START = 1230

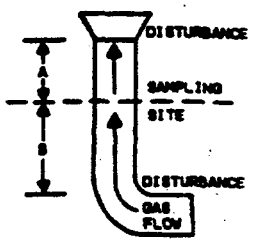
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 30.01
ASSUMED MOISTURE, % 6%
PROBE LENGTH, in. 17'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in.
PROBE HEATER SETTING —
HEATER BOX SETTING
Δ Cp FACTOR .84
FILTER NO. 167
FILTER TARE WEIGHT 483150.4 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.004 @ 30 in. Hg
PITOTS 0.00 @ 3 in. H,O
ORSAT OK

K = .92

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm ft³ 965.710	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	2.5	+5.9	335	1.1		1.01	967.0	89	89			2
2	5		329	1.2		1.10	968.9	91	88			2
3			336	1.0		.92	969.8	92	88			2
4	10		329	1.3		1.20	971.1	93	88			2
1			328	.95		.87	972.6	93	88			2
2	15		334	1.05		.97	973.9	94	89			2
3			335	1.15		1.06	975.3	95	89			3
4	20		336	1.09		1.0	976.7	95	89			3
1			339	.99		.91	978.1	95	89			3
2	25		331	1.04		.96	979.4	95	89			3
3			332	.95		.87	980.8	96	90			3
4	30		329	.86		.79	982.1	96	90			3
1			340	1.27		1.17	983.4	96	90			3
2	35		333	.99		.91	984.8	96	90			3
3			338	1.36		1.25	986.1	97	90			3
4	40		337	1.21		1.11	987.6	96	91			4
1			335	.91		.84	989.1	96	91			3
2	45		336	1.18		1.09	990.4	96	91			4
3			331	1.23		1.13	991.8	96	91			4
4	50		330	1.18		1.09	993.2	96	91			4
1			333	.86		.79	994.6	96	91			4
2	55		338	.95		.87	995.9	96	91			4
3			335	1.09		1.0	997.2	96	91			4
4	60		336	.92		.85	998.6	97	91			4
Av		45.9	333.4			1.0326	.9843	38.240		92.6		

TIME END = 1340

POST TEST LEAK CHECKS

METER 0.004 @ 20 in. Hg
PITOTS 0.0 @ 3 in. H,O
ORSAT OK

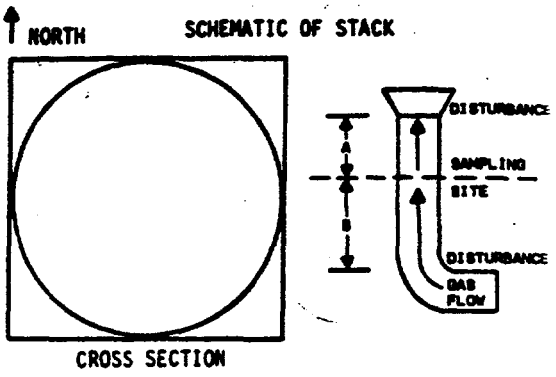
VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	~~710~~	106	—		211
INITIAL	100	100	0		200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-28-94
LOCATION Portage, IN
OPERATOR A.W.
STACK NO. FGD Inlet
RUN NO. 2 M5/26A
SAMPLE BOX NO. _____
METER BOX NO. _____
METER ΔH @ _____
Y = _____
TIME START = _____

AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % _____
PROBE LENGTH, in. _____
NOZZLE DIAMETER, in. _____
STACK DIAMETER, in. _____
PROBE HEATER SETTING _____
HEATER BOX SETTING _____
Δ Cp FACTOR _____
FILTER NO. _____
FILTER TARE WEIGHT _____ mg.



PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT _____

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		335	1.1		1.01	999.9	97	91			4
2	65		328	1.0		.92	001.2	96	91			4
3	67.5		326	.95		.87	002.6	96	91			4
4	70		331	1.09		1.00	003.95	95	91			4
Av												

TIME END = _____

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

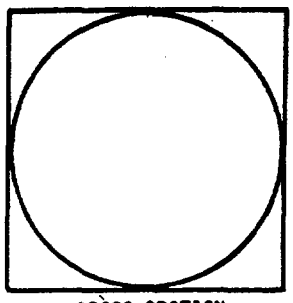
PLANT Pure Air
DATE 6/27/94
LOCATION Portage IN.
OPERATOR Tony Weber
STACK NO. FGD Inlet
RUN NO. 3M26A
SAMPLE BOX NO. —
METER BOX NO. 4Y
METER ΔH @ 1.908
Y = 1.001
TIME START = 2:12

AMBIENT TEMPERATURE 85
BAROMETRIC PRESSURE 30.01
ASSUMED MOISTURE, % 6
PROBE LENGTH, in. 17'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in.
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. 13
FILTER TARE WEIGHT 4852 4.3 mg.

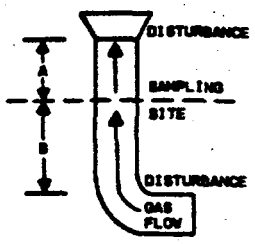
K: .92

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.002 @ 21 in. Hg
PITOTS 0.0 @ 3 in. H,O
ORSAT OF

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm ft³ (003.960)	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	2.5	6.1 +	323	1.1		1.01	005.3	91	90			3
2	5		328	1.0		.92	006.7	91	90			3
3			321	1.3		1.20	007.8	91	90			4
4	10		339	.95		.87	009.5	92	89			4
1			330	1.6		1.47	010.8	92	89			5
2	15		320	1.5		1.38	012.4	92	89			5
3			330	1.36		1.25	014.0	92	88			5
4	20		331	.91		.84	015.6	92	88			3
1			335	1.18		1.09	016.8	93	88			4
2	25		325	1.4		1.29	018.3	94	88			5
3			330	1.23		1.13	019.7	95	89			5
4	30		324	.92		.85	021.2	95	89			4
1			321	1.5		1.38	022.5	94	89			5
2	35		320	1.5		1.38	024.0	95	89			5
3			321	1.3		1.20	025.6	95	89			5
4	40		326	1.09		1.00	027.1	96	90			4
1			324	1.6		1.47	028.5	96	90			6
2	45		339	1.5		1.38	030.1	96	91			5
3			334	1.18		1.09	031.7	96	91			5
4	50		324	.86		.79	033.1	96	91			3
1			321	1.4		1.29	034.4	96	91			4
2	55		337	1.23		1.13	035.9	97	91			5
3			337	1.18		1.09	037.4	97	92			5
4	60		334	1.04		.96	038.8	96	92			5
Av		6.1 +	328.2		1.1156	1.155	40.740		92.3			

TIME END = _____

POST TEST LEAK CHECKS

METER 0.002 @ 20 in. Hg
PITOTS 0.0 @ 5 in. H,O
ORSAT OF

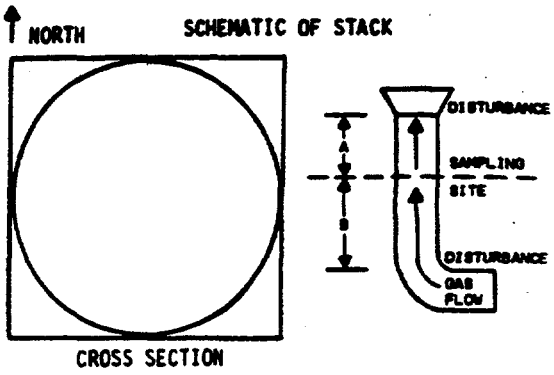
VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	150	110			11
INITIAL	106	60			
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT PURE
DATE 6-28-94
LOCATION Porter, IN
OPERATOR A.W
STACK NO.
RUN NO. R3 M26A
SAMPLE BOX NO.
METER BOX NO.
METER ΔH @
Y =
TIME START =

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.



PRE TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		324	1.5		1.38	040.2	96	91			5
2	65		327	1.5		1.38	041.7	97	91			6
3	67.5		332	1.3		1.20	043.3	97	92			5
4	70		334	1.0		.92	044.750	97	92			5
Av												

TIME END =

POST TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml				SILICA GEL WEIGHT g
	1	2	3	4	
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

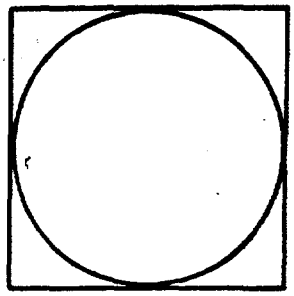
PARTICULATE FIELD DATA

PLANT PURE AIR
DATE 6-28-94
LOCATION PORTAGE, IN
OPERATOR GE CC AS
STACK NO. INLET
RUN NO. R1 RM 8
SAMPLE BOX NO. —
METER BOX NO. A6
METER ΔH @ 1.892
Y = 1.003
TIME START = 10:55 A

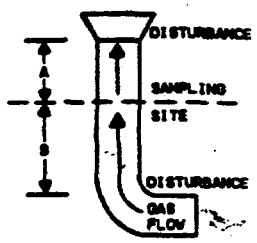
AMBIENT TEMPERATURE 80°
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3%
PROBE LENGTH, in. 17'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 816
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT = mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 000 @ 10 in. Hg
PITOTS 000 @ 4 in. H₂O
ORSAT OK

1.908

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δp	Δ H in H₂O	Vm ft³ 179.660	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	2.5		335	1.5		1.36	181.24	84	84			2
2	5		335	1.4		1.27	182.82	85	84			2
3	7.5		340	1.4		1.27	184.35	90	84			2
4	10		338	1.3		1.18	185.89	90	85			2
1	12.5		336	1.6		1.45	187.38	91	85			2
2	15		335	1.4		1.27	189.00	91	85			2
3	17.5		332	1.2		1.08	190.53	92	86			1
4	20		329	1.2		1.08	192.00	93	86			1
1	22.5		330	1.6		1.45	193.63	93	86			2
2	25		335	1.5		1.36	195.23	94	86			2
3	27.5		338	1.5		1.36	196.82	94	87			2
4	30		329	1.1		.99	198.25	95	86			1
1	32.5		326	1.5		1.36	199.84	95	87			2
2	35		330	1.3		1.18	201.38	95	87			2
3	37.5		334	1.1		.99	202.78	96	86			1
4	40		330	1.0		.90	204.13	96	86			1
1	42.5		335	1.5		1.36	205.70	97	86			2
2	45		335	1.4		1.27	207.28	97	87			2
3	47.5		329	1.4		1.27	208.87	97	87			2
4	50		330	1.2		1.08	210.35	97	87			1
1	52.5		337	1.6		1.45	212.04	97	87			2
2	55		337	1.6		1.45	213.72	98	89			2
3	57.5		336	1.3		1.18	215.24	98	89			1
4	60		320	1.1		.99	216.63	98	90			1
Av			333.4		1.1497	1.2018	42.605		90.7			

TIME END = _____

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air

DATE 6-28-94

LOCATION _____

OPERATOR _____

STACK NO. _____

RUN NO. R1 RM 8 cont'd

SAMPLE BOX NO. _____

METER BOX NO. _____

METER ΔH @ _____

Y = _____

TIME START = _____ 7:19 ET

AMBIENT TEMPERATURE _____

BAROMETRIC PRESSURE _____

ASSUMED MOISTURE, % _____

PROBE LENGTH, in. _____

NOZZLE DIAMETER, in. _____

STACK DIAMETER, in. _____

PROBE HEATER SETTING _____

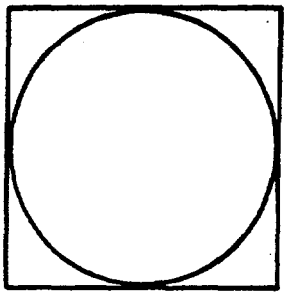
HEATER BOX SETTING _____

Δ Cp FACTOR _____

FILTER NO. _____

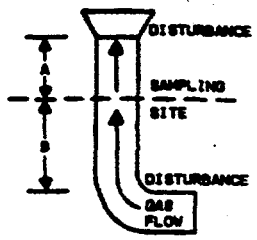
FILTER TARE WEIGHT _____ mg.

NORTH



CROSS SECTION

SCHEMATIC OF STACK



PRE TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT _____

.908

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		329	1.2		1.08	218.09	98	90			1
2	65		333	1.2		1.08	219.55	98	90			1
3	67.5		337	1.1		.99	220.94	93	91			1
4	70		336	1.0		.90	222.265	98	91			1
Av												

TIME END = _____

POST TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

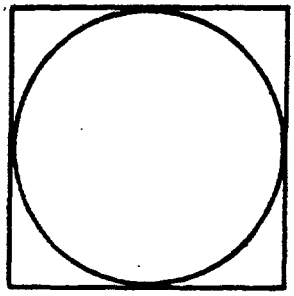
PLANT Pure Air
DATE 6-28-94
LOCATION IN
OPERATOR A.S
STACK NO. FGD inlet
RUN NO. 2, RMB
SAMPLE BOX NO. —
METER BOX NO. A6
METER ΔH @ 1.892
Y = 1.003
TIME START = 12:30 p.M

AMBIENT TEMPERATURE 85
BAROMETRIC PRESSURE 30.01
ASSUMED MOISTURE, % 6%
PROBE LENGTH, in. 12'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 316 x 34
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

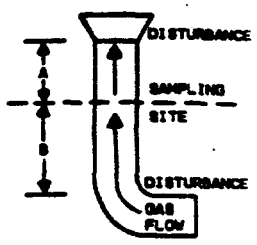
.908

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.00 @ 13 in. Hg
PITOTS 0.00 @ 3 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE ± in H₂O	Ts °F	Δ P in H₂O	√Δp	Δ H in H₂O	Vm ft³ 232.549	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	1	2.5	5.9	335	1.6		1.45	234.1	78	70	—	57	2
	2	5		332	1.5		1.36	235.7	78	70		↓	1
	3	7.5		336	1.3		1.18	237.2	79	70			1
	Y	10		329	1.0		.91	238.6	79	70			1
2	1			327	1.5		1.36	240.1	79	70			2
	2	15		335	1.4		1.27	241.7	79	71			2
	3			336	1.4		1.27	243.2	80	71			2
	Y	20		339	1.1		.99	244.7	80	71			1
3	1			331	1.3		1.18	246.2	81	71			1
	2	25		331	1.15		1.04	247.7	81	72			1
	3			329	1.0		.91	249.1	82	72			1
	Y	30		340	.95		.86	250.4	82	72			1
4	1			333	1.3		1.18	251.8	83	73			1
	2	35		338	1.2		1.09	253.2	84	73			1
	3			337	1.1		.99	254.6	85	73			1
	Y	40		335	1.0		.91	256.1	85	73			1
5	1			336	1.35		1.23	257.3	85	73			2
	2	45		332	1.15		1.04	258.8	86	73			1
	3			331	1.05		.95	260.2	86	73			1
	Y	50		329	.95		.86	261.6	87	74			1
6	1			334	1.4		1.27	262.9	87	74			2
	2	55		338	1.4		1.27	264.5	87	74			2
	3			335	1.2		1.09	266.0	88	74			1
	Y	60		336	1.0		.92	267.5	88	74			1
Av			45.9	334.4		1.1095	1.1246	40.883		78.0			

TIME END = 1:40

POST TEST LEAK CHECKS

METER — @ — in. Hg
PITOTS — @ — in. H₂O
ORSAT —

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml (1 IPA, 2, 3 H₂O₂, 4)				SILICA GEL WEIGHT g
	1	2	3	4	
FINAL					
INITIAL	100	100	100		
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

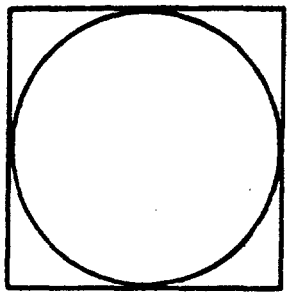
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-28-94
LOCATION IN
OPERATOR AS
STACK NO. FGD inlet
RUN NO. 2, RM 8
SAMPLE BOX NO. ____
METER BOX NO. #6
METER ΔH @ 1.892
Y = 1.003
TIME START = ____

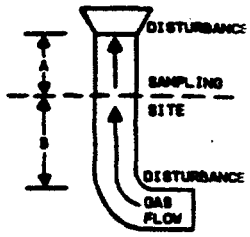
AMBIENT TEMPERATURE 85
BAROMETRIC PRESSURE 30.01
ASSUMED MOISTURE, % 6
PROBE LENGTH, in. 12'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 316x34
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT ____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT ____

P #	θ	STATIC PRESSURE ⊕- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5	5.9	336	1.6		1.45	268.8	82	74	—	59	2
2	65		338	1.5		1.36	270.4	82	74		↓	2
3	67.5		337	1.3		1.18	271.9	82	74			1
Y	70		334	1.0		.92	273.4 32.80	74				
Av												

TIME END = ____

POST TEST LEAK CHECKS

METER 0.00 @ 13 in. Hg
PITOTS 0.00 @ 3 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

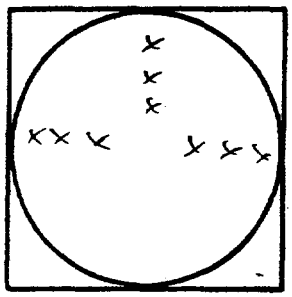
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/28/94
LOCATION Chesterton IN
OPERATOR TR/TSC
STACK NO. #1 Outlet
RUN NO. R1 R135B26A
SAMPLE BOX NO. A3
METER BOX NO. A3
METER ΔH @ 1.875
Y = 0.999
TIME START = 10:40

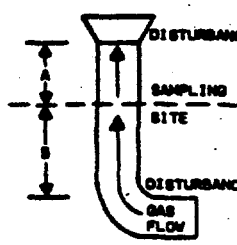
AMBIENT TEMPERATURE 75
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31'
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320±25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.001 @ 15 in. Hg
PITOTS 0 @ 2 in. H₂O
ORSAT OK

K = 7.7

P #	Θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 519.843	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5	.85	125	.30		2.31	523.9	75	76	310		6
2	10		122	.30		2.31	527.8	89	92	312		6
3	15		122	.32		2.46	531.7	96	83	308		6
4	20		124	.35		2.70	536.2	92	85	285		6
5	25		125	.35		2.70	540.5	98	86	264		6
6	30		124	.35		2.70	544.6	100	87	272		6
7	35		125	.33		2.54	548.7	98	87	291		6
8	40		125	.32		2.46	552.7	101	88	303		6
9	45		125	.33		2.54	556.8	102	89	305		6
10	50		124	.33		2.54	561.0	102	89	305		6
11	55		124	.33		2.54	565.0	102	90	304		6
12	60		124	.34		2.62	569.140	102	90	303		6
Av		+.85	124.1		.5735	2.538	49.297		91.6			6

TIME END = 11:50 AM

POST TEST LEAK CHECKS

METER .001 @ 15 in. Hg
PITOTS 0 @ 4 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	1226	134	5		214
INITIAL	100	100	0	56	200
LIQUID COLLECTED	126	34	5		14
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

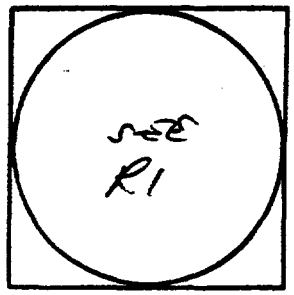
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/28/94
LOCATION CHESTERTON IN
OPERATOR CS/TR/TS
STACK NO. 1 Outlet
RUN NO. R2 R3S/2CA
SAMPLE BOX NO. A3
METER BOX NO. A3
METER ΔH @ 1.875
Y = .999
TIME START = 12:36

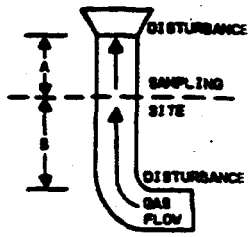
AMBIENT TEMPERATURE 75
BAROMETRIC PRESSURE 29.85
ASSUMED MOISTURE, % 15
PROBE LENGTH, ~~ft.~~ 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31'
PROBE HEATER SETTING 320±25
HEATER BOX SETTING 320±25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.000 @ 15 in. Hg
PITOTS o @ 5 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 569.207	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5		125	.34		2.619	573.3	154	83	252		6
2	10		125	.34		2.62	577.3	98	86	283		6
3	15		124	.34		2.62	581.0	99	87	298		6
4	20		125	.33		2.54	585.1	94	87	280		6
5	25		125	.33		2.54	589.5	99	87	247		6
6	30		124	.33		2.54	593.8	99	87	267		6
7	35		124	.33		2.54	597.9	95	87	250		6
8	40		124	.33		2.54	602.0	99	87	273		6
9	45		124	.33		2.54	606.2	100	88	286		6
10	50		124	.33		2.54	610.3	100	88	290		6
11	55		124	.33		2.54	614.6	100	88	293		6
12	60		124	.34		2.62	618.546	100	88	285		6
Av		1.85	124.3		.5773	2.567	49.339		95.0			

TIME END = 13:40

POST TEST LEAK CHECKS

METER 6.002 @ 15 in. Hg
PITOTS o @ 5 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	202	145	5		218
INITIAL	100	100	0	50	200
LIQUID COLLECTED	102	45	3		18
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

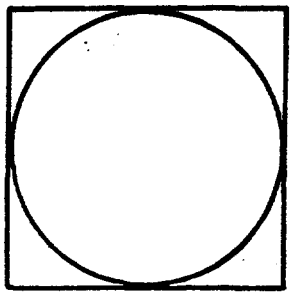
PARTICULATE FIELD DATA

PLANT Air Products
DATE 6-28-94
LOCATION Portel
OPERATOR Chad
STACK NO. Outlet
RUN NO. R3 RMSB
SAMPLE BOX NO. _____
METER BOX NO. _____
METER ΔH @ 1.87
Y = .999
TIME START = 2:00

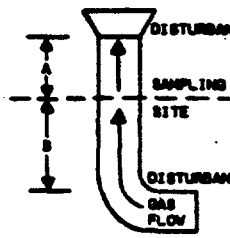
AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE 29.85
ASSUMED MOISTURE, % 15
PROBE LENGTH, in. _____
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31'
PROBE HEATER SETTING 320 ± 25
HEATER BOX SETTING 320 ± 25
Δ Cp FACTOR .84
FILTER NO. _____
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.0 @ 20 in. Hg
PITOTS OK @ 4 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 618.745	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5		124	.33		2.54	623.0	98	87	186		3
2	10		124	.33		2.54	627.2	99	88	253		3
3	15		124	.33		2.54	631.3	101	89	284		3
4	20		124	.32		2.54	635.4	102	89	297		3
5	25		125	.33		2.54	639.5	101	89	302		3
6	30		125	.31		2.4	643.6	102	89	306		3
7	35		125	.33		2.54	647.7	99	89	240		3
8	40		125	.33		2.54	651.7	101	89	265		3
9	45		125	.32		2.46	655.8	102	90	277		3
10	50		125	.32		2.46	659.8	101	91	286		3
11	55		125	.33		2.54	663.8	105	91	304		3
12	60		125	.32		2.46	667.785	104	92	307		3
Av		4.85	124.7		.5708	2.51	49.040		95.3			

TIME END = 3:10 PM

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	236	122			
INITIAL	100	100			200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

POST TEST LEAK CHECKS

METER 0.0 @ 20 in. Hg
PITOTS OK @ 4 in. H₂O
ORSAT OK

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

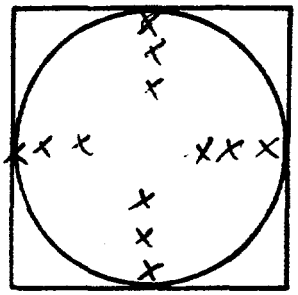
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/26/94
LOCATION Portage Ind
OPERATOR TS/TR/CS
STACK NO. FGD Outlet
RUN NO. R1 - M8
SAMPLE BOX NO. A3
METER BOX NO. A7
METER ΔH @ 1.839
Y = .993
TIME START = 10:40

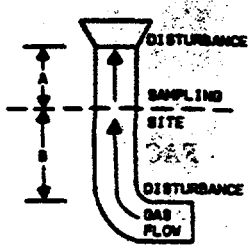
AMBIENT TEMPERATURE 62
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 16'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31
PROBE HEATER SETTING 325 ± 25
HEATER BOX SETTING 325 ± 25
Δ Cp FACTOR
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 000.1 @ 15 in. Hg
PITOTS 000 @ 3 in. H₂O
ORSAT OK

K = 7.52

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 927.764	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
5		+.45	132	.30		2.26	931.90	75	75	248	59	8
10			133	.29		2.14	935.10	80	75	246	59	7
15			133	.30		2.26	940.0	83	75	246	59	7
20			133	.30		2.26	944.00	86	75	248	59	7
25			133	.31		2.33	948.4	86	76	246	59	7
30			134	.29		2.14	952.20	86	77	249	59	7
35			134	.32		2.41	956.4	86	78	249	59	7
40			133	.31		2.33	960.40	85	78	249	59	7
45			133	.28		2.12	964.4	85	78	249	59	7
50			132	.29		2.18	968.6	84	78	249	59	7
55			132	.30		2.26	973.20	82	78	249	59	7
60			132	.28		2.11	976.60	84	79	249	59	7
Av		+.85	132.8		.5453	2.2392	48.839		80.5			

TIME END = 11:50 AM

POST TEST LEAK CHECKS

METER 0.0 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL	100	100		56	2005
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

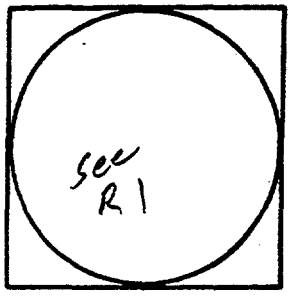
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/26/94
LOCATION Portage IND
OPERATOR FR/AS/CS
STACK NO. FGD outlet
RUN NO. R2-R6
SAMPLE BOX NO. A3
METER BOX NO. A7
METER ΔH @ 1.839
Y = .993
TIME START = 12:30

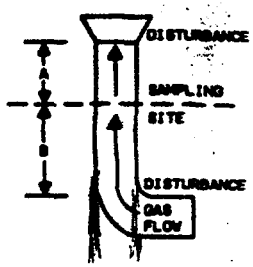
AMBIENT TEMPERATURE 82
BAROMETRIC PRESSURE 29.85
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31'
PROBE HEATER SETTING 325 ±25
HEATER BOX SETTING 325 ±25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



7.52

PRE TEST LEAK CHECKS

METER 0.001 @ 15 in. Hg
PITOTS OK @ 5 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 49.936	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
5		+.85	132	.35		2.63	1001.8	85	80	346	59	9
10		+.85	133	.30		2.26	1006.5	90	81	348	59	9
15		+.85	134	.32		2.41	1010.6	92	81	348	59	9
20			134	.35		2.63	1014.3	92	86	348	59	9
25			134	.29		2.18	1019.1	96	86	348	59	10
30			133	.33		2.48	1023.3	97	86	348	59	9
35			133	.30		2.16	1025.46	90	84	346	59	9
40			134	.34		2.56	1031.0	90	84	348	59	9
45			134	.30		2.16	1035.0	95	84	348	59	9
50			134	.30		2.16	1039.10	94	84	348	59	9
55			134	.28		2.11	1043.3	96	84	346	59	9
60			134	.30		2.16	1047.54	97	85	346	59	9
Av		+.85	133.6		.5594	2.325	49.578		88.3			

TIME END = 18:39

POST TEST LEAK CHECKS

METER 0.002 @ 15 in. Hg
PITOTS OK @ 5 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL	100	100		56	200.7
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO₂	O₂	CO	N₂
1					
2					
3					
4					

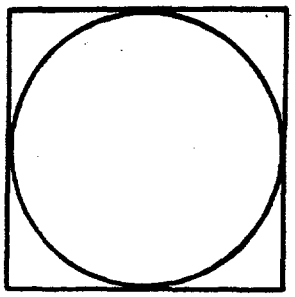
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/29/97
LOCATION Portage IN.
OPERATOR Tony Weber
STACK NO. F&B inlet
RUN NO. R1 M 29/26A
SAMPLE BOX NO. —
METER BOX NO. #2
METER ΔH @ 1.903
Y = 1.001
TIME START = 8:30

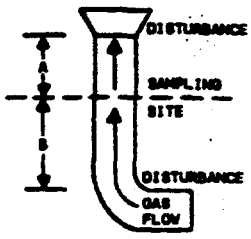
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.8
ASSUMED MOISTURE, % 6%
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 138' ?
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. 2415
FILTER TARE WEIGHT 39.571.7 mg.
1.6 - .95

NORTH

SCHEMATIC OF STACK



CROSS SECTION



4675

PRE TEST LEAK CHECKS

METER 0.00 @ 18 in. Hg
PITOTS 0.00 @ 3 in. H₂O
ORSAT OK

K= .92

P #	θ	STATIC PRESSURE ⊖/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 044.78	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	2.5	6.1	338	1.4		1.29	045.7	71	71			2
2	5		324	1.2		1.10	047.5	74	71			2
3			327	1.3		1.20	047.6	75	71			2
4	10		321	1.15		1.06	049.1	76	71			2
1			335	1.3		1.20	050.5	77	71			2
2	15		337	1.22		1.10	051.9	77	71			2
3				.95		.87	053.3	77	71			2
4	20			1.4		1.29	054.6	77	71			2
1				1.6		1.47	056.2	78	71			3
2	25			1.15		1.06	057.7	78	71			2
3				1.10		1.01	059.1	78	71			2
4	30			1.6		1.47	060.4	79	71			3
1				1.5		1.32	062.0	79	71			3
2	35			1.3		1.20	063.6	79	71			3
3				1.6		1.47	065.0	79	71			3
4	40			.95		.87	066.7	79	72			2
1				1.6		1.47	068.0	79	72			3
2	45			1.25		1.15	069.5	80	72			3
3				1.4		1.29	071.0	80	72			3
4	50			1.3		1.20	072.5	80	72			3
1				1.5		1.32	074.1	80	72			3
2	55			1.3		1.20	075.5	80	72			3
3				1.4		1.29	077.0	80	72			3
4	60			1.5		1.32	078.6	81	72			3
Av		+6.1	335.7		1.1613	1.2364	40.070		75.0			

TIME END = _____

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1 (H₂SO₄)	2	3	4	SILICA GEL WEIGHT g
FINAL	153	100			209
INITIAL	100	100	—	36	200
LIQUID COLLECTED	53	100			9
TOTAL VOLUME COLLECTED			(62)		

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.3	6.3		
2					
3					
4					

PARTICULATE FIELD DATA

PLANT _____ AMBIENT TEMPERATURE _____

DATE _____ BAROMETRIC PRESSURE _____

LOCATION _____ ASSUMED MOISTURE, % _____

OPERATOR _____ PROBE LENGTH, in. _____

STACK NO. _____ NOZZLE DIAMETER, in. _____

RUN NO. R1 M 17/26A STACK DIAMETER, in. _____

SAMPLE BOX NO. _____ PROBE HEATER SETTING _____

METER BOX NO. _____ HEATER BOX SETTING _____

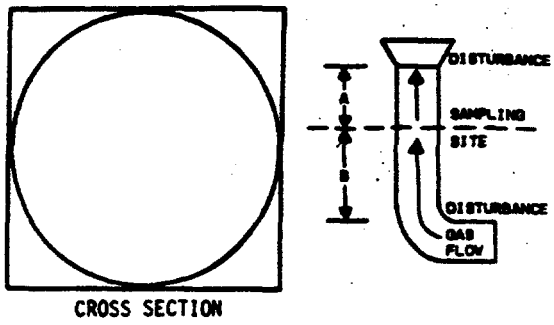
METER ΔH @ _____ Δ Cp FACTOR _____

Y = _____ FILTER NO. _____

TIME START = _____ FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER @ in. Hg

PITOTS @ in. H₂O

ORSAT _____

P #	θ	STATIC PRESSURE (+)(-) in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5	6.1		1.5		1.32	080.1	80	73			4
2	65			1.6		1.47	081.6	80	73			4
3	67.5			1.5		1.32	083.2	80	73			4
4	70			1.4		1.29	084.80	80	73			4
Av												

TIME END = _____

POST TEST LEAK CHECKS

METER 0.00 @ 15 in. Hg

PITOTS 0.00 @ 3 in. H₂O

ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

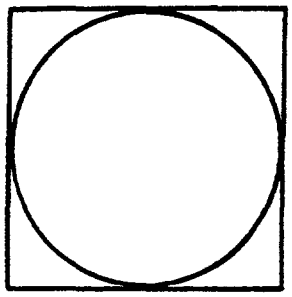
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/29/94
LOCATION Portage IN.
OPERATOR Tony Weber
STACK NO. FGD inlet
RUN NO. R2 M17/26A
SAMPLE BOX NO. —
METER BOX NO. #2
METER ΔH @ 1.908
Y = 1.001
TIME START = 10:25 / 11:25

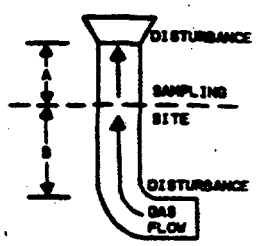
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.8
ASSUMED MOISTURE, % 6
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in.
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. 564
FILTER TARE WEIGHT 521 82.4 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER @ 18 in. Hg
PITOTS @ 3 in. H₂O
ORSAT OK

K = .92

P #	θ	STATIC PRESSURE (-) in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 087.210	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	2.5	6.1	339	1.6		1.47	088.8	75	72			7
2	5		321	1.4		1.29	090.5	77	72			7
3	7.5		330	1.5		1.38	092.0	78	72			7
4	10			1.2		1.10	093.5	79	71			6
1	12.5			1.4		1.29	095.0	80	73			6
2	15			1.3		1.20	096.5	80	72			7
3	17.5			1.5		1.38	098.0	81	73			7
4	20			1.5		1.38	099.6	82	73			7
1	22.5			.95		.87	101.2	82	73			5
2	25			1.6		1.47	102.5	82	74			6
3	27.5			1.4		1.29	104.0	81	74			7
4	30			1.1		1.01	105.5	80	73			6
1	32.5			1.3		1.20	107.0	80	73			6
2	35			1.6		1.47	108.4	80	73			8
3	37.5			1.3		1.20	110.0	80	73			7
4	40			1.6		1.47	111.6	81	73			7
1	42.5			.95		.87	113.2	81	73			5
2	45			1.1		1.01	114.5	82	73			6
3	47.5			1.2		1.10	115.9	82	74			6
4	50			1.2		1.10	117.3	82	74			7
1	52.5			1.5		1.38	118.7	82	74			7
2	55			1.3		1.20	120.3	82	74			7
3	57.5			1.6		1.47	121.8	82	74			7
4	60			1.1		1.01	123.4	82	74			7
Av		6.1	332.0	1.154		1.231		76.5				

TIME END = _____

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	140	100			209
INITIAL	100	100			200
LIQUID COLLECTED	46	0			9
TOTAL VOLUME COLLECTED			(55)		

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.4	6.4		
2					
3					
4					

PARTICULATE FIELD DATA

PLANT _____

DATE _____

LOCATION _____

OPERATOR _____

STACK NO. _____

RUN NO. R2 M 17/26A

SAMPLE BOX NO. _____

METER BOX NO. _____

METER ΔH @ _____

Y = _____

TIME START = _____

AMBIENT TEMPERATURE _____

BAROMETRIC PRESSURE _____

ASSUMED MOISTURE, % _____

PROBE LENGTH, in. _____

NOZZLE DIAMETER, in. _____

STACK DIAMETER, in. _____

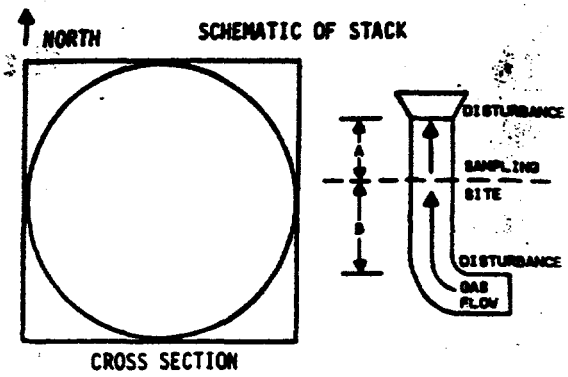
PROBE HEATER SETTING _____

HEATER BOX SETTING _____

Δ Cp FACTOR _____

FILTER NO. _____

FILTER TARE WEIGHT _____ mg.



PRE TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H_2O

ORSAT _____

P #	θ	STATIC PRESSURE +/- in H_2O	Ts °F	Δ P in H_2O	$\sqrt{\Delta P}$	Δ H in H_2O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1		62.5		1.3		1.20	124.8	82	74			7
2		65		1.3		1.20	126.3	83	74			6
3		67.5		1.2		1.10	127.6	84	75			6
4		70		1.5		1.38	129.05	84	75			6
Av												

TIME END = _____

POST TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H_2O

ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

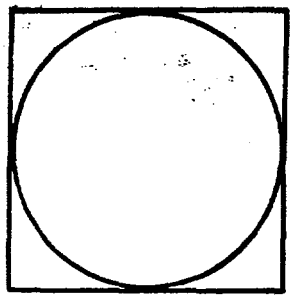
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/29/94
LOCATION Portage IN.
OPERATOR Tony Weber
STACK NO. Inlet
RUN NO. R3 M 17/26
SAMPLE BOX NO.
METER BOX NO. H2
METER ΔH @ 1.908
Y = 1.001
TIME START = 11:55

AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.8
ASSUMED MOISTURE, % 6
PROBE LENGTH, in. 14'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING
Δ Cp FACTOR .84
FILTER NO. 010
FILTER TARE WEIGHT 50974.2 mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER 0 18 in. Hg
PITOTS 0 3 in. H₂O
ORSAT OK

K=.92

P #	θ	STATIC PRESSURE (+)- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 129.052	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F.	VACUUM (in Hg)
1	2.5	6.1	336	1.5		1.38	130.7	79	74			1
2	5		339	1.4		1.29	132.2	81	74			1
3			321	1.4		1.29	133.8	83	75			1
4	10		326	1.6		1.47	135.5	85	76			1
1			327	1.2		1.10	137.2	85	76			1
2	15		323	1.5		1.38	138.6	85	76			1
3			329	1.1		1.01	140.2	85	76			1
4	20		339	1.5		1.38	141.6	85	76			1
1			337	1.3		1.20	143.2	85	76			1
2	25		329	1.3		1.20	144.7	84	76			1
3			328	1.4		1.29	146.1	84	76			1
4	30		322	1.1		1.01	147.7	84	75			1
1			330	.95		.87	149.3	84	75			1
2	35		331	1.6		1.47	150.4	84	75			1
3			334	1.5		1.38	152.0	85	75			1
4	40		327	1.2		1.10	153.6	85	75			1
1			326	1.4		1.29	155.1	85	75			1
2	45		333	1.3		1.20	156.6	85	75			1
3			339	1.1		1.01	158.1	85	76			1
4	50		331	1.4		1.29	159.5	85	76			1
1			334	1.4		1.29	161.0	86	76			1
2	55		329	1.2		1.10	162.6	86	76			1
3			327	1.3		1.20	164.0	86	77			1
4	60		324	1.5		1.38	165.5	87	77			1
Av			330.5	1.157		1.237		79.8				

TIME END = 1:10 PM

POST TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	SILICA GEL WEIGHT g
FINAL	152	106		215
INITIAL	100	100		200
LIQUID COLLECTED	52	6		15
TOTAL VOLUME COLLECTED	73 total			

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.3	6.9		
2					
3					
4					

PARTICULATE FIELD DATA

PLANT _____ AMBIENT TEMPERATURE _____

DATE _____ BAROMETRIC PRESSURE _____

LOCATION _____ ASSUMED MOISTURE, % _____

OPERATOR Tony Weber PROBE LENGTH, in. _____

STACK NO. _____ NOZZLE DIAMETER, in. _____

RUN NO. R3 M17/26 STACK DIAMETER, in. _____

SAMPLE BOX NO. _____ PROBE HEATER SETTING _____

METER BOX NO. _____ HEATER BOX SETTING _____

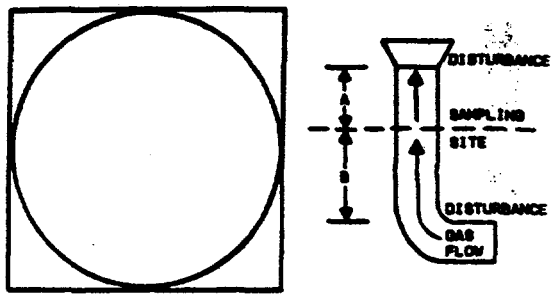
METER ΔH @ _____ Δ Cp FACTOR _____

Y = _____ FILTER NO. _____

TIME START = _____ FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT _____

P #	θ	STATIC PRESSURE +/- in H_2O	Ts °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft^3	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		336	1.5		1.38	167.1	88	78			1
2	65		326	1.5		1.38	168.6	88	78			1
3	67.5		339	1.3		1.20	170.2	88	78			1
4	70		331	1.2		1.10	171.713	88	78			1
Av												

TIME END = _____

POST TEST LEAK CHECKS

METER 0 in. Hg

PITOTS 0 in. H₂O

ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml				SILICA GEL WEIGHT g
	1	2	3	4	
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

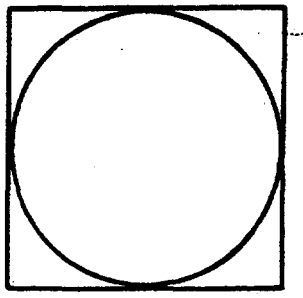
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-29-94
LOCATION IN
OPERATOR AS
STACK NO. FGD inlet
RUN NO. 1 RM8
SAMPLE BOX NO. —
METER BOX NO. A6
METER ΔH @ 1.892
Y = 1.008
TIME START = 8:30 AM

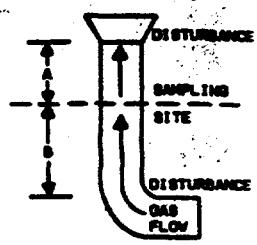
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.8
ASSUMED MOISTURE, % 6
PROBE LENGTH, in. 17'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 138 x ?
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER 0.00 @ 18 in. Hg
PITOTS 0.00 @ 3 in. H₂O
ORSAT OK

90?

P #	Θ	STATIC PRESSURE (+/-) in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 28.0.034	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1 1	2.5	6.1	338	1.6		1.45	281.2	78	75	—	59	4
2	5		334	1.4		1.27	282.4	78	75		↓	3
3			335	1.4		1.27	283.0	79	75			3
4	10		329	1.2		1.09	285.3	79	75			2
2 1			328	1.4		1.27	286.6	79	75			2
2	15		336	1.3		1.18	288.3	80	75			3
3			337	1.15		1.04	289.7	81	75			2
4	20		340	1.0		.91	291.2	81	76			2
3 1			339	1.4		1.27	292.6	81	76			3
2	25		341	1.3		1.18	294.0	81	76			3
3			337	1.10		.99	295.4	82	76			2
4	30		335	.95		.86	296.6	82	76			2
4 1			336	1.35		1.23	298.1	82	76			3
2	35		331	1.20		1.09	299.6	83	77			3
3			329	1.05		.95	301.0	83	77			2
4	40		331	.95		.86	302.3	84	78			2
5 1			332	1.4		1.27	303.6	85	78			3
2	45		334	1.4		1.27	305.1	85	78			3
3			335	1.2		1.09	306.6	85	78			2
4	50		334	1.1		.99	308.1	85	78			2
6 1			336	1.5		1.36	309.4	85	79			4
2	55		337	1.3		1.18	311.0	86	79			3
3			339	1.25		1.14	312.4	86	79			3
4	60		336	1.15		1.04	313.9	86	79			3
Av		+6.1	335.7			1.1224	1.1461	39.793	79.9			

TIME END = _____

POST TEST LEAK CHECKS

METER 0 in. Hg
PITOTS 0 in. H₂O
ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1 (IPA)	2	3 (H₂O₂)	4	SILICA GEL WEIGHT g
FINAL	115				207
INITIAL	100	100	100	SG	200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

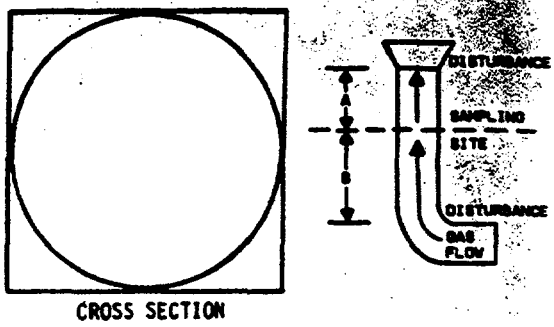
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-29-94
LOCATION IN
OPERATOR AS
STACK NO. FGD Inlet
RUN NO. 1
SAMPLE BOX NO. —
METER BOX NO. A6
METER ΔH @ 1.892
Y = 1.003
TIME START = _____

AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.8
ASSUMED MOISTURE, % 6
PROBE LENGTH, in. 17
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 138x?
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



PRE TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H,O
ORSAT _____

P #	θ	STATIC PRESSURE +/- in H,O	Ts °F	Δ P in H,O	√Δ P	Δ H in H,O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5		339	1.6		1.45	315.3	86	79	—	59	4
2	65		341	1.5		1.36	316.8	86	79		↓	4
3	67.5		338	1.2		1.09	318.4	86	79			2
4	70		336	1.1		.99	319.827	86	79			2
Av												

TIME END = _____

POST TEST LEAK CHECKS

METER 0.00 @ 18 in. Hg
PITOTS 0.00 @ 3 in. H,O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

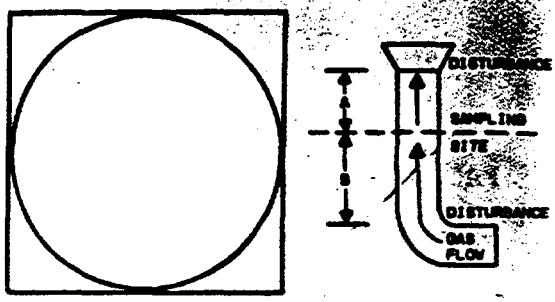
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-29-94
LOCATION IN
OPERATOR CC, AS GB
STACK NO. FGD inlet
RUN NO. 2, RM8
SAMPLE BOX NO. —
METER BOX NO. A6
METER ΔH @ 1.892
Y = 1.008
TIME START = 11:25 A

AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.8
ASSUMED MOISTURE, % 6%
PROBE LENGTH, in. 12'
NOZZLE DIAMETER, in. .185
STACK DIAMETER, in. 132"?
PROBE HEATER SETTING —
HEATER BOX SETTING —
Δ Cp FACTOR .84
FILTER NO. —
FILTER TARE WEIGHT — mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION

PRE TEST LEAK CHECKS

METER 0.000 @ 12 in. Hg
PITOTS 0.000 @ 3 in. H₂O
ORSAT OK

.903

P #	θ	STATIC PRESSURE (+) - in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 324.887	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	2.5	5.9	335	1.4		1.27	326.44	74	74	—		2
2	5		336	1.2		1.08	327.89	77	74			2
3	7.5		331	1.1		.99	329.29	77	74			2
Y	10		330	1.1		.99	330.65	80	74			2
1	12.5		335	1.2		1.08	332.06	80	74			2
2	15		330	1.2		1.08	333.48	80	75			2
3	17.5		329	1.1		.99	334.82	81	75			1
Y	20		328	1.2		1.08	336.28	82	74			1
1	22.5		330	1.3		1.18	337.70	82	75			2
2	25		330	1.4		1.27	339.21	83	75			2
3	27.5		335	1.2		1.08	340.81	83	75			2
Y	30		337	1.2		1.08	342.29	83	75			2
1	32.5		331	1.5		1.36	343.88	82	75			3
2	35		335	1.4		1.27	345.45	82	75			2
3	37.5		337	1.4		1.27	347.00	83	75			2
Y	40		332	1.2		1.08	348.50	84	75			1
1	42.5		330	1.3		1.18	349.90	84	75			1
2	45		329	1.3		1.18	351.34	85	75			1
3	47.5		328	1.2		1.08	352.75	85	75			2
Y	50		331	1.1		.99	354.15	85	76			1
1	52.5		336	1.3		1.18	355.63	85	75			2
2	55		335	1.2		1.08	357.04	86	76			2
3	57.5		330	1.2		1.08	358.47	86	76			2
Y	60		329	1.0		.89	359.80	86	76			1
Av		45.9	332.0			1.1121	1.1225	40.771	79.7			

TIME END = _____

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1 (IPA)	2	3	4 (H₂O₂)	SILICA GEL WEIGHT g
FINAL					
INITIAL	100	100	100	36	200
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pine Ave

DATE 6-29-94

LOCATION Pomona, IP

OPERATOR GE

STACK NO. INLET

RUN NO. R2 PM8 (cont'd)

SAMPLE BOX NO. —

METER BOX NO. A2e

METER ΔH @ 1.892

Y = 1.008

TIME START = _____

AMBIENT TEMPERATURE 75

BAROMETRIC PRESSURE 29.8

ASSUMED MOISTURE, % 6

PROBE LENGTH, in. 17'

NOZZLE DIAMETER, in. .185

STACK DIAMETER, in. _____

PROBE HEATER SETTING _____

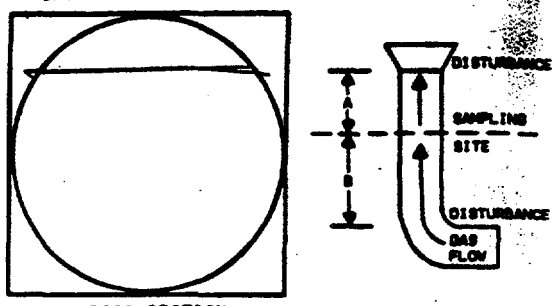
HEATER BOX SETTING _____

Δ Cp FACTOR .84

FILTER NO. _____

FILTER TARE WEIGHT _____ mg.

SCHEMATIC OF STACK



PRE TEST LEAK CHECKS

METER @ in. Hg

PITOTS @ in. H₂O

ORSAT _____

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	62.5	+5.9	328	1.3		1.18	361.25	87	86			2
2	65		329	1.3		1.18	362.74	87	86			2
3	67.5		335	1.2		1.08	364.19	87	86			1
4	70		334	1.2		1.08	365.658	87	86			1
Av												

TIME END = _____

POST TEST LEAK CHECKS

METER @ in. Hg

PITOTS @ in. H₂O

ORSAT _____

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml				SILICA GEL WEIGHT g
	1	2	3	4	
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

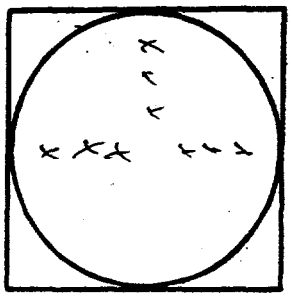
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-29-94
LOCATION Portage
OPERATOR CSTR-TS
STACK NO. 1 Outlet
RUN NO. R1-RM5B/Z6A
SAMPLE BOX NO. A6
METER BOX NO. A3
METER ΔH @ 1.875
Y = .999
TIME START = 8:30 AM

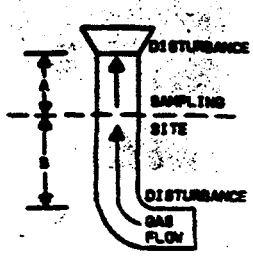
AMBIENT TEMPERATURE 65
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 15%
PROBE LENGTH, in. 18 FT
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31 FT
PROBE HEATER SETTING 320 I 25
HEATER BOX SETTING 320 I 25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .002 @ 15 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT

K 7.7

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 669.046	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1		.85	125	.33		2.541	673.2	71	71	268		6
2		.85	129	.32		2.46	677.3	75	71	264		6
3		.85	130	.32		2.46	681.2	76	71	276		6
4		.85	131	.32		2.46	685.2	73	70	250		6
5		.85	129	.33		2.54	689.2	77	70	263		6
6		.85	130	.34		2.62	693.27	76	70	256		6
7		.85	128	.33		2.54	697.35	75	70	253		6
8		.85	131	.34		2.62	701.36	78	70	251		6
9		.85	130	.34		2.62	705.48	79	70	256		6
10		.85	129	.33		2.54	709.41	79	71	258		6
11		.85	130	.34		2.62	713.41	79	71	257		6
12		.85	130	.33		2.54	717.439	78	71	250		6
Av		+.85	129.3		.5751	2.5467	48.393		73.4			

TIME END = 9:50

POST TEST LEAK CHECKS

METER 0.001 @ 15 in. Hg
PITOTS 0 @ 2 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	222	132	2	7	218
INITIAL	100	100	0	80	200
LIQUID COLLECTED	122	32	3	—	18
TOTAL VOLUME COLLECTED			175		

175 total

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.4	6.9		
2					
3					
4					

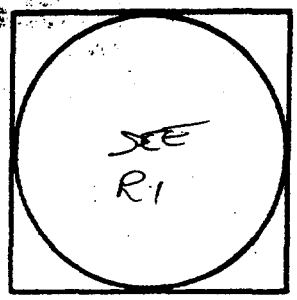
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-29-94
LOCATION Portage
OPERATOR CS - TR - TS
STACK NO. 1 Outlet
RUN NO. R2 - RM5B/26A
SAMPLE BOX NO. A-6
METER BOX NO. A3
METER ΔH @ 1.875
Y = .999
TIME START = 10:20

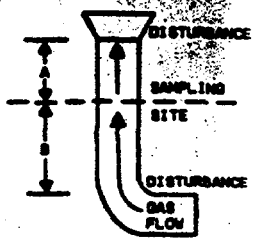
AMBIENT TEMPERATURE 70
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % 15%
PROBE LENGTH, in. 13 A
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31 Ft
PROBE HEATER SETTING 320 I 25
HEATER BOX SETTING 320 I 25
Δ Cp FACTOR .84
FILTER NO. _____
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .002 @ 15 in. Hg
PITOTS 2 @ 3 in. H₂O
ORSAT _____

7.7

P / θ	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 717.748	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5	+.85	130	.30		2.31	721.9	72	70	309		4
2	10	.85	129	.30		2.31	725.36	76	70	308		4
3	15	.85	131	.32		2.46	729.23	82	71	305		4
4	20	.85	128	.33		2.54	733.24	81	74	291		4
5	25	.85	130	.33		2.54	737.3	82	73	300		4
6	30		134	.34		2.62	741.3	81	73	300		5
7	35		132	.35		2.70	746.1	75	68	300		3
8	40		133	.37		2.85	750.5	77	69	301		6
9	45		132	.37		2.85	754.29	78	70	312		6
10	50		131	.35		2.70	758.69	76	69	214		6
11	55		132	.35		2.70	763.08	77	69	210		6
12	60		130	.33		2.54	767.136	77	69	224		5
Av		+.85	131.0		.5799	2.5517	49.388		74.1			

TIME END = 1:37 PM

POST TEST LEAK CHECKS

METER .602 @ 15 in. Hg
PITOTS 0 @ 4 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	228	138	4		216
INITIAL	100	100	0	56	200
LIQUID COLLECTED	128	38	4		
TOTAL VOLUME COLLECTED					

186 ml

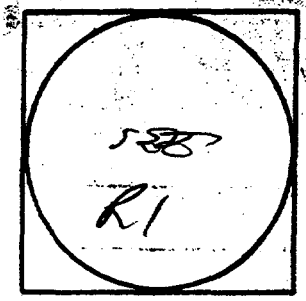
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.6	7.8		
2					
3					
4					

PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6-29-94
LOCATION Portage
OPERATOR TS
STACK NO. Outlet
RUN NO. 3 M5
SAMPLE BOX NO. AC
METER BOX NO. A3
METER ΔH @ 1.875
Y = 0.999
TIME START = 12:10

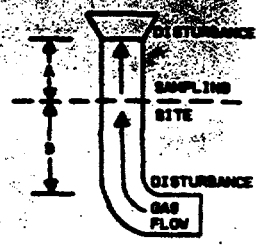
AMBIENT TEMPERATURE 68
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 15
PROBE LENGTH, ~~HG~~ 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, ~~in~~ 315
PROBE HEATER SETTING 320 I 25
HEATER BOX SETTING 320 I 25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT _____ mg.

NORTH



CROSS SECTION

SCHEMATIC OF STACK



PRE TEST LEAK CHECKS

METER 0.002 @ 15" in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT 2 C

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 767.166	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
1	5	.85	131	.32		2.46	771.17	74	68	310		5
2	10	.85	133	.31		2.39	775.0	78	68	310		5
3	15	.85	130	.31		2.39	778.98	80	69	312		5
4	20		131	.32		2.46	782.7	75	70	315		6
5	25		130	.32		2.46	786.7	78	70	322		6
6	30		132	.32		2.54	790.66	73	69	326		6
7	35		130	.32		2.46	794.6	75	69	325		6
8	40		129	.32		2.46	798.5	80	70	325		6
9	45		131	.33		2.54	802.43	81	71	325		6
10	50		133	.33		2.54	806.4	81	71	325		6
11	55		133	.32		2.46	810.2	81	71	330		6
12	60		130	.31		2.39	814.157	80	71	305		6
Av		.85	131.1			1.5657	2.4625	47.021		74.1		

TIME END = 13:10

POST TEST LEAK CHECKS

METER 0.002 @ 15" in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT 0 C

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL	284	172	4		215
INITIAL	100	100	0	56	200
LIQUID COLLECTED	134	72	4		15
TOTAL VOLUME COLLECTED				175	

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		12.5	6.9		
2					
3					
4					

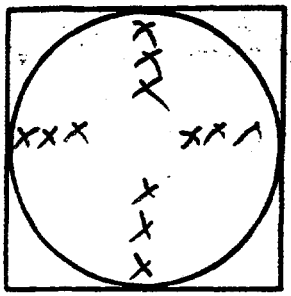
PARTICULATE FIELD DATA

PLANT Pure Air
DATE 6/29/94
LOCATION Portage Ind
OPERATOR TS/TR
STACK NO. FGD Outlet
RUN NO. R1 Rn 8
SAMPLE BOX NO.
METER BOX NO. A-7
METER ΔH @ 1.839
Y = .947
TIME START = 8:30 AM

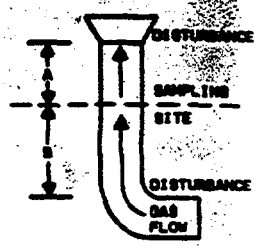
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 15%
PROBE LENGTH, in. 18'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31
PROBE HEATER SETTING 325 ±25
HEATER BOX SETTING 325 ± 25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT _____ mg.

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .0001 @ 7.5 in. Hg
PITOTS 600 @ 6 in. H₂O
ORSAT OK

7.52

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³ 48.254	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
5		.85	133	.30		2.26	052.10	70	70	325	54	7
10		.85	133	.31		2.33	056.20	71	69	324	54	7
15			134	.34		2.56	060.60	73	64	324	54	8
20			135	.33		2.48	064.45	72	69	325	54	8
25			135	.32		2.41	069.20	72	64	325	59	8
30			135	.33		2.48	072.80	72	64	325	54	8
35			135	.33		2.48	077.73	72	64	325	54	8
40			135	.35		2.41	082.00	72	64	325	54	9
45			135	.36		2.71	085.90	74	68	325	59	9
50			133	.30		2.26	089.80	70	68	325	54	7
55			133	.29		2.18	093.55	72	68	325	59	7
60			133	.28		2.11	097.471	72	68	325	59	7
Av		1.85	134.1		.563	2.389	49.217		70.3			

TIME END = 9:43 AM

POST TEST LEAK CHECKS

METER 0.004 @ 10 in. Hg
PITOTS 0 @ 3 in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

PARTICULATE FIELD DATA

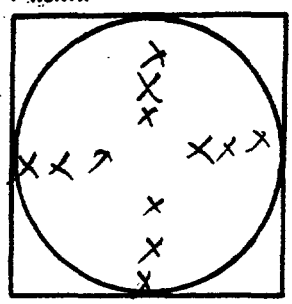
PLANT Pure Air
DATE 6/24/94
LOCATION Portage
OPERATOR TS/FRIC3
STACK NO. FGD Outlet
RUN NO. R2 RM 8
SAMPLE BOX NO. A6
METER BOX NO. A7
METER ΔH @ 1.839
Y = .993
TIME START = 10:20

AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 15%
PROBE LENGTH, in. 10'
NOZZLE DIAMETER, in. .312
STACK DIAMETER, in. 31'
PROBE HEATER SETTING 325 ± 25
HEATER BOX SETTING 325 ± 25
Δ Cp FACTOR .84
FILTER NO.
FILTER TARE WEIGHT mg.

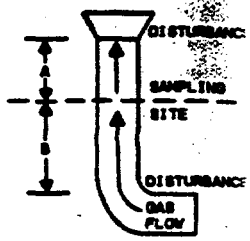
K 7.52

NORTH

SCHEMATIC OF STACK



CROSS SECTION



PRE TEST LEAK CHECKS

METER .0001 @ 10 in. Hg
PITOTS .00C @ 8 in. H₂O
ORSAT OK

P #	θ	STATIC PRESSURE +/- in H₂O	Ts °F	Δ P in H₂O	√Δ P	Δ H in H₂O	Vm ft³	Tm INLET °F	Tm OUTLET °F	OVEN TEMP. °F	IMP. OUTLET TEMP. °F	VACUUM (in Hg)
							997.98					
5		+.85	133	.31		2.33	103.60	70	70	320	59	4
10			133	.30		2.26	107.9	74	70	321	54	4
15			133	.31		2.33	112.50	75	71	322	54	4
20			134	.32		2.41	117.20	77	72	322	54	4
25			134	.31		2.33	120.30	76	71	321	54	4
30			134	.32		2.41	124.26	73	72	321	54	4
35			134	.30		2.26	128.50	67	68	321	54	4
40			134	.33		2.48	132.90	68	66	320	54	4
45			134	.32		2.41	136.90	68	66	320	54	4
50			133	.30		2.26	141.80	67	66	320	54	4
55			133	.30		2.26	144.80	71	66	320	58	4
60			133	.29		2.18	148.750	71	66	320	58	4
Av		+.85	133.5		.5559	2.326	50.769		99.2			

TIME END = 11:37 AM

POST TEST LEAK CHECKS

METER @ in. Hg
PITOTS @ in. H₂O
ORSAT OK

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT g
FINAL					
INITIAL	100	100		56	2005
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

APPENDIX L

LABORATORY ANALYSIS

Triangle Laboratories of RTP Project 28342

Almega Corporation

Addendum Date: July 12, 1994

Sixteen liquid samples were received by Triangle Laboratories of RTP, Inc. on June 20, 1994 at ambient temperature and in good condition. The samples were stored at ambient temperature until the time of analysis. These samples were analyzed for HCl content by ion chromatography using Method 26 with suppressed conductivity detection. Results reported relate only to the items tested.

Date received:	June 20, 1994
Date analyzed:	June 21/22, 1994

Instrument Conditions:

Dionex DX300 Ion Chromatograph with a PED-II Conductivity Detector

Eluent flow:	1.5 mL/min. (1.8 mM sodium carbonate/1.7mM sodium bicarbonate)
Suppressor:	Anion self-regenerating suppressor-1
Sample Loop:	50 uL
Detection:	Conductivity - suppressed ion
Data Recording:	Dionex AI 450 software

This report should not be reproduced except in full. Any reproduction requires the permission of Triangle Laboratories of RTP, Inc.

COMMENTS:

A six point chloride calibration curve ranging from 0.5 ppm to 100 ppm was performed both before and after sample analysis.

Reported concentrations are mean values determined from duplicate analyses.

No chloride was found in either of the method blanks. Chloride was detected in some of the outlet samples at levels below the calibration range. Amounts for samples with a run concentration below 0.5 ppm should be considered estimated.

FOR FURTHER INFORMATION:

This report should not be reproduced except in full. Any reproduction requires the permission of Triangle Laboratories of RTP, Inc. If you have technical questions concerning the contents of this package or the procedures and protocols employed to generate the analytical data, please contact Barry Rayfield at (919) 544-8357.

Addendum:

The samples were inadvertently not analyzed for fluoride. Enclosed please find calibrations and results for the fluoride analyses performed on July 8, 1994. As with the chloride analysis, run concentrations at a level below 0.5 ppm are below the linear calibration and the amounts reported should be considered estimated.

Report Preparation

Eileen Winchester
Report Preparation Chemist

Quality Control

for Barry Rayfield
Project Manager

The total number of pages in the data package is 58

The Almega Corporation

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date 6/15/94 Page 1 of 2

Project Number 7316

SOURCE PURE AIR
TEST DATE 7-8 June 94
Method of Shipment

PROJECT MANAGER
Bill Byczinski
PHONE NUMBER
(708) 595-0175

ANALYSES: PM2.5A #10 HF

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	PM2.5A	#10	HF	Sample Condition/ REMARKS
FGD Inlet Imp 1-2 R1	6/7		0802	✓			1	✓			
FGD Inlet Imp 1-2 R2	6/7		0803	✓			1	✓			
FGD Outlet Imp 1-2 R1	6/7		1598	✓			1	✓			
FGD Outlet Imp 1-2 R2	6/7		1603	✓			1	✓			
FGD Inlet Imp 1-2 R1	6/8		2252	✓			1	✓			
FGD Inlet Imp 1-2 R2	6/8		0804	✓			1	✓			
FGD Outlet Imp 1-2 R1	6/8		1750	✓			1	✓			
FGD Outlet Imp 1-2 R2	6/8		1760	✓			1	✓			

SAMPLERS: (Signature) Lina M. Blaine

Relinquished by: (Signature)

Received by: (Signature) — Date Time

Received by: (Signature) — Date Time

INDICATE SAMPLE DISPOSITION
1. Sample to be Returned to Client: Yes ____ No ____ Other ____
2. Requested Sample Storage Time: ____ Days

Relinquished by: (Signature) — Date Time

Received for Laboratory by: — Date RECEIVED Time: JUN 20 1994 1030

Date ACCEPTED Time: JUN 20 1994

Special Instructions: Please return all dangerous goods packaging.

The Almega Corporation

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date 6/15/94 Page 2 of 2 4

Project Number 7316

SOURCE Pure Air

TEST DATE 9,13 June 94

PROJECT MANAGER (708) 595-0175

PHONE NUMBER Bill Byczinski

Method of Shipment

ANALYSES

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	Rm26A HCl HF	Sample Condition/ REMARKS
FGD inlet Imp 1-2 R1	6/9		2253	✓			1	✓	
FGD inlet Imp 1-2 R2	6/9		2254	✓			1	✓	
FGD outlet Imp 1-2 R1	6/9		2078	✓			1	✓	
FGD outlet Imp 1-2 R2	6/9		2082	✓			1	✓	
FGD inlet Imp 1-2 R1	6/13		0805	✓			1	✓	
FGD inlet Imp 1-2 R2	6/13		2255	✓			1	✓	
FGD outlet Imp 1-2 R1	6/13		1746	✓			1	✓	
FGD outlet Imp 1-2 R2	6/13		1757	✓			1	✓	

SAMPLERS: (Signature) Lisa M. Blaine

Relinquished by: (Signature)

Received by: (Signature) — Date Time

Received by: (Signature) — Date Time

INDICATE SAMPLE DISPOSITION

1. Sample to be Returned to Client: Yes _____ No _____ Other _____
2. Requested Sample Storage Time: _____ Days

Relinquished by: (Signature) — Date Time

Received for Laboratory by: — Date RECEIVED Time: JUN 20 1994 1630 — Date ACCEPTED Time: JUN 20 1994 1633

Special Instructions

Custody Seal : Present/Intact	TLI Project Number	28342	Book
Chain of Custody : Present			
Sample Tags : Present	Client: AC003	ALMEGA CORPORATION	82
Sample Tag Numbers : Listed			
SMO Forms : Absent	Date Received	06/20/94 By	Page
Box	Temp 70.0 F	Carrier and Number	FEDX.4645928990	233

TLI Number / mR/H / Client ID / Matrix / Location	To LAB Date/Init	To STORAGE Date/Init	To LAB Date/Init	To STORAGE Date/Init	To LAB Date/Init	To STORAGE Date/Init	To LAB Date/Init	To STORAGE Date/Init
82-233-1 LIQUID FGD INLET IMP1-2 R1 0802 FRIG#3A								
82-233-2 LIQUID FGD INLET IMP1-2 R2 0803 FRIG#3A								
82-233-3 LIQUID FGD INLET IMP1-2 R1 2252 FRIG#3A								
82-233-4 LIQUID FGD INLET IMP1-2 R2 0804 FRIG#3A								
82-233-5 LIQUID FGD INLET IMP1-2 R1 2253 FRIG#3A								
82-233-6 LIQUID FGD INLET IMP1-2 R2 2254 FRIG#3A								
82-233-7 LIQUID FGD INLET IMP1-2 R1 0805 FRIG#3A								
82-233-8 LIQUID FGD INLET IMP1-2 R2 2255 FRIG#3A								
82-233-9 LIQUID FGD OUTLET IMP1-2 R1 1598 FRIG#3A								
82-233-10 LIQUID FGD OUTLET IMP1-2 R2 1603 FRIG#3A								

Receiving Remarks:

Archive Remarks:

Custody Seal : Present/Intact	TLI Project Number	28342	Book
Chain of Custody : Present			
Sample Tags : Present	Client: AC003	ALMEGA CORPORATION	82
Sample Tag Numbers : Listed			
SMO Forms : Absent	Date Received	06/20/94 By Bill Short	Page
Box Temp 70.0 F	Carrier and Number	FEDX.4645928990	233

TLI Number / mR/H / Client ID	Matrix / Location	To LAB Date/Init	To STORAGE Date/Init	To LAB Date/Init	To STORAGE Date/Init	To LAB Date/Init	To STORAGE Date/Init	To LAB Date/Init	To STORAGE Date/Init
82-233-11 FGD OUTLET IMP1-2 R1 1750	LIQUID FRIG#3A								
82-233-12 FGD OUTLET IMP1-2 R2 1760	LIQUID FRIG#3A								
82-233-13 FGD OUTLET IMP1-2 R1 2078	LIQUID FRIG#3A								
82-233-14 FGD OUTLET IMP1-2 R2 2082	LIQUID FRIG#3A								
82-233-15 FGD OUTLET IMP1-2 R1 1746	LIQUID FRIG#3A								
82-233-16 FGD OUTLET IMP1-2 R2 1757	LIQUID FRIG#3A								

Receiving Remarks:

Archive Remarks:

DIONEX SCHEDULE - C:\DX\SCHEDULE\28342R2.SCH

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int.Std.
1	STD 0.5 PPM	..\2ANION.m	..\STD00501.D01	1	1	1
2	STD 0.5 PPM	..\2ANION.m	..\STD00501.D02	1	1	1
3	STD 1.0 PPM	..\2ANION.m	..\STD00101.D03	1	1	1
4	STD 1.0 PPM	..\2ANION.m	..\STD00101.D04	1	1	1
5	STD 3.0 PPM	..\2ANION.m	..\STD00301.D05	1	1	1
6	STD 3.0 PPM	..\2ANION.m	..\STD00301.D06	1	1	1
7	STD 10.0 PPM	..\2ANION.m	..\STD01001.D07	1	1	1
8	STD 10.0 PPM	..\2ANION.m	..\STD01001.D08	1	1	1
9	STD 30.0 PPM	..\2ANION.m	..\STD03001.D09	1	1	1
10	STD 30.0 PPM	..\2ANION.m	..\STD03001.D10	1	1	1
11	STD 100.0 PPM	..\2ANION.m	..\STD10001.D11	1	1	1
12	STD 100.0 PPM	..\2ANION.m	..\STD10001.D12	1	1	1
13	H2O BLANK	..\2ANION.m	..\H2OBLK1.D13	1	1	1
14	H2O BLANK	..\2ANION.m	..\H2OBLK1.D14	1	1	1
15	QC 20 PPM	..\2ANION.m	..\QC20PPM1.D15	1	1	1
16	QC 20 PPM	..\2ANION.m	..\QC20PPM1.D16	1	1	1
17	FGD INLET IMP-2 R1	..\2ANION.m	..\82233011.D17	1	1	1
18	FGD INLET IMP-2 R1	..\2ANION.m	..\82233011.D18	1	1	1
19	FGD INLET IMP-2 R2	..\2ANION.m	..\82233021.D19	1	1	1
20	FGD INLET IMP-2 R2	..\2ANION.m	..\82233021.D20	1	1	1
21	FGD INLET IMP-2 R1	..\2ANION.m	..\82233031.D21	1	1	1
22	FGD INLET IMP-2 R1	..\2ANION.m	..\82233031.D22	1	1	1
23	FGD INLET IMP-2 R2	..\2ANION.m	..\82233041.D23	1	1	1
24	FGD INLET IMP-2 R2	..\2ANION.m	..\82233041.D24	1	1	1
25	FGD INLET IMP-2 R1	..\2ANION.m	..\82233051.D25	1	1	1
26	FGD INLET IMP-2 R1	..\2ANION.m	..\82233051.D26	1	1	1
27	FGD INLET IMP-2 R2	..\2ANION.m	..\82233061.D27	1	1	1
28	FGD INLET IMP-2 R2	..\2ANION.m	..\82233061.D28	1	1	1
29	FGD INLET IMP-2 R1	..\2ANION.m	..\82233071.D29	1	1	1
30	FGD INLET IMP-2 R1	..\2ANION.m	..\82233071.D30	1	1	1
31	FGD INLET IMP-2 R2	..\2ANION.m	..\82233081.D31	1	1	1
32	FGD INLET IMP-2 R2	..\2ANION.m	..\82233081.D32	1	1	1
33	FGD INLET IMP-2 R1	..\2ANION.m	..\82233091.D33	1	1	1
34	FGD INLET IMP-2 R1	..\2ANION.m	..\82233091.D34	1	1	1
35	FGD INLET IMP-2 R2	..\2ANION.m	..\82233101.D35	1	1	1
36	FGD INLET IMP-2 R2	..\2ANION.m	..\82233101.D36	1	1	1
37	FGD OUTLET IMP-2 R1	..\2ANION.m	..\82233111.D37	1	1	1
38	FGD OUTLET IMP-2 R1	..\2ANION.m	..\82233111.D38	1	1	1
39	FGD OUTLET IMP-2 R2	..\2ANION.m	..\82233121.D39	1	1	1
40	FGD OUTLET IMP-2 R2	..\2ANION.m	..\82233121.D40	1	1	1
41	FGD OUTLET IMP-2 R1	..\2ANION.m	..\82233131.D41	1	1	1
42	FGD OUTLET IMP-2 R1	..\2ANION.m	..\82233131.D42	1	1	1
43	FGD OUTLET IMP-2 R2	..\2ANION.m	..\82233141.D43	1	1	1
44	FGD OUTLET IMP-2 R2	..\2ANION.m	..\82233141.D44	1	1	1
45	FGD OUTLET IMP-2 R1	..\2ANION.m	..\82233151.D45	1	1	1
46	FGD OUTLET IMP-2 R1	..\2ANION.m	..\82233151.D46	1	1	1
47	FGD OUTLET IMP-2 R2	..\2ANION.m	..\82233161.D47	1	1	1
48	FGD OUTLET IMP-2 R2	..\2ANION.m	..\82233161.D48	1	1	1
49	STD 0.5 PPM	..\2ANION.m	..\STD00501.D49	1	1	1
50	STD 0.5 PPM	..\2ANION.m	..\STD00501.D50	1	1	1
51	STD 1.0 PPM	..\2ANION.m	..\STD00101.D51	1	1	1
52	STD 1.0 PPM	..\2ANION.m	..\STD00101.D52	1	1	1
53	STD 3.0 PPM	..\2ANION.m	..\STD00301.D53	1	1	1
54	STD 3.0 PPM	..\2ANION.m	..\STD00301.D54	1	1	1
55	STD 10.0 PPM	..\2ANION.m	..\STD01001.D55	1	1	1
56	STD 10.0 PPM	..\2ANION.m	..\STD01001.D56	1	1	1
57	STD 30.0 PPM	..\2ANION.m	..\STD03001.D57	1	1	1

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int.Std.
58	STD 30.0 PPM	..\2ANION.m	..\STD03001.D58	1	1	1
59	STD 100.0 PPM	..\2ANION.m	..\STD10001.D59	1	1	1
60	STD 100.0 PPM	..\2ANION.m	..\STD10001.D60	1	1	1
1	END	..\STANDCL.	..\END	1	1	1

Comment:
7/8/94 PROJECT #28342 RE- ANALYZED ON THIS SCHEDULE FOR (HF) TIMES TWO . TIMOTHY BELLAMY.

JUN-30-1994 19:01 FROM TRIANGLE LABS OF RTP TO 17085952103 P.04

TLI# 28342-HCL
CLIENT SAMPLES
ALMEGA CORPORATION
21-22-JUNE-94

TLI ID	CLIENT ID	RT	AREA	LOG AREA	RUN CONC (ppm)	DILUTION FACTOR	SAMPLE CONC (ppm)	AVG CONC (ppm)	RPD	TOTAL mL	TOTAL mg Cl	TOTAL mg HCl	TOTAL mg Cl2	PH
81-233-1	FGD INLET IMP 1-2 R1 0802	2.75	1201153152	9.080	71.604	1	71.604	71.300	0.9	355	25.312	26.031	---	2
		2.75	1189464090	9.075	70.996	1	70.996							
81-233-2	FGD INLET IMP 1-2 R2 0803	2.59	931348260	8.969	57.355	1	57.355	57.392	0.1	245	14.061	14.461	---	2
		2.59	932736081	8.970	57.429	1	57.429							
81-233-3	FGD INLET IMP 1-2 R1 2252	2.68	1384603878	9.135	80.033	1	80.033	80.311	0.7	245	19.676	20.235	---	2
		2.68	1375469786	9.138	80.588	1	80.588							
81-233-4	FGD INLET IMP 1-2 R2 0804	2.65	1076861952	9.032	65.097	1	65.097	65.395	0.9	245	16.022	16.477	---	2
		2.65	1088151565	9.037	65.692	1	65.692							
81-233-5	FGD INLET IMP 1-2 R1 2253	2.64	1338298461	9.127	78.685	1	78.685	79.207	1.3	230	18.218	18.735	---	2
		2.64	1358641904	9.133	79.728	1	79.728							
81-233-6	FGD INLET IMP 1-2 R2 2254	2.60	769323034	8.897	49.647	1	49.647	49.741	0.4	235	11.689	12.022	---	2
		2.60	792755750	8.899	49.835	1	49.835							
81-233-7	FGD INLET IMP 1-2 R1 0805	2.56	107389632	8.031	8.715	1	8.715	8.720	0.1	335	2.921	3.004	---	2
		2.56	107522651	8.032	8.725	1	8.725							
81-233-8	FGD INLET IMP 1-2 R2 2255	2.65	1204766720	9.081	71.792	1	71.792	71.897	0.3	330	23.726	24.401	---	2
		2.65	1208810990	9.082	72.002	1	72.002							
81-233-9	FGD OUTLET IMP 1-2 R1 1598	2.58	5112371	6.709	0.612	1	0.612	0.616	1.2	440	0.271	0.279	---	2
		2.58	5181514	6.714	0.619	1	0.619							
81-233-10	FGD OUTLET IMP 1-2 R2 1603	2.56	2424688	6.385	0.319	1	0.319	0.314	3.2	420	0.132	0.136	---	2
		2.56	2386390	6.369	0.309	1	0.309							
81-233-11	FGD OUTLET IMP 1-2 R1 1750	2.56	1846877	6.266	0.252	1	0.252	0.243	6.9	445	0.108	0.111	---	2
		2.56	1705667	6.232	0.235	1	0.235							
81-233-12	FGD OUTLET IMP 1-2 R2 1760	2.55	1763338	6.246	0.242	1	0.242	0.229	10.9	430	0.099	0.101	---	2
		2.55	1555302	6.192	0.217	1	0.217							
81-233-13	FGD OUTLET IMP 1-2 R1 2078	2.66	6602346	6.820	0.765	1	0.765	0.766	0.2	330	0.253	0.260	---	2
		2.65	6620790	6.821	0.767	1	0.767							
81-233-14	FGD OUTLET IMP 1-2 R2 2082	2.57	1927450	6.285	0.261	1	0.261	0.268	5.1	465	0.126	0.128	---	2
		2.56	2042509	6.310	0.275	1	0.275							
81-233-15	FGD OUTLET IMP 1-2 R1 1748	2.64	14212874	7.153	1.494	1	1.494	1.496	0.3	615	0.920	0.946	---	2
		2.65	14263110	7.154	1.498	1	1.498							
81-233-16	FGD OUTLET IMP 1-2 R2 1757	2.50	11398627	7.057	1.232	1	1.232	1.232	0.1	310	0.382	0.393	---	2
		2.50	11406845	7.057	1.233	1	1.233							

TOTAL mg HCL : (TOTAL mg CL) (FW HCL/ MW CL)
TOTAL mg CL2 : TOTAL mg CL x 2
ND=NONE DETECTED

TLI# 28342-FLUORIDE
CLIENT SAMPLES
ALMEGA CORPORATION
08-JULY-94

TLI ID	CLIENT ID	RT	AREA	LOG AREA	RUN CONC (ppm)	DILUTION FACTOR	SAMPLE CONC (ppm)	AVG CONC (ppm)	RPD	TOTAL mL	TOTAL mg F	*TOTAL mg HF	TOTAL mg F2	PH
81-233-1	FGD INLET IMP 1-2 R1 0802	1.54	90562925	7.96	8.01	1	8.01	8.01	0.2	355	2.85	3.00	---	2
		1.53	90774309	7.96	8.02	1	8.02							
81-233-2	FGD INLET IMP 1-2 R2 0803	ND	ND	ND	ND	1	ND	ND	ND	245	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-3	FGD INLET IMP 1-2 R1 2252	1.50	9758330	6.99	0.93	1	0.93	0.92	1.6	245	0.23	0.24	---	2
		1.50	9597550	6.98	0.92	1	0.92							
81-233-4	FGD INLET IMP 1-2 R2 0804	ND	ND	ND	ND	1	ND	ND	ND	245	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-5	FGD INLET IMP 1-2 R1 2253	1.49	4830349	6.68	0.47	1	0.47	0.50	9.9	230	0.11	0.12	---	2
		1.49	5351000	6.73	0.52	1	0.52							
81-233-6	FGD INLET IMP 1-2 R2 2254	1.50	3027211	6.48	0.30	1	0.30	0.30	0.0	235	0.07	0.07	---	2
		1.50	3028586	6.48	0.30	1	0.30							
81-233-7	FGD INLET IMP 1-2 R1 0805	1.55	15368943	7.19	1.44	1	1.44	1.44	0.2	335	0.48	0.51	---	2
		1.55	15404003	7.19	1.45	1	1.45							
81-233-8	FGD INLET IMP 1-2 R2 2255	ND	ND	ND	ND	1	ND	ND	ND	330	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-9	FGD OUTLET IMP 1-2 R1 1598	ND	ND	ND	ND	1	ND	ND	ND	440	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-10	FGD OUTLET IMP 1-2 R2 1603	ND	ND	ND	ND	1	ND	ND	ND	420	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-11	FGD OUTLET IMP 1-2 R1 1750	ND	ND	ND	ND	1	ND	ND	ND	445	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-12	FGD OUTLET IMP 1-2 R2 1760	ND	ND	ND	ND	1	ND	ND	ND	430	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-13	FGD OUTLET IMP 1-2 R1 2078	1.50	1130434	6.05	0.12	1	0.12	0.11	2.3	330	0.04	0.04	---	2
		1.50	1103274	6.04	0.11	1	0.11							
81-233-14	FGD OUTLET IMP 1-2 R2 2082	ND	ND	ND	ND	1	ND	ND	ND	465	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-15	FGD OUTLET IMP 1-2 R1 1746	1.54	946683	5.98	0.10	1	0.10	0.10	1.4	615	0.06	0.06	---	2
		1.54	960259	5.98	0.10	1	0.10							
81-233-16	FGD OUTLET IMP 1-2 R2 1757	ND	ND	ND	ND	1	ND	ND	ND	310	ND	ND	---	2
		ND	ND	ND	ND	1	ND							

*TOTAL mg HF = (f.w. HF / m.w. F) x [F]
ND = NONE DETECTED

Data Reprocessed On 07/11/1994 14:23:16

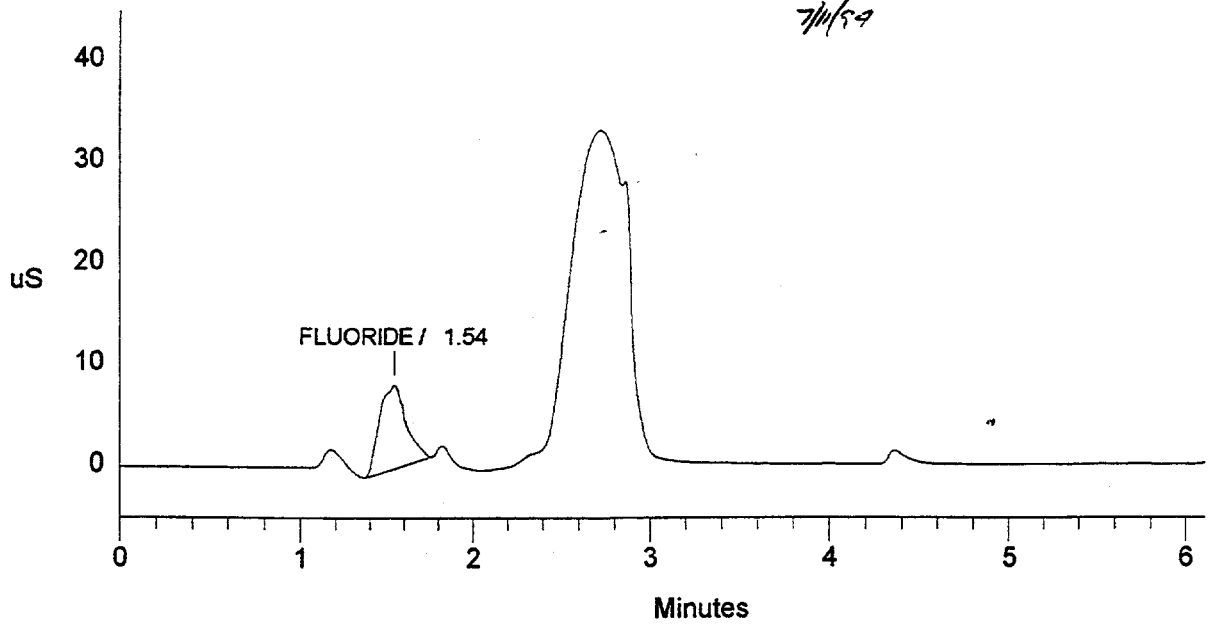
Sample Name: FGD INLET IMPI-2 R1 0802 Date: 07/08/1994 15:19:42
Data File : C:\DX\DATA\28342R2\82233011.D17
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 17 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.11	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.54	FLUORIDE	0.000	8147014	90562925	1	28.33
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	8147014	90562925		

File: 82233011.D17 Sample: FGD INLET IMPI-2 R1 0802



Data Reprocessed On 07/11/1994 14:25:24

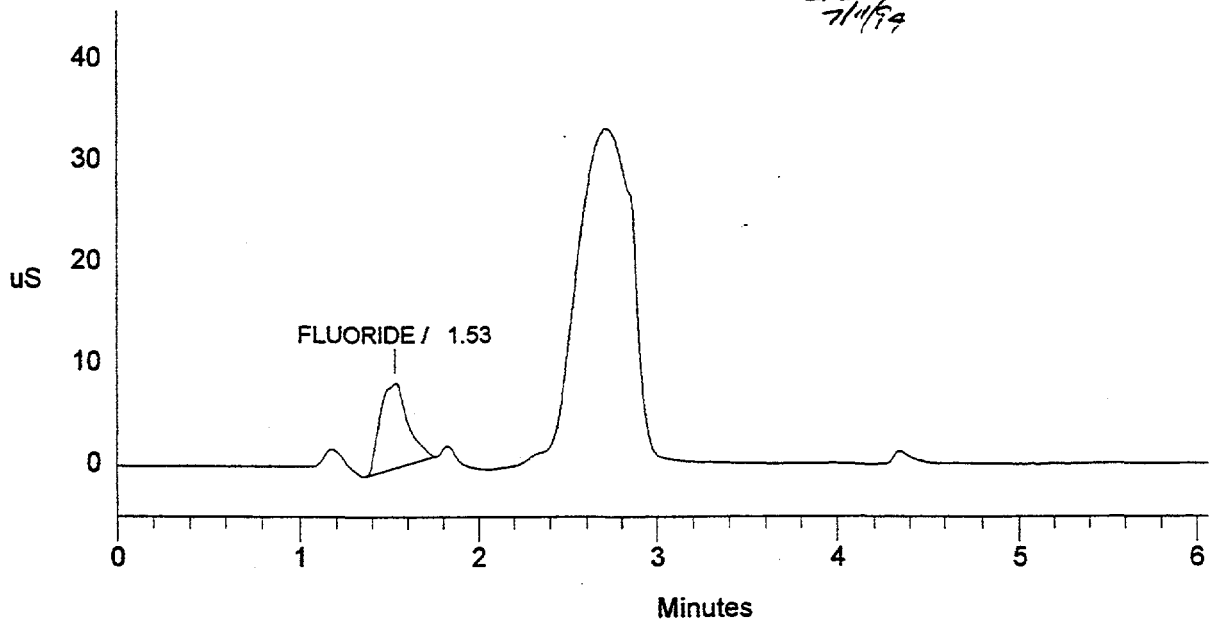
Sample Name: FGD INLET IMP-2 R1 0802 Date: 07/08/1994 15:33:29
Data File : C:\DX\DATA\28342R2\82233011.D18
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 18 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.07	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.53	FLUORIDE	0.000	8358708	90774309	1	27.50
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	8358708	90774309		

File: 82233011.D18 Sample: FGD INLET IMP-2 R1 0802



Data Reprocessed On 07/11/1994 14:27:58

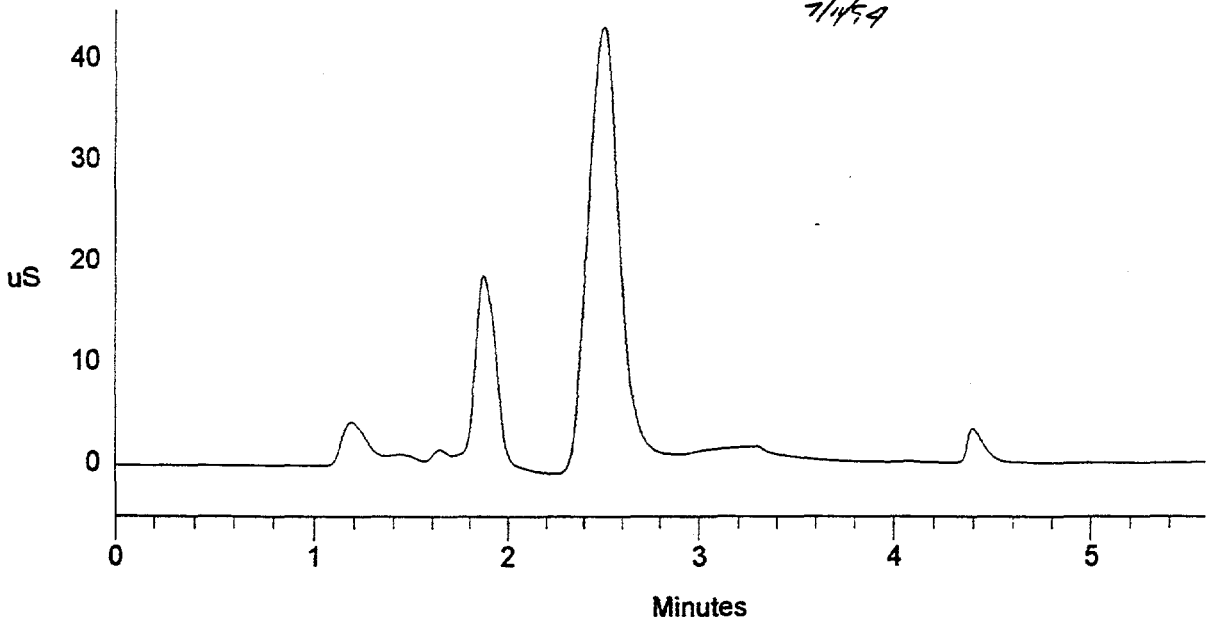
Sample Name: FGD INLET IMPI-2 R2 0803 Date: 07/08/1994 15:47:16
Data File : C:\DX\DATA\28342R2\82233021.D19
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 19 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.58	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233021.D19 Sample: FGD INLET IMPI-2 R2 0803



Data Reprocessed On 07/11/1994 14:29:16

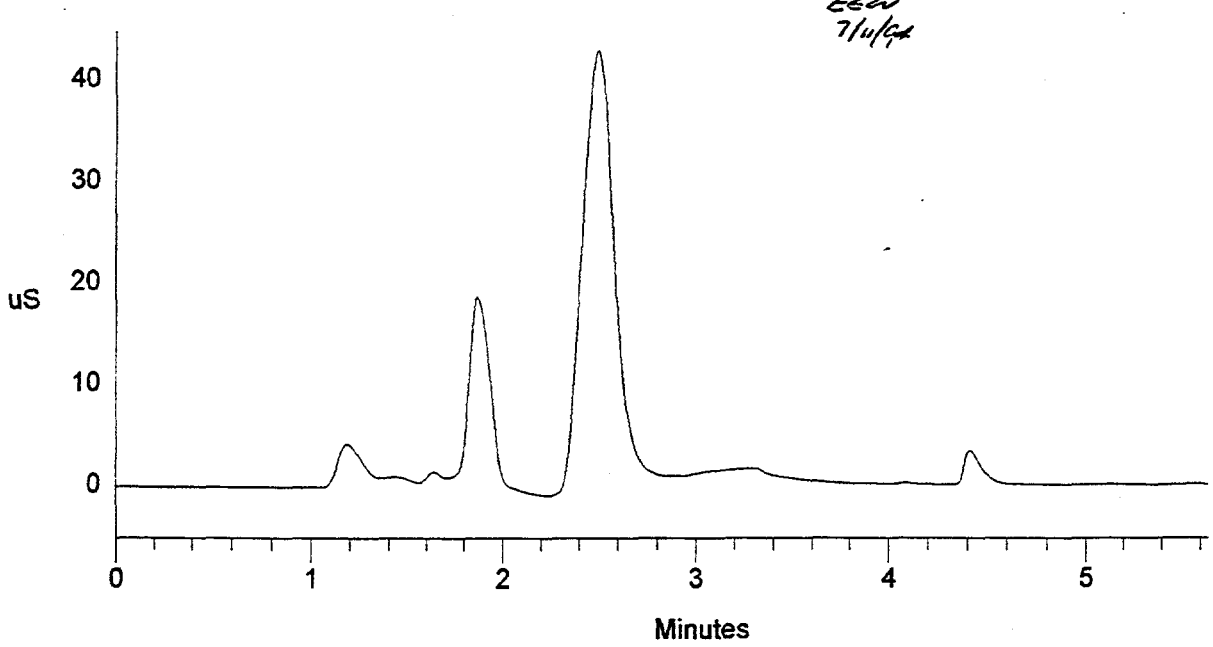
Sample Name: FGD INLET IMP-2 R2 0803 Date: 07/08/1994 16:01:03
Data File : C:\DX\DATA\28342R2\82233021.D20
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 20 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
xternal	1	1	3600	5Hz	0.00	5.64	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233021.D20 Sample: FGD INLET IMP-2 R2 0803



Data Reprocessed On 07/11/1994 14:35:45

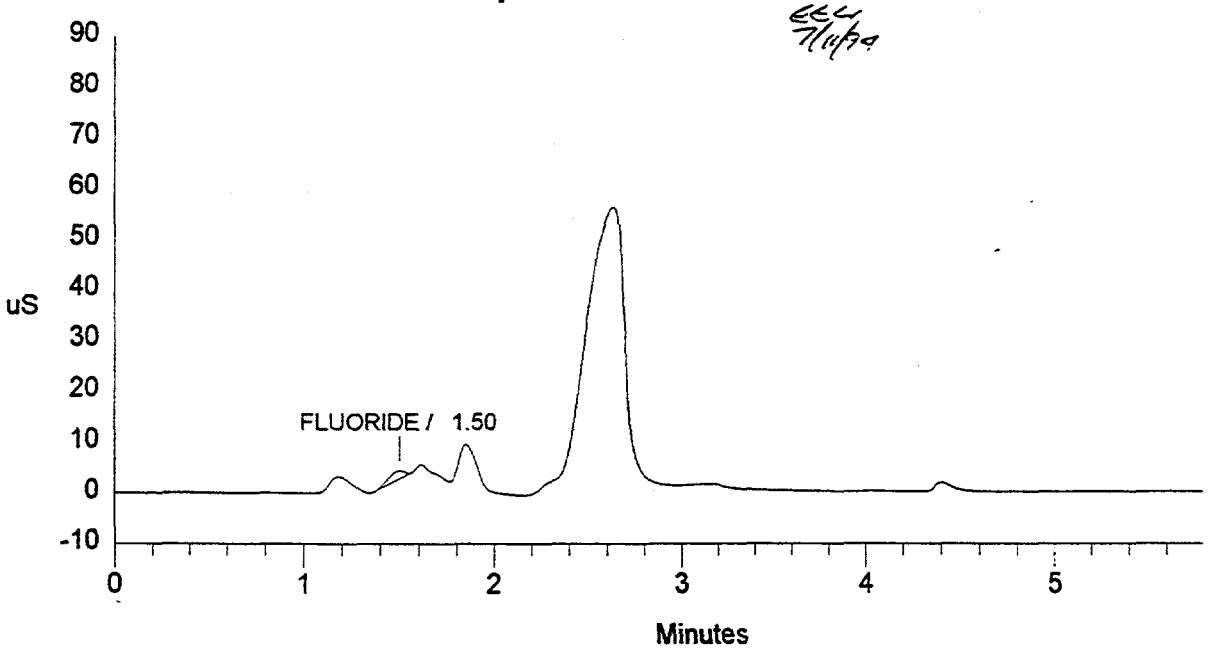
Sample Name: FGD INLET IMP-2 R1 2252 Date: 07/08/1994 16:14:49
Data File : C:\DX\DATA\28342R2\82233031.D21
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 21 Detector:PED-Cond.
Analyst : Column:

libration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
ternal	1	1	3600	5Hz	0.00	5.79	1000

********** Component Report: All Components **********

k. um	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.50	FLUORIDE	0.000	1629065	9758330	1	25.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	1629065	9758330		

File: 82233031.D21 Sample: FGD INLET IMP-2 R1 2252



Data Reprocessed On 07/11/1994 14:33:28

EEC 7/11/94

Sample Name: FGD INLET IMP-2 R1 2252 Date: 07/08/1994 16:28:35
Data File : C:\DX\DATA\28342R2\82233031.D22
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 22 Detector:PED-Cond.
Analyst : Column:

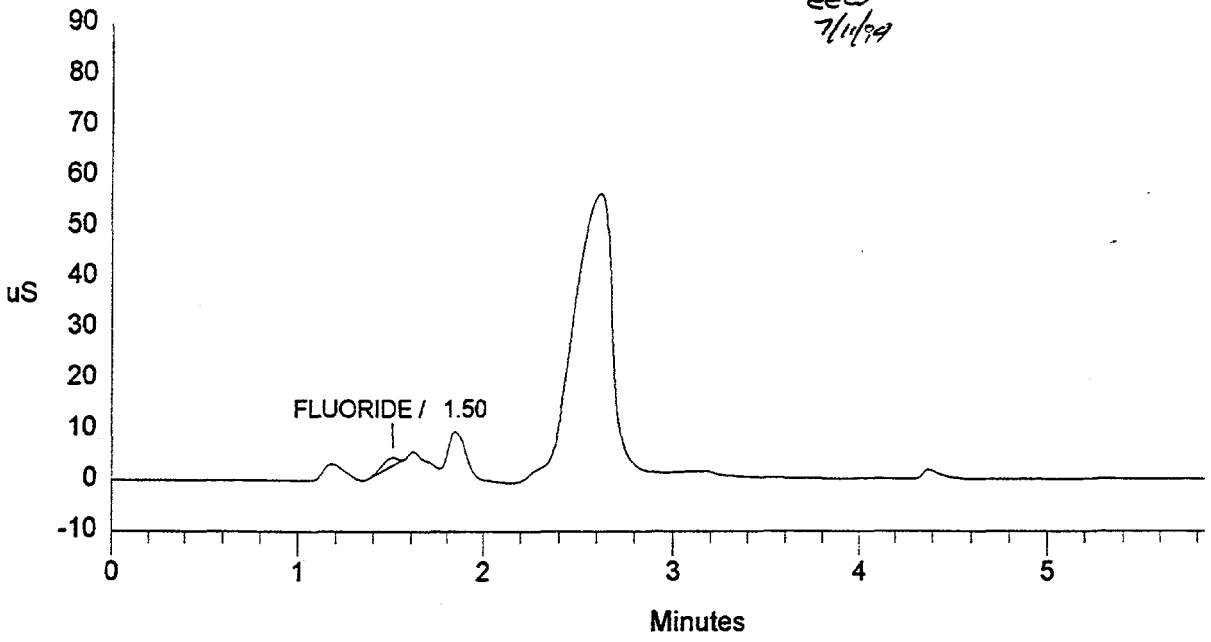
Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.84	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.50	FLUORIDE	0.000	1544584	9597550	1	25.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	1544584	9597550		

File: 82233031.D22 Sample: FGD INLET IMP-2 R1 2252

EEC 7/11/94



Data Reprocessed On 07/11/1994 14:50:04

EEC 7/11/94

Sample Name: FGD INLET IMP-2 R2 0804 Date: 07/08/1994 16:42:21
Data File : C:\DX\DATA\28342R2\82233041.D23
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 23 Detector:PED-Cond.
Analyst : Column:

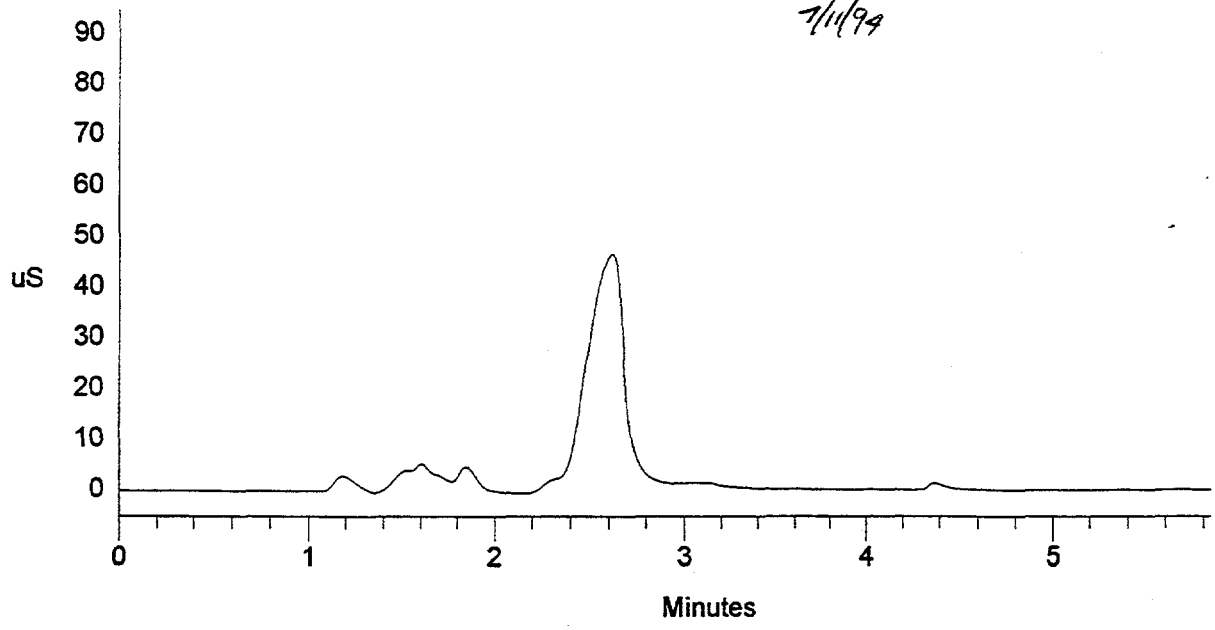
Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.84	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233041.D23 Sample: FGD INLET IMP-2 R2 0804

EEC 7/11/94



Data Reprocessed On 07/11/1994 14:52:47

EEW 7/11/94

Sample Name: FGD INLET IMP-2 R2 0804 Date: 07/08/1994 16:56:07
Data File : C:\DX\DATA\28342R2\82233041.D24
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 24 Detector:PED-Cond.
Analyst : Column:

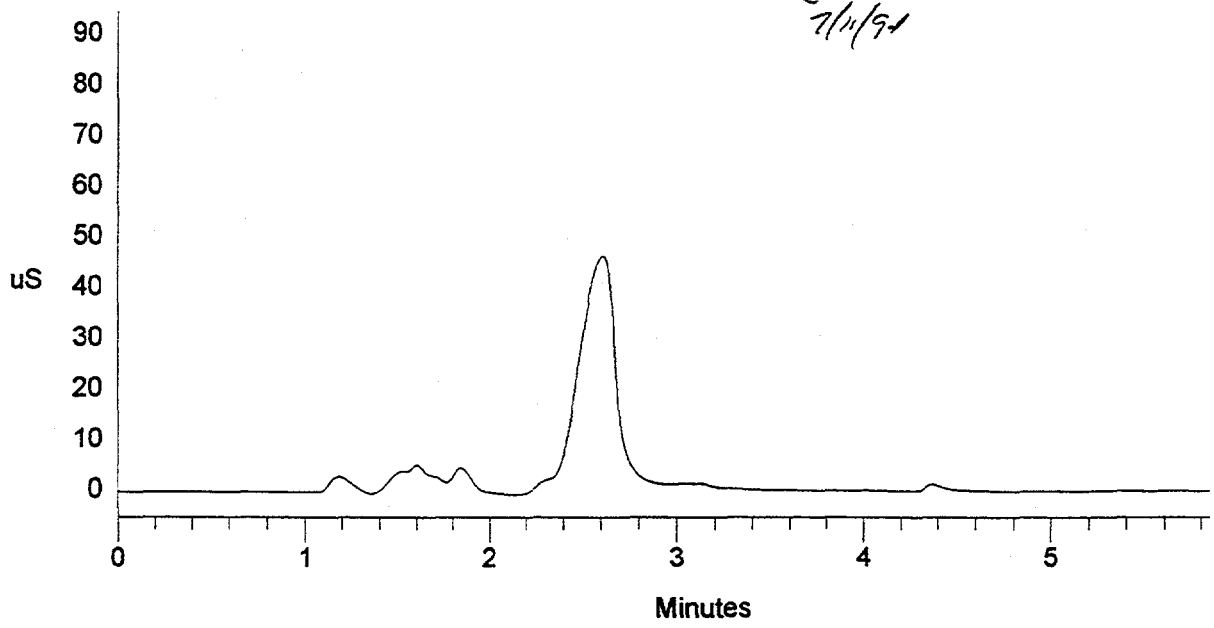
Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.85	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233041.D24 Sample: FGD INLET IMP-2 R2 0804

EEW 7/11/94



Data Reprocessed On 07/11/1994 15:08:39

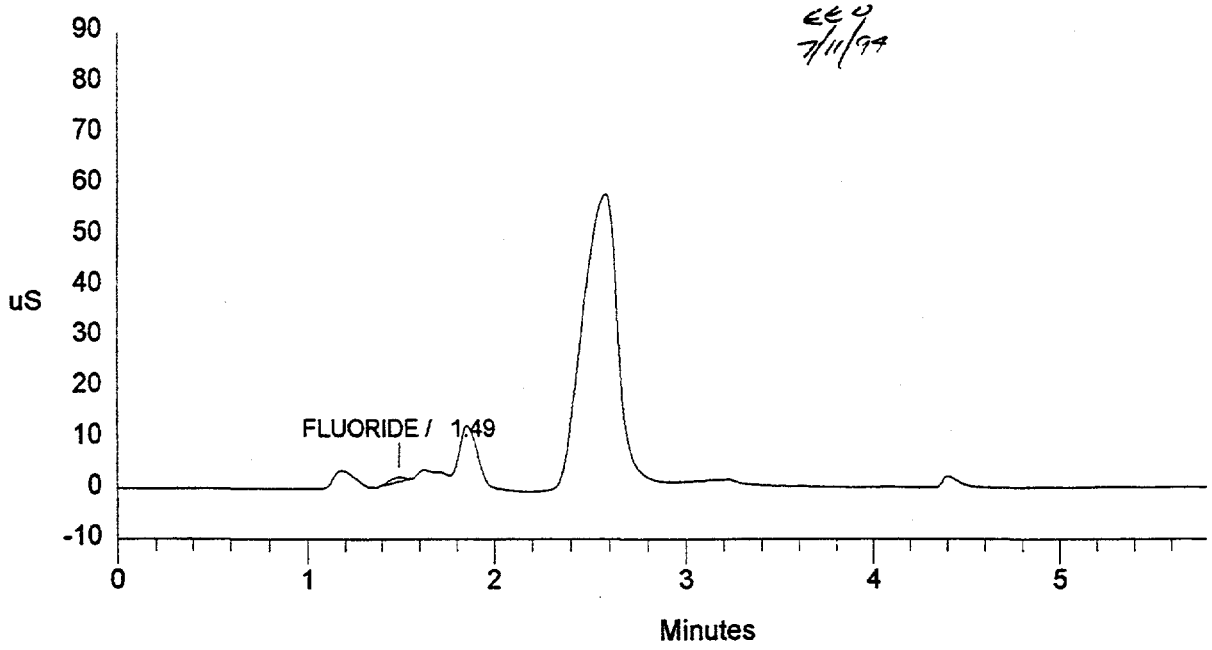
Sample Name: FGD INLET IMP-2 R1 2253			Date: 07/08/1994 17:09:54
Data File : C:\DX\DATA\28342R2\82233051.D25			
Method : C:\DX\METHOD\2ANION.met			
ACI Address: 1 System: 1	Inject#: 25		Detector:PED-Cond.
Analyst :	Column:		

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.79	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.49	FLUORIDE	0.000	852270	4830349	1	24.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	852270	4830349		

File: 82233051.D25 Sample: FGD INLET IMP-2 R1 2253



Data Reprocessed On 07/11/1994 15:15:21

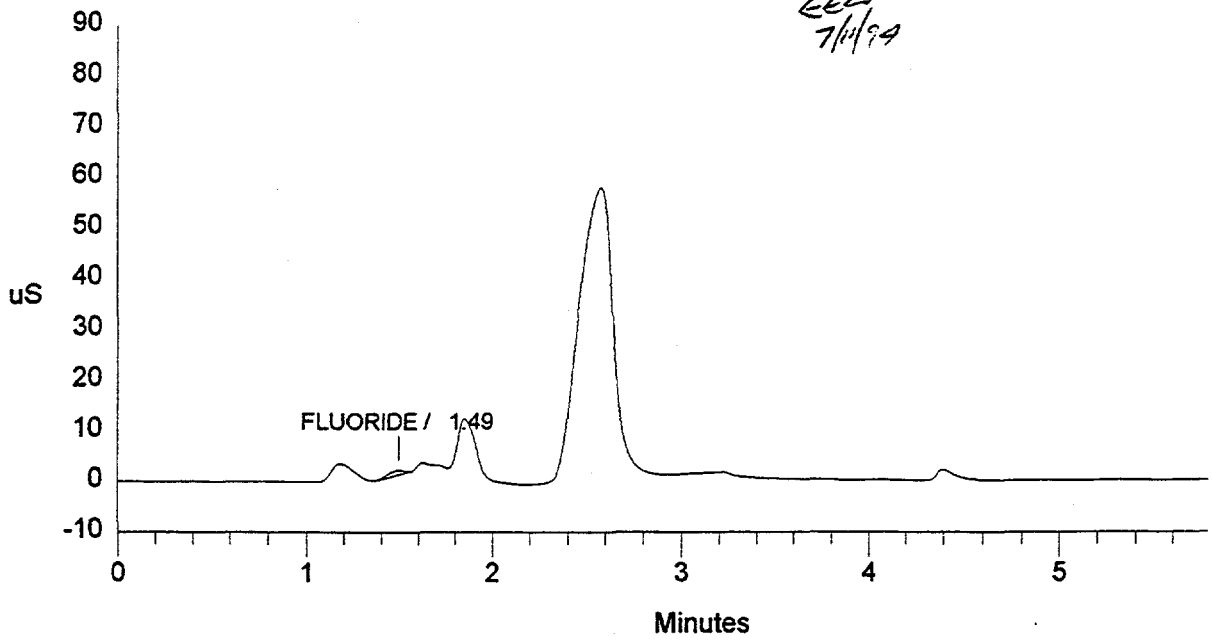
Sample Name: FGD INLET IMP-2 R1 2253 Date: 07/08/1994 17:23:40
Data File : C:\DX\DATA\28342R2\82233051.D26
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 26 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.79	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.49	FLUORIDE	0.000	887994	5351000	1	24.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	887994	5351000		

File: 82233051.D26 Sample: FGD INLET IMP-2 R1 2253



Data Reprocessed On 07/11/1994 15:17:57

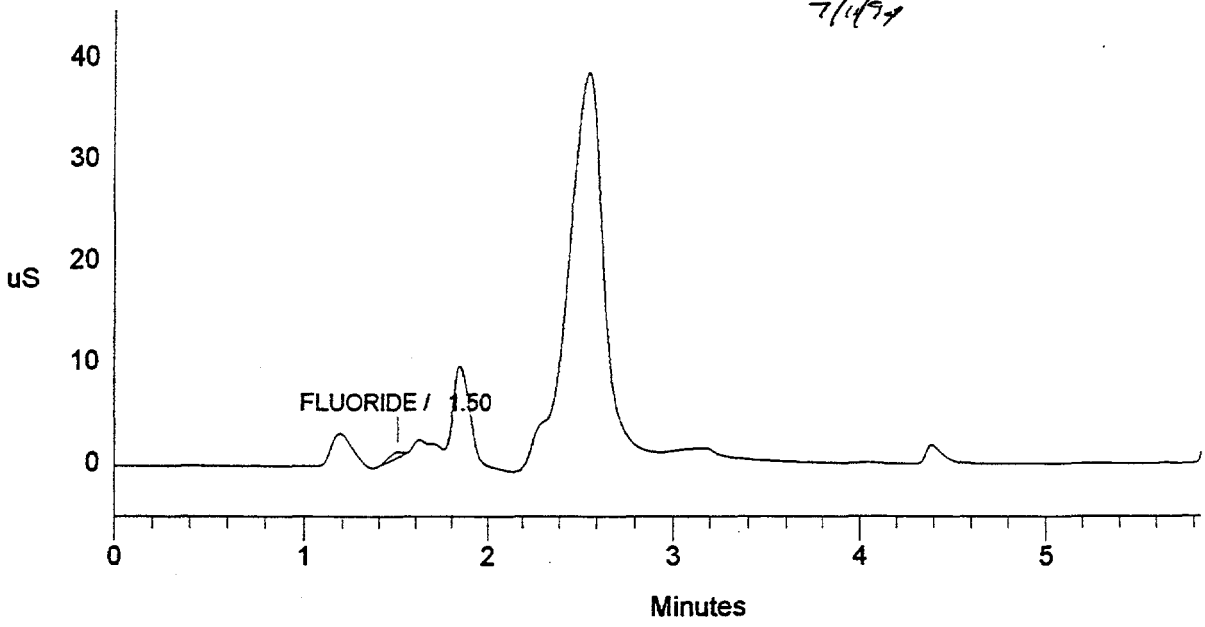
Sample Name: FGD INLET IMP-2 R2 2254 Date: 07/08/1994 17:37:27
Data File : C:\DX\DATA\28342R2\82233061.D27
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 27 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.84	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.50	FLUORIDE	0.000	557548	3027211	1	25.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	557548	3027211		

File: 82233061.D27 Sample: FGD INLET IMP-2 R2 2254



Data Reprocessed On 07/11/1994 15:20:45

EEL 7/11/94

Sample Name: FGD INLET IMP-2 R2 2254 Date: 07/08/1994 17:51:13
Data File : C:\DX\DATA\28342R2\82233061.D28
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 28 Detector:PED-Cond.
Analyst : Column:

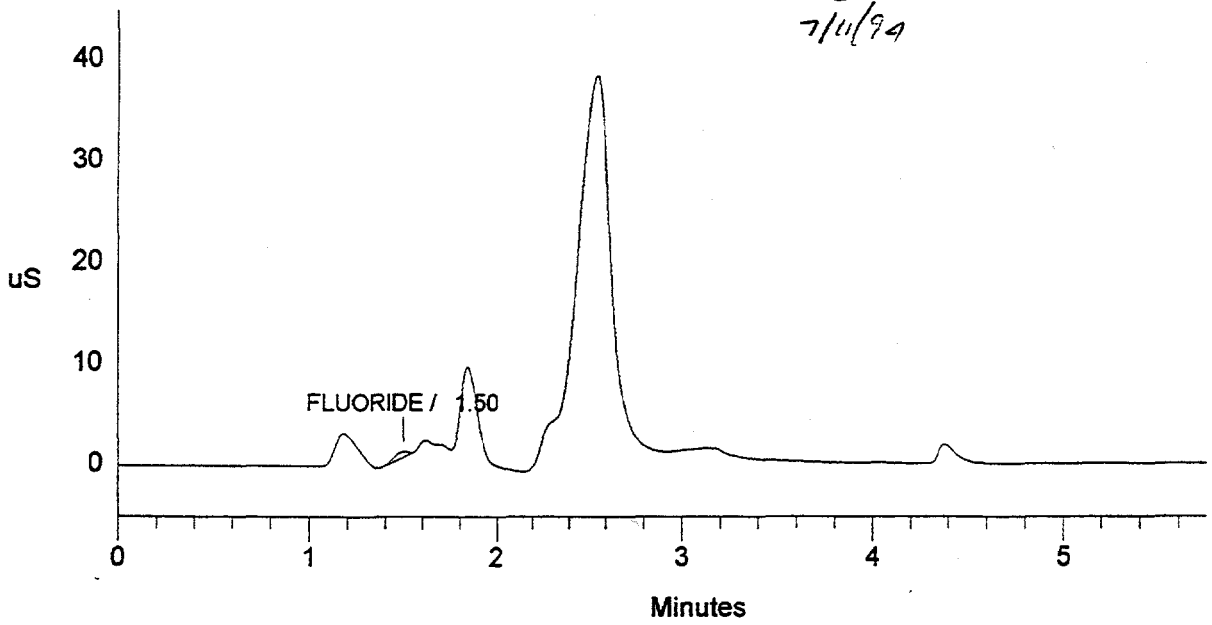
Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.75	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.50	FLUORIDE	0.000	531179	3028586	1	25.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	531179	3028586		

File: 82233061.D28 Sample: FGD INLET IMP-2 R2 2254

EEL 7/11/94



Data Reprocessed On 07/11/1994 15:22:20

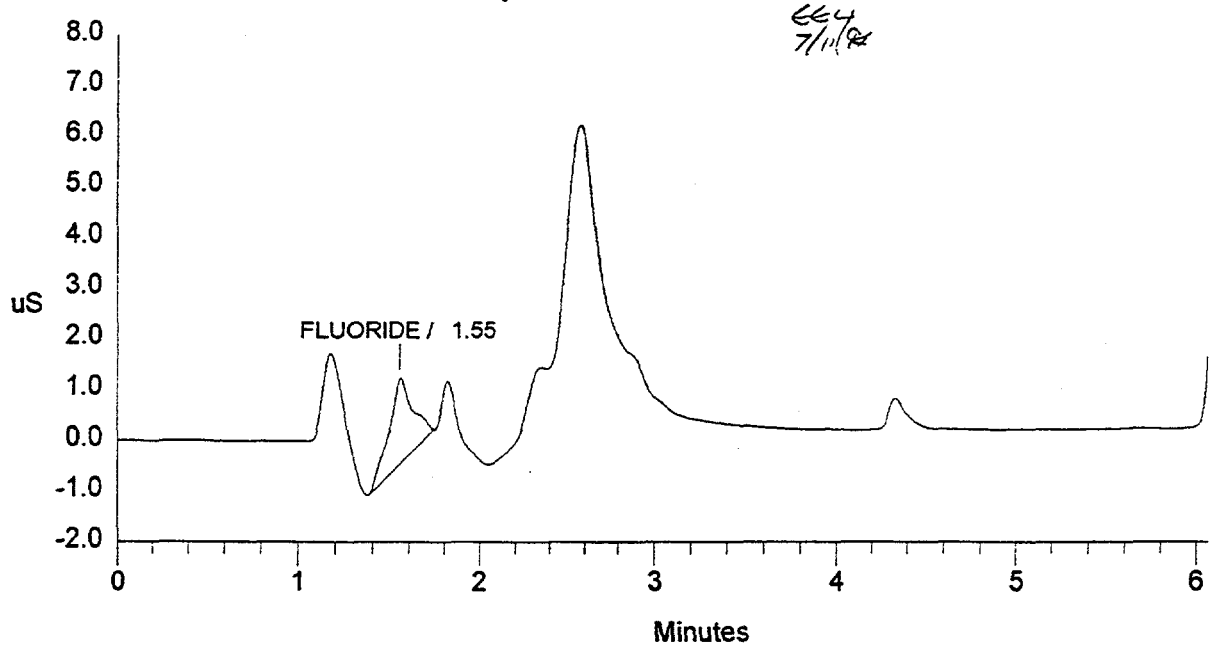
Sample Name: FGD INLET IMP-2 R1 0805 Date: 07/08/1994 18:04:58
Data File : C:\DX\DATA\28342R2\82233071.D29
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 29 Detector:PED-Cond.
Analyst : Column:

alibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
xternal	1	1	3600	5Hz	0.00	6.07	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.55	FLUORIDE	0.000	1663191	15368943	1	29.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	1663191	15368943		

File: 82233071.D29 Sample: FGD INLET IMP-2 R1 0805



Data Reprocessed On 07/11/1994 15:23:12

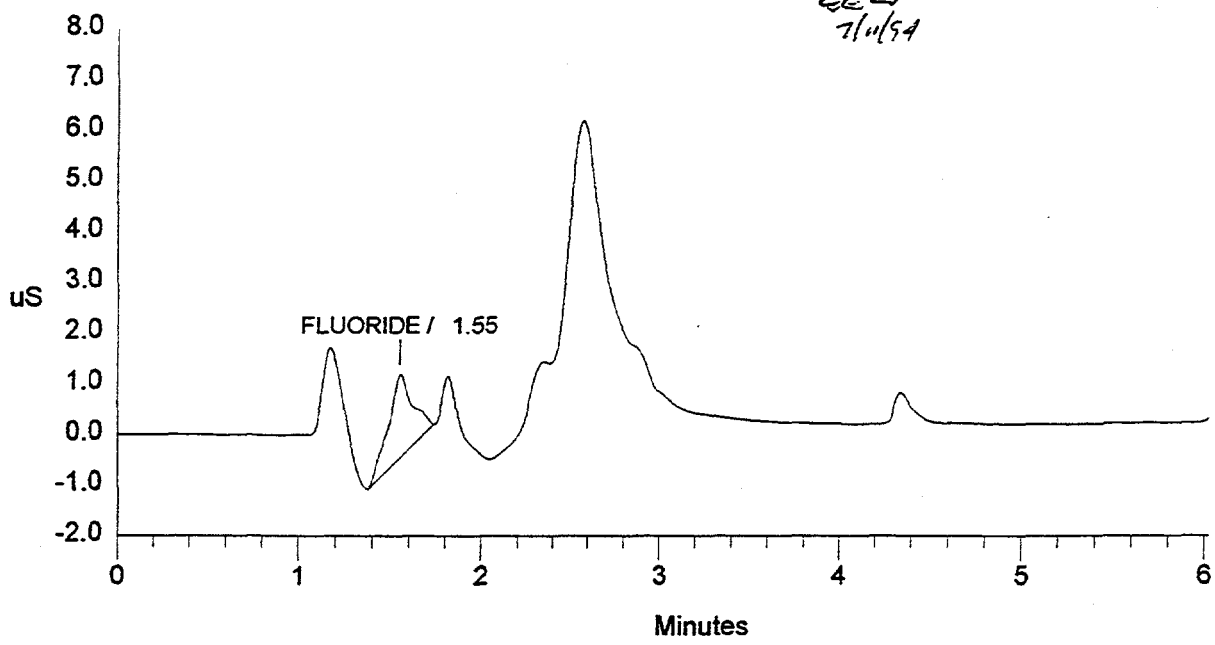
Sample Name: FGD INLET IMP-2 R1 0805 Date: 07/08/1994 18:18:44
Data File : C:\DX\DATA\28342R2\82233071.D30
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 30 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.03	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.55	FLUORIDE	0.000	1657362	15404003	1	29.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	1657362	15404003		

File: 82233071.D30 Sample: FGD INLET IMP-2 R1 0805



Data Reprocessed On 07/11/1994 15:24:56

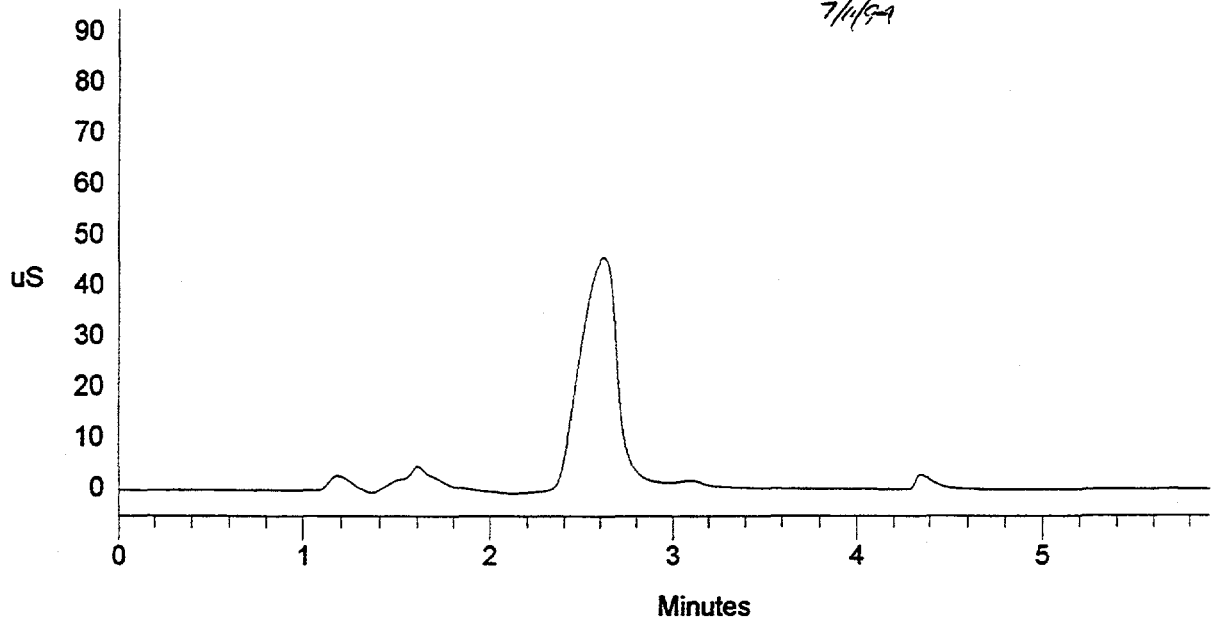
Sample Name: FGD INLET IMP-2 R2 2255 Date: 07/08/1994 18:32:30
Data File : C:\DX\DATA\28342R2\82233081.D31
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 31 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.91	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233081.D31 Sample: FGD INLET IMP-2 R2 2255



Data Reprocessed On 07/11/1994 15:25:48

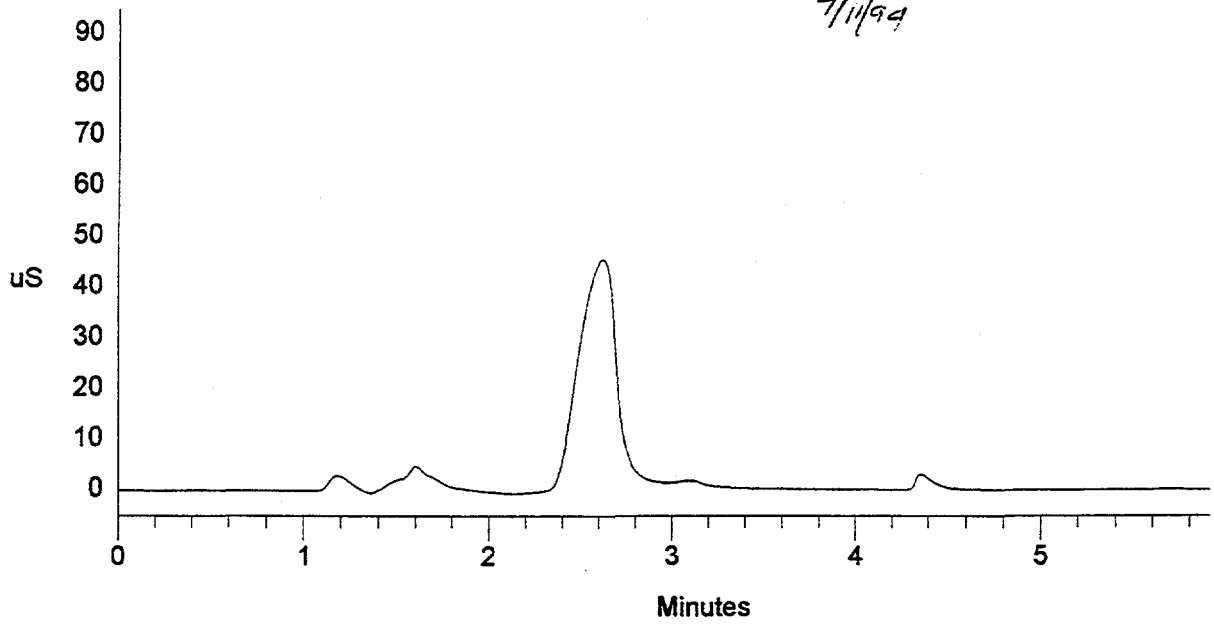
Sample Name: FGD INLET IMP-2 R2 2255 Date: 07/08/1994 18:46:17
Data File : C:\DX\DATA\28342R2\82233081.D32
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 32 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.91	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233081.D32 Sample: FGD INLET IMP-2 R2 2255



Data Reprocessed On 07/11/1994 15:27:30

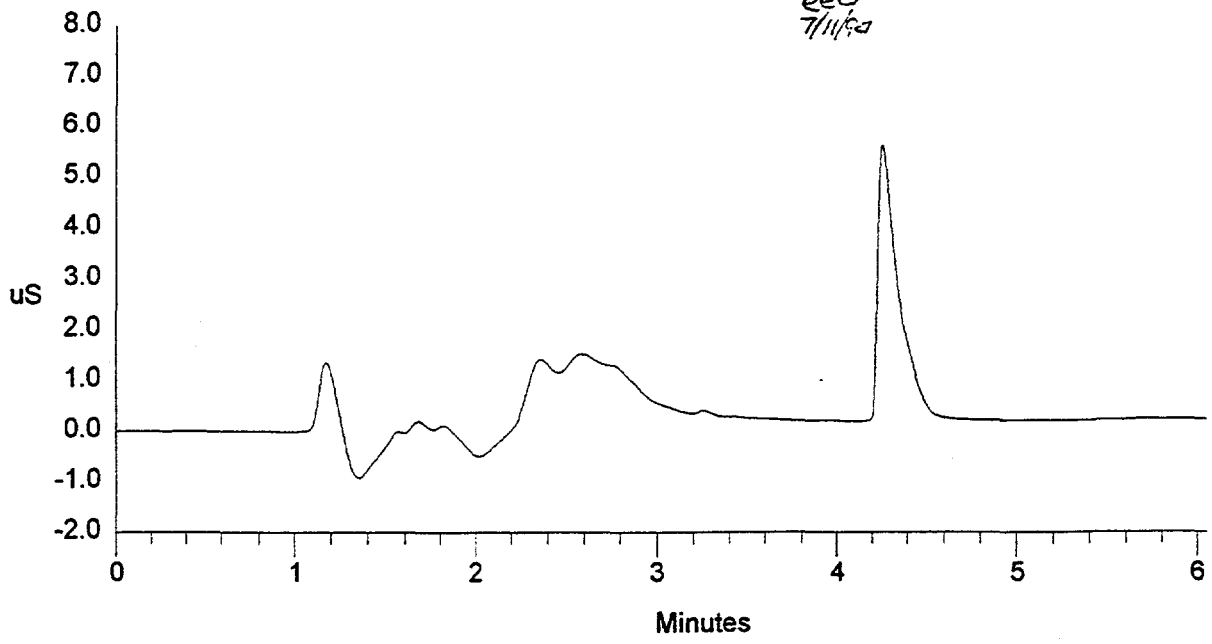
Sample Name: FGD INLET IMP-2 R1 1598 Date: 07/08/1994 19:00:05
Data File : C:\DX\DATA\28342R2\82233091.D33
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 33 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.06	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233091.D33 Sample: FGD INLET IMP-2 R1 1598



Data Reprocessed On 07/11/1994 15:28:56

EEG 7/11/94

Sample Name: FGD INLET IMP-2 R1 1598 Date: 07/08/1994 19:13:51
Data File : C:\DX\DATA\28342R2\82233091.D34
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 34 Detector:PED-Cond.
Analyst : Column:

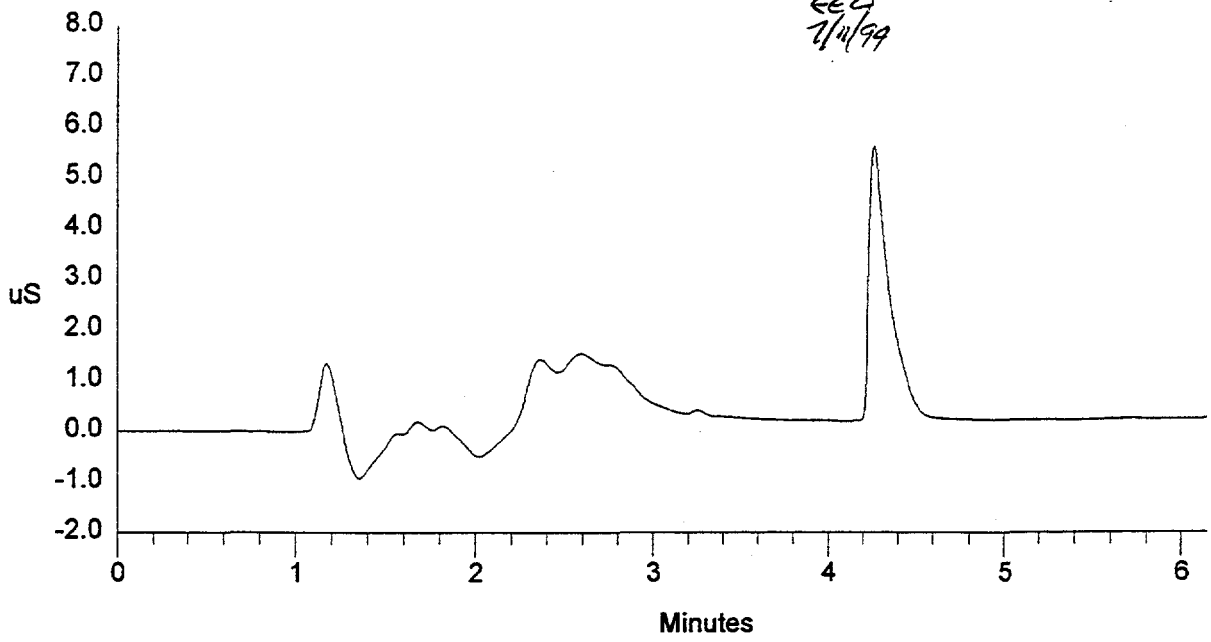
Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.15	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233091.D34 Sample: FGD INLET IMP-2 R1 1598

EEG 7/11/94



Data Reprocessed On 07/11/1994 15:31:43

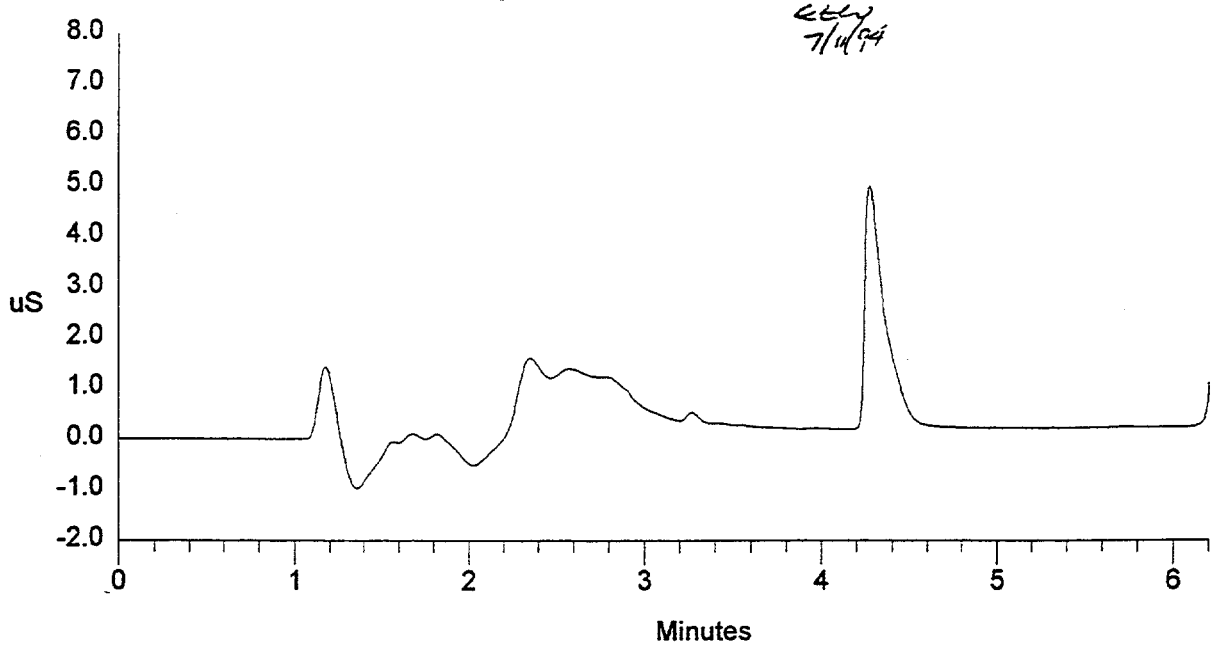
Sample Name: FGD INLET IMP-2 R2 1603 Date: 07/08/1994 19:27:37
Data File : C:\DX\DATA\28342R2\82233101.D35
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 35 Detector:PED-Cond.
Analyst : Column:

alibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
xternal	1	1	3600	5Hz	0.00	6.21	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233101.D35 Sample: FGD INLET IMP-2 R2 1603



Data Reprocessed On 07/11/1994 15:33:19

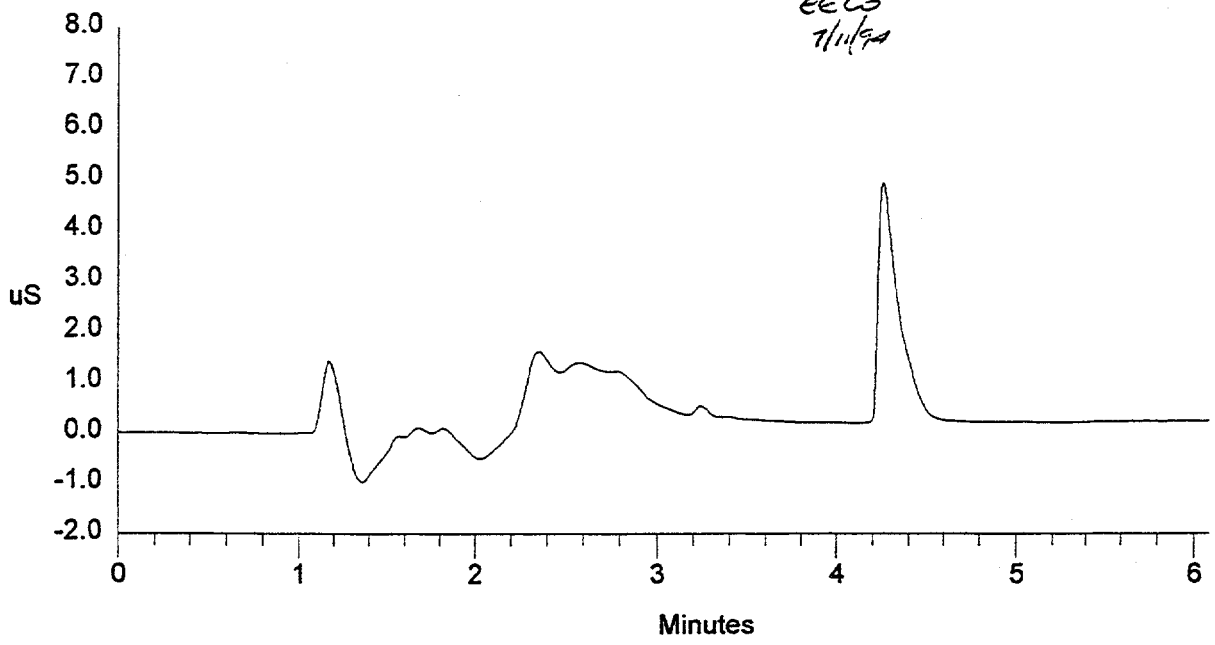
Sample Name: FGD INLET IMP-2 R2 1603 Date: 07/08/1994 19:41:24
Data File : C:\DX\DATA\28342R2\82233101.D36
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 36 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.09	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233101.D36 Sample: FGD INLET IMP-2 R2 1603



Data Reprocessed On 07/11/1994 15:34:44

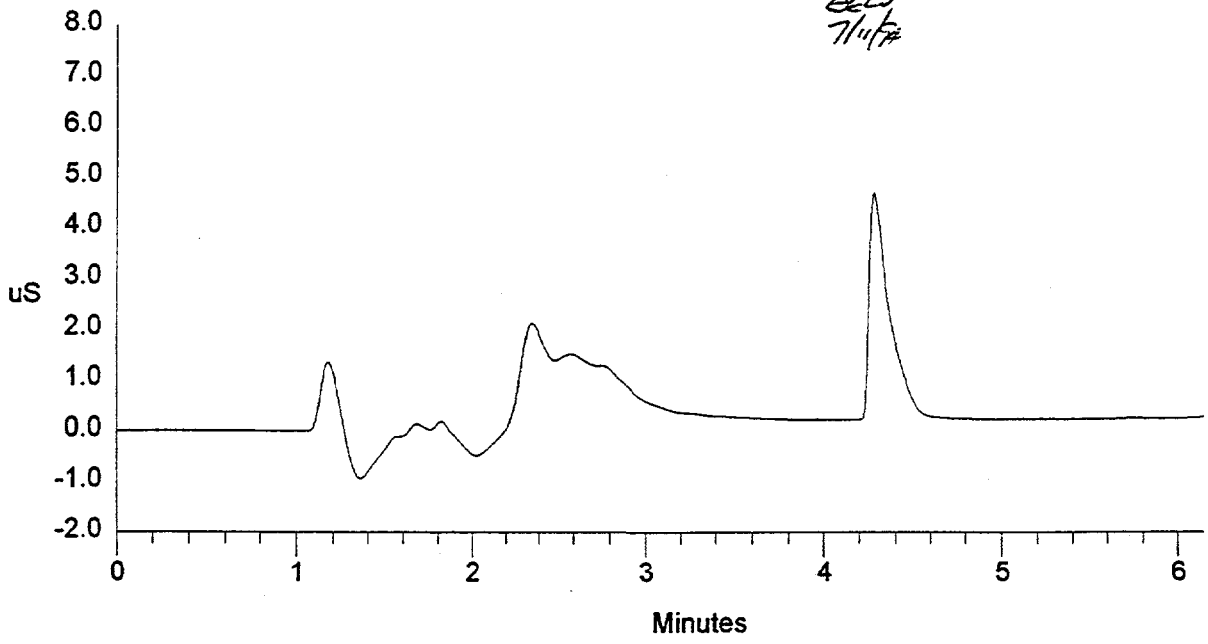
Sample Name: FGD OUTLET IMP-2 R1 1750 Date: 07/08/1994 19:55:10
Data File : C:\DX\DATA\28342R2\82233111.D37
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 37 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.15	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233111.D37 Sample: FGD OUTLET IMP-2 R1 1750



Data Reprocessed On 07/11/1994 15:35:31

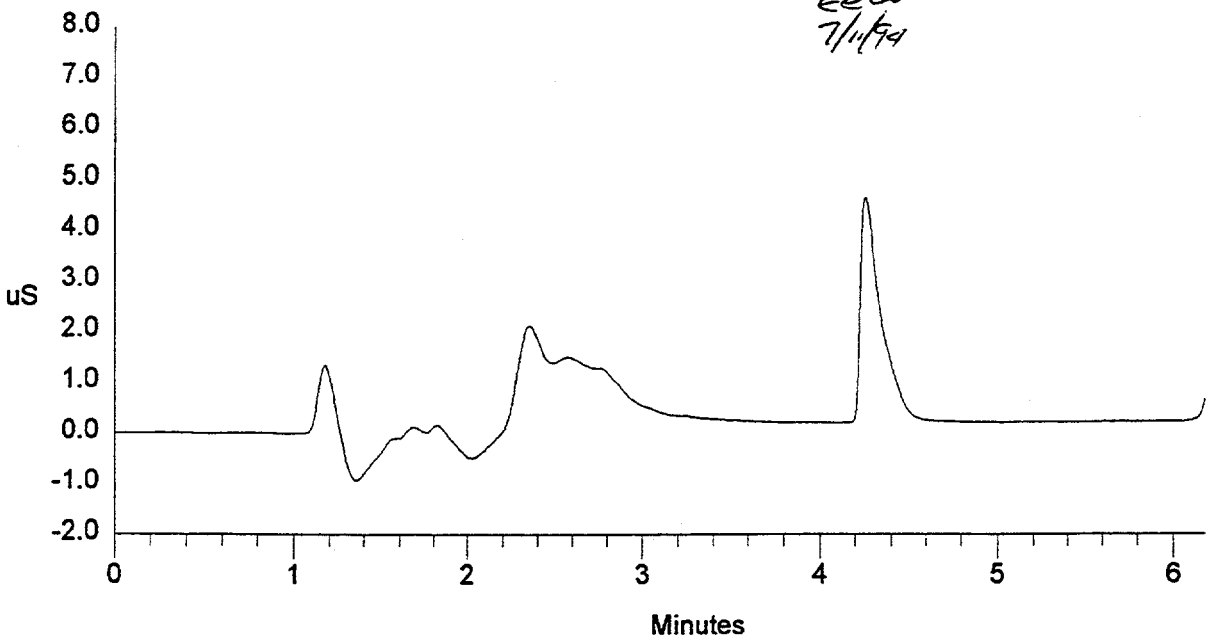
Sample Name: FGD OUTLET IMP-2 R1 1750 Date: 07/08/1994 20:08:56
Data File : C:\DX\DATA\28342R2\82233111.D38
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 38 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.18	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233111.D38 Sample: FGD OUTLET IMP-2 R1 1750



Data Reprocessed On 07/11/1994 15:37:15

EEW 7/11/94

Sample Name: FGD OUTLET IMP-2 R2 1760 Date: 07/08/1994 20:22:41
Data File : C:\DX\DATA\28342R2\82233121.D39
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 39 Detector:PED-Cond.
Analyst : Column:

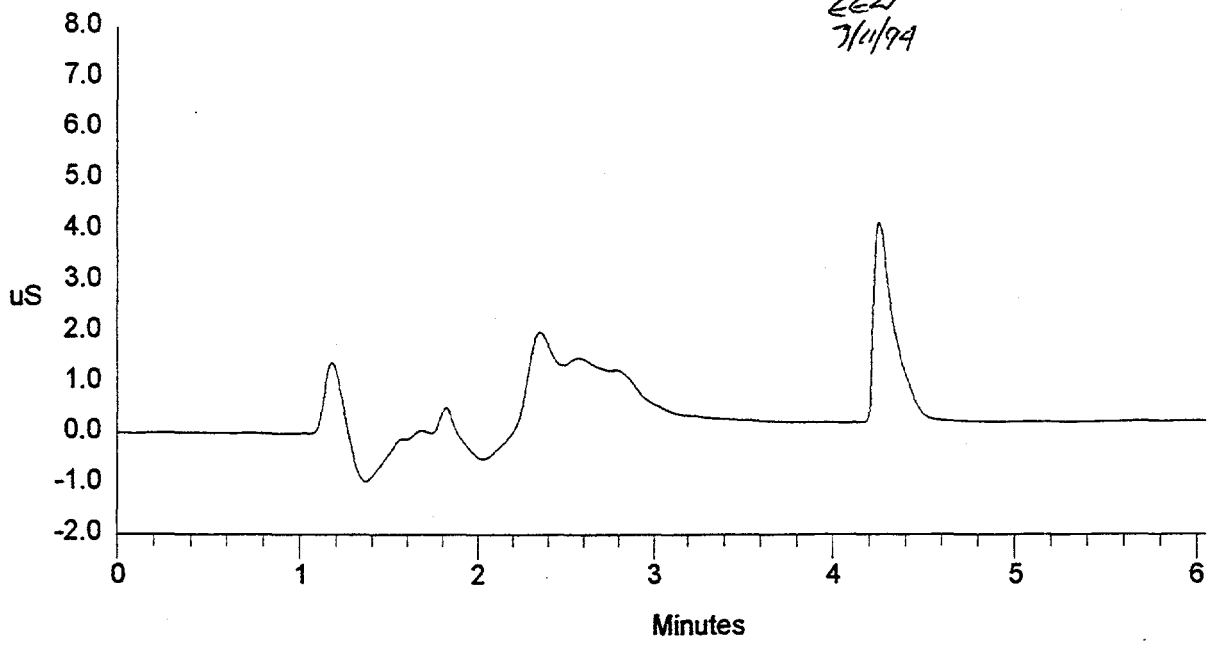
Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.06	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233121.D39 Sample: FGD OUTLET IMP-2 R2 1760

EEW 7/11/94



Data Reprocessed On 07/11/1994 15:39:13

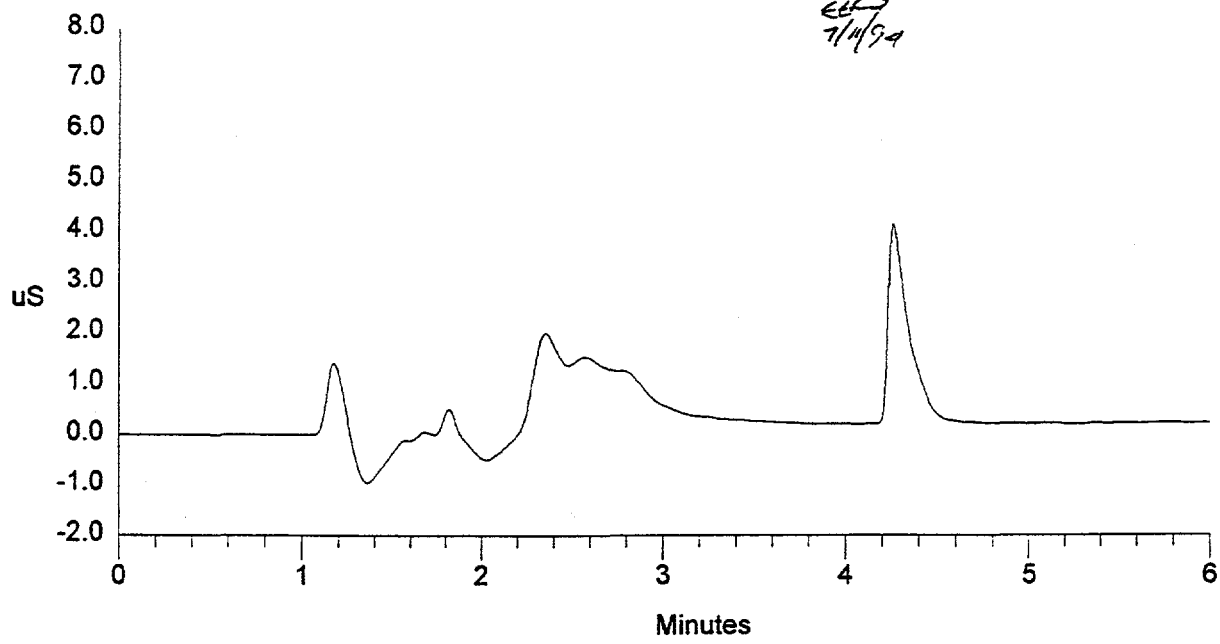
Sample Name: FGD OUTLET IMP-2 R2 1760 Date: 07/08/1994 20:36:28
Data File : C:\DX\DATA\28342R2\82233121.D40
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 40 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233121.D40 Sample: FGD OUTLET IMP-2 R2 1760



Data Reprocessed On 07/11/1994 15:42:12

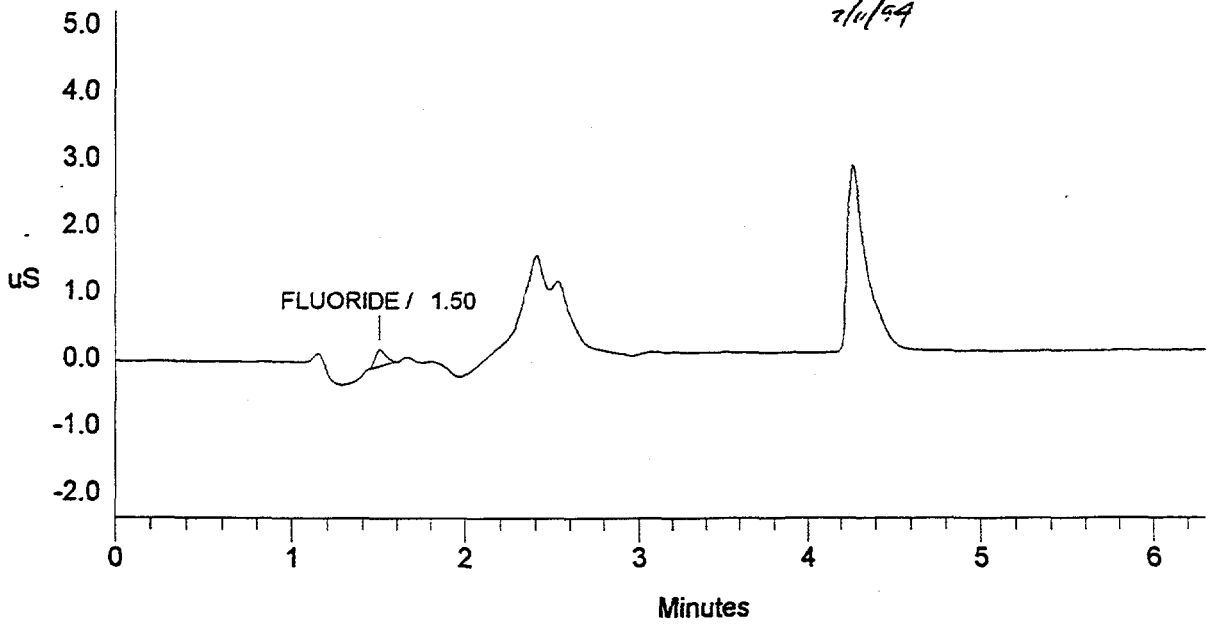
Sample Name: FGD OUTLET IMP-2 R1 2078 Date: 07/08/1994 20:50:15
Data File : C:\DX\DATA\28342R2\82233131.D41
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 41 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.30	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.50	FLUORIDE	0.000	253205	1130434	1	25.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	253205	1130434		

File: 82233131.D41 Sample: FGD OUTLET IMP-2 R1 2078



Data Reprocessed On 07/11/1994 15:45:14

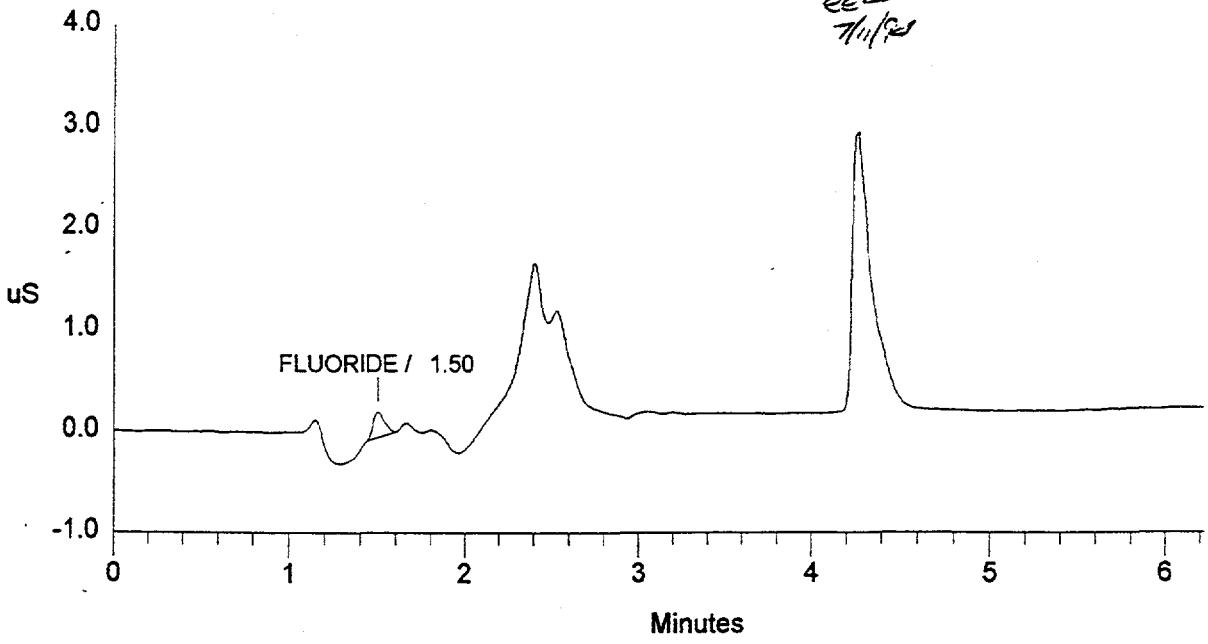
Sample Name: FGD OUTLET IMPI-2 R1 2078 Date: 07/08/1994 21:04:01
Data File : C:\DX\DATA\28342R2\82233131.D42
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 42 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.23	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.50	FLUORIDE	0.000	244305	1103274	1	25.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	244305	1103274		

File: 82233131.D42 Sample: FGD OUTLET IMPI-2 R1 2078



Data Reprocessed On 07/11/1994 15:46:47

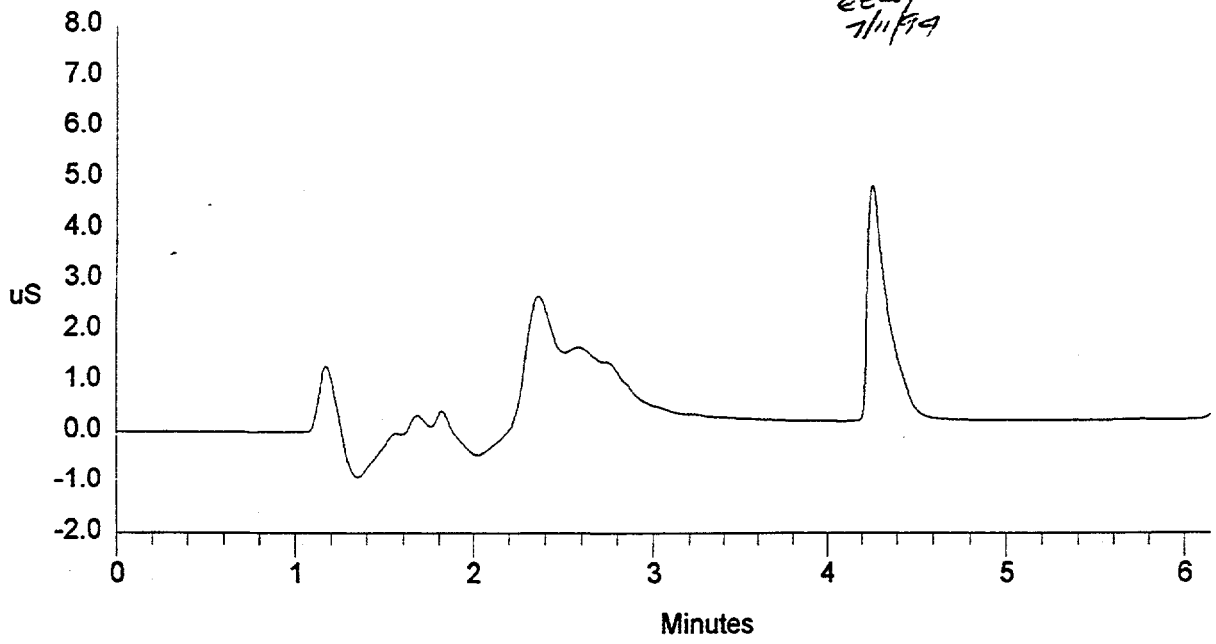
Sample Name: FGD OUTLET IMP-2 R2 2082 Date: 07/08/1994 21:17:47
Data File : C:\DX\DATA\28342R2\82233141.D43
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 43 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.15	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233141.D43 Sample: FGD OUTLET IMP-2 R2 2082



Data Reprocessed On 07/11/1994 15:49:41

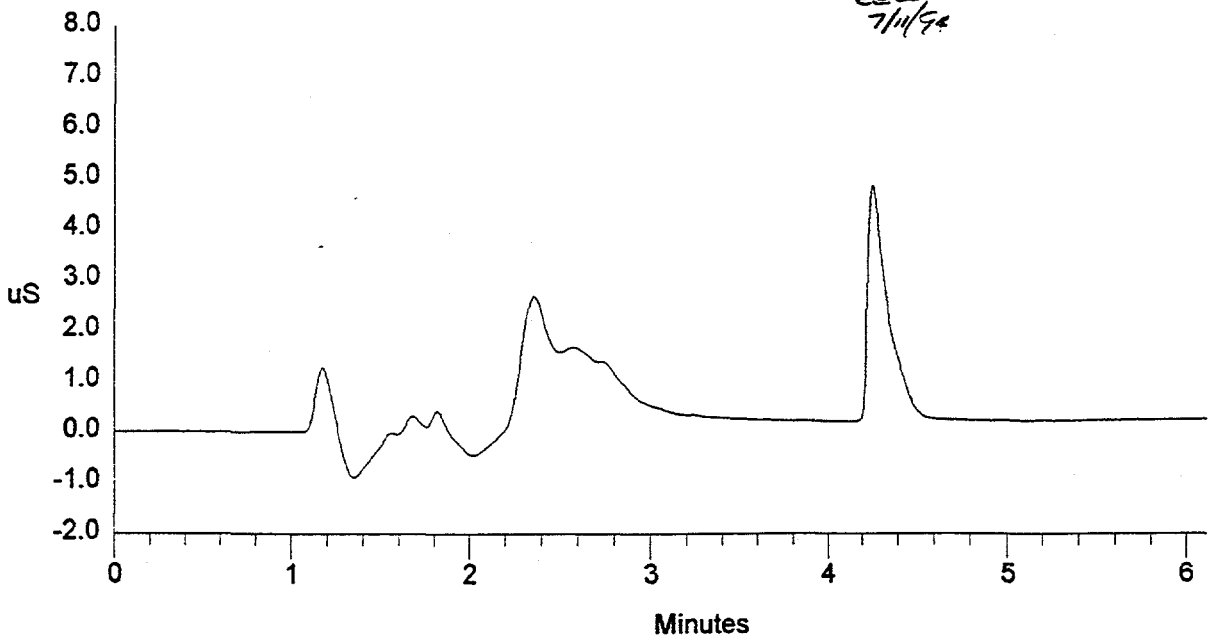
Sample Name: FGD OUTLET IMP-2 R2 2082 Date: 07/08/1994 21:31:33
Data File : C:\DX\DATA\28342R2\82233141.D44
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 44 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.12	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233141.D44 Sample: FGD OUTLET IMP-2 R2 2082



Data Reprocessed On 07/11/1994 15:51:43

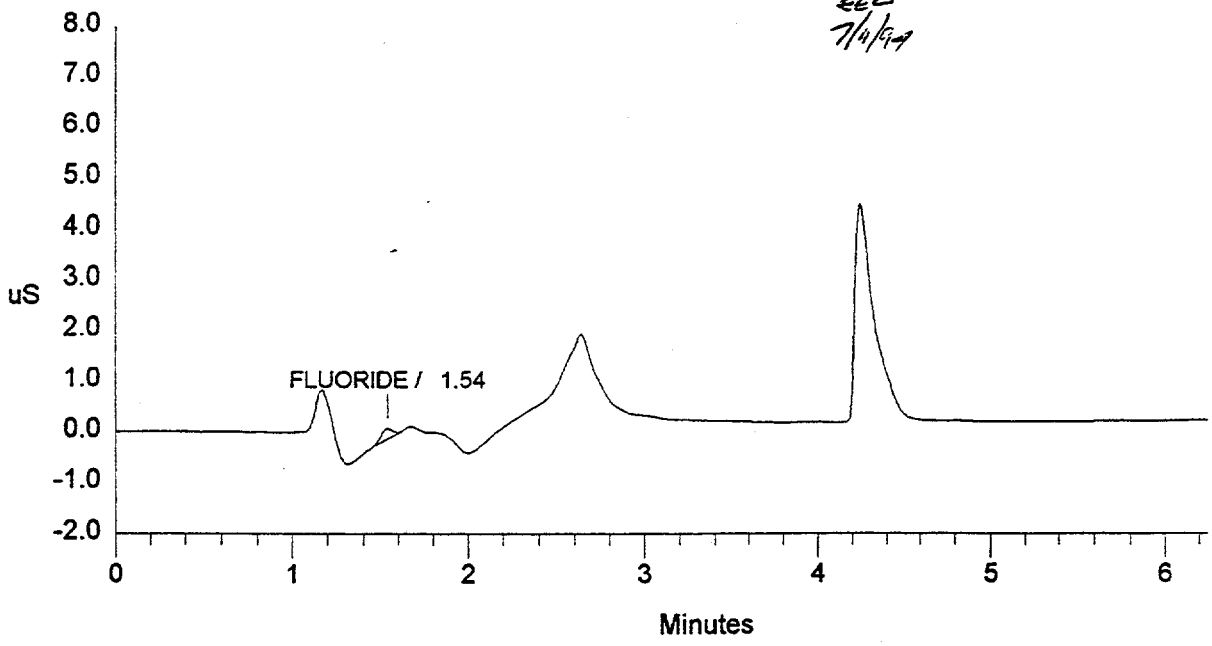
Sample Name: FGD OUTLET IMP-2 R1 1746 Date: 07/08/1994 21:45:19
Data File : C:\DX\DATA\28342R2\82233151.D45
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 45 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.25	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.54	FLUORIDE	0.000	202404	946683	1	28.33
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	202404	946683		

File: 82233151.D45 Sample: FGD OUTLET IMP-2 R1 1746



Data Reprocessed On 07/11/1994 15:53:27

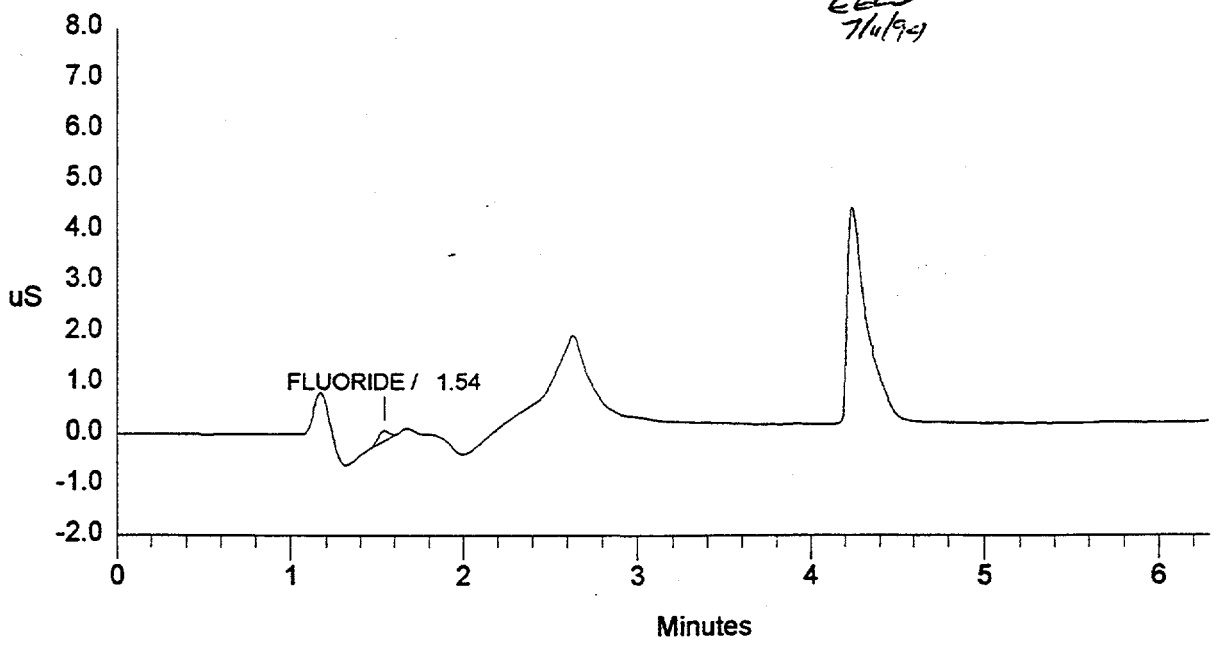
Sample Name:	FGD OUTLET IMP-2 R1 1746	Date:	07/08/1994 21:59:05
Data File :	C:\DX\DATA\28342R2\82233151.D46		
Method :	C:\DX\METHOD\2ANION.met		
ACI Address: 1	System: 1 Inject#: 46	Detector:	PED-Cond.
Analyst :	Column:		

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.29	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.54	FLUORIDE	0.000	202608	960259	1	28.33
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	202608	960259		

File: 82233151.D46 Sample: FGD OUTLET IMP-2 R1 1746



Data Reprocessed On 07/11/1994 15:54:44

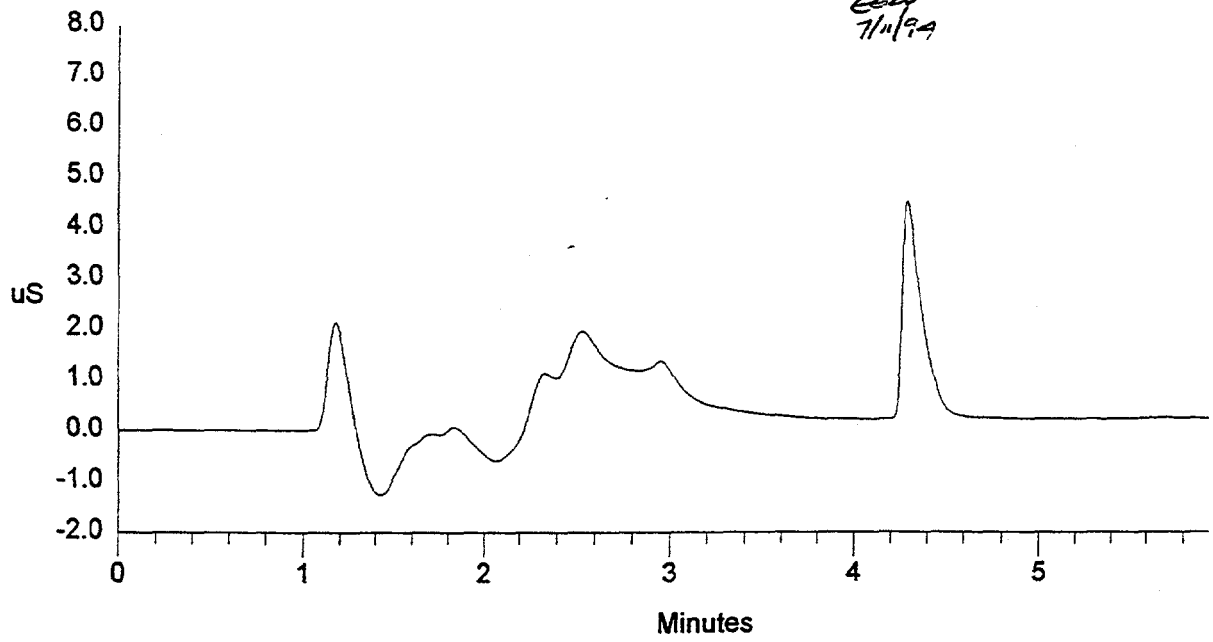
Sample Name: FGD OUTLET IMP-2 R2 1757 Date: 07/08/1994 22:12:51
Data File : C:\DX\DATA\28342R2\82233161.D47
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 47 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	5.94	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233161.D47 Sample: FGD OUTLET IMP-2 R2 1757



Data Reprocessed On 07/11/1994 15:55:56

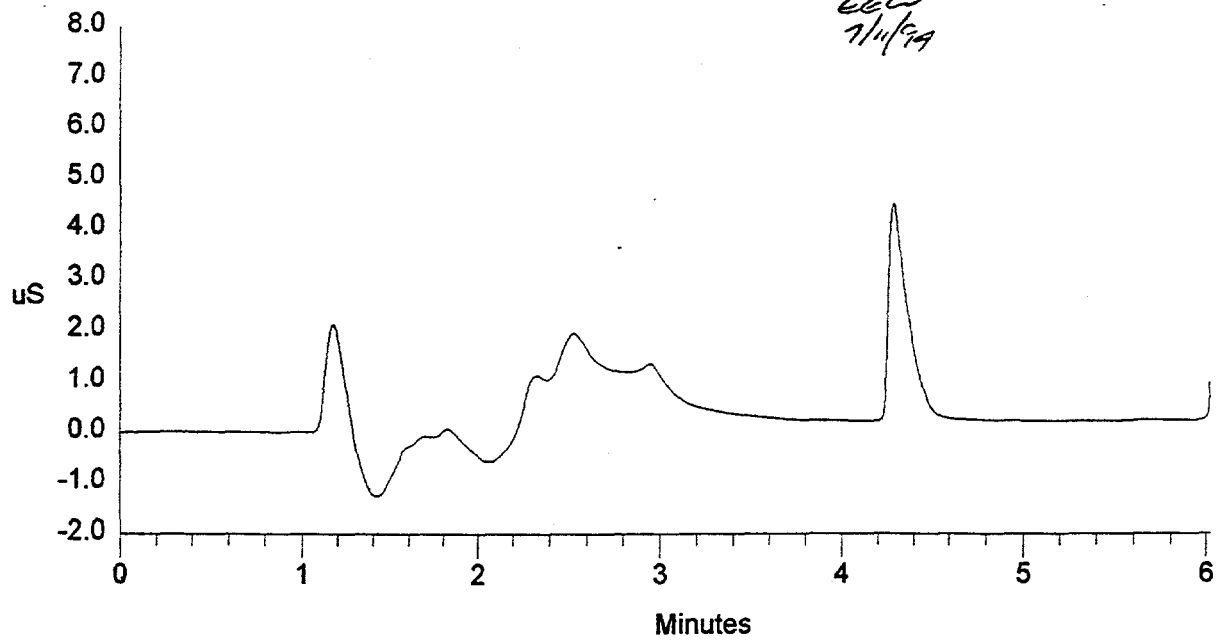
Sample Name: FGD OUTLET IMP-2 R2 1757 Date: 07/08/1994 22:26:36
Data File : C:\DX\DATA\28342R2\82233161.D48
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 48 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	6.03	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: 82233161.D48 Sample: FGD OUTLET IMP-2 R2 1757



TLI# 28342-FLUORIDE
CALIBRATION
8-9-JULY-94

CONC (ppm)	RT	AREA	LOG CONC	LOG AREA	PREDICTED (ppm)	%DIFF	RESPONSE (CONC/AREA)
100	1.49	1154828129	2.000	9.063	93.64	-6.8	8.66E-08
30	1.45	372954096	1.477	8.572	31.42	4.5	8.04E-08
10	1.43	119534591	1.000	8.077	10.47	4.5	8.37E-08
3	1.43	33008450	0.477	7.519	3.02	0.6	9.09E-08
1	1.42	10218740	0.000	7.009	0.97	-2.8	9.79E-08
0.5	1.43	4995854	-0.301	6.699	0.49	-2.6	1.00E-07
100	1.48	1151611586	2.000	9.061	93.39	-7.1	8.68E-08
30	1.45	377319407	1.477	8.577	31.78	5.6	7.95E-08
10	1.44	118765256	1.000	8.075	10.40	3.9	8.42E-08
3	1.43	33338146	0.477	7.523	3.05	1.6	9.00E-08
1	1.43	10644579	0.000	7.027	1.01	1.2	9.39E-08
0.5	1.43	4945588	-0.301	6.694	0.48	-3.6	1.01E-07

Regression Output:

Constant		7.02186
Std Err of Y Est		0.02072
R Squared		0.99949
No. of Observations		12
Degrees of Freedom		10
X Coefficient(s)	1.03509	
Std Err of Coef.	0.00743	

EXTERNAL CALIBRATION CHECK

CONC (ppm)	RT	AREA	LOG AREA	PREDICTED (ppm)	%DIFF
10.0	1.43	119538857	8.078	10.47	4.5
10.0	1.43	119302067	8.077	10.45	4.3

BLANKS

TYPE	RT	AREA	AVERAGE AREA
H20		ND	
H20		ND	

Data Reprocessed On 07/11/1994 14:16:58

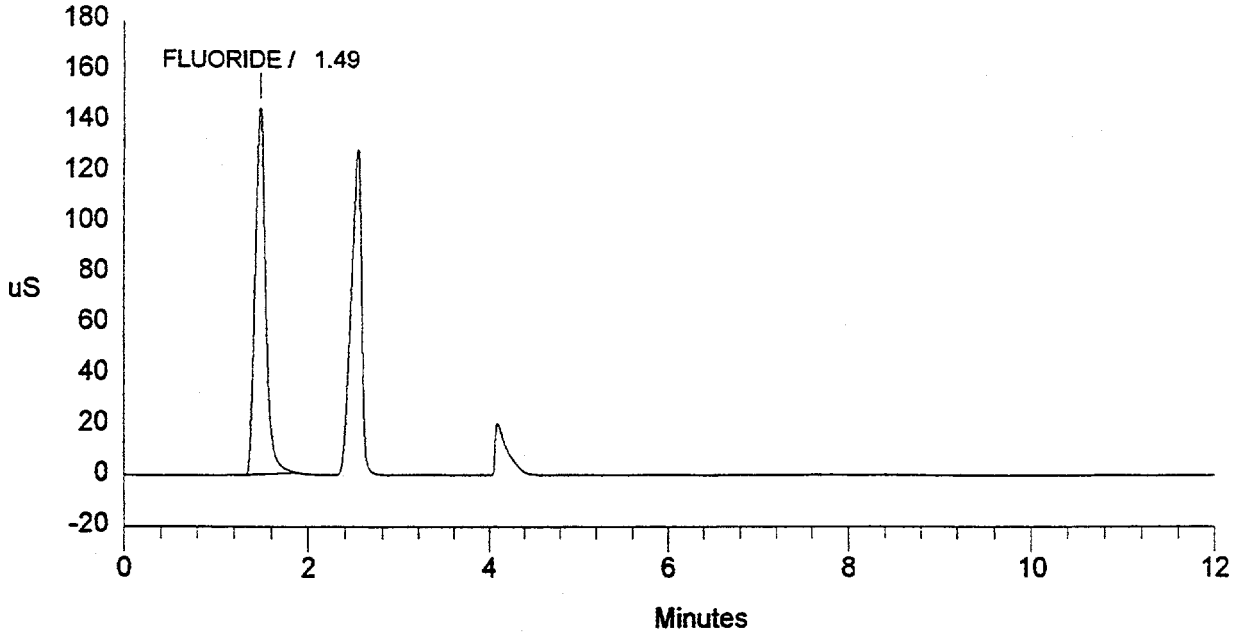
Sample Name: STD 100.0 PPM Date: 07/08/1994 14:10:38
Data File : C:\DX\DATA\28342R2\STD10001.D12
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 12 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.49	FLUORIDE	0.000	144847142	1154828129	1	24.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	144847142	1154828129		

File: STD10001.D12 Sample: STD 100.0 PPM



Data Reprocessed On 07/11/1994 14:14:46

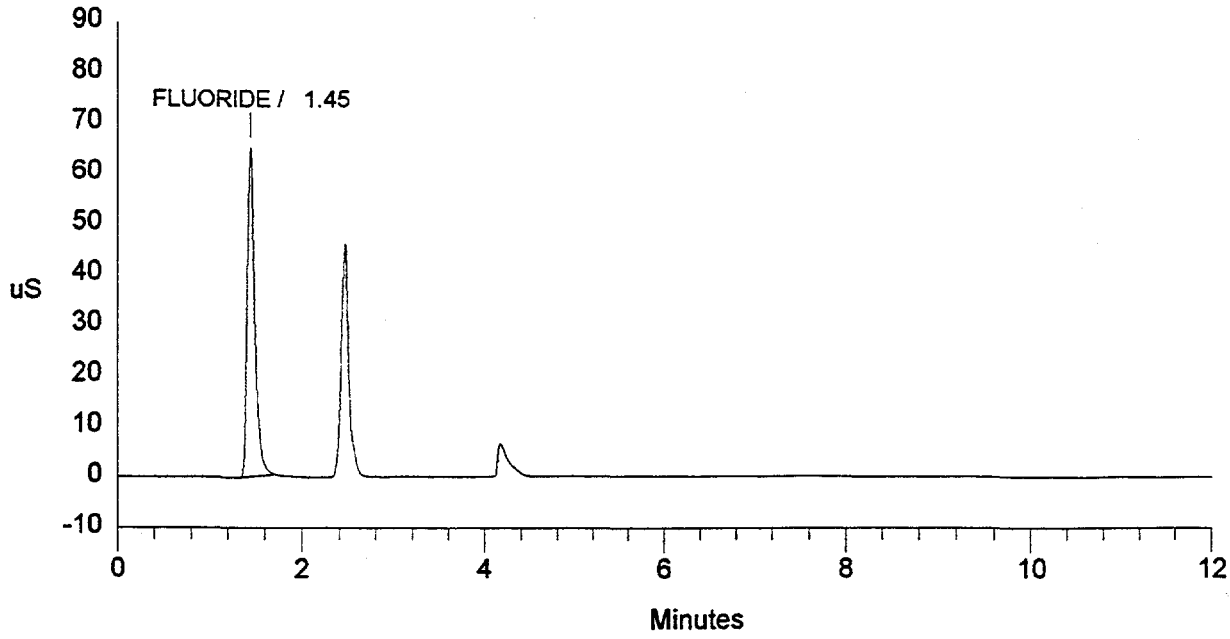
Sample Name: STD 30.0 PPM Date: 07/08/1994 13:43:00
Data File : C:\DX\DATA\28342R2\STD03001.D10
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 10 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.45	FLUORIDE	0.000	65098684	372954096	1	20.83
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	65098684	372954096		

File: STD03001.D10 Sample: STD 30.0 PPM



Data Reprocessed On 07/11/1994 14:00:44

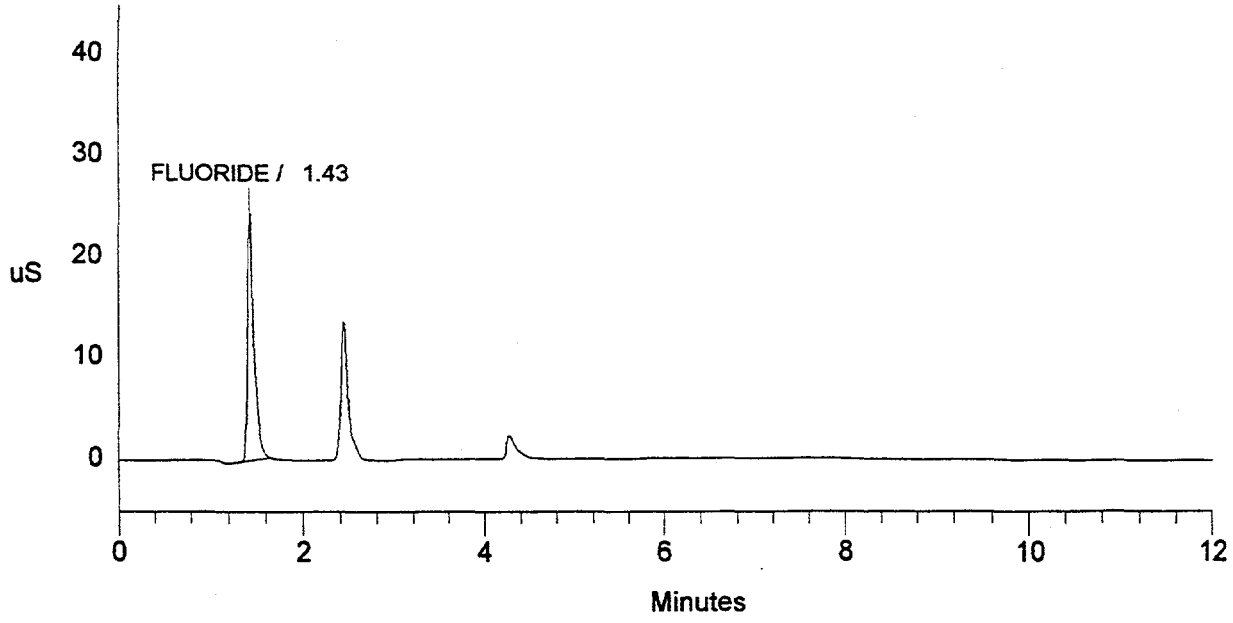
Sample Name: STD 10.0 PPM Date: 07/08/1994 13:15:25
Data File : C:\DX\DATA\28342R2\STD01001.D08
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 8 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.43	FLUORIDE	0.000	23581671	119534591	1	19.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	23581671	119534591		

File: STD01001.D08 Sample: STD 10.0 PPM



Data Reprocessed On 07/11/1994 13:52:50

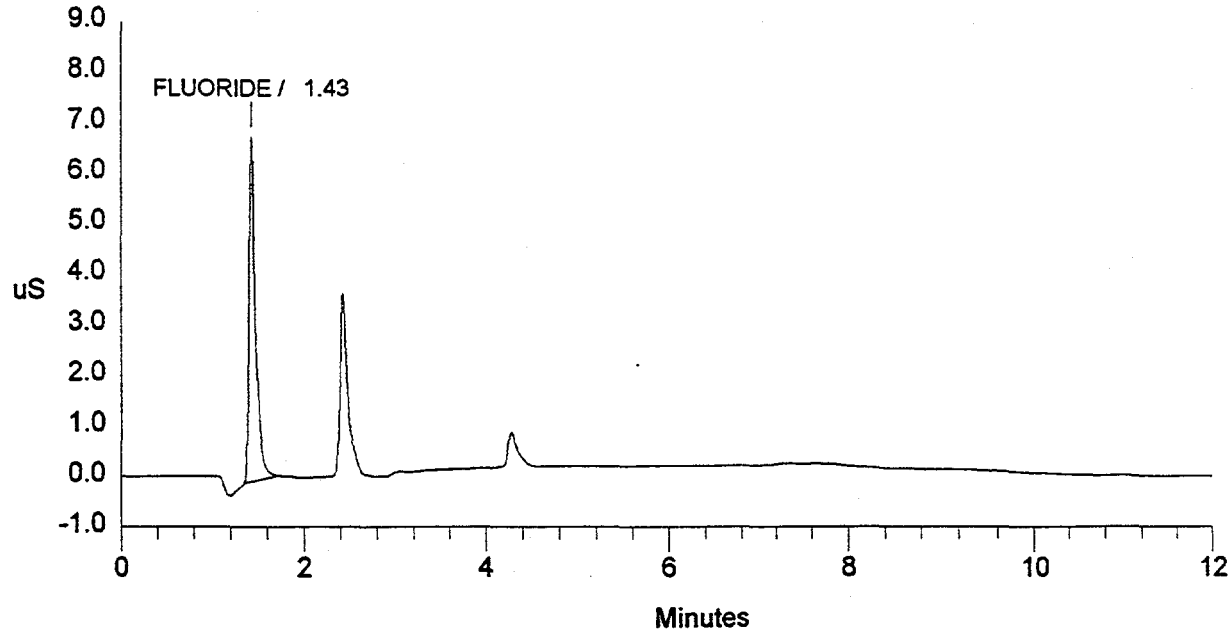
Sample Name: STD 3.0 PPM Date: 07/08/1994 12:47:45
Data File : C:\DX\DATA\28342R2\STD00301.D06
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 6 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.43	FLUORIDE	0.000	6827308	33008450	1	19.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	6827308	33008450		

File: STD00301.D06 Sample: STD 3.0 PPM



Data Reprocess

Sample Name:	STD 0.5 PPM
Data File :	C:\DX\DATA\28342R[illegible]
Method :	C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 2	Detector:PED-Cond.
Analyst : Column:	

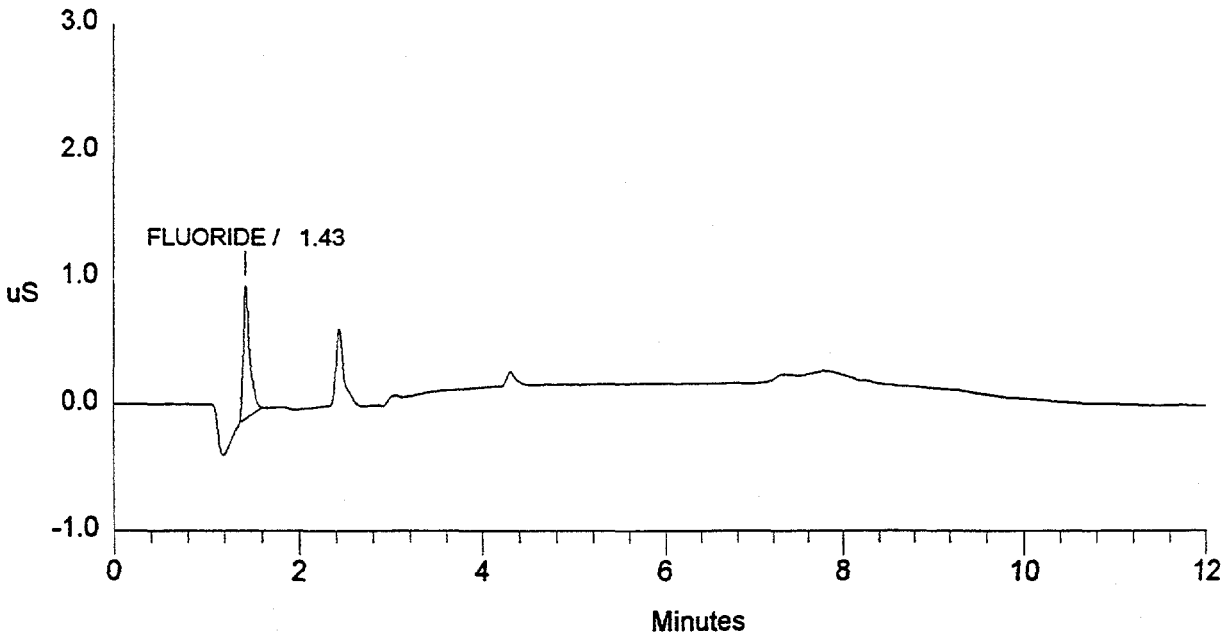
11:52:40

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.43	FLUORIDE	0.000	1044774	4995854	1	19.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	1044774	4995854		

File: STD00501.D02 Sample: STD 0.5 PPM



Data Reprocessed On 07/11/1994 14:18:44

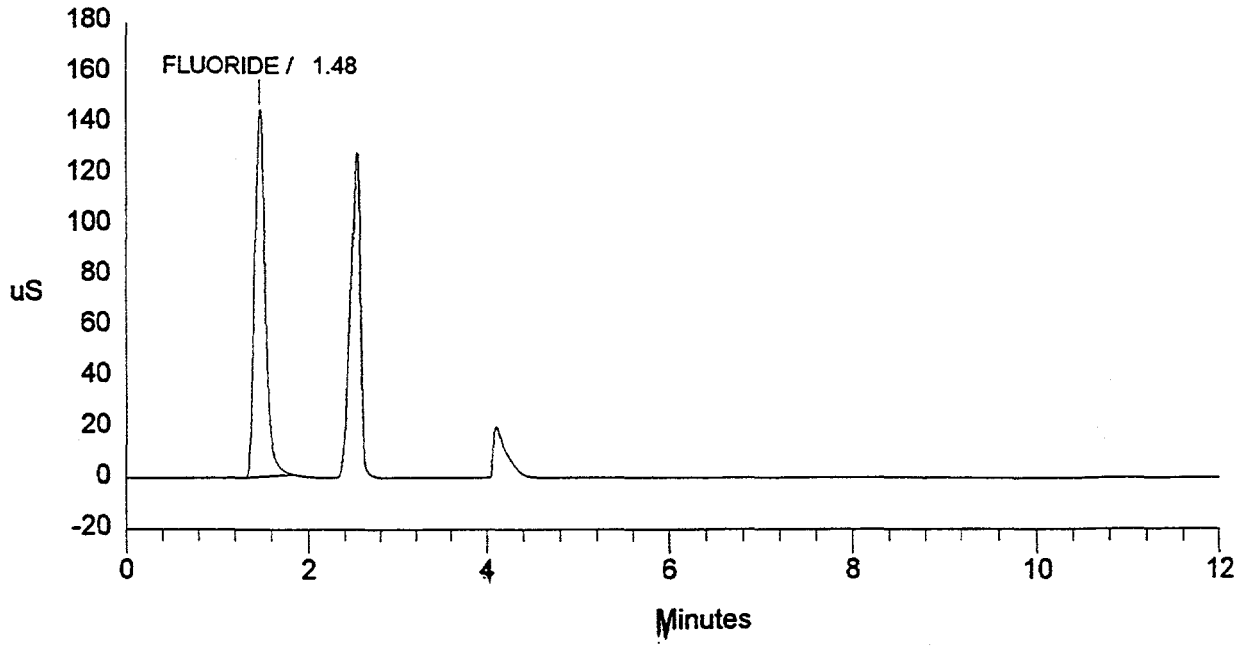
Sample Name: STD 100.0 PPM Date: 07/09/1994 01:11:54
Data File : C:\DX\DATA\28342R2\STD10001.D60
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 60 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.48	FLUORIDE	0.000	143058697	1151611586	1	23.33
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	143058697	1151611586		

File: STD10001.D60 Sample: STD 100.0 PPM



Data Reprocessed On 07/11/1994 14:15:49

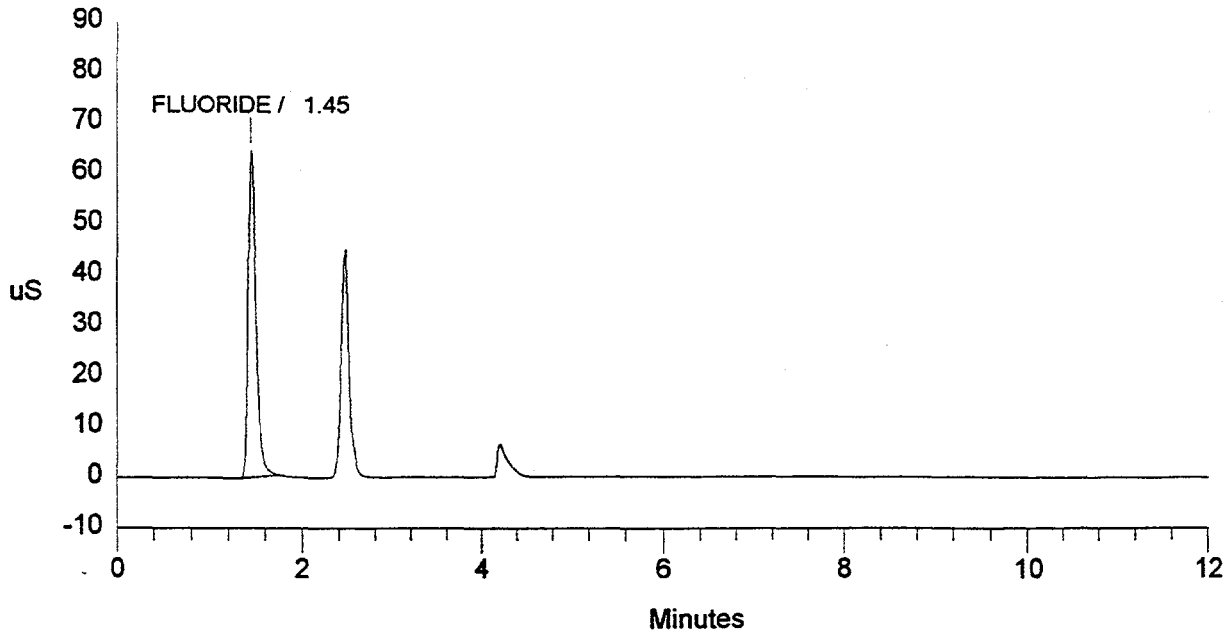
Sample Name: STD 30.0 PPM Date: 07/09/1994 00:44:19
Data File : C:\DX\DATA\28342R2\STD03001.D58
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 58 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.45	FLUORIDE	0.000	63988600	377319407	1	20.83
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	63988600	377319407		

File: STD03001.D58 Sample: STD 30.0 PPM



Data Reprocessed On 07/11/1994 14:02:37

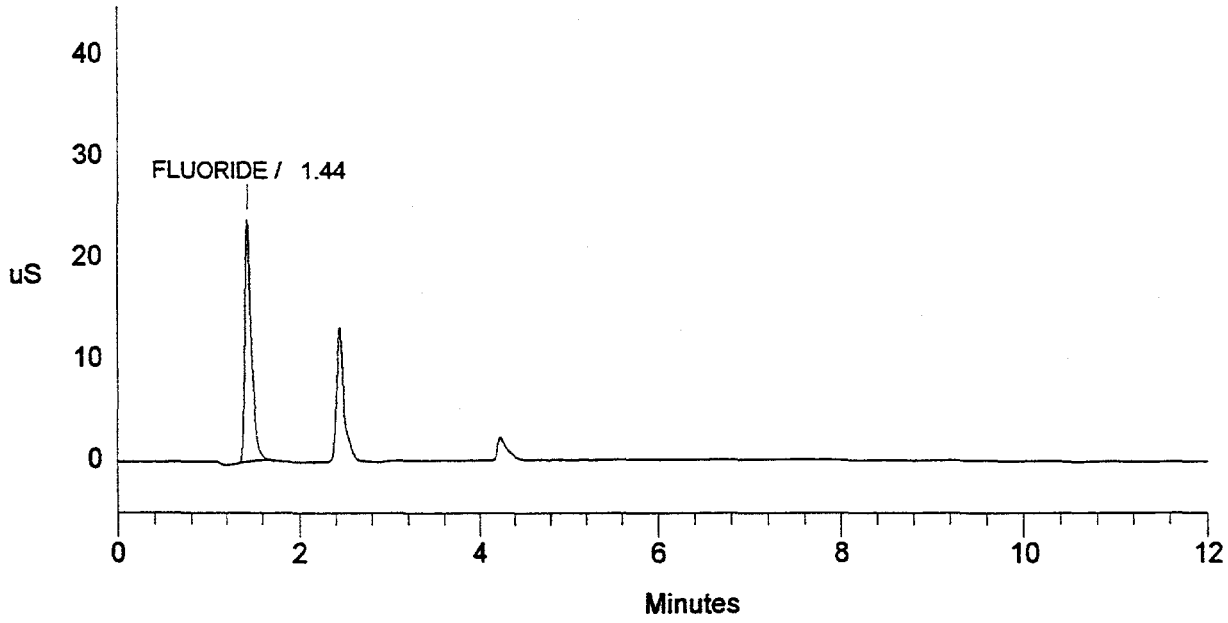
Sample Name: STD 10.0 PPM Date: 07/09/1994 00:16:47
Data File : C:\DX\DATA\28342R2\STD01001.D56
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 56 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.44	FLUORIDE	0.000	23929650	118765256	1	20.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	23929650	118765256		

File: STD01001.D56 Sample: STD 10.0 PPM



Data Reprocessed On 07/11/1994 13:53:49

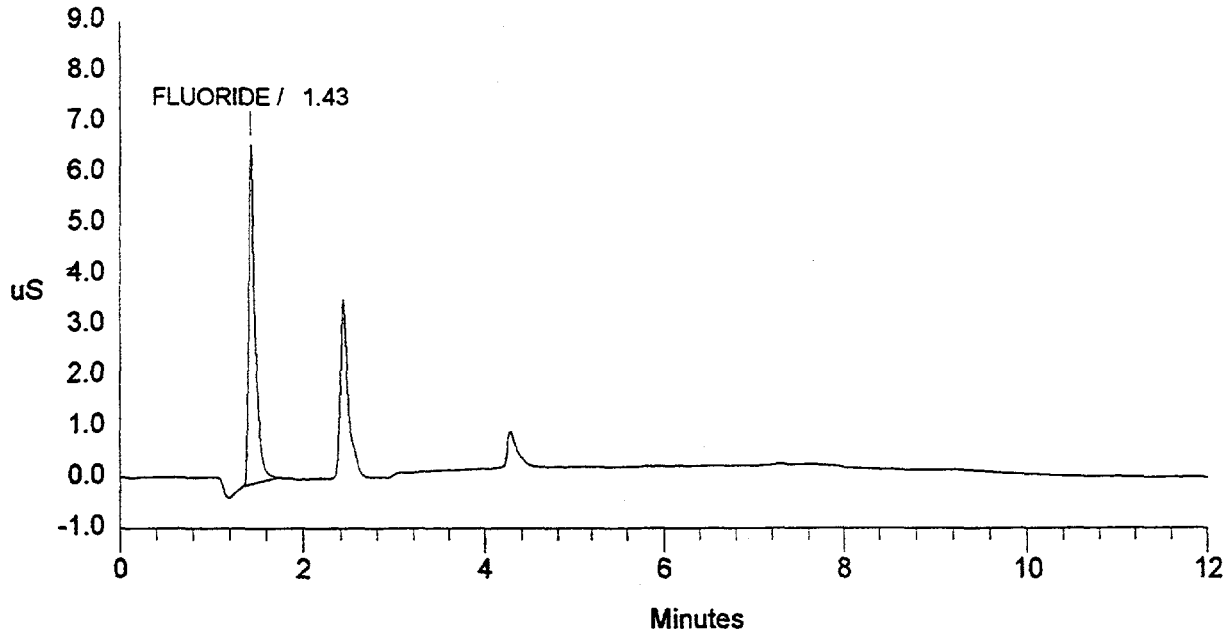
Sample Name: STD 3.0 PPM Date: 07/08/1994 23:49:15
Data File : C:\DX\DATA\28342R2\STD00301.D54
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 54 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.43	FLUORIDE	0.000	6685235	33338146	1	19.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	6685235	33338146		

File: STD00301.D54 Sample: STD 3.0 PPM



Data Reprocessed On 07/11/1994 13:49:05

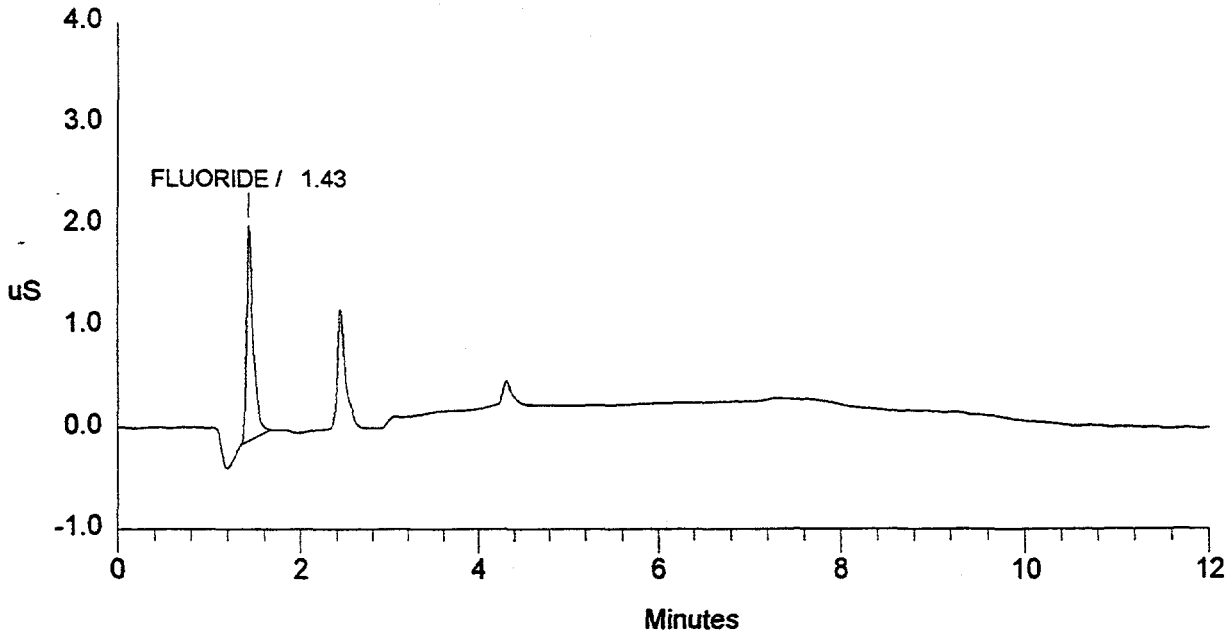
Sample Name: STD 1.0 PPM Date: 07/08/1994 23:21:44
Data File : C:\DX\DATA\28342R2\STD00101.D52
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 52 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.43	FLUORIDE	0.000	2102751	10644579	1	19.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	2102751	10644579		

File: STD00101.D52 Sample: STD 1.0 PPM



Data Reprocessed On 07/11/1994 13:58:34

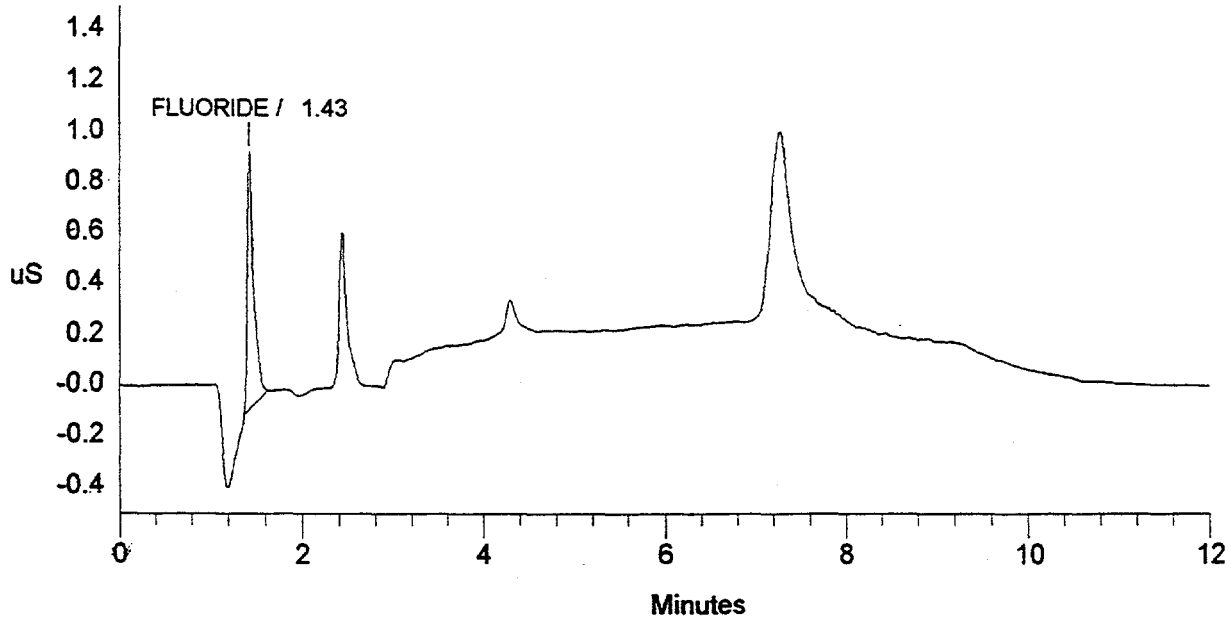
Sample Name: STD 0.5 PPM Date: 07/08/1994 22:54:10
Data File : C:\DX\DATA\28342R2\STD00501.D50
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 50 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.43	FLUORIDE	0.000	997398	4945588	1	19.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	997398	4945588		

File: STD00501.D50 Sample: STD 0.5 PPM



Data Reprocessed On 07/11/1994 13:50:14

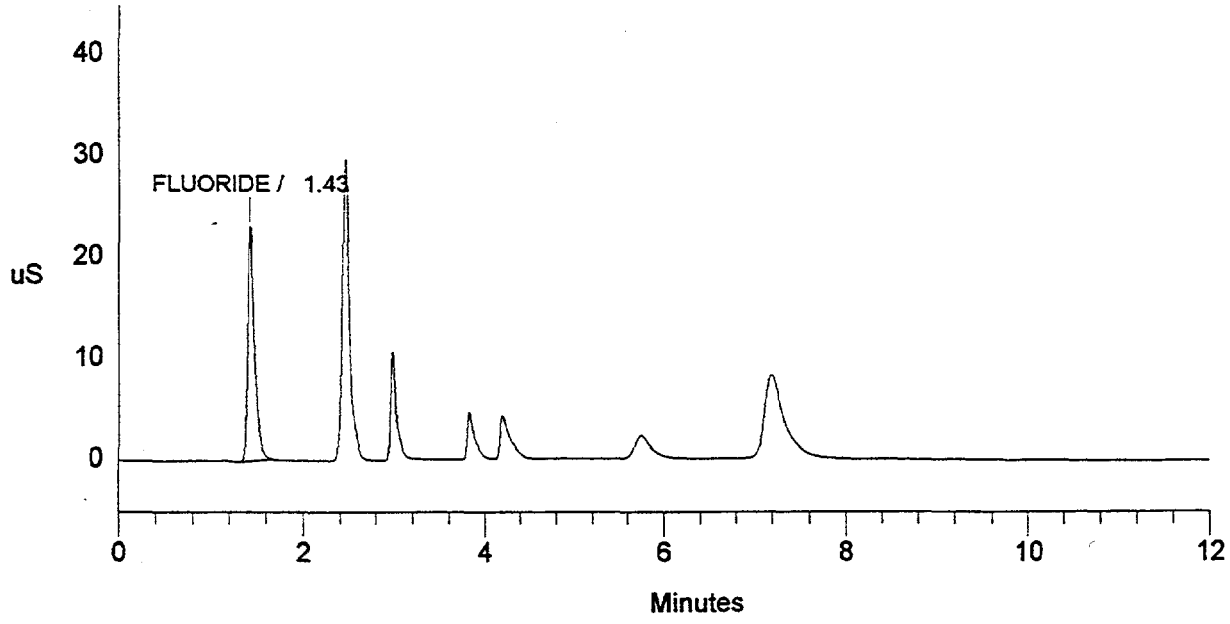
Sample Name: QC 20 PPM Date: 07/08/1994 14:52:09
Data File : C:\DX\DATA\28342R2\QC20PPM1.D15
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 15 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.43	FLUORIDE	0.000	22547449	119538857	1	19.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	22547449	119538857		

File: QC20PPM1.D15 Sample: QC 20 PPM



Data Reprocessed On 07/11/1994 13:51:43

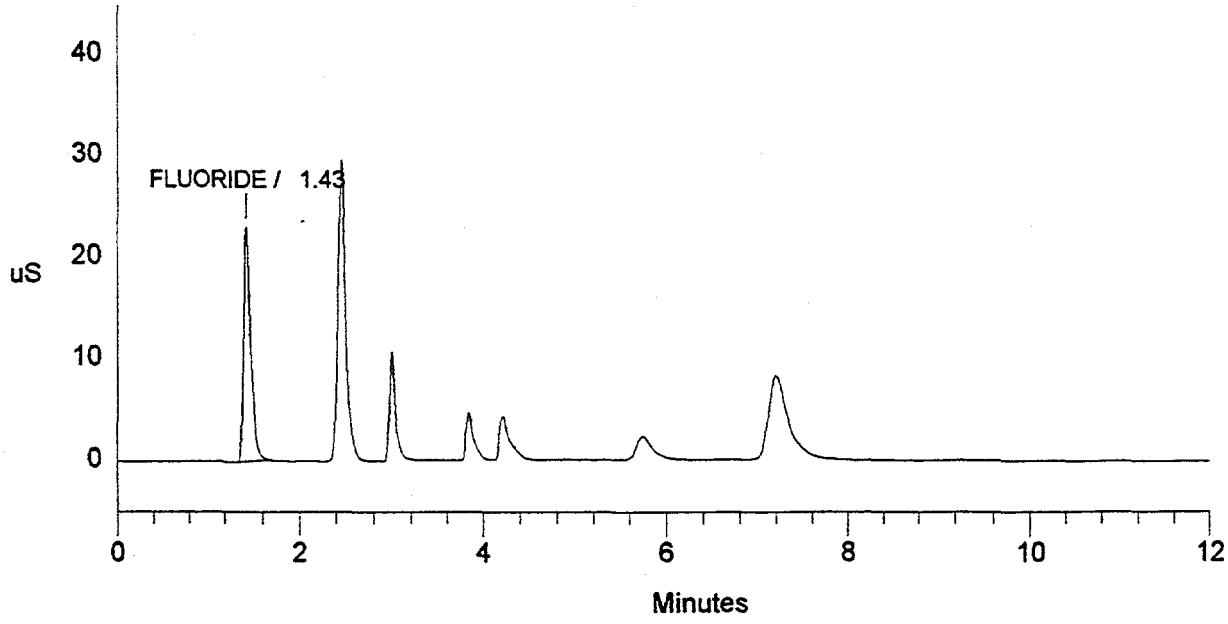
Sample Name: QC 20 PPM Date: 07/08/1994 15:05:55
Data File : C:\DX\DATA\28342R2\QC20PPM1.D16
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 16 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
1	1.43	FLUORIDE	0.000	22988831	119302067	1	19.17
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	22988831	119302067		

File: QC20PPM1.D16 Sample: QC 20 PPM



Data Reprocessed On 07/11/1994 15:58:19

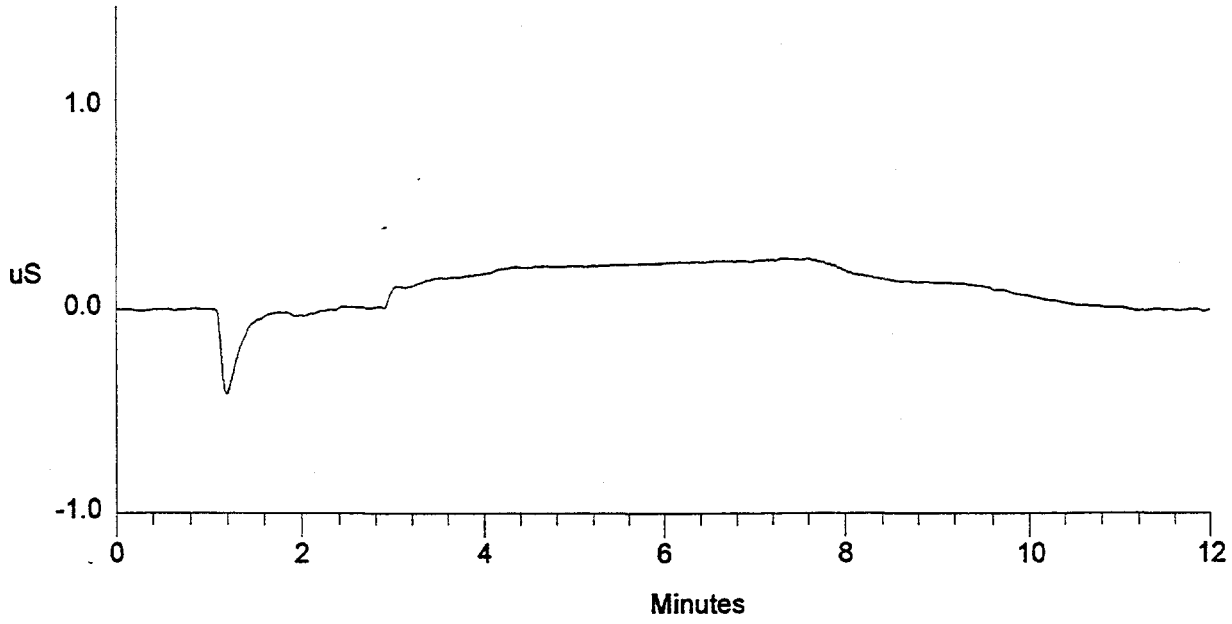
Sample Name: H2O BLANK Date: 07/08/1994 14:24:25
Data File : C:\DX\DATA\28342R2\H2OBLK11.D13
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 13 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: H2OBLK11.D13 Sample: H2O BLANK



Data Reprocessed On 07/11/1994 16:00:43

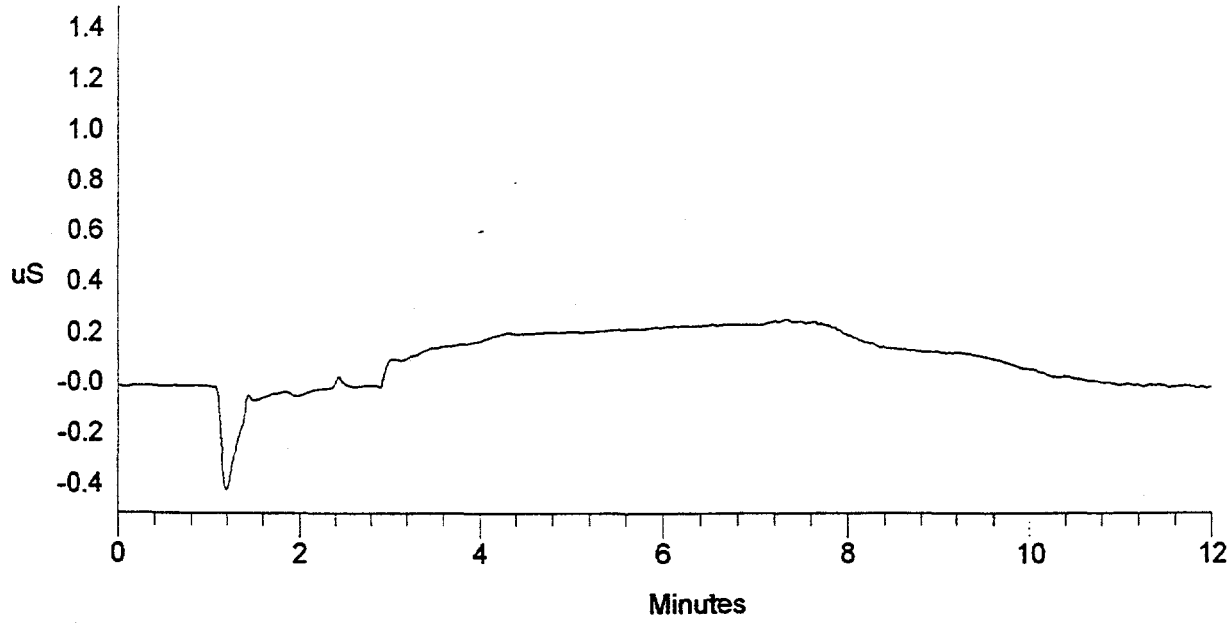
Sample Name: H2O BLANK Date: 07/08/1994 14:38:18
Data File : C:\DX\DATA\28342R2\H2OBLK11.D14
Method : C:\DX\METHOD\2ANION.met
ACI Address: 1 System: 1 Inject#: 14 Detector:PED-Cond.
Analyst : Column:

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	3600	5Hz	0.00	12.00	1000

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl. Code	%Delta
0	0.00	FLUORIDE	0.000	0	0	0	0.00
0	0.00	BROMIDE	0.000	0	0	0	0.00
		Totals	0.000	0	0		

File: H2OBLK11.D14 Sample: H2O BLANK



Triangle Laboratories of RTP Project 28342

Almega Corporation

Addendum Date: July 12, 1994

Sixteen liquid samples were received by Triangle Laboratories of RTP, Inc. on June 20, 1994 at ambient temperature and in good condition. The samples were stored at ambient temperature until the time of analysis. These samples were analyzed for HCl content by ion chromatography using Method 26 with suppressed conductivity detection. Results reported relate only to the items tested.

Date received:	June 20, 1994
Date analyzed:	June 21/22, 1994

Instrument Conditions:

Dionex DX300 Ion Chromatograph with a PED-II Conductivity Detector

Eluent flow:	1.5 mL/min. (1.8 mM sodium carbonate/1.7mM sodium bicarbonate)
Suppressor:	Anion self-regenerating suppressor-1
Sample Loop:	50 uL
Detection:	Conductivity - suppressed ion
Data Recording:	Dionex AI 450 software

This report should not be reproduced except in full. Any reproduction requires the permission of Triangle Laboratories of RTP, Inc.

Triangle Laboratories of RTP, Inc.

COMMENTS:

A six point chloride calibration curve ranging from 0.5 ppm to 100 ppm was performed both before and after sample analysis.

Reported concentrations are mean values determined from duplicate analyses.

No chloride was found in either of the method blanks. Chloride was detected in some of the outlet samples at levels below the calibration range. Amounts for samples with a run concentration below 0.5 ppm should be considered estimated.

FOR FURTHER INFORMATION:

This report should not be reproduced except in full. Any reproduction requires the permission of Triangle Laboratories of RTP, Inc. If you have technical questions concerning the contents of this package or the procedures and protocols employed to generate the analytical data, please contact Barry Rayfield at (919) 544-8357.

Addendum:

The samples were inadvertently not analyzed for fluoride. Enclosed please find calibrations and results for the fluoride analyses performed on July 8, 1994. As with the chloride analysis, run concentrations at a level below 0.5 ppm are below the linear calibration and the amounts reported should be considered estimated.

Report Preparation

Eileen Winchester
Report Preparation Chemist

Quality Control

for Barry Rayfield
Project Manager

The total number of pages in the data package is _____

TLI# 28342

TLI# 28342-FLUORIDE
CLIENT SAMPLES
ALMEGA CORPORATION
08-JULY-94

TLI ID	CLIENT ID	RT	AREA	LOD AREA	RUN CONC (ppm)	DILUTION FACTOR	SAMPLE CONC (ppm)	AVG CONC (ppm)	RSD	TOTAL mL	TOTAL mg F	TOTAL mg HF	TOTAL mg F2	FN
81-233-1	FGD INLET IMP 1-2 R1 0802	1.54	90562925	7.96	8.01	1	8.01	8.01	0.2	355	2.85	3.00	---	2
		1.53	90774309	7.96	8.02	1	8.02							
81-233-2	FGD INLET IMP 1-2 R2 0803	ND	ND	ND	ND	1	ND	ND	ND	245	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-3	FGD INLET IMP 1-2 R1 2252	1.50	9756330	6.98	0.93	1	0.93	0.92	1.6	245	0.23	0.24	---	2
		1.50	9597550	6.98	0.92	1	0.92							
81-233-4	FGD INLET IMP 1-2 R2 0804	ND	ND	ND	ND	1	ND	ND	ND	245	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-5	FGD INLET IMP 1-2 R1 2253	1.49	4830349	6.68	0.47	1	0.47	0.50	9.9	230	0.11	0.12	---	2
		1.49	5351000	6.73	0.52	1	0.52							
81-233-6	FGD INLET IMP 1-2 R2 2254	1.50	3027211	6.48	0.30	1	0.30	0.30	0.9	235	0.07	0.07	---	2
		1.50	3028586	6.48	0.30	1	0.30							
81-233-7	FGD INLET IMP 1-2 R1 0805	1.55	15368943	7.19	1.44	1	1.44	1.44	0.2	335	0.48	0.51	---	2
		1.55	15404003	7.19	1.45	1	1.45							
81-233-8	FGD INLET IMP 1-2 R2 2255	ND	ND	ND	ND	1	ND	ND	ND	330	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-9	FGD OUTLET IMP 1-2 R1 1598	ND	ND	ND	ND	1	ND	ND	ND	440	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-10	FGD OUTLET IMP 1-2 R2 1603	ND	ND	ND	ND	1	ND	ND	ND	420	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-11	FGD OUTLET IMP 1-2 R1 1750	ND	ND	ND	ND	1	ND	ND	ND	445	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-12	FGD OUTLET IMP 1-2 R2 1760	ND	ND	ND	ND	1	ND	ND	ND	430	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-13	FGD OUTLET IMP 1-2 R1 2078	1.50	1130434	6.05	0.12	1	0.12	0.11	2.3	330	0.04	0.04	---	2
		1.50	1103274	6.04	0.11	1	0.11							
81-233-14	FGD OUTLET IMP 1-2 R2 2082	ND	ND	ND	ND	1	ND	ND	ND	465	ND	ND	---	2
		ND	ND	ND	ND	1	ND							
81-233-15	FGD OUTLET IMP 1-2 R1 1746	1.54	946683	5.98	0.10	1	0.10	0.10	1.4	615	0.06	0.06	---	2
		1.54	960259	5.98	0.10	1	0.10							
81-233-16	FGD OUTLET IMP 1-2 R2 1757	ND	ND	ND	ND	1	ND	ND	ND	310	ND	ND	---	2
		ND	ND	ND	ND	1	ND							

*TOTAL mg HF = (f.w. HF / m.w. F) x [F]
ND = NONE DETECTED

California Analytical
Laboratory

Enseco
Corning Environmental Services

July 27, 1994
ENSECO CAL LAB PROJECT NUMBER: 076504
PO/CONTRACT: 2010-7316

Larry Fisher
ENSA
601 A Country Club Drive
Bensenville, IL 60106

Dear Mr. Fisher:

This report contains the analytical results for the twelve Impinger samples which were received under chain of custody by Enseco Cal Lab on 8 July 1994. These samples are associated with your Project 7316.

The case narrative is an integral part of this report.

Results were sent to you via facsimile on 26 July 1994.

If you have any questions, please call me at (916) 374-4300.

Sincerely,

Robert Weidenfeld
Project Manager

dju

Enseco - CAL
2544 Industrial Boulevard
West Sacramento, California 95691
916/373-5600 Fax: 916/372-1059

TABLE OF CONTENTS

ENSECO CAL LAB PROJECT NUMBER 076504

Case Narrative

Enseco Cal Lab's Quality Assurance Program

Sample Description Information

Chain of Custody Documentation

Volume, Chloride, Fluoride - Method EPA-26
Includes Samples: 1 through 12
Sample Data Sheets
Method Blank Report
Laboratory Control Sample Report (DCS)

CASE NARRATIVE

ENSECO CAL LAB PROJECT NUMBER 076504

There were no anomalies associated with this report.

ENSECO CAL LAB'S QUALITY ASSURANCE PROGRAM

Enseco Cal Lab has implemented an extensive Quality Assurance (QA) program to ensure the production of scientifically sound, legally defensible data of known documental quality. A key element of this program is Enseco's Laboratory Control Sample (LCS) system. Controlling lab operations with LCS (as opposed to matrix spike/matrix spike duplicate samples), allows the lab to differentiate between bias as a result of procedural errors versus bias due to matrix effects. The analyst can then identify and implement the appropriate corrective actions at the bench level, without waiting for extensive senior level review or costly and time-consuming sample re-analyses. The LCS program also provides our client with information to assess batch, and overall laboratory performance.

Laboratory Control Samples - (LCS)

Laboratory Control Samples (LCS) are well-characterized, laboratory generated samples used to monitor the laboratory's day-to-day performance of routine analytical methods. The results of the LCS are compared to well-defined laboratory acceptance criteria to determine whether the laboratory system is "in control". Three types of LCS are routinely analyzed: Duplicate Control Samples (DCS), Single Control Samples (SCS), and method blanks. Each of these LCS are described below.

Duplicate Control Samples. A DCS is a well-characterized matrix (blank water, sand, sodium sulfate or celite) which is spiked with certain target parameters and analyzed at approximately 10% of the sample load in order to establish method-specific control limits.

Single Control Samples. An SCS consists of a control matrix that is spiked with surrogate compounds appropriate to the method being used. In cases where no surrogate is available, (e.g. metals or conventional analyses) a single control sample identical to the DCS serves as the control sample. An SCS is prepared for each sample lot. Accuracy is calculated identically to the DCS.

Method Blank Results. A method blank is a laboratory-generated sample which assesses the degree to which laboratory operations and procedures cause false-positive analytical results for your samples.

Volume, Chloride and Fluoride - Method EPA-26

THE ALMEGA CORPORATION

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date 7-1-94 Page 1 of 2

Project Number 7316

SOURCE PURE AIR, FGD OUTLET

TEST DATE 27-29 JUNE 94

Method of Shipment

PROJECT MANAGER Bill Bilczinski

PHONE NUMBER (708) 595-0175

ANALYSES

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	Zn2EA HCl & HF	Sample Condition/ REMARKS
Imp 1+2, R1	6/27		2549	✓				✓	Rec'd Intact
Imp 1+2, R2	6/27		2218	✓				✓	
Imp 1+2, R1	6/28		2239	✓				✓	
Imp 1+2, R2	6/28		2213	✓				✓	
Imp 1+2, R1	6/29		2235	✓				✓	
Imp 1+2, R2	6/29		2537	✓				✓	

SAMPLERS: (Signature)

Relinquished by: (Signature)

Received by: (Signature) — Date Time

Received by: (Signature) — Date Time

INDICATE SAMPLE DISPOSITION
1. Sample to be Returned to Client: Yes _____ No _____ Other _____
2. Requested Sample Storage Time: _____ Days

Relinquished by: (Signature) — Date Time

Received for Laboratory by: — Date RECEIVED Time: 7/8/94 0925 — Date ACCEPTED Time

Special Instructions

The Almega Corporation

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date 7-1-94 Page 2 of 2

Project Number 7316

SOURCE PURE AIR, FGD INLET

TEST DATE 27-29 JUNE 94

PROJECT MANAGER Bill Bjczinski

PHONE NUMBER (708)595-0175

Method of Shipment

ANALYSES

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	Rm 26A HCl & HF	Sample Condition/ REMARKS
Imp 1+2, R1	6/27		2550	✓			1	✓	Rec'd Intact
Imp 1+2, R2	6/27		2551	✓			1	✓	
Imp 1+2, R1	6/28		2552	✓			1	✓	
Imp 1+2, R2	6/28		2449	✓			1	✓	
Imp 1+2 R1	6/29		2553	✓			1	✓	
Imp 1+2, R2	6/29		2554	✓			1	✓	

SAMPLERS: (Signature) C M Keane

Relinquished by: (Signature)

Received by: (Signature) — Date Time

Received by: (Signature) — Date Time

INDICATE SAMPLE DISPOSITION
1. Sample to be Returned to Client: Yes _____ No _____ Other _____
2. Requested Sample Storage Time: _____ Days

Relinquished by: (Signature) — Date Time

Received for Laboratory by: Peter Crawford — Date RECEIVED Time: 7/8/94 0925 — Date ACCEPTED Time

Special Instructions [redacted]

PURCHASE ORDER

THE ALMEGA CORPORATION
601-A Country Club Drive
Bensenville, Illinois 60106
Phone (708) 595-0175
FAX (708) 595-2103

P.O. NO.: 2010 – 7316 –
NUMBER – PROJECT CODE – OFFICE CODE

Supplier Code:

TO: QUANTERRA LABS
2544 INDUSTRIAL BLVD.
WEST SACRAMENTO, CA
95691

SHIP TO:

Ship to Attention of:	F.O.B.:	Terms:

QUANTITY	PART #	ANALYSIS CODE	DESCRIPTION	PRICE	PER	AMOUNT
12 SAMPLES			RM26A HCl & HF ANALYSIS			
					TOTAL:	

Ordered by: Gina Blaine

Signature: Gina M Blaine

Date: 7-6-94

Authorization:

Date:

PURCHASE ORDER

THE ALMEGA CORPORATION
601-A Country Club Drive
Bensenville, Illinois 60106
Phone (708) 595-0175
FAX (708) 595-2103

P.O. NO.: 2010 – 7316 –
NUMBER – PROJECT CODE – OFFICE CODE

Supplier Code:

TO: QUANTERRA LABS
2544 INDUSTRIAL BLVD.
WEST SACRAMENTO, CA
95691

SHIP TO:

Ship to Attention of:	F.O.B.:	Terms:

QUANTITY	PART #	ANALYSIS CODE	DESCRIPTION	PRICE	PER	AMOUNT
12 SAMPLES			RM26A HCl & HF ANALYSIS			
					TOTAL:	

Ordered by: Gina Blaine

Signature: Gina M Blaine

Date: 7-6-94

Authorization:

Date:

Enseco
Corning Environmental Services

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R1 2549
Lab ID: 076504-0001-SA
Matrix: LIQUID Sampled: 27 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	572	ml	NA		NA	20 JUL 94
Chloride	ND	ug/sampl	5880	EPA-26	NA	20 JUL 94 1
Fluoride	ND	ug/sampl	3010	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Reporting limit raised due to blank contamination and matrix interference.

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

Enseco
Corning Environmental Services

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R2 2218
Lab ID: 076504-0002-SA
Matrix: LIQUID Sampled: 27 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	519	ml	NA		NA	20 JUL 94
Chloride	5750	ug/sampl	5340	EPA-26	NA	20 JUL 94 1
Fluoride	ND	ug/sampl	2730	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Reporting limit raised due to blank contamination and matrix interference

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

Enseco
Corning Environmental Services

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R1 2239
Lab ID: 076504-0003-SA
Matrix: LIQUID Sampled: 28 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	565	ml	NA		NA	20 JUL 94
Chloride	ND	ug/sampl	5810	EPA-26	NA	20 JUL 94 1
Fluoride	ND	ug/sampl	2980	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Reporting limit raised due to blank contamination and matrix interference.

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

Enseco
Corning Environmental Services

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R2 2213
Lab ID: 076504-0004-SA
Matrix: LIQUID Sampled: 28 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	517	ml	NA		NA	20 JUL 94
Chloride	5760	ug/sampl	5320	EPA-26	NA	20 JUL 94 1
Fluoride	ND	ug/sampl	2720	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Reporting limit raised due to blank contamination and matrix interference.

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

Enseco
Corning Environmental Services

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R1 2235
Lab ID: 076504-0005-SA
Matrix: LIQUID Sampled: 29 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	540	ml	NA		NA	20 JUL 94
Chloride	ND	ug/sampl	55600	EPA-26	NA	20 JUL 94 1
Fluoride	ND	ug/sampl	2840	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Reporting limit raised due to blank contamination and matrix interference.

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R2 2537
Lab ID: 076504-0006-SA
Matrix: LIQUID Sampled: 29 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	552	ml	NA		NA	20 JUL 94
Chloride	ND	ug/sampl	5680	EPA-26	NA	20 JUL 94 1
Fluoride	ND	ug/sampl	2910	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Reporting limit raised due to blank contamination and matrix interference.

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

Enseco
Corning Environmental Services

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R1 2550
Lab ID: 076504-0007-SA
Matrix: LIQUID Sampled: 27 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	331	ml	NA		NA	20 JUL 94
Chloride	15700	ug/sampl	3400	EPA-26	NA	20 JUL 94 1
Fluoride	ND	ug/sampl	1740	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Reporting limit raised due to blank contamination and due to matrix inference.

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

Enseco
Corning Environmental Services

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R2 2551
Lab ID: 076504-0008-SA
Matrix: LIQUID Sampled: 27 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	233	ml	NA		NA	20 JUL 94
Chloride	27200	ug/sampl	2400	EPA-26	NA	20 JUL 94 1R
Fluoride	2440	ug/sampl	1230	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Note R : Raised reporting limit(s) due to high analyte level(s).

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

Enseco
Corning Environmental Services

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R1 2552
Lab ID: 076504-0009-SA
Matrix: LIQUID Sampled: 28 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date	
Volume	386	ml	NA		NA	20 JUL 94	
Chloride	26100	ug/sampl	3970	EPA-26	NA	20 JUL 94	1R
Fluoride	2450	ug/sampl	2030	EPA-26	NA	20 JUL 94	2G

Note 1 : Result reported as chloride as HCL.

Note R : Raised reporting limit(s) due to high analyte level(s).

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R2 2449
Lab ID: 076504-0010-SA
Matrix: LIQUID Sampled: 28 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	242	ml	NA		NA	20 JUL 94
Chloride	22900	ug/sampl	2490	EPA-26	NA	20 JUL 94 1R
Fluoride	ND	ug/sampl	1280	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Note R : Raised reporting limit(s) due to high analyte level(s).

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

Enseco
Corning Environmental Services

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R1 2553
Lab ID: 076504-0011-SA
Matrix: LIQUID Sampled: 29 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	248	ml	NA		NA	20 JUL 94
Chloride	24700	ug/sampl	2550	EPA-26	NA	20 JUL 94 1R
Fluoride	1790	ug/sampl	1300	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Note R : Raised reporting limit(s) due to high analyte level(s).

Note 2 : Result reported as flouride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

GENERAL INORGANICS

(Water)

Client Name: ENSA
Client ID: Imp 1+2, R2 2554
Lab ID: 076504-0012-SA
Matrix: LIQUID Sampled: 29 JUN 94 Received: 08 JUL 94
Authorized: 06 JUL 94 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Volume	241	ml	NA		NA	20 JUL 94
Chloride	36400	ug/sampl	2480	EPA-26	NA	20 JUL 94 1R
Fluoride	4350	ug/sampl	1270	EPA-26	NA	20 JUL 94 2G

Note 1 : Result reported as chloride as HCL.

Note R : Raised reporting limit(s) due to high analyte level(s).

Note 2 : Result reported as fluoride as HF.

Note G : Reporting Limit raised due to matrix interference.

ND = Not detected
NA = Not applicable

Reported By: Lisa Upton Approved By: Darlene Flores

The cover letter is an integral part of this report.
Rev 230787

QC LOT ASSIGNMENT REPORT
Wet Chemistry Analysis and Preparation

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
076504-0001-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0002-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0003-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0004-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0005-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0006-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0007-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0008-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0009-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0010-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0011-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X
076504-0012-SA	AQUEOUS	IC-A	20 JUL 94-X	20 JUL 94-X

Enseco
Corning Environmental Services

METHOD BLANK REPORT
Wet Chemistry Analysis and Preparation

Analyte	Result	Units	Reporting Limit
Test: EPA26-CL-IC-A			
Matrix: AQUEOUS			
QC Lot: 20 JUL 94-X QC Run: 20 JUL 94-X			
Chloride	ND	mg/L	1.0
Fluoride	ND	mg/L	0.50

DUPLICATE CONTROL SAMPLE REPORT
Wet Chemistry Analysis and Preparation

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	AVG	Accuracy Average(%) DCS	Limits	Precision (RPD) DCS	Limit
Category: IC-A								
Matrix: AQUEOUS								
QC Lot: 20 JUL 94-X								
Concentration Units: mg/L								
Fluoride	10.0	10.6	10.4	10.5	105	90-110	1.2	10.0
Chloride	10	10.4	10.4	10.4	104	90-110	0.1	10.0
Nitrite (as N)	3.0	NA	NA	NC	NC	90-110	NC	10.0
Bromide	5.0	NA	NA	NC	NC	90-110	NC	10.0
Nitrate (as N)	3.0	NA	NA	NC	NC	90-110	NC	10.0
Orthophosphate (as P)	10	NA	NA	NC	NC	90-110	NC	10.0
Sulfate	15	NA	NA	NC	NC	90-110	NC	10.0

ND = Not detected.
NC = Not calculated, calculation not applicable.
NA = Not applicable.

Calculations are performed before rounding to avoid round-off errors in calculated results.

THE ALMEGA CORPORATION

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date_____Page_____of_____

Project Number_____

SOURCE PURE AIR

TEST DATE 7 JUNE 94

PROJECT MANAGER RSB

PHONE NUMBER

Method of Shipment

ANALYSES

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	RM 8	Sample Condition/ REMARKS
Imp 1 FGD IN R1	6/7		300	✓			1	✓	
Imp 2-3 FGD IN R1	6/7		301	✓			1	✓	
Imp 1 FGD IN R2	6/7		302	✓			1	✓	
Imp 2-3 FGD IN R2	6/7		303	✓			1	✓	
Imp 1 FGD OUT R1	6/7		677	✓			1	✓	
Imp 2-3 FGD OUT R1	6/7		304	✓			1	✓	
Imp 1 FGD OUT R2	6/7		2176	✓			1	✓	
Imp 2-3 FGD OUT R2	6/7		305	✓			1	✓	

SAMPLERS: (Signature)

Received by: (Signature) — Date Time

Relinquished by: (Signature)

Received by: (Signature) — Date Time

INDICATE SAMPLE DISPOSITION
1. Sample to be Returned to Client:
Yes _____ No _____ Other_____
2. Requested Sample Storage Time:
_____ Days

Relinquished by: (Signature) — Date Time

Received for Laboratory by: — Date RECEIVED Time — Date ACCEPTED Time

Special Instructions

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: Inlet

LOCATION: FGD Inlet RUN NUMBER: M5-T1

DATE: 6-7-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING _____ GROSS FILTER WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS FILTER WT. 39419.9 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

FILTER TARE WT. 39398.4 mg

WEIGHT OF PARTICULATE ON FILTER 21.5 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.0 mg

TOTAL WEIGHT OF PARTICULATE 26.5 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Inlet RUN NUMBER: MS-Test 2

DATE: 6-7-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 30 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. 112747.2 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. 112742.0 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.2 mg

DATE OF WEIGHING _____ GROSS FILTER WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS FILTER WT. 45187.6 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

FILTER TARE WT. 45166.8 mg

WEIGHT OF PARTICULATE ON FILTER 20.8 ~~2[illegible]8~~ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.2 mg

TOTAL WEIGHT OF PARTICULATE 26.0 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air
STACK NUMBER: _____
LOCATION: FGD ~~Exit~~ Inlet
RUN NUMBER: M5 - Test 3
DATE: 6-7-94
RELATIVE HUMIDITY: _____ %
ACETONE DENSITY (Pa): _____ g/m
LIQUID LEVEL MARKED AND CONTAINER SEALED? _____
ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/
ACETONE RINSE VOLUME (Vaw) 34 ml
BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg
TIME OF WEIGHING _____
DATE OF WEIGHING _____ GROSS WT. 101180.1 mg
TIME OF WEIGHING _____
AVERAGE GROSS WT. _____ mg
LESS BLANK RESIDUE (Wa) _____ mg
TARE WT. 101177.8 mg
WEIGHT OF PARTICULATE IN ACETONE RINSE 2.3 mg

DATE OF WEIGHING _____ GROSS FILTER WT. _____ mg
TIME OF WEIGHING _____
DATE OF WEIGHING _____ GROSS FILTER WT. 42810.2 mg
TIME OF WEIGHING _____
AVERAGE GROSS WT. _____ mg
FILTER TARE WT. 42779.2 mg
WEIGHT OF PARTICULATE ON FILTER 31.0 mg
WEIGHT OF PARTICULATE IN ACETONE RINSE 2.3 mg
TOTAL WEIGHT OF PARTICULATE 33.3 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: STACK

LOCATION: FGD [redacted] Outlet RUN NUMBER: MSB - TEST 1

DATE: 6-7-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/ml

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/g

ACETONE RINSE VOLUME (Vaw) 172 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. 99.8816 mg

TIME OF WEIGHING _____

* AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

* TARE WT. 99.8764 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.2 mg

DATE OF WEIGHING _____ GROSS FILTER WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ * GROSS FILTER WT. 604.4 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

* FILTER TARE WT. 595.4 mg

WEIGHT OF PARTICULATE ON FILTER 9.0 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.2 mg

TOTAL WEIGHT OF PARTICULATE 14.2 mg

REMARKS: _____

_____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: STACK

LOCATION: FGD Outlet RUN NUMBER: M5B-Test 2

DATE: 6-7-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 84 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. 98304.0 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. 98302.6 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 1.4 mg

DATE OF WEIGHING _____ GROSS FILTER WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS FILTER WT. 603.2 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

FILTER TARE WT. 595.3 mg

WEIGHT OF PARTICULATE ON FILTER 7.9 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 1.4 mg

TOTAL WEIGHT OF PARTICULATE 9.3 mg

REMARKS: _____

_____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: STACK

LOCATION: FGD Outlet RUN NUMBER: M5B-Test 3

DATE: 6-7-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 106 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. 97059.1 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. 97050.8 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 8.3 mg

DATE OF WEIGHING _____ GROSS FILTER WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS FILTER WT. 601.4 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

FILTER TARE WT. 591.4 mg

WEIGHT OF PARTICULATE ON FILTER 10.0 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 8.3 mg

TOTAL WEIGHT OF PARTICULATE 18.3 mg

REMARKS: _____

INITIALS OF ANALYST _____

Almega/Pure Air
Project # 7316
EPA Method 8 Analysis for H2SO4, SO2, and SO3

Date: 6-7-94 Disk: JS-13 File # 73160607.WQ1

Standard	aliquot mls used	mls BaCl2	avg mls BaCl2
0.0102 N H2SO4	25	26.14	
0.0102 N H2SO4	25	25.98	26.06

Normality of Bacl2 titrant (N) = 0.0097

Sample	total sam vol mls (Vsoln)	aliquot mls used (Va)	mls BaCl2	avg mls BaCl2 (Vt)
IPA Blank		100	0.12	
IPA Blank		100	0.09	0.11
FGD Inlet, R1 IPA	300	10	5.28	
FGD Inlet, R1 IPA	300	10	5.22	5.25
FGD Inlet, R1 H2O2	1000	1	26.30	
FGD Inlet, R1 H2O2	1000	1	26.39	26.35
Stack, R1 IPA	250	10	10.94	
Stack, R1 IPA	250	10	10.78	10.86
Stack, R1 H2O2	1000	10	25.94	
Stack, R1 H2O2	1000	10	25.78	25.86
FGD Inlet, R2 IPA	336	10	4.50	
FGD Inlet, R2 IPA	336	10	4.60	4.55
FGD Inlet, R2 H2O2	1000	1	22.04	
FGD Inlet, R2 H2O2	1000	1	21.94	21.99
Stack, R2 IPA	266	20	3.00	
Stack, R2 IPA	266	20	2.92	2.96
Stack, R2 H2O2	1000	10	27.12	
Stack, R2 H2O2	1000	10	26.94	27.03

Almega/Pure Air
Project #7316
EPA Method 8 Analysis for H2SO4, SO2, and SO3

Date: 6-7-94 Disk: JS-13 File # 73160607.WQ1

Standard	aliquot mls used	mls BaCl2	avg mls BaCl2
0.0102 N H2SO4	25	26.14	
0.0102 N H2SO4	25	25.90	26.06

Normality of BaCl2 titrant (N) = 0.0097

Sample	total sam vol mls (Vsoln)	aliquot mls used (Va)	mls BaCl2	avg mls BaCl2 (Vt)
IPA Blank		100	0.12	
IPA Blank		100	0.09	0.11
FGD Inlet, R1 IPA	300	10	5.28	
FGD Inlet, R1 IPA	300	10	5.22	5.25
FGD Inlet, R1 H2O2	1000	1	26.30	
FGD Inlet, R1 H2O2	1000	1	26.39	26.35
Stack, R1 IPA	250	10	10.84	
Stack, R1 IPA	250	10	10.78	10.86
Stack, R1 H2O2	1000	10	25.94	
Stack, R1 H2O2	1000	10	25.78	25.86
FGD Inlet, R2 IPA	336	10	4.80	
FGD Inlet, R2 IPA	336	10	4.60	4.55
FGD Inlet, R2 H2O2	1000	1	22.04	
FGD Inlet, R2 H2O2	1000	1	21.94	21.99
Stack, R2 IPA	266	20	3.00	
Stack, R2 IPA	266	20	2.92	2.96
Stack, R2 H2O2	1000	10	27.12	
Stack, R2 H2O2	1000	10	26.94	27.03

Silica gel weights

Sample	initial weight	final weight	gained
FGD Inlet, R1	266.0	294.1	28.1
Stack, R1	200.0	235.8	35.8
FGD Inlet, R2	245.6	263.6	18.0
Stack, R2	200.0	232.6	32.6

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Inlet RUN NUMBER: M5-TEST 1

DATE: 6-8-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 74 ~~80 [illegible]~~ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-10-94 GROSS WT. _____ mg

TIME OF WEIGHING _____ 102663.1 ~~105404.7~~

DATE OF WEIGHING _____ GROSS WT. ~~102663.1~~ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 102663.1 mg

LESS BLANK RESIDUE (Wa) 102662.9 mg

102661.0 ~~105400.0~~ TARE WT. ~~102661.0~~ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 1.9 ~~2.1~~ mg

DATE OF WEIGHING _____ GROSS FILTER WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS FILTER WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 61230.9 mg

FILTER TARE WT. 61208.0 mg

WEIGHT OF PARTICULATE ON FILTER 22.9 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE ~~2.1~~ 1.9 mg

TOTAL WEIGHT OF PARTICULATE 24.8 mg

REMARKS: _____

_____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Inlet RUN NUMBER: M5 - Test 2

DATE: 6-8-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 36 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-11-94 GROSS WT. 102530.9 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS WT. 102530.6 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 102530.7 mg

LESS BLANK RESIDUE (Wa) 102530.6 mg

TARE WT. 102527.0 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 3.6 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 46361.1 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

FILTER TARE WT. 46.339.4 mg

WEIGHT OF PARTICULATE ON FILTER 21.7 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 3,6 mg

TOTAL WEIGHT OF PARTICULATE 25.3 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air
STACK NUMBER: _____
LOCATION: FGD Inlet
RUN NUMBER: M5-Test 3
DATE: 6-8-94
RELATIVE HUMIDITY: _____ %
ACETONE DENSITY (Pa): _____ g/m
LIQUID LEVEL MARKED AND CONTAINER SEALED? _____
ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/
ACETONE RINSE VOLUME (Vaw) 16 ml
BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-12-94 GROSS WT. 105981.4 mg
TIME OF WEIGHING _____
DATE OF WEIGHING 6-12-94 GROSS WT. 105981.5 mg
TIME OF WEIGHING _____
AVERAGE GROSS WT. 105981.4 mg
LESS BLANK RESIDUE (Wa) 105981.4 mg
TARE WT. 105980.6 mg
WEIGHT OF PARTICULATE IN ACETONE RINSE 0.8 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. _____ mg
TIME OF WEIGHING _____
DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 51004.4 mg
TIME OF WEIGHING _____
AVERAGE GROSS WT. _____ mg
FILTER TARE WT. 51001.6 mg
WEIGHT OF PARTICULATE ON FILTER 2.8 mg
WEIGHT OF PARTICULATE IN ACETONE RINSE 0.8 mg
TOTAL WEIGHT OF PARTICULATE 3.6 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Outlet RUN NUMBER: MSB - Test 1

DATE: 6-8-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 80 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-10-94 GROSS WT. 105401.7 mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 105401.7 mg

LESS BLANK RESIDUE (Wa) 105401.5 mg

TARE WT. 105400.0 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 1.5 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. 608.6 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 608.9 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 608.7 mg

FILTER TARE WT. 595.5 mg

WEIGHT OF PARTICULATE ON FILTER 13.2 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 1.5 mg

TOTAL WEIGHT OF PARTICULATE 14.7 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Outlet RUN NUMBER: MSB-TEST 2

DATE: 6-8-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 106 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-11-94 GROSS WT. 113290.4 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS WT. 113290.8 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 113290.6 mg

LESS BLANK RESIDUE (Wa) 113290.3 mg

TARE WT. 113284.0 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 6.3 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. 610.4 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 610.9 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 610.6 mg

FILTER TARE WT. 597.2 mg

WEIGHT OF PARTICULATE ON FILTER 13.4 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 6.3 mg

TOTAL WEIGHT OF PARTICULATE 19.7 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: _____

LOCATION: FGD Outlet RUN NUMBER: MSB-TEST 3

DATE: 6-8-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/ml

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/g

ACETONE RINSE VOLUME (Vaw) 160 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-11-94 GROSS WT. 104253.8 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS WT. 104253.7 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 104253.7 mg

LESS BLANK RESIDUE (Wa) 104253.2 mg

TARE WT. 104250.6 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.6 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. 607.2 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 607.6 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 607.4 mg

FILTER TARE WT. 595.1 mg

WEIGHT OF PARTICULATE ON FILTER 12.3 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.6 mg

TOTAL WEIGHT OF PARTICULATE 14.9 mg

REMARKS: _____

INITIALS OF ANALYST _____

Almega/Pure Air
Project # 7316
EPA Method 8 Analysis for H2SO4, SO2, and SO3

Date: 6-8-94 Disk: JS-13 File # 73160608.WQ1

Standard	aliquot mls used	mls BaCl2	avg mls BaCl2
0.0102 N H2SO4	25	25.94	
0.0102 N H2SO4	25	26.00	25.97

Normality of Bacl2 titrant (N) = 0.0098

Sample	total sam vol mls (Vsoln)	aliquot mls used (Va)	mls BaCl2	avg mls BaCl2 (Vt)
IPA Blank		100	0.08	
IPA Blank		100	0.08	0.08
FGD Inlet, R1 IPA	250	10	8.35	
FGD Inlet, R1 IPA	250	10	8.27	8.31
FGD Inlet, R1 H2O2	1000	1	28.30	
FGD Inlet, R1 H2O2	1000	1	28.18	28.24
Stack, R1 IPA	266	10	3.95	
Stack, R1 IPA	266	10	3.91	3.93
Stack, R1 H2O2	1000	10	23.40	
Stack, R1 H2O2	1000	10	23.48	23.44
FGD Inlet, R2 IPA	295	5	6.33	
FGD Inlet, R2 IPA	295	5	6.17	6.25
FGD Inlet, R2 H2O2	1000	1	28.50	
FGD Inlet, R2 H2O2	1000	1	28.68	28.59
Stack, R2 IPA	250	10	5.38	
Stack, R2 IPA	250	10	5.35	5.37
Stack, R2 H2O2	1000	10	23.51	
Stack, R2 H2O2	1000	10	23.58	23.55

Almega/Pure Air
Project 7316
EPA Method 5b for Nonsulfuric Acid Particulates

Date: 6-8-94 Disk: JS-13 File # 73160608.WQ1

Probe Washes

beaker #	Sample	sam vol	gms tare wt	final wt	final wt	avg final wt	Part. weight mgs
1	Stack R1	80	105.4000	105.4017		105.4017	1.5
7	Inlet R1	74	102.6610	102.6631	102.6631	102.6631	1.9
8	Inlet R2	86	102.5270	102.5309	102.5306	102.5308	3.7
9	Stack R2	106	113.2840	113.2904	113.2908	113.2906	6.3
11	Inlet R3	16	105.9806	105.9814	105.9815	105.9815	0.9
10	Stack R3	160	104.2506	104.2538	104.2537	104.2538	2.8
12	Ace Blk	100	102.8361	102.8361	102.8364	102.8364	

Filters & Thimbles

filter #	Sample	mgs tare wt	final wt	avg final wt	Part. weight mgs
	Inlet R1	61208.0	61230.9		22.9
816	Stack R1	595.5	608.6	608.9	13.3
	Inlet R2	46339.4	46361.1		21.7
676	Stack R2	597.2	610.4	610.9	13.4
	Inlet R3	51001.6	51004.4		2.8
748	Stack R3	595.1	607.2	607.6	12.3

Silica gel weights

Sample	Initial weight	final weight	gained
FGD Inlet, R1	244.6	256.6	12.0
Stack, R1	200.0	214.0	14.0
FGD Inlet, R2	221.5	236.6	15.1
Stack, R2	282.0	293.9	11.9
FGD Inlet, R3	200.0	205.5	5.5
Stack, R3	200.0	213.9	13.9

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Inlet RUN NUMBER: M5 - Test 1

DATE: 6-9-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/ml

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/g

ACETONE RINSE VOLUME (Vaw) 14 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-11-94 GROSS WT. 98969.9 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS WT. 98970.3 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 98970.1 mg

LESS BLANK RESIDUE (Wa) 98970.0 mg

TARE WT. 98968.0 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.0 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. 43192.2 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 43192.7 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 43192.4 mg

FILTER TARE WT. 43184.3 mg

WEIGHT OF PARTICULATE ON FILTER 8.1 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.0 mg

TOTAL WEIGHT OF PARTICULATE 10.1 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Inlet RUN NUMBER: M5- Test 2

DATE: 6-9-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/ml

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/g

ACETONE RINSE VOLUME (Vaw) 12 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-11-94 GROSS WT. 99009.7 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS WT. 99009.4 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 99009.6 mg

LESS BLANK RESIDUE (Wa) 99009.6 mg

TARE WT. 99007.8 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 1.8 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. 49062.7 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 49063.1 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 49062.9 mg

FILTER TARE WT. 49045.0 mg

WEIGHT OF PARTICULATE ON FILTER 17.9 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 1.8 mg

TOTAL WEIGHT OF PARTICULATE 19.7 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Inlet RUN NUMBER: M5-Test 3

DATE: 6-9-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 20 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-11-94 GROSS WT. 109109.9 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS WT. 109110.3 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 109110.1 mg

LESS BLANK RESIDUE (Wa) 109110.0 mg

TARE WT. 109104.7 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.3 mg

DATE OF WEIGHING 6-13-94 GROSS FILTER WT. 46756.1 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-13-94 GROSS FILTER WT. 46756.3 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 46756.2 mg

FILTER TARE WT. 46744.3 mg

WEIGHT OF PARTICULATE ON FILTER 11.9 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.3 mg

TOTAL WEIGHT OF PARTICULATE 17.2 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Outlet RUN NUMBER: M5B-Test 1

DATE: 6-9-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/ml

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/g

ACETONE RINSE VOLUME (Vaw) 110 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-11-94 GROSS WT. 101420.3 ~~101652.1~~ mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS WT. 101420.6 ~~101652.5~~ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 101420.4 mg

LESS BLANK RESIDUE (Wa) 101420.1 mg

101417.1 TARE WT. ~~101646.4~~ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 3.0 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. 607.7 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 607.9 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 607.8 mg

FILTER TARE WT. 596.3 mg

WEIGHT OF PARTICULATE ON FILTER 11.5 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 3.0 mg

TOTAL WEIGHT OF PARTICULATE 14.5 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Outlet RUN NUMBER: MSB-Test 2

DATE: 6-9-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 90 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-11-94 GROSS WT. 110360.4 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS WT. 110360.4 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 110360.4 mg

LESS BLANK RESIDUE (Wa) 110360.1 mg

TARE WT. 110357.7 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.4 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. 607.3 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 607.5 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 607.4 mg

FILTER TARE WT. 592.3 mg

WEIGHT OF PARTICULATE ON FILTER 15.1 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.4 mg

TOTAL WEIGHT OF PARTICULATE 17.5 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: _____

LOCATION: FGD Outlet RUN NUMBER: MSB-TEST 3

DATE: 6-9-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) 110 ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-11-94 GROSS WT. 111652.1 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS WT. 111652.5 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 111652.3 mg

LESS BLANK RESIDUE (Wa) 111652.0 mg

TARE WT. 111646.4 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.6 mg

DATE OF WEIGHING 6-11-94 GROSS FILTER WT. 610.0 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-12-94 GROSS FILTER WT. 610.4 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 610.2 mg

FILTER TARE WT. 600.1 mg

WEIGHT OF PARTICULATE ON FILTER 10.1 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.6 mg

TOTAL WEIGHT OF PARTICULATE 15.7 mg

REMARKS: _____

INITIALS OF ANALYST _____

Almega/Pure Air
Project # 7316
EPA Method 8 Analysis for H2SO4, SO2, and SO3

Date: 6-8-94 Disk: JS-13 File # 73160608.WQ1

Standard	aliquot mls used	mls BaCl2	avg mls BaCl2
0.0102 N H2SO4	25	25.94	
0.0102 N H2SO4	25	26.00	25.97

Normality of Bacl2 titrant (N) = 0.0098

Sample	total sam vol mls (Vsoln)	aliquot mls used (Va)	mls BaCl2	avg mls BaCl2 (Vt)
IPA Blank		100	0.08	
IPA Blank		100	0.08	0.08
FGD Inlet, R1 IPA	250	10	8.35	
FGD Inlet, R1 IPA	250	10	8.27	8.31
FGD Inlet, R1 H2O2	1000	1	28.30	
FGD Inlet, R1 H2O2	1000	1	28.18	28.24
Stack, R1 IPA	266	10	3.95	
Stack, R1 IPA	266	10	3.91	3.93
Stack, R1 H2O2	1000	10	23.40	
Stack, R1 H2O2	1000	10	23.48	23.44
FGD Inlet, R2 IPA	295	5	6.33	
FGD Inlet, R2 IPA	295	5	6.17	6.25
FGD Inlet, R2 H2O2	1000	1	28.50	
FGD Inlet, R2 H2O2	1000	1	28.68	28.59
Stack, R2 IPA	250	10	5.38	
Stack, R2 IPA	250	10	5.35	5.37
Stack, R2 H2O2	1000	10	23.51	
Stack, R2 H2O2	1000	10	23.58	23.55

Almega/Pure Air
Project # 7316
EPA Method 8 Analysis for H2SO4, SO2, and SO3

Date: 6-9-94 Disk: JS-13 File # 73160609.WQ1

Standard	aliquot mls used	mls BaCl2	avg mls BaCl2
0.0102 N H2SO4	25	25.83	
0.0102 N H2SO4	25	25.88	25.86

Normality of Bacl2 titrant (N) = 0.0098

Sample	total sam vol mls (Vsoln)	aliquot mls used (Va)	mls BaCl2	avg mls BaCl2 (Vt)
IPA Blank		100	0.09	
IPA Blank		100	0.10	0.10
FGD Inlet, R1 IPA	250	10	10.96	
FGD Inlet, R1 IPA	250	10	11.12	11.04
FGD Inlet, R1 H2O2	1000	1	24.84	
FGD Inlet, R1 H2O2	1000	1	25.01	24.93
Stack, R1 IPA	280	10	4.10	
Stack, R1 IPA	280	10	3.93	4.02
Stack, R1 H2O2	1000	10	22.15	
Stack, R1 H2O2	1000	10	22.20	22.18
FGD Inlet, R2 IPA	250	10	9.82	
FGD Inlet, R2 IPA	250	10	9.74	9.78
FGD Inlet, R2 H2O2	1000	1	25.22	
FGD Inlet, R2 H2O2	1000	1	25.04	25.13
Stack, R2 IPA	300	10	6.83	
Stack, R2 IPA	300	10	6.69	6.76
Stack, R2 H2O2	1000	10	36.77	
Stack, R2 H2O2	1000	10	36.63	36.70

mega/Pure Air
ect 7316
A Method 5b for Nonsulfuric Acid Particulates

te: 6-9-94 Disk: JS-13 File # 73160609.WQ1

obe Washes

aker #	Sample	sam vol	gms tare wt	gms tare wt	final wt	final wt	Part. weight mgs
15	Inlet R1	14	98.9680		98.9699	98.9703	2.1
14	Stack R1	110	101.4171		101.4203	101.4206	3.1
23	Inlet R2	12	99.0078		99.0097	99.0094	1.7
24	Stack R2	90	110.3577		110.3604	110.3604	2.5
CUR	Inlet R3	20	109.1047		109.1099	109.1103	5.4
C	Stack R3	110	111.6464		111.6521	111.6525	5.6
12	Ace Blk	100	102.8361		102.8363	102.8364	

ers & Thimbles

ter #	Sample	mgs tare wt	mgs tare wt	final wt	avg final wt	Part. weight mgs
	Inlet R1	43184.3		43192.2	43192.7	8.1
675	Stack R1	596.3		607.7	607.9	11.5
	Inlet R2	49045.0		49062.7	49063.1	17.9
750	Stack R2	592.3		607.3	607.5	15.1
	Inlet R3	46744.3		46756.1	46756.3	11.9
709	Stack R3	600.1		610.0	610.4	10.1

lica gel weights

mple	initial weight	final weight	gained
D Inlet, R1	200.0	204.6	4.6
ack, R1	200.0	242.3	42.3
Inlet, R2	296.8	312.9	16.1
ack, R2	200.0	215.1	15.1
D Inlet, R3	265.0	276.1	11.1
ack, R3			0.0

Almega/Pure Air
Project 7316
EPA Method 5b for Nonsulfuric Acid Particulates

Date: 6-13-94 Disk: JS-13 File # 73160613.WQ1

Probe Washes

			gms				Part. weight
beaker #	Sample	sam vol	tare wt	tare wt	final wt	final wt	mgs
21	Inlet R1	40	101.8957	101.8958	101.9108	101.9111	15.1
22	Stack R1	186	110.4846	110.4844	110.4863	110.4859	1.1
19	Inlet R2	14	98.7480	98.7477	98.7497	98.7497	1.8
13	Stack R2	92	99.9922	99.9920	99.9930	99.9926	0.5
12	Ace Blk	100	102.8361		102.8363	102.8364	

Filters & Thimbles

		mgs			Part. weight
filter #	Sample	tare wt	final wt	final wt	mgs
	Inlet R1		41045.8	41046.2	
893	Stack R1	597.2	616.4	616.0	19.0
	Inlet R2	61987.7	62335.3	62335.7	347.8
896	Stack R2	593.5	600.3	600.4	6.8

Silica gel weights

Sample	initial weight	final weight	gained
FGD Inlet, R1	200.0	204.6	4.6
Stack, R1	200.0	242.3	42.3
FGD Inlet, R2	296.8	312.9	16.1
Stack, R2	200.0	215.1	15.1

Almega/Pure Air
Project # 7316
EPA Method 8 Analysis for H2SO4, SO2, and SO3

Date: 6-13-94 Disk: JS-13 File # 73160613.WQ1

Standard	aliquot mls used	mls BaCl2	avg mls BaCl2
0.0102 N H2SO4	25	25.94	
0.0102 N H2SO4	25	25.96	25.95

Normality of BaCl2 titrant (N) = 0.0098

Sample	total sam vol mls (Vsoln)	aliquot mls used (Va)	mls BaCl2	avg mls BaCl2 (Vt)
IPA Blank		100	0.10	
IPA Blank		100	0.13	0.12
FGD Inlet, R1 IPA	330	10	7.20	
FGD Inlet, R1 IPA	330	10	7.24	7.22
FGD Inlet, R1 H2O2	1000	1	22.18	
FGD Inlet, R1 H2O2	1000	1	22.23	22.21
Stack, R1 IPA	400	10	3.15	
Stack, R1 IPA	400	10	3.13	3.14
Stack, R1 H2O2	1000	10	14.51	
Stack, R1 H2O2	1000	10	14.54	14.53
FGD Inlet, R2 IPA	250	10	4.64	
FGD Inlet, R2 IPA	250	10	4.48	4.56
FGD Inlet, R2 H2O2	1000	1	22.26	
FGD Inlet, R2 H2O2	1000	1	22.20	22.23
Stack, R2 IPA	250	10	3.26	
Stack, R2 IPA	250	10	3.08	3.17
Stack, R2 H2O2	1000	10	15.43	
Stack, R2 H2O2	1000	10	15.31	15.37

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: DIKE A.C. STACK NUMBER: FGT, INLET

LOCATION: VICKSBURG, MS RUN NUMBER: R1

DATE: 6-27-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 46 168.4 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 46 168.3 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 46 168.4 mg

FILTER TARE WT. 46 133.1 mg

WEIGHT OF PARTICULATE ON FILTER 35.3 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

TOTAL WEIGHT OF PARTICULATE 35.3 mg

REMARKS: _____

INITIALS OF ANALYST [illegible]

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD OUTLET

LOCATION: PORTER, IN RUN NUMBER: R1

DATE: 6-27-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-28-94 GROSS WT. 101 120.0 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-28-94 GROSS WT. 101 120.1 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 101 120.1 mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. 101 106.4 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 13.7 mg

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 600.8 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 600.9 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 600.9 mg

FILTER TARE WT. 588.9 mg

WEIGHT OF PARTICULATE ON FILTER 12.0 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 13.7 mg

TOTAL WEIGHT OF PARTICULATE 25.7 mg

REMARKS: _____

INITIALS OF ANALYST [illegible]

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PIPE A/C STACK NUMBER: FSD INLET

LOCATION: PDTEP 1C1 RUN NUMBER: R2

DATE: 6-28-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg,

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 40 022.2 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 40 022.0 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 40 022.1 mg

FILTER TARE WT. 399 89.7 mg

WEIGHT OF PARTICULATE ON FILTER 32.4 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

TOTAL WEIGHT OF PARTICULATE 32.4 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR
STACK NUMBER: FGD OUTLET
LOCATION: PORTER, IN
RUN NUMBER: R2
DATE: 6-27-94
RELATIVE HUMIDITY: _____ %
ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____
ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/
ACETONE RINSE VOLUME (Vaw) _____ ml
BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-28-94 GROSS WT. 112845.8 mg
TIME OF WEIGHING _____
DATE OF WEIGHING 6-28-94 GROSS WT. 102846.0 mg
TIME OF WEIGHING _____
AVERAGE GROSS WT. 102845.9 mg
LESS BLANK RESIDUE (Wa) _____ mg
TARE WT. 102835.6 mg
WEIGHT OF PARTICULATE IN ACETONE RINSE 10.3 mg

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 605.7 mg
TIME OF WEIGHING _____
DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 605.6 mg
TIME OF WEIGHING _____
AVERAGE GROSS WT. 605.7 mg
FILTER TARE WT. 592.8 mg
WEIGHT OF PARTICULATE ON FILTER 12.9 mg
WEIGHT OF PARTICULATE IN ACETONE RINSE 10.3 mg
TOTAL WEIGHT OF PARTICULATE 23.2 mg

REMARKS: _____

INITIALS OF ANALYST SB

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: Pure Air STACK NUMBER: FB INLET

LOCATION: [illegible] RUN NUMBER: R3

DATE: [illegible] RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 51 051.4 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 51 051.3 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 51 051.4 mg

FILTER TARE WT. 50 995.0 mg

WEIGHT OF PARTICULATE ON FILTER 56.4 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

TOTAL WEIGHT OF PARTICULATE 56.4 mg

REMARKS: _____

INITIALS OF ANALYST [illegible]

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD OUTLET

LOCATION: PORTER, IN RUN NUMBER: R3

DATE: 6-27-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-28-94 GROSS WT. 97149.5 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-28-94 GROSS WT. 97149.6 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 97149.6 mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. 97139.8 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 9.8 mg

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 605.0 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 604.8 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 604.9 mg

FILTER TARE WT. 590.2 mg

WEIGHT OF PARTICULATE ON FILTER 14.7 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 9.8 mg

TOTAL WEIGHT OF PARTICULATE 24.5 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD INLET

LOCATION: PORTER IN RUN NUMBER: R1

DATE: 6-28-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 44 906.8 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 44 906.7 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 44 906.8 mg

FILTER TARE WT. 44 882.3 mg

WEIGHT OF PARTICULATE ON FILTER 24.5 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

TOTAL WEIGHT OF PARTICULATE 24.5 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD INLET

LOCATION: PORTER, IN RUN NUMBER: R2

DATE: 6-28-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 48 190.7 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 48 190.5 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 48 190.6 mg

FILTER TARE WT. 48 150.4 mg

WEIGHT OF PARTICULATE ON FILTER 40.2 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

TOTAL WEIGHT OF PARTICULATE 40.2 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR
STACK NUMBER: FGD INLET
LOCATION: PORTER, IN
RUN NUMBER: R3
DATE: 6-29-94
RELATIVE HUMIDITY: _____ %
ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____
ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/
ACETONE RINSE VOLUME (Vaw) _____ ml
BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg
TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg
TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 48 573.3 mg
TIME OF WEIGHING _____

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 48 573.4 mg
TIME OF WEIGHING _____

AVERAGE GROSS WT. 48 573.4 mg

FILTER TARE WT. 48 524.3 mg

WEIGHT OF PARTICULATE ON FILTER 49.1 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE ——— mg

TOTAL WEIGHT OF PARTICULATE 49.1 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD OUTLET

LOCATION: PORTER, IN RUN NUMBER: R1

DATE: 6-28-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-27-94 GROSS WT. 110 501.8 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-29-94 GROSS WT. 110 502.0 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 110 501.9 mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. 110 493.6 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 8.3 mg

DATE OF WEIGHING 6-28-94 GROSS FILTER WT. 602.5 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 602.3 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 602.4 mg

FILTER TARE WT. 590.0 mg

WEIGHT OF PARTICULATE ON FILTER 12.4 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 8.3 mg

TOTAL WEIGHT OF PARTICULATE 20.7 mg

REMARKS: _____

INITIALS OF ANALYST [illegible]

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR
STACK NUMBER: FGD OUTLET
LOCATION: PORTER, IN
RUN NUMBER: R2
DATE: 6-28-94
RELATIVE HUMIDITY: _____ %
ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____
ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/
ACETONE RINSE VOLUME (Vaw) _____ ml
BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-27-94 GROSS WT. 102 734.1 mg
TIME OF WEIGHING _____
DATE OF WEIGHING 6-29-94 GROSS WT. 102 734.2 mg
TIME OF WEIGHING _____
AVERAGE GROSS WT. 102 734.2 mg
LESS BLANK RESIDUE (Wa) _____ mg
TARE WT. 102 728.6 mg
WEIGHT OF PARTICULATE IN ACETONE RINSE 5.6 mg

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 609.6 mg
TIME OF WEIGHING _____
DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 609.8 mg
TIME OF WEIGHING _____
AVERAGE GROSS WT. 609.7 mg
FILTER TARE WT. 597.7 mg
WEIGHT OF PARTICULATE ON FILTER 12.0 mg
WEIGHT OF PARTICULATE IN ACETONE RINSE 5.6 mg
TOTAL WEIGHT OF PARTICULATE 17.6 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD OUTLET

LOCATION: PORTER, IN RUN NUMBER: R3

DATE: 6-22-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-29-94 GROSS WT. 101 950.1 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-29-94 GROSS WT. 101 949.9 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 101 950.0 mg

LESS BLANK RESIDUE (Wa) — mg

TARE WT. 101 947.6 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.4 mg

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 608.7 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-29-94 GROSS FILTER WT. 608.6 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 608.7 mg

FILTER TARE WT. 592.2 mg

WEIGHT OF PARTICULATE ON FILTER 16.5 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.4 mg

TOTAL WEIGHT OF PARTICULATE 18.9 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD INLET

LOCATION: PORTER, IN RUN NUMBER: R1

DATE: 6-29-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 39617.4 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 39617.5 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 39617.5 mg

FILTER TARE WT. 39571.7 mg

WEIGHT OF PARTICULATE ON FILTER 45.8 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE — mg

TOTAL WEIGHT OF PARTICULATE 45.8 mg

REMARKS: _____

INITIALS OF ANALYST [illegible]

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR
LOCATION: PORTER, IN
DATE: 6-29-94

STACK NUMBER: FGD INLET
RUN NUMBER: R2
RELATIVE HUMIDITY: _____ %
ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____
ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/
ACETONE RINSE VOLUME (Vaw) _____ ml
BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg
TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg
TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 52 238.1 mg
TIME OF WEIGHING _____

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 52 238.3 mg
TIME OF WEIGHING _____

AVERAGE GROSS WT. 52 238.2 mg

FILTER TARE WT. 52 182.4 mg

WEIGHT OF PARTICULATE ON FILTER 55.8 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE — mg

TOTAL WEIGHT OF PARTICULATE 55.8 mg

REMARKS: _____

INITIALS OF ANALYST SE

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD INLET

LOCATION: VOLTAIRE IN RUN NUMBER: R3

DATE: 12-29-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

DATE OF WEIGHING _____ GROSS WT. _____ mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. _____ mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. _____ mg

WEIGHT OF PARTICULATE IN ACETONE RINSE _____ mg

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 50 998.9 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 50 998.7 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 50 998.8 mg

FILTER TARE WT. 50974.2 mg

WEIGHT OF PARTICULATE ON FILTER 24.6 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE — mg

TOTAL WEIGHT OF PARTICULATE 24.6 mg

REMARKS: _____

INITIALS OF ANALYST [illegible]

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD OUTLET

LOCATION: PORTER IN RUN NUMBER: R1

DATE: 6-29-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-30-94 GROSS WT. 116 434.8 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-30-94 GROSS WT. 116 434.7 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 116 434.8 mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. 116 427.9 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 6.9 mg

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 614.0 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 613.8 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 613.9 mg

FILTER TARE WT. 600.4 mg

WEIGHT OF PARTICULATE ON FILTER 13.5 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 6.9 mg

TOTAL WEIGHT OF PARTICULATE 20.4 mg

REMARKS: _____

INITIALS OF ANALYST SJB

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD OUTLET

LOCATION: PORTER, IN RUN NUMBER: R2

DATE: 6-29-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg/

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-30-94 GROSS WT. 99 802.2 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-30-94 GROSS WT. 99 802.3 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 99 802.3 mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. 99 797.0 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.3 mg

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 611.6 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 611.4 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 611.5 mg

FILTER TARE WT. 596.0 mg

WEIGHT OF PARTICULATE ON FILTER 15.5 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 5.3 mg

TOTAL WEIGHT OF PARTICULATE 20.8 mg

REMARKS: _____

INITIALS OF ANALYST _____

The Almega Corporation

PARTICULATE ANALYTICAL DATA FORM

COMPANY: PURE AIR STACK NUMBER: FGD OUTLET

LOCATION: PORTER, IN RUN NUMBER: R3

DATE: 6-29-94 RELATIVE HUMIDITY: _____ %

ACETONE DENSITY (Pa): _____ g/m

LIQUID LEVEL MARKED AND CONTAINER SEALED? _____

ACETONE BLANK RESIDUE CONCENTRATION (Ca) _____ mg,

ACETONE RINSE VOLUME (Vaw) _____ ml

BLANK RESIDUE IN ACETONE RINSE (Wa) = Ca.Vaw.Pa = _____ mg

NOTE: IN NO CASE SHOULD A BLANK RESIDUE 0.01 mg/g OR 0.001 % OF THE WEIGHT OF ACETONE USED BE SUBTRACTED FROM THE SAMPLE WEIGHT.

DATE OF WEIGHING 6-30-94 GROSS WT. 101 666.9 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-30-94 GROSS WT. 101 667.1 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 101 667.0 mg

LESS BLANK RESIDUE (Wa) _____ mg

TARE WT. 101 664.4 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.6 mg

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 613.7 mg

TIME OF WEIGHING _____

DATE OF WEIGHING 6-30-94 GROSS FILTER WT. 613.9 mg

TIME OF WEIGHING _____

AVERAGE GROSS WT. 613.8 mg

FILTER TARE WT. 599.0 mg

WEIGHT OF PARTICULATE ON FILTER 14.8 mg

WEIGHT OF PARTICULATE IN ACETONE RINSE 2.6 mg

TOTAL WEIGHT OF PARTICULATE 17.4 mg

REMARKS: _____

INITIALS OF ANALYST _____

COMPANY: KURE AIR

DATE: 29 JUNE 94

LOCATION: PORTER, IN

SOURCE: FGD OUTLET

TITRATION DATA FOR: SO_3 / SO_2

DATA SHEET

RUN NUMBER	V_s	V_{a_1}	V_{t_1}	V_{a_2}	V_{t_2}	V_{a_3}	V_{t_3}		$V_{t_{avg}}$
IMP 1 R1	450	20	5.81	20	5.79	20	5.80		
IMP 2&3 R1	1000	10	19.06	10	19.03	10	19.05		
IMP 1 R2	375	20	5.97	10	5.86	10	5.92		
IMP 2&3 R2	1000	10	20.22	10	20.15	10	20.19		
DI BLANK		10	.04						
IPA BLANK		10	.13						

Titrant Standardization Data:

Standard: H_2SO_4

Normality: .01015

Date of certification: 2/94

Titrant: BARIUM PERCHLORATE

$V_{a_{std}}$: 10 ml

$V_{t_1\,std}$: 9.89 ml

$V_{t_2\,std}$: 9.92 ml

$V_{t_{avg\ std}}$: 9.91 ml

$$N_{titrant} = \frac{(N_{std})(V_{a_{std}})}{(V_{t_{avg\ std}})}$$

$N_{titrant}$ = .0102

APPENDIX M

CALIBRATIONS AND SAMPLE CHAIN-OF-CUSTODY

A1

APEX INSTRUMENTS
EPA METHOD 5
Meter Box Calibration

Model #: 511 E Date: 5/26/93
Serial #: 30583 Barometric Pressure 29.80

dH	Time	DRY GAS METER VOLUME Initial	Final	Total	Temp Tai	Temp Tmo	CALIBRATION METER VOLUME (Yc= 1.0023) Initial	Final	Total	Temp. Init.	Temp. Final
0.50	15.0	89.407	95.343	5.936	80	76	696.299	702.201	5.902	73	73
					81	76					
1.00	11.0	95.343	101.433	6.090	79	76	702.201	708.267	6.066	73	73
					83	76					
2.00	10.0	101.433	109.144	7.711	90	76	708.267	715.955	7.688	73	73
					86	77					
3.00	10.0	109.144	116.665	9.501	84	77	715.955	725.430	9.475	73	73
					89	78					
5.00	6.0	123.340	130.714	7.374	84	78	730.127	737.499	7.372	73	73
					89	79					

METER Y		DEL H	
1.0051	-0.002	1.813	-0.04
1.0062	-0.001	1.846	-0.01
1.0070	0.000	1.897	0.04
1.0090	0.007	1.870	0.02
1.0075	0.001	1.850	0.00
AVG.	1.007	AVG.	1.855

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English Units)

TEST NUMBER _____ DATE 7-25 METER BOX NUMBER A1 PLANT _____

BAROMETRIC PRESSURE, P_b = 29.61 in. Hg DRY GAS METER NUMBER 93 PRETEST Y 1.007

Orifice Manometer Setting (ΔH) in. H_2O	GAS VOLUME		TEMPERATURE				Time (θ) min	Vacuum Setting in. Hg	Y_i	$\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$
	Reference Test Meter (V_w), ft^3	Dry Gas Meter (V_d), ft^3	Reference Test (t_w), °F	DRY GAS METER						
				Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average (t_d), °F				
3.5	542.864 547.414	739.975 745.473	71	75	74	74.5	5	7		.829
3.5	552.925	750.923	71	94	76	85	5	7		1.020
3.5	556.071	756.029	73	93	78	85.5	5	7		1.023
									Y =	0.967

V_w	4.565	5.511	5.146
V_d	5.497	5.500	5.105

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

Where:

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in. H_2O.

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

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

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

APEX INSTRUMENTS
EPA METHOD 5
Meter Box Calibration

Model #: 511-E-A Date: 12/9/93
Serial #: 31293 Barometric Pressure 29.72

dH	Time	DRY GAS METER VOLUME Initial	Final	Total	Temp Tmi	Temp Tmo	CALIBRATION METER VOLUME (Yc= 1.0000) Initial	Final	Total	Temp. Init.	Temp. Final
0.50	15.0	407.100	413.007	5.907	70	69	603.412	609.276	5.864	68	68
					73	69					
1.00	10.0	414.487	420.031	5.544	70	69	610.752	616.268	5.516	68	68
					70	69					
2.00	8.0	450.100	456.225	6.125	80	69	746.221	752.349	6.128	69	69
					77	69					
3.00	7.0	456.225	462.768	6.543	77	69	752.349	758.888	6.539	69	69
					85	71					
5.00	6.0	462.768	469.928	7.160	82	71	758.888	766.050	7.162	69	69
					84	72					

METER Y		DEL H	
0.9957	-0.00	1.839	-0.06
0.9953	-0.01	1.847	-0.06
1.0045	0.00	1.923	0.02
1.0042	0.00	1.936	0.03
1.0035	0.00	1.971	0.07
AVG.	1.001	AVG.	1.903

APEX INSTRUMENTS
EPA METHOD 5
Meter Box Calibration

A3

APEX INSTRUMENTS
EPA METHOD 5
Meter Box Calibration

Model #: 522 Date: 4/28/94
Serial #: 40408 Barometric Pressure 29.82

	Time	DRY GAS METER VOLUME			Temp		CALIBRATION METER VOLUME (Yc= 1.0000)			Temp.	
dH		Initial	Final	Total	Tmi	Tmo	Initial	Final	Total	Init.	Final
0.50	14.00	27.214	32.786	5.572	81	81	865.528	871.048	5.520	77	77
					83	81					
1.00	11.00	32.786	39.016	6.230	83	81	871.048	877.210	6.162	77	77
					87	81					
2.00	11.00	39.016	47.588	8.572	87	81	877.210	885.706	8.496	77	77
					91	82					
3.00	7.00	47.588	54.271	6.683	91	82	885.706	892.320	6.614	77	77
					91	83					
5.00	5.00	54.271	60.315	6.044	90	83	892.320	898.331	6.011	77	77
					90	84					

METER Y		DEL H	
0.9977	-0.00	1.822	-0.05
0.9977	-0.00	1.806	-0.07
1.0014	0.00	1.898	0.02
1.0002	0.00	1.899	0.02
1.0003	0.00	1.951	0.08

AVG. 0.999 AVG.1.875

A4

APEX INSTRUMENTS
EPA METHOD 5
Meter Box Calibration

Model #: 522 Date: 4/27/94
Serial #: 40407 Barometric Pressure 29.72

dH	Time	DRY GAS METER VOLUME Initial	Final	Total	Temp Tmi	Tmo	CALIBRATION METER VOLUME (Yc= 1.0000) Initial	Final	Total	Temp. Init.	Final
0.50	18.00	7.910	15.427	7.517	83	80	801.045	808.472	7.427	78	78
					83	81					
1.00	10.00	19.534	25.391	5.857	83	81	812.532	818.320	5.788	78	78
					87	83					
2.00	8.00	25.391	31.923	6.532	87	83	818.320	824.793	6.473	78	78
					89	82					
3.00	6.25	31.923	38.059	6.136	89	82	824.793	830.868	6.075	78	78
					90	83					
5.00	6.00	38.059	45.785	7.726	90	83	830.868	838.549	7.681	78	78
					92	84					

METER Y		DEL H	
0.9937	-0.00	1.678	-0.05
0.9959	-0.00	1.700	-0.03
0.9994	0.00	1.738	0.01
0.9974	0.00	1.807	0.08
0.9989	0.00	1.733	0.00
AVG. 0.997		AVG.1.731	

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number _____ Date 8-8 Meter box number 14 Plant _____

Barometric pressure, P_b = 29.63 in. Hg Dry gas meter number 803 Pretest Y .997

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Reference test meter (V_w), ft^3	Gas volume: Dry Gas meter (V_d), ft^3	Temperature: Reference test (t_w), °F	Temperature: Dry gas meter: Inlet (t_{di}), °F	Temperature: Dry gas meter: Outlet (t_{do}), °F	Temperature: Dry gas meter: Average (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$
	609.257	511.367								
3	613.327	516.402	66	73	74	73.5	5	6		0.978
3	618.406	521.596	66	74	81	77.5	5	6		1.023
3	623.352	526.594	68.5	75	83	79	5	6		1.043
R1	5.070	5.115							Y =	1.001
R2	5.019	5.114								
R3	4.951	4.913								

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

V_w = Gas volume passing through the reference test meter, ft^3.
V_d = Gas volume passing through the dry gas meter, ft^3.
t_w = Temperature of the gas in the reference test meter, °F.
t_{di} = Temperature of the inlet gas of the dry gas meter, °F.
t_{do} = Temperature of the outlet gas of the dry gas meter, °F.
t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{di} and t_{do}, °F.
ΔH = Pressure differential across orifice, in. H_2O.
Y_i = Ratio of accuracy of reference test meter to dry gas meter for each run.
Y = Average ratio of accuracy of reference test meter to dry gas meter for all three runs; tolerance = pretest Y ±0.05Y.
P_b = Barometric pressure, in. Hg.
θ = Time of calibration run, min.

A5

APEX INSTRUMENTS
EPA METHOD 5
Meter Box Calibration

Model #: 522 Date:
Serial #: 40409 Barometric Pressure 29.82

dH	Time	DRY GAS METER VOLUME Initial	Final	Total	Temp Tmi	Temp Tmo	CALIBRATION METER VOLUME (Yc= 1.0000) Initial	Final	Total	Temp. Init.	Temp. Final
0.50	15.00	145.084	151.366	6.282	78	78	49.383	55.619	6.236	76	76
					83	78					
1.00	10.00	151.366	157.237	5.871	83	78	55.619	61.449	5.830	76	76
					83	79					
2.00	8.00	157.237	163.733	6.496	83	78	61.449	67.889	6.440	76	76
					88	81					
3.00	7.00	163.733	170.686	6.953	83	79	67.889	74.785	6.896	76	76
					90	80					
5.00	5.00	170.686	177.047	6.361	90	80	74.785	81.099	6.314	76	76
					90	81					

METER Y		DEL H	
0.9975	-0.00	1.642	-0.07
0.9994	0.00	1.669	-0.05
0.9985	0.00	1.747	0.03
0.9974	-0.00	1.750	0.03
0.9974	-0.00	1.772	0.06
AVG. 0.998		AVG. 1.716	

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English Units)

TEST NUMBER R1-R3 DATE 7/18/94 METER BOX NUMBER A5 PLANT ABBOTT

BAROMETRIC PRESSURE, P_b = 29.24 in. Hg DRY GAS METER NUMBER 83 PRETEST Y .998

Orifice Manometer Setting (ΔH) in. H_2O	GAS VOLUME		TEMPERATURE				Time (θ) min	Vacuum Setting in. Hg	Y_i	$\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$
	Reference Test Meter (V_w), ft^3 371.043	Dry Gas Meter (V_d), ft^3 762.730	Reference Test (t_w), °F	DRY GAS METER Inlet (t_{d_i}), °F	DRY GAS METER Outlet (t_{d_o}), °F	DRY GAS METER Average (t_d), °F				
1.51	374.572	766.266	75	92	75	83.5	5	6		1.010
1.51	378.087	769.808	75	92	76	84	5	6		1.005
1.51	381.602	773.348	75	91	76	83.5	5	6		1.005
									Y =	1.007

V_w 3.529 3.515 3.515

V_d 3.536 3.542 3.540

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

Where:

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in. H_2O.

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

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

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

A6

APEX INSTRUMENTS
EPA METHOD 5
Meter Box Calibration

Model #: 522 Date: 4/29/94
Serial #: 40411 Barometric Pressure 29.82

dH	Time	DRY GAS METER VOLUME Initial	Final	Total	Temp Tmi	Temp Tmo	CALIBRATION METER VOLUME (Yc= 1.0000) Initial	Final	Total	Temp. Init.	Temp. Final
0.50	15.00	14.278	20.152	5.874	82	82	161.501	167.326	5.825	76	76
					83	82					
1.00	12.00	20.152	26.824	6.672	83	82	167.326	173.951	6.625	76	76
					87	82					
2.00	10.00	26.824	34.575	7.751	87	82	173.951	181.650	7.699	76	76
					90	82					
3.00	6.00	34.575	40.267	5.692	88	83	181.650	187.299	5.649	76	77
					88	83					
5.00	5.00	40.267	46.329	6.062	88	83	187.299	193.336	6.037	77	77
					91	84					

METER Y		DEL H	
1.0020	-0.00	1.868	-0.02
1.0044	0.00	1.849	-0.04
1.0055	0.00	1.901	0.01
1.0017	-0.00	1.907	0.02
1.0012	-0.00	1.934	0.04
AVG.	1.003	AVG.	1.892

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English Units)

TEST NUMBER R1 R2 R3 DATE 7/10/94 METER BOX NUMBER A6 PLANT E.A.R

BAROMETRIC PRESSURE, P_b = 29.45 in. Hg DRY GAS METER NUMBER 40411 PRETEST Y 1.003

Orifice Manometer Setting (ΔH) in. H_2O	GAS VOLUME		TEMPERATURE				Time (θ) min	Vacuum Setting in. Hg	Y_i	$\frac{V_w P_b Y_i (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$
	Reference Test Meter (V_w), ft^3 499.446	Dry Gas Meter (V_d), ft^3 327.692	Reference Test (t_w), °F	DRY GAS METER Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average (t_d), °F				
1.45	504.146	332.457	64	79	72	75.5	7	6		1.004
1.45	508.870	336.154	66	86	73	79.5	7	6		1.027
1.45	513.442	341.902	66.5	88	74	81	7	6		0.986
	R1	R2	R3						Y =	1.006
V_w	4.700	4.724	4.572							
V_d	4.765	4.697	4.748							

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

Where:

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in. H_2O.

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

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

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

A7

APEX INSTRUMENTS
EPA METHOD 5
Meter Box Calibration

Model #: 522 Date: 4/29/94
Serial #: 40410 Barometric Pressure 29.82

dH	Time	DRY GAS METER VOLUME Initial	Final	Total	Temp Tmi	Temp Tmo	CALIBRATION METER VOLUME (Yc= 1.0000) Initial	Final	Total	Temp. Init.	Temp. Final
0.50	17.00	44.018	50.931	6.913	81	80	124.900	131.693	6.793	76	76
					85	80					
1.00	10.00	50.931	56.648	5.717	85	80	131.693	137.318	5.625	76	76
					87	81					
2.00	7.00	56.648	62.242	5.594	87	81	137.318	142.815	5.497	76	76
					88	81					
3.00	6.00	62.242	68.017	5.775	88	81	142.815	148.495	5.680	76	76
					89	82					
5.00	5.00	68.017	74.162	6.145	89	82	148.495	154.555	6.060	76	76
					89	82					

METER Y		DEL H	
0.9915	-0.00	1.771	-0.07
0.9948	0.00	1.786	-0.05
0.9929	0.00	1.831	-0.01
0.9927	0.00	1.888	0.05
0.9914	-0.00	1.918	0.08
AVG. 0.993		AVG. 1.839	

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number R1R2R3 Date 7/18/94 Meter box number A7 Plant Natural Starch

Barometric pressure, P_b = 29.45 in. Hg Dry gas meter number 40410 Pretest Y 0.993

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Reference test meter (V_w), ft^3	Gas volume: Dry Gas meter (V_d), ft^3	Temperature: Reference test (t_w), °F	Temperature: Dry gas meter: Inlet (t_{di}), °F	Temperature: Dry gas meter: Outlet (t_{do}), °F	Temperature: Dry gas meter: Average (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$
	522.846	304.792								
0.6	527.614	309.528	67.5	81	75	78	11	4		1.025
0.6	532.361	314.350	68.5	89	75	82	11	4		1.009
0.6	537.292	319.259	68.5	89	76	78.5	11	4		1.022
	V_w 4.768	4.747	4.931							
	V_d 4.736	2.922	4.909							
									Y =	1.018

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

where

V_w = Gas volume passing through the reference test meter, ft^3.
V_d = Gas volume passing through the dry gas meter, ft^3.
t_w = Temperature of the gas in the reference test meter, °F.
t_{di} = Temperature of the inlet gas of the dry gas meter, °F.
t_{do} = Temperature of the outlet gas of the dry gas meter, °F.
t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{di} and t_{do}, °F.
ΔH = Pressure differential across orifice, in. H_2O.
Y_i = Ratio of accuracy of reference test meter to dry gas meter for each run.
Y = Average ratio of accuracy of reference test meter to dry gas meter for all three runs; tolerance = pretest Y ±0.05Y.
P_b = Barometric pressure, in. Hg.
θ = Time of calibration run, min.

The Almega Corporation

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date 6/15/94 Page ____ of ____

Project Number _____

SOURCE PURE AIR

TEST DATE 7-8 JUNE 94

Method of Shipment

PROJECT MANAGER B.B.

PHONE NUMBER

ANALYSES: Rm 17, Rm 53

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	Rm 17	Rm 53	Sample Condition/ REMARKS
FGD IN THIMBLE R1	6/7		2249					✓		
FGD IN THIMBLE R2	6/7		2248					✓		
FGD IN THIMBLE R3	6/7		2261					✓		
FGD OUT FILTER R1	6/7		0825						✓	
FGD OUT FILTER R2	6/7		0820						✓	
FGD OUT FILTER R3	6/7		0822						✓	
FGD IN THIMBLE R1	6/8		011					✓		
FGD IN THIMBLE R2	6/8		013					✓		

SAMPLERS: (Signature)

Received by: (Signature) — Date Time

Relinquished by: (Signature)

Received by: (Signature) — Date Time

INDICATE SAMPLE DISPOSITION
1. Sample to be Returned to Client:
Yes _____ No _____ Other _____
2. Requested Sample Storage Time:
_____ Days

Relinquished by: (Signature) — Date Time

Received for Laboratory by: — Date RECEIVED Time — Date ACCEPTED Time

Special Instructions

THE ALMEGA CORPORATION

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date 6/15/94 Page 1 of 2

Project Number 7316

SOURCE Pure Air

TEST DATE 7-8 June 94

Method of Shipment

PROJECT MANAGER Bill Bayczinski

PHONE NUMBER (708) 595-0175

ANALYSES

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	Pm2.5 HCl HF	Sample Condition/ REMARKS
FGD Inlet Imp 1-2 R1	6/7		0802	✓			1	✓	
FGD Inlet Imp 1-2 R2	6/7		0803	✓			1	✓	
FGD Outlet Imp 1-2 R1	6/7		1598	✓			1	✓	
FGD Outlet Imp 1-2 R2	6/7		1603	✓			1	✓	
FGD Inlet Imp 1-2 R1	6/8		2252	✓			1	✓	
FGD Inlet Imp 1-2 R2	6/8		0804	✓			1	✓	
FGD Outlet Imp 1-2 R1	6/8		1750	✓			1	✓	
FGD Outlet Imp 1-2 R2	6/8		1760	✓			1	✓	

SAMPLERS: (Signature) Lina M. Blaine

Relinquished by: (Signature)

Relinquished by: (Signature)

Received by: (Signature) Date Time

Received by: (Signature) Date Time

Relinquished by: (Signature) Date Time

Received for Laboratory by: Date RECEIVED Time

Date ACCEPTED Time

INDICATE SAMPLE DISPOSITION

1. Sample to be Returned to Client:
   Yes _____ No _____ Other _____
2. Requested Sample Storage Time:
   _____ Days

Special Instructions

The Almega Corporation

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date_____Page_____of_____

Project Number_____

SOURCE PURE AIR

TEST DATE 8 June 94

PROJECT MANAGER BK

PHONE NUMBER

Method of Shipment

ANALYSES

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	PM8	Sample Condition/ REMARKS
Imp 1 FGD IN R1	6/8		306	✓			1	✓	
Imp 2-3 FGD IN R1	6/8		308	✓			1	✓	
Imp 1 FGD IN R2			309	✓			1	✓	
Imp 23FGD IN R2			310	✓			1	✓	
Imp 1 FGD OUT R1			1610	✓			1	✓	
Imp 2-3 FGD OUT R1			311	✓			1	✓	
Imp 1 FGD OUT R2			1613	✓			1	✓	
Imp 2-3 FGD OUT R2	↓		312	✓			1	✓	

SAMPLERS: (Signature)

Received by: (Signature) Date Time

Relinquished by: (Signature)

Received by: (Signature) Date Time

INDICATE SAMPLE DISPOSITION
1. Sample to be Returned to Client:
Yes _____ No _____ Other_____
2. Requested Sample Storage Time:
_____ Days

Relinquished by: (Signature) Date Time

Received for Laboratory by: Date RECEIVED Time

Date ACCEPTED Time

Special Instructions

The Almega Corporation

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date 6/15/94 Page 2 of 2

Project Number 7316

SOURCE PURE AIR

TEST DATE 9,13 JUNE 94

PROJECT MANAGER (708)595-0175

PHONE NUMBER Bill Byczinski

Method of Shipment

ANALYSES

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	Pm26A HCl HF	Sample Condition/ REMARKS
FGD inlet Imp 1-2 R1	6/9		2253	✓			1	✓	
FGD inlet Imp 1-2 R2	6/9		2254	✓			1	✓	
FGD outlet Imp 1-2 R1	6/9		2078	✓			1	✓	
FGD outlet Imp 1-2 R2	6/9		2082	✓			1	✓	
FGD inlet Imp 1-2 R1	6/13		0805	✓			1	✓	
FGD inlet Imp 1-2 R2	6/13		2255	✓			1	✓	
FGD outlet Imp 1-2 R1	6/13		1746	✓			1	✓	
FGD outlet Imp 1-2 R2	6/13		1757	✓			1	✓	

SAMPLERS: (Signature) Ana M. Blaine

Relinquished by: (Signature)

Received by: (Signature) Date Time

Received by: (Signature) Date Time

INDICATE SAMPLE DISPOSITION
1. Sample to be Returned to Client: Yes _____ No _____ Other _____
2. Requested Sample Storage Time: _____ Days

Relinquished by: (Signature) Date Time

Received for Laboratory by: Date RECEIVED Time Date ACCEPTED Time

Special Instructions

THE ALMEGA CORPORATION

601-A Country Club Drive
Bensenville, Illinois 60106
Phone: (708) 595-0175
Fax: (708) 595-2103

CHAIN OF CUSTODY RECORD

Date_____Page_____of_____

Project Number_____

SOURCE PURE AIR

TEST DATE 9 JUNE 94

PROJECT MANAGER BB

PHONE NUMBER

Method of Shipment

ANALYSES

Sample No. or Identification	Date	Time	Lab Sample Number	Type of Sample: LIQ	AIR	SOLID	Number of Containers	PM8	Sample Condition/ REMARKS
Imp 1 FGD IN R1	6/9		200	✓			1	✓	
Imp 2-3 FGD IN R1	"		201	✓			1	✓	
Imp 1 FGD IN R2	"		1896	✓			1	✓	
Imp 2-3 FGD IN R2	"		202	✓			1	✓	
Imp 1 FGD OUT R1	"		1614	✓			1	✓	
Imp 2-3 FGD OUT R1	"		1615	✓			1	✓	
Imp 1 FGD OUT R2	"		1617	✓			1	✓	
Imp 2-3 FGD OUT R2	"		866	✓			1	✓	

SAMPLERS: (Signature)

Received by: (Signature) Date Time

Relinquished by: (Signature)

Received by: (Signature) Date Time

INDICATE SAMPLE DISPOSITION
1. Sample to be Returned to Client: Yes _____ No _____ Other_____
2. Requested Sample Storage Time: _____ Days

Relinquished by: (Signature) Date Time

Received for Laboratory by: Date RECEIVED Time Date ACCEPTED Time

Special Instructions