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12-ECD-0233

US DEPARTMENT OF ENERGY OFFICE OF RIVER PROTECTION (ORP) SUBMITTAL OF COMPLETED STACK SAMPLING SYSTEM INSPECTION CHECKLIST AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) N13.1-1999 SAMPLING AND MONITORING RELEASES OF AIRBORNE RADIOACTIVE SUBSTANCES FROM THE STACKS AND DUCTS OF NUCLEAR FACILITIES FOR THE AN AND AW DOUBLE SHELL TANK FARM TANK EXHAUSTERS STACKS 296-A-44 296-A-45 296-A-46 AND 296-A-47 EMISSION UNITS 735 736 855 AND 856 RESPECTIVELY

SECTION 4 OF 4

Combination of Modeled, Measured, and Published Data

Probe Information

Shrouded probe performance has been well documented in the literature (Chandra and McFarland 1997)[14]. Figure 28 is a plot summarizing the expected performance of Shrouded Probes as Published by Chandra and McFarland as incorporated with limited experimental data generated during this investigation.

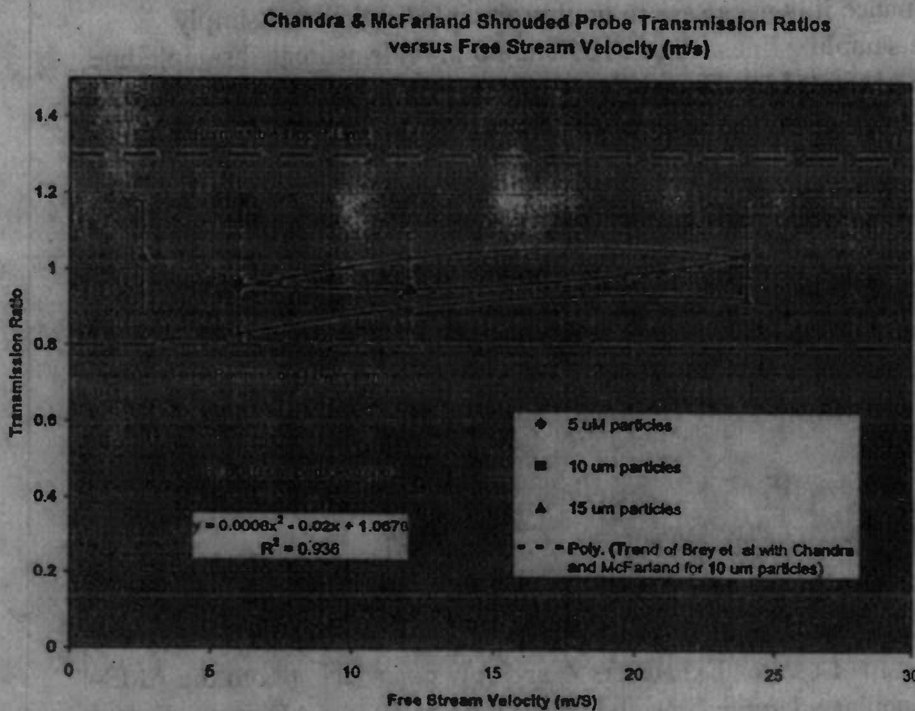

Figure 28 Chandra and McFarland data Summary from: Sumit Chandra and Andrew R. McFarland, Shrouded Probe Performance: Variable Flow Operation and Effect of Free Stream Turbulence, Aerosol Science and Technology 26:111-126 (1997). The 6-m/s free stream velocity corresponded to a sample flow rate of 30 LPM, the 12-m/s free stream velocity corresponded to a sample flow rate of 56.5 LPM and the 24-m/s free stream velocity corresponded to a sample flow rate of 113 LPM. Brey et al. field data as reported above for particles in the size range of 7.1 to 11.19 µm obtained at a free stream velocity of 2.59 m/s with a sampling rate of 20 LPM is superimposed on this plot. A trend line assuming that these 7.1 to 11.19-µm particles can be represented as 10-µm particles and which incorporates the Chandra and McFarland 10-µm particles is also superimposed on this figure. The free stream to sample flow ratio of the Chandra and McFarland data is about 0.2 the measured values in question have a free stream to sample flow of 0.12. Note the lowest probe transmission ratio of 0.943 occurs at a free stream velocity of about 12 m/s.

[14] Sumit Chandra and Andrew R. McFarland, Shrouded Probe Performance: Variable Flow Operation and Effect of Free Stream Turbulence, Aerosol Science and Technology 26:111-126 (1997)

<u>Sample Line Information</u>

The Software code Deposition 2001a - version 1 was used to model deposition within the *sampling lines* of the Premier W-314 Exhausters over ranges of sampling flow rate that were not available for the Thermo Andersen Sampling Probe in the code DEPOSITION 2001a. Sampling flow rate using the Thermo Andersen sampling probes is restricted to a flow rate of 56.6 LPM (2 SCFM) while using this code. To model sampling line performance it is necessary to omit probe information and simply consider losses in the sampling lines. Figures 29 and 30 provide estimated sample line particle deposition as generated by the code DEPOSITION 2001a for sample flow rates ranging from 20 LPM (0.7 SCFM) to 70 LPM (2.5 SCFM). The model input parameters were as appropriate the same as those provided in Table Twelve and Thirteen given above.

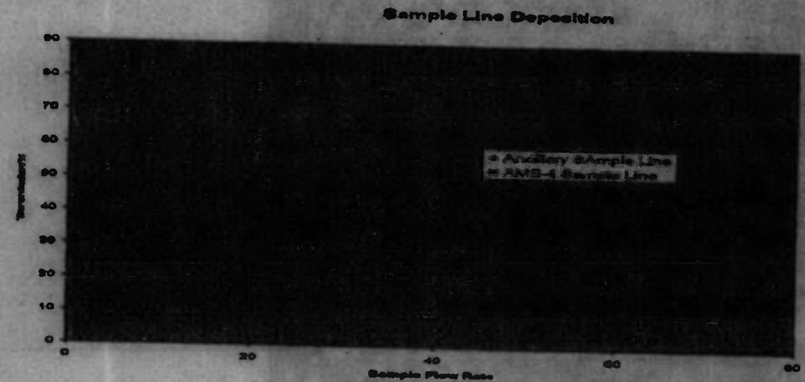

Figure 29: Estimated Line Loss for Exhausters A and AW considering both the AMS-4 Sample line and the Ancillary Sample Line and penetration of 10-µm AD mono-disperse particles.

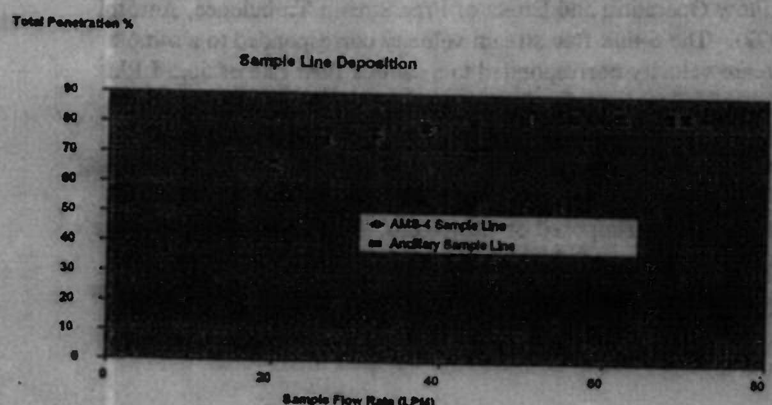

Figure 30: Estimated Line Loss for Exhausters B and BW considering both the AMS-4 Sample line and the Ancillary Sample Line and penetration of 10-µm AD mono-disperse particles.

Combining information from Figures 28, 29, and 30 as the product of probe losses and sample losses can be accomplished as a three dimensional surface plot for all four probes. These are presented below as Figures 31 through 34 for 10-µm AD particles. Just considering the lowest efficiency combinations in the system is an alternate means of describing the performance of the W-314 exhausters. The lowest probe performance for 10-µm particles is observed, as noted previously, at a free stream velocity of about 12 m/s with a transmission ratio of 0.943. The lowest transmission ratio in all four types of samples lines is in the Ancillary line of skids A and AW with a value of 0.57 when a sample rate of 20LPM is employed. The product of these two lowest values, which is the worse case particle penetration, is a percentage penetration of 53.8%. This value is greater than 50% and is, therefore, acceptable according to the criteria of ANSI/HPS N13.1-1999.

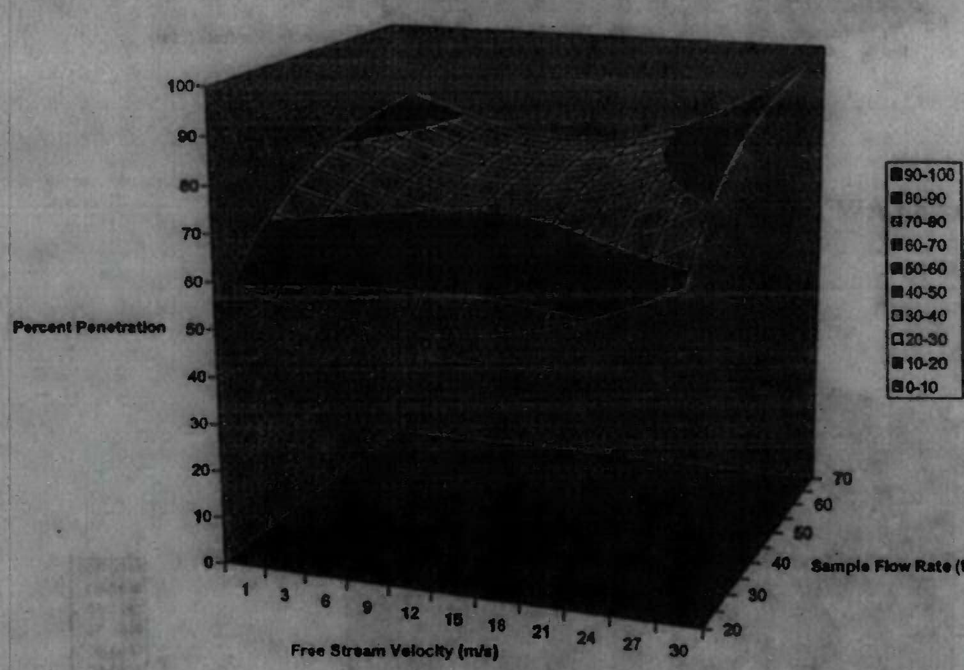

Figure 31 Skid A and AW ancillary line and probe performance.

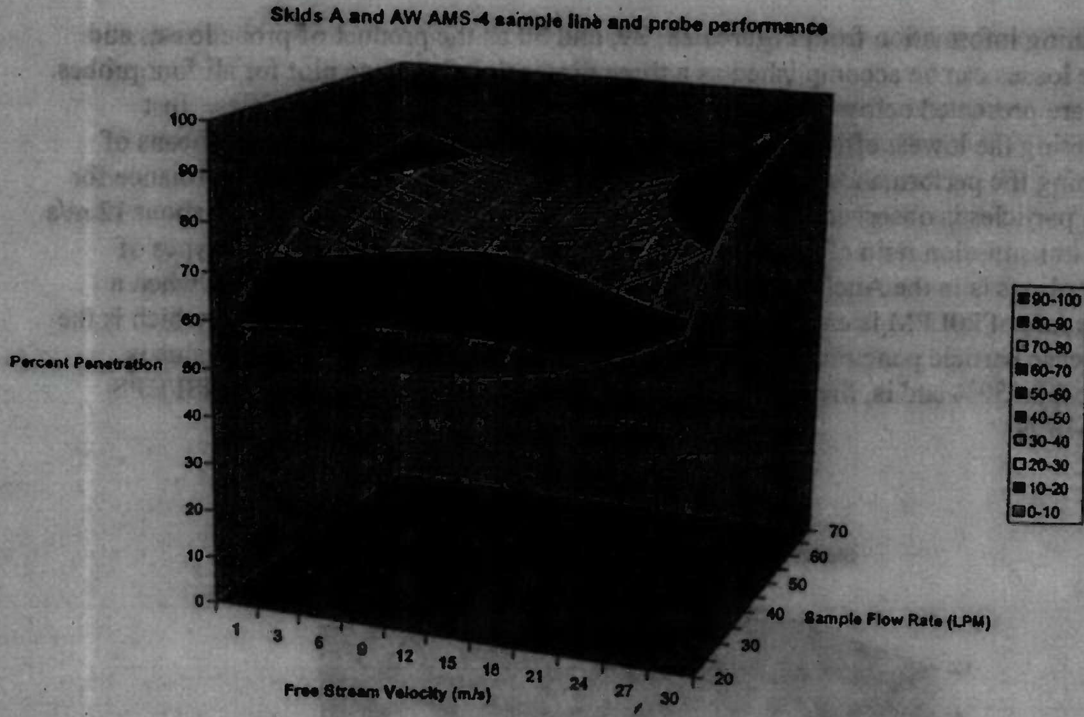

Figure 32 Skid A and AW AMS-4 line and probe performance.

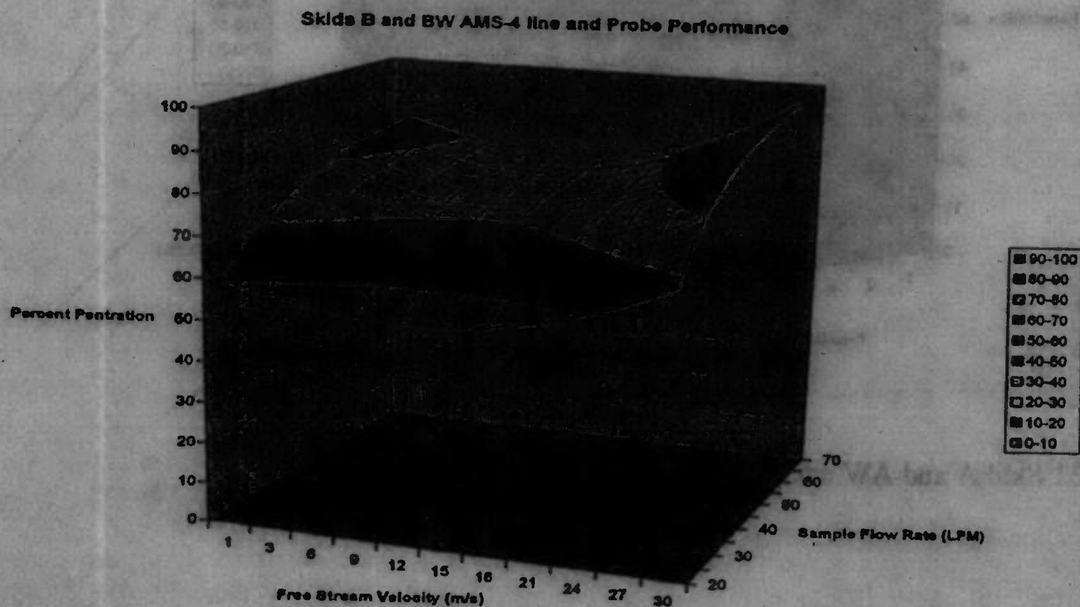

Figure 33 Skid B and BW AMS-4 line and Probe performance

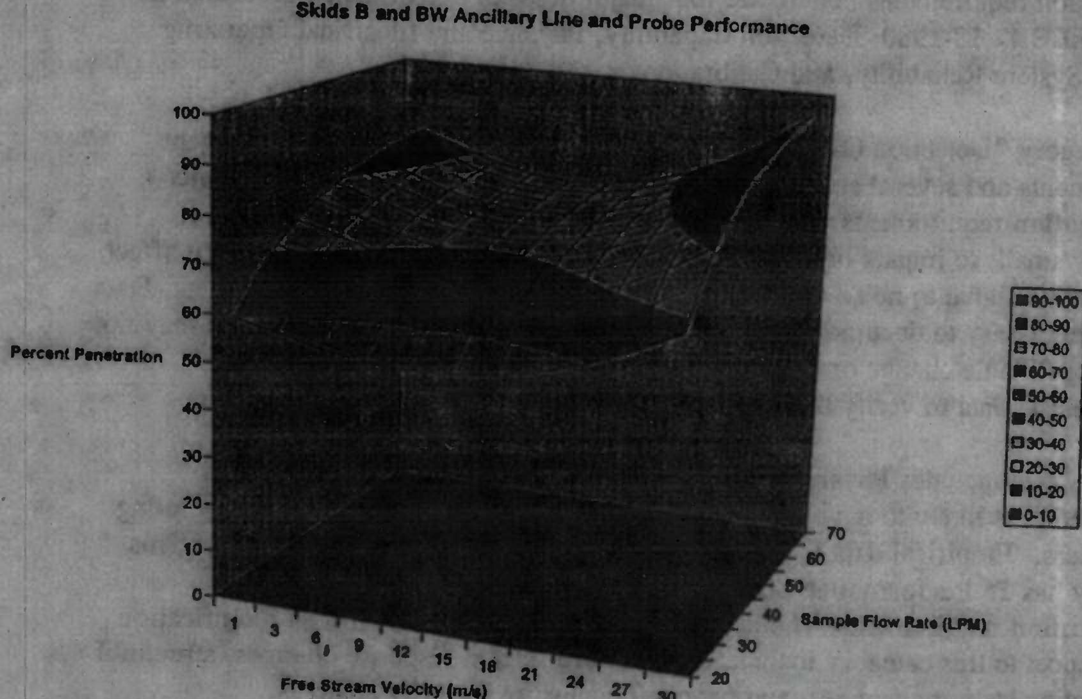

Figure 34 Skid B and BW ancillary line and Probe performance

QUALIFICATION OF EFFLUENT MONITORING INSTRUMENTATION

The W-314 Exhauster system employs an Eberline AMS-4 Continuous Air Monitor (CAM) for purposes of radiation detection. ANSI/IEEE 42.18 compliance of the AMS-4 CAM was originally documented in the report: Evaluation of Eberline AMS-3A and AMS-4 Beta Continuous Air Monitors: *M.L. Johnson, D.R. Sisk, Battelle, Pacific Northwest National Laboratory PNNL-10938, 1996*. However, slight modifications to enhance performance were made to the AMS-4 CAMs installed in the W-314 Exhauster Units. Scientist from ISU and A&A formed an Assessment Working Group tasked with reviewing the W-314 system's compliance with ANSI/IEEE N42.18-1980. The results of the evaluation are provided as discussion and in tabular format in Attachment Eight.

Attachment Eight provides the details of the Assessment Working Group's analysis of ANSI/IEEE N42.18-1980 compliance. This report is an expert evaluation of continuous air monitor performance compliance with respect to ANSI/IEEE N42.18-1980 as limited by equipment performance capability and specifically not considering radiation detection ability. The radiation detection ability of the system can only be determined *in* *situ* as it is a function of the magnitude of background environmental radiation under which the system is operated. Included within the Attachment Eight Document is an assessment of the likely impacts on performance due to changes in the AMS-4 system considering the previously reported ANSI/IEEE N42.18-1980 performance and information requirements. There are four major areas of performance described in ANSI/IEEE 42.18-1980: Detection Capability, Physical and Electrical Operating Limits, System Reliability, and Calibration.

The category "Detection Capability" includes 12 major **Performance Statement** requirements and several sub-requirements and it involves 6 major **Performance Specification** requirements. The AMS-4 modifications have a potential, even if arguably small, to impact on these areas. Mainly, the addition of a cable might affect the system's signal to noise ratio and timing characteristics to some small extent. Data will be necessary to document the differences in response to this area. There may not be an appreciable change on these areas because of the AMS-4 modification; nevertheless, data to verify this "speculation of minor impact" is not available.

Category two includes Physical and Electrical Operating Limits. The AMS-4 modification is likely to have only a small effect, if any, on these required operating parameters. Empirical data is necessary to determine the magnitude of effect. This category has 15 **Performance Statement** requirements and 7 **Performance Specification** requirements. The key issues associated with the AMS-4 modification with respect to this category include: temperature related response changes, structural or mounting stability changes, and potential enclosure integrity changes.

The third category considers instrument reliability. There are 8 listed **Performance Statement** requirements and 4 **Performance Specification requirements** in the third category. With the exception of potential extracameral effects the AMS-4 modifications are not anticipated to affect the items in this category. Further, the performance criteria concerning potential extracameral effects are only suggested, not required.

Calibration issues represent the subject matter in the fourth category. The fourth category has 2 **Performance Statement requirements** and 6 **Performance Specification requirements**. The AMS-4 modifications will not impact the items in this category.

Conclusions

The W-314 Exhauster A, AW, B and BW Skids manufactured by Premier Technology performed in an acceptable manner with respect to all ANSI/HPS N13.1 qualification criteria.

Based upon previously published information on probe performance, modeled sampling line performance and measured data obtained during investigations of the W-314 Exhausters manufactured by Premier Technology the qualified operating range of the exhauster systems may span an exhaust stack flow rate range from 401 SCFM (461 ACFM) corresponding to a free stream velocity of 2.6 m/s employing a minimum stack sample flow rate of 0.7 SCFM (20 LPM) to an Exhauster flow rate of 2,484 SCFM (3,615 ACFM) corresponding to a free stream velocity of 16.0 m/s employing a maximum stack sample flow rate of 2.5 SCFM (70 LPM). As an acceptable alternate, a constant sample flow rate of 2.0 SCFM (56.6 LPM) could be maintained over the range of the exhauster stack flow rate of 401 SCFM (461 ACFM) to 2,484 SCFM (3,615 ACFM).

Slight modifications to the Eberline AMS-4 CAM have been made to enhance the performance of the W-314 Exhauster over a broad range of operating conditions. These modifications, due to their subtle nature, are unlikely to have an important effect on system performance relative to the ANSI/IEEE N42.18-1980 performance requirements; however, experimental evidence to validate this speculation is not available.

Attachments

Premier Technologies Inc. W-314 Exhauster

ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Approved

Richard R. Brey, Ph.D., C.H.P.

Joseph L. Alvarez, Ph.D., C.H.P.

Attachment One

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 -1999 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

TABLE OF CONTENTS

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 -1999 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Compliance Testing of the Hanford Tank Farm Project W-314 Exhauster

Idaho State University Physics Department
Pocatello, ID
Auxier & Associates, Inc.
Knoxville, TN

Performed for
Premier Technology, Inc.
Pocatello, ID

STATEMENT OF WORK

Qualify the sampling location and the sampling apparatus for the Hanford Tank Farm Project W-314 Exhauster. The acceptance criteria and the testing methods shall be as defined in American National Standards Institute/Health Physics Society ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities" and ANSI/IEEE 42.18, "Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents."

OBJECTIVES

Test the Hanford Tank Farm Project W-314 Exhauster for compliance with ANSI/HPS N13.1 and ANSI/IEEE 42.18.

ANSI N13.1 section 5.2.2 states that the sampling location shall be chosen to provide a valid representative sample of the contaminant discharge. Section 5.3 discusses methods for qualifying the sampling location and Table 4 located in that section lists characteristics to be tested, methods of testing, and acceptance criteria. The characteristics are

- Test for cyclonic flow
- Determine velocity profile
- Determine tracer gas profile
- Determine maximum tracer gas concentration
- Determine aerosol particle profile

Section 6.3.2 provides requirements for sampling nozzle performance and Section 6.4 for transport tube performance. The characteristics are

- Nozzle transmission ratio
- Deposition losses in transport tubes

These seven characteristics will be tested against the appropriate ANSI N13.1 criteria using precision measurement techniques, i.e., techniques that are capable of measuring the characteristic to less than 10% of the allowable variation. The last characteristic, deposition losses in transport tubes will be verified by transport code, DEPOSITION 2001a or later.

ANSI/IEEE 42.18 specifies general considerations for selecting instruments for effluent monitoring. These considerations include sensitivity range in relation to the required reporting or alarm levels for the application, compatibility to the monitored environment, ability to be calibrated and tested at the required levels, and stability considerations as regards temperature, vibration, orientation, physical shock, electromagnetic radiation, and chemical compatibility. The instrument and test specifics as supplied by the instrument vendor will be compared to applicable requirements in ANSI/IEEE 42.18 as stipulated in International Electrotechnical Commission IEC 60761 "Equipment for Continuously Monitoring Radioactivity in Gaseous Effluents" and applicable subparts. No on site testing of the instruments will be performed.

METHODS AND MATERIALS

CYCLONIC FLOW

The average flow angle at the sample extraction point in a stack shall not exceed 20° relative to the longitudinal axis of the stack. The average flow angle will be determined in accordance with 40 CFR 60, Appendix A, Method 1, Section 2.4 using the pitot tube method.

VELOCITY PROFILE

The velocity profile will be determined using orthogonal pitot tube traverses at the sample extraction point. The selection of measurement points will be in accordance with 40 CFR 60, Appendix A, Method 1. The coefficient of variation (COV) of the velocity profile shall not exceed 20% over the center region of the stack that encompasses at least two-thirds of the stack area.

TRACER GAS PROFILE

A tracer gas will be used to ensure the uniformity of mixing of the exhaust at the point of sample extraction. The selection of measurement points will be in accordance with 40 CFR 60, Appendix A, Method 1. The coefficient of variation (COV) of the gas concentration profile shall not exceed 20% over the center region of the stack that encompasses at least two-thirds of the stack area. The tracer gas will be either sulfur hexafloride (SF_6) or carbon dioxide (CO_2). The tracer gas concentration will be measured by either gas chromatography mass spectroscopy, FTIR specrtroscopy or IR Spectrometer. The gas concentration may be performed either real time using a portable gas chromatograph or in the laboratory using samples collected in tedlar bags.

MAXIMUM TRACER GAS CONCENTRATION

The results of the tracer gas profile test and additional tests points as necessary will be used to determine the maximum tracer gas concentration. The <u>maximum value</u> of tracer gas concentration shall not exceed the mean value by more than 30% of the mean value at any point on tracer gas profile traverses.

AEROSOL PARTICLE PROFILE

Aerosols will be used to ensure the uniformity of mixing of the exhaust at the point of sample extraction. The selection of measurement points will be in accordance with 40 CFR 60, Appendix A, Method 1. The coefficient of variation (COV) of the aerosol particle concentration profile shall not exceed 20% over the center region of the stack that encompasses at least two-thirds of the stack area. The aerosols will be a low vapor pressure organic liquid. The aerosol concentration will be measured by collection on stages of a cascade impactor. The cascade impactor will allow profiling by particle size up to 10- m aerodynamic diameter. The aerosol concentration by particle size will be determined by either weighing the amount deposited on each impactor stage or by dissolving the material off the impactor stage by a known volume of solvent, then determining the concentration in the solvent.

NOZZLE TRANMISSION RATIO

The nozzle transmission ratio will be tested with aerosols of a low vapor pressure organic liquid having a size range from 0 to 10- m aerodynamic diameter. The test will be performed either in the actual exhaust stack location or on a test bed constructed to simulate the stack conditions. The aerosol concentration in the aspirated sample will be measured using a cascade impactor and the same techniques described under the aerosol particle profile measurements. The ratio of the concentration in the aspirated sample to that in test stream will be used to determine the aerosol transmission ratio by particle size. The aerosol transmission ratio shall not be lower than 0.8 or higher than 1.3. Documented testing by the manufacturer that conforms to ANSI N13.1 may be substituted for the above test. Manufacturer testing will be fully documented in the final report.

DEPOSITION LOSSES IN THE TRANSPORT TUBE

Deposition losses of aerosol particles from the sample extraction point to the point of collection will be evaluated using the computer code DEPOSITION 2001a or the most recent version. The results of the calculation will be confirmed using a test aerosol if modifications to the can be made without altering the structural design, i.e., all modifications will be restricted to substitution of couplings and no change of direction. The aerosol testing will be substantially the same as that of deposition losses in the transport tube. Aerosol transmission will be evaluated for sizes 0 to 10- m aerodynamic diameter and transmission for any size shall not be less than 50%.

QUALIFICATION OF EFFLUENT MONITORING INSTURMENTATION

Instrument vendor will be requested to supply relevant ANSI/IEEE 42.18 test results. The test results will be evaluated against the expected operating environment at the Hanford site and on the Premier Technology skid. Instrument response and calibration/testing requirements will be compared to Hanford site specification for release limits for the Hanford Tank Farm Project W-314 Exhauster. The results of the evaluation will be provided as discussion and in tabular format to support conclusions that the instrument qualifies or fails the appropriate criteria.

PROJECT MANAGEMENT PLAN

Idaho State University (ISU) will conduct the compliance testing of the Hanford Tank Farm Project W-314 Exhauster as built by Premier Technologies with part of the work subcontracted to Auxier & Associates (A&A). The work will be performed through the Premier Technologies Project Coordinator. The ISU Project Manager will perform the management of measurement operations and data analysis.

PROJECT COORDINATOR
Jeff Schutte
Premier Technology, Inc.
170 East Siphon Road
Pocatello, ID 83202

PROJECT MANAGER
Richard R. Brey, PhD, CHP
Health Physics
Idaho State University
Campus Box 8106
Pocatello, ID 83209

SITE MANAGER and PROJECT QA OFFICER
Joseph L. Alvarez, PhD, CHP
Auxier & Associates, Inc.
9821 Cogdill Rd.
Knoxville, TN 37932

MEASUREMENT TEAM MEMBERS
Measurements will be performed by or under the direct supervision of the Site Manager or Project manager by ISU students as a project applicable to a degree in a technical field. Measurement team members will have completed course work necessary to perform all data analysis and instrument operation.

RESPONSIBILITIES
The Project Coordinator is the point of contact for Premier Technologies. The project coordinator is responsible for ensuring access to the W-314 Exhauster and all necessary technical data. The project-coordinator is responsible for the safety policy, safety information, and safety requirements during testing and work completion on the W-314 Exhauster skid.

The Project Manager is the primary point of contact for all compliance testing work. The project manager is responsible for ensuring that all deliverables specified in the compliance-testing contract are completed and submitted to Premier Technologies per the terms of the contract. The project manager is responsible for ensuring the implementation of all procedures and that personnel are properly trained in the procedures, the equipment used, and the necessary safety aspects of the testing. The Site Manager and Project QA Officer are responsible for ensuring that all work is performed in a manner that satisfies quality assurance (QA) and quality control (QC) requirements as specified in this Work plan. The site manager will discuss, prior to initiating testing, the scope of work, contractual and regulatory requirements, and applicable QA/QC procedures with the testing team. The Site Manager will make daily assignments, conduct daily safety meetings, act as a collection point for test information, and deliver completed work to the project manager. The Project QA Officer will ensure that data and data analysis is performed according to A&A QA/QC procedures and that all data and documents produced will be placed in A&A project files in Knoxville, TN.

COMPLIANCE TESTING SCHEDULE

Complete Work plan and all procedures	March 1, 2003
Conduct testing	March 17-21, 2003
Conduct follow-up testing (if necessary)	April 7-11, 2003
Draft final report	April 25, 2003
Final report	May 16, 2003

HEALTH AND SAFETY PLAN

This Health and Safety Plan establishes requirements to ensure the safety of ISU and A&A personnel who will conduct a compliance test on the Hanford Tank Farm Project W-314 Exhauster as built by Premier Technologies at Premier Technologies' facilities in Pocatello, Idaho.

Qualify the sampling location and the sampling apparatus for the Hanford Tank Farm Project W-314 Exhauster. The acceptance criteria and the testing methods shall be as defined in ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities" and ANSI/IEEE 42.18, "Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents."

This Health & Safety Plan is applicable to:

1) performing flow, mixing, and transport efficiency measurements on an exhaust stack,
2) performing collection efficiency measurements on an exhaust stack aerosol and gas sampling system,
3) injecting test substances for efficiency and collection efficiency measurements
4) performing the above tests while located at the height, above ground

level, of the sample extraction location of the exhaust stack.

POLICY STATEMENT

It is the policy of A&A and ISU to provide a safe and healthful work environment for all its employees and to satisfy applicable environmental, safety, and health regulations. A&A considers no phase of operations or administration to be of greater importance than the prevention of injury or illness; safety takes precedence over expediency or shortcuts. Every reasonable effort will be made during all A&A and ISU activities, to reduce the possibility of injury, illness, or accident and to prevent environmental degradation.

RESPONSIBILITIES

This Health and Safety (H&S) Plan prescribes the procedures that must be followed during the activities of this project. Operational changes which could affect the health or safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager and Health and Safety Officer of ISU and A&A, The provisions of this plan are mandatory for all ISU and A&A personnel assigned to the project.

All Personnel

Each person is responsible for the health and safety of themselves and their coworkers, for completing tasks in a safe manner, and for reporting any unsafe acts or conditions to their supervisor. All personnel are responsible for continuous adherence to these health and safety procedures during the performance of their work. No person may work in a manner that conflicts with the letter or the intent of the safety and environmental precautions expressed in these procedures.

Project Health and Safety Officer

The project Site Manager shall serve as the project H&S Officer and is responsible for the preparation and modification of this H&S Plan. Any changes to the H&S Plan must be approved by the project H&S Officer. The project H&S Officer will advise the Project Manager on health and safety issues. The project H&S Officer is the designated regulatory contact on matters related to occupational health and safety.

Project Manager

The Project Manager is ultimately responsible for ensuring that all project activities are completed in accordance with requirements set forth in this plan. The Project Manager is responsible for ensuring all accidents and incidents on the project are reported and thoroughly investigated. The Project Manager in collaboration with ISU and A&A Health & Safety Committee Chairpersons must approve any changes and modifications to this Health and Safety Plan.

On-site Personnel

All ISU and A&A personnel are required to read and acknowledge their understanding of this H&S Plan. All site project personnel are expected to abide by the requirements of the plan and cooperate with site supervision in ensuring a safe and healthful work site. Site personnel are strongly encouraged to use the buddy system by working in pairs on testing assignments and are required to immediately report accidents and injuries, no matter how minor, to the Site Manager.

JOB HAZARD ANALYSIS
SCOPE OF WORK

Test team members will perform measurements as noted above.

Access to the Hanford Tank Farm Project W-314 Exhauster will not involve hazardous chemicals, explosives, or radiation; therefore special training under OSHA is not anticipated.

Safety Hazards

Physical Hazards

Anticipated physical hazards of concern are:

- Vehicle accidents
- Slips, trips, or falls
- Temperature Extremes
- Biological hazards, none

Vehicle Accidents

The possibility of vehicle-related injury or accident is inherent to all aspects of fieldwork. Accidents may occur during travel to or from a site as well as during on-site activities. Vehicle/equipment operators will adhere to federal, state, and local regulations regarding the operation of their motor vehicle/equipment. The number of passengers in a vehicle will not exceed the number of functional seat belts available. Seat belts will be used at all times by the persons riding in vehicles. All drivers will adhere to the speed limits, signs, and road markings. Any employee who operates a company-leased vehicle shall have a valid drivers-license and shall be covered under a valid personal automotive liability insurance policy. Employees convicted of moving violations that occurred while the employee was on duty or driving a vehicle leased by the company may be terminated from involvement on the project.

Slips, Trips, and Falls

Testing measurements will be performed at elevated locations; therefore, the testing team may encounter conditions which expose them to the hazards of slips, trips, and falls. Premier Technologies will provide railings and/or other equipment in accordance with OSHA regulations to prevent falls from elevated locations and will provide clean, uncluttered, and dry surfaces for working and accessing work locations.

The testing team will evaluate and document hazards in the work area and determine adequacy of safety measures. Hazards will be discussed in the daily safety meeting. All testing team members should exercise caution to protect themselves from these hazards.

Temperature Extremes
The testing is expected to be during early spring, and the majority of test activities are to be performed indoors. Nevertheless, if heat or cold stress becomes a possibility, this Health & Safety Plan will be reassessed and amended accordingly.

Biological Hazards
The testing is expected to be during early spring, and the majority of test activities are to be performed indoors, it is unlikely that there will be poisonous insect or animal problems during the planned testing period. Likewise, there is little likelihood of encountering poisonous plants. Nevertheless, if biological hazards become a possibility, this Health & Safety Plan will be reassessed and amended accordingly.

Personal Protective Equipment

Based on the job hazard analysis, it is not expected that project personnel will need extensive protective clothing. Safety goggles, hard hats, protective shoes, and heavy gloves will be worn if equipment is used that require these protective measures or as required by Premier Technologies safety policy.

Employee Training

There is no special OSHA training requirements anticipated for the testing. Premier Technologies may require site-specific training for access. Plant specific orientation will be completed before access is granted and included as necessary in daily safety meetings. The level of training for the project personnel will be consistent with their job function and responsibilities.

Emergency Response Plan

Employee Injury
All employee injuries must be promptly reported to the Site Manager who will:

- Ensure that the injured employee receives prompt first aid and medical attention
- Ensure that the Project Manager and the H&S Officer are promptly notified of the incident so that the Project Manager can promptly notify ISU or A&A, as appropriate
- Initiate an investigation of the incident.

Emergency Response Network

The designated emergency agencies and personnel for this project are:

Hospital	**Emergency 911** (208) 234-0777 Portneuf Regional Medical Center 777 Hospital Way (208) 239-1000 651 Memorial Drive (I-15 to Clark Street - follow signs)
Local Police	**Emergency 911** (208) 234-6100 911 North 7th Street
Fire Departments	**Emergency 911** (208) 234-6201
ISU Site Manager / Health & Safety Officer	Rich Brey (208)-282-2667 ISU 785 S. 8th Street, Pocatello, ID 83209
A&A Health & Safety Committee Chairman	(865) 675-3669 9821 Cogdill Rd., Suite 1 Knoxville, TN 37932
A&A Site Manager / Health & Safety Officer	Joseph L. Alvarez Auxier & Associates, Inc. 9821 Cogdill Rd. Knoxville, TN 37932

QUALITY ASSURANCE PROGRAM PLAN

The Quality Assurance Program Plan (QAPP) for the Compliance Testing of the Hanford Tank Farm Project W-314 Exhauster governs the performance of all tasks of the Compliance Testing to ensure that the data collected are meaningful, valid, defensible, and can be used to achieve the project objectives. This plan includes all the essential elements of a QAPP as defined in ***Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80.***

PROJECT DESCRIPTION

Qualify the sampling location and the sampling apparatus for the Hanford Tank Farm Project W-314 Exhauster. The acceptance criteria and the testing methods shall be as defined in American National Standards Institute/Health Physics Society ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities" and ANSI/IEEE 42.18, "Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents."

INTENDED USE OF THE AQUIRED DATA

The intended use of the acquired data is to determine if the Hanford Tank Farm Project W-314 Exhauster meets the acceptance criteria of ANSI/HPS N13.1-1999.

Project Organization and Responsibilities

The Hanford Tank Farm Project W-314 Exhauster built by Premier Technologies of Pocatello, ID has an exhaust stack that will be tested by Idaho State University and its subcontractor Auxier & Associates. The organization and responsibilities for the project are given in the section Project Management Plan.

The personnel listed by name in the Project Management plan may delegate tasks of the assigned responsibilities to a designee; the task delegation shall be documented, dated, and signed by the person delegating the responsibility. This documentation shall be retained in the project files.

QUALITY ASSURANCE PROGRAM

The purpose of a Quality Assurance (QA) Program is to establish policies for effectively implementing Work Plan and procedures, and to provide an internal means for control and review so that the work performed is of the highest professional standard.

The responsibility for the overall direction of the Project QA Program rests with the Project Manager. The Project QA Officer is responsible for maintaining the QA Program and verifying its implementation through audits and surveillance.

QUALITY ASSURANCE DOCUMENTS

The QA Program is documented in this Quality Assurance Program Plan (QAPP) and supporting procedures which establish requirements for quality-related activities. The policies and procedures specified define acceptable practices to be used by personnel. The QAPP is project specific and serves as the governing QA document for this project.

PROJECT QUALITY ASSURANCE OBJECTIVES

Project quality objectives are that:

- Scientific data will be of a quality to meet scientific and legal scrutiny
- Data will be gathered or developed in accordance with procedures appropriate for the data's intended use
- Data will be of known or acceptable precision, accuracy, completeness, representativeness, and comparability as required for this project.

Fundamental mechanisms that will be employed to achieve these quality goals can be categorized as prevention, assessment, and correction. These include:

- Prevention of errors by planning, documented instructions and procedures, and careful selection and training of skilled, qualified personnel
- Quality assessment through a program of audits and surveillance to supplement continual informal review
- Correction to prevent recurrence of conditions adverse to quality.

The QAPP has been prepared in direct response to these goals. This plan describes the QA Program to be implemented and the quality control (QC) procedures to be followed by ISU and A&A during the course of this project.

The QAPP describes the project organization structure and specifies the procedures, documentation requirements, sample custody requirements, acceptance criteria, audit and corrective action provisions, etc., to be applied to provide confidence that all operations and activities meet the intent of U.S. Department of Energy requirements. The QAPP is prepared in accordance with U.S. EPA guidance as presented in *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80.

The procedures contained or referred to herein have been taken from:

- *Quality Assurance Plan for Radiological Survey Activities*, Auxier & Associates, Inc., February, 1996
- *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD)*, September, 1986
- *Code of Federal Regulations* (CFR), 40 CFR 261, Appendix II, "Toxic Characteristic Leaching Procedure"
- *U.S. EPA Quality Assurance Handbook* (U.S. EPA 600/9-76-005)
- *Proposed Sampling and Analytical Methodologies for Addition to Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, U.S. EPA, (PB85-103026)
- *American Society for Testing and Materials (ASTM) Standards*; Section II, Vols. 11.01 and 11.02, "Water," and Section 4, Vol. 04.08, "Soil and Rock, Building Stones."
- American National Standards Institute/Health Physics Society ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities
- American National Standards Institute/IEEE ANSI/IEEE 42.18, "Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents."

QUALITY ASSURANCE OBJECTIVES FOR DATA

QA objectives for data are discussed in the Data Quality Objectives section. Definitions for precision, accuracy, completeness, representativeness, and comparability are as follows:

- Precision: A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Comparison of replicate values is best expressed as the relative percent difference (RPD). Various measures of precision exist depending upon the "prescribed similar conditions."
- Accuracy: The degree of agreement of a measurement (or an average of replicate measurements), X, with an acceptable reference or true value, T, usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100 (X-T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measure of the bias in a system.
- Completeness: A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions.
- Representativeness: Expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental concern.
- Comparability: Expresses the confidence with which one data set can be compared to another.

CHAIN-OF-CUSTODY PROCEDURES

SAMPLING – AIR FIL TERS AND CASCADE IMPACTOR

SUBSTRATES

The following will be used in the chain-of-custody process for sample tracking and field activities:

- prelabeled sample storage containers or similar containers
- sample set forms to accompany each sample set

All sample storage containers will be labeled to indicate sample location and type. Each location/type set will be numbered sequentially and the number will be assigned to sample set in the data log.

CHAIN-OF-CUSTODY RECORD

Documentation of the air-filter and cascade impactor substrates chain-of-custody is provided by the use of the sample record form. No procedures are required to safeguard the samples from tampering or protect them from environmental hazards or extremes. Nevertheless, samples shall be handled, stored, and transported in a manner to ensure sample integrity and protection from damage. Therefore, chain-of-custody procedures are necessary from collection of the sample until sample analysis. These procedures require:

- a sample collection location where air filter holders and cascade impactors can be stored and protected from damage and the environment
- a location where air filters and cascade impactors can be unloaded and samples placed in sample storage containers that is clean and environmentally protected
- a storage location for the samples that is clean and environmentally protected

The analysis forms will serve as the chain-of-custody records by accounting for sets of samples during analysis. These forms will be initiated in response to each sample record form. No documentation is required for transfer of samples to shipper or to the laboratory if the testing personnel perform all activities.

EQUIPMENT CALIBRATION AND MAINTENANCE

A formal calibration program will control measuring and test equipment used in the field. The program will provide equipment of the proper type, range, accuracy, and precision to provide data compatible with the specified requirements and desired results. Calibration of measuring and test equipment will be performed according to the manufacturer's recommendations. Where applicable calibrations performed by a manufacturer will be considered appropriate.

RESPONSIBILITIES

The ultimate responsibility for the calibration of equipment rests with the Project Manager and the QA Officer. The Site Manager is responsible for monitoring the calibration of field equipment.

CALIBRATION PROCEDURES

The documented and approved procedures from equipment manufacturers will be used for calibrating measuring and test equipment.

The manufacturer's serial number shall uniquely identify calibrated equipment. A calibration sticker will be attached to the appropriate equipment so team members can recognize the most recent date of calibration and when the next calibration is due. It is the responsibility of all survey team members to check calibration status prior to using the equipment.

Calibrations and performance checks shall be performed at prescribed intervals. Such checks will frequency be based on the type of equipment, inherent stability and the manufacturer's recommendations. Equipment will be calibrated, whenever possible, using reference standards having known relationships to nationally recognized standards (e.g., NIST) or accepted values of natural physical constants. If national standards do not exist, the basis for calibration will be documented. Where applicable calibrations performed by a manufacturer will be considered appropriate.

Equipment that becomes inoperable during use, or exceeds control limits for performance checks will be removed from service, segregated to prevent inadvertent use, and tagged to indicate it is out of calibration. Such equipment will be repaired and recalibrated to the satisfaction of the Site Manager and the QA Officer. Equipment that cannot be repaired will be replaced.

Records will be prepared and maintained for each piece of calibrated measuring and test equipment to indicate that established manufacturer calibration procedures have been followed.

DATA REDUCTION, VALIDATION, AND REPORTING

Numerical analyses, including manual calculations, and computer modeling and data plotting will be documented and subjected to quality control review and peer review. Records of numerical analyses will be legible and complete enough to permit reconstruction of the work by a qualified individual other than the originator. Reduction, validation, and reporting of data collected will be performed in accordance with Data Management Plan.

DATA VERIFICATION

- Calculate QC data before completing other calculations and before reporting data
- Calculate analysis results and complete data sheets; sign and date each page
- Request that another analyst or supervisor approve the notebook data sheets by formal checking
- Record data on project data summary sheets as necessary; initial and date forms
- File instrument charts in appropriate data files; enter required information on form
- Enter QC data on appropriate forms and charts.

REPORT PREPARATION

- Review data on project data sheets and previous similar project data, if available
- Review detection limits and report summarized data with appropriate significant figures and units
- Submit data to project group for report preparation
- Verify typed data for formal checking
- Discuss results with Site Manager prior to submittal of report
- Report results externally
- Transmit appropriate records to project files.

FIELD DATA VALIDATION

Field data generated in accordance with the project-specific Work Plan will primarily comprise airflow data. This data will be validated by review of the project documentation to check that all forms specified in the Work Plan and QAPP have been completely and correctly filled out and that documentation exists for the required instrument calibration. This documentation will be considered sufficient to provide that proper procedures have been followed during the field investigation.

NUMERICAL ANALYSIS PROCEDURES

Analysis activities will be performed in a planned and controlled manner. Performance responsibility ultimately rests with the Project Manager. Prior to initiating the activities, the Project Manager will discuss the scope of the work, contractual and regulatory requirements, and applicable QA/QC procedures with assigned personnel. The QA Officer may perform these oversight duties at the request of the Project Manager.

To provide evidence of satisfactory work performance and the basis for information transmitted externally, analyses and their results will be completely documented and checked. Documentation may include calculations, computer programs, logs, drawings, and tables.

CALCULATIONS

Calculations should be legible and in a form suitable for reproduction, filing, and retrieval. Documentation should be sufficient to permit a technically qualified individual to review and understand the calculations and verify the results.

Calculations should be performed on standardized spreadsheets of Microsoft EXCEL or equivalent. The use of internet service calculators deemed to be reliable by the project manager is all acceptable. All calculation pages will be individually identified. The spreadsheet should provide spaces for the originator's name and date of work, the checker's name and date, calculation subject, project name, and sheet number. All of this information should be completed for each sheet.

Calculations should, as appropriate, include a statement of calculation intent, description of methodology used, assumptions and their justification, input data and equation references, numerical calculations including units, and results. Input data may include:

- Results of field and laboratory testing or calculations
- Information obtained from external personnel or literature and site data tests.

At the end of the calculations, the results should be summarized if this will provide clarity. Calculations shall be verified as specified in CALCULATION CHECKING.

COMPUTER PROGRAMS

Computer spreadsheets used for analysis should be documented and verified in accordance with applicable requirements as specified in COMPUTER INPUT CHECKING. Spreadsheets may be password controlled. Computer output will be dated and clearly identified as to contents. Sets of output should be labeled with project name, program used, analysis title, and the user's name.

LOGS, DRAWINGS, AND TABLES
The results of analysis activities may be presented in logs, drawings, and tables of various forms. The format of logs and tables will be governed by the information to be presented. Drawing or figure number and appropriate title will uniquely identify drawings. References to other drawings and sources of information will be provided as necessary.

ANALYSIS VERIFICATION
All calculations, computer program input, logs, drawings, and tables should be formally checked using the standard process outlined in the following sections.

CALCULATION CHECKING
Assignments for checking calculations will be made or approved by the Project Manager or QA Officer. An individual(s) other than the person(s) who performed the original work or specified the method or input parameters to be used will perform verification. The individual(s) selected will have technical expertise in the calculation subject.

It is emphasized that a numerical check is not sufficient. The checker is responsible for every item on every sheet, including the completion of the title block and page numbers.

To properly check calculations the following guidelines are recommended but not necessarily required:

- the originator supplies the designated checker with a machine copy of the calculations. Originals should not leave the originator's possession until they are ready for final checker signing
- the checker marks the calculation copy with a yellow marker for all items approved
- if the checker disagrees, for any reason, the checker crosses through the item with a red marker and writes the recommended correction or comment above the item
- the checker initials and dates all pages of the checkprints
- the checker returns the checkprints to the originator who, in turn, reviews all recommended changes. If a disagreement exists, the originator adds comments to the check prints using a third color and then confers with the checker until all differences are resolved
- the originator corrects, or "scrubs," the calculation originals so they agree with the checkprints. A one-to-one correspondence between the originals and checkprints must exist
- the originator gives the originals and checkprints to the checker who compares them to verify agreed-to corrections have been made
- when the checker is satisfied, he signs and dates the originals
- checkprints are maintained in the project files.

COMPUTER PROGRAM INPUT CHECKING
Computer input should be formally checked using the standard process outlined in CALCULATION CHECKING above. A single exception to this process is that the checking may be performed on the input originals. The verification will include a conceptual review of the program itself based on the problem being solved, a review of the computer model employed, a check that the program has been verified, and a formal check of the input data.

DRAWINGS
Drawings should be checked like calculations using yellow and red markers. Checkprints of the same drawing will be marked to show progression of the checking process. If a drawing is revised, the entire checking process will be repeated for the revised areas only. A new check print will be prepared.

TABLES
All final tables presenting information, data, or the results of analyses should be checked using the standard process for calculations. Checkprints of the same table will be marked to show progression of the checking process.

INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY
Internal QC checks are performed to verify the resulting quality of the measurement tasks of the field investigation and associated tasks.

TRAINING
The ISU and A&A personnel working on this project will be properly trained and qualified to perform the tasks to which they are assigned. Prior to commencement of fieldwork, the site survey team will be given instructions specific to this project covering the following areas:

- Organization and lines of communication and authority
- Description of the work areas
- Overview of the Work Plan and the QAPP
- Documentation requirements
- Documentation of recurring training
- Test Procedures

PROCUREMENT
Procurement of equipment, supplies, and services for project-related activities, which may, by virtue of their nature and/or intended use, directly affect the quality of the survey data, is managed to assure that appropriate specifications and requirements are established and satisfied. The requesting part (usually the Project Manager, Site Manager, or a member of a survey team) is responsible for assessment/inspection of items or services and approving acceptance. Control of records related to this process is the responsibility of the Business Manager.

QA REVIEW OF REPORTS, PLANS, AND SPECIFICATIONS

Prior to issuance of a final report, it will be reviewed by knowledgeable members of the project staff, the Site Manager, and the Project Manager, or designated representative. This review will address whether:

- the report satisfies the scope of work, client requirements, and pertinent regulatory requirements
- assumptions are clearly stated, justified, and documented
- a reference is cited for any information used during the report preparation that was originated outside the project
- the report correctly and accurately presents the results obtained by the project work
- the tables and figures presented in the report are prepared, checked, and approved according to requirements
- the basis for the recommendations and conclusions presented in the report are clearly documented
- the typed report has been proofread, and punctuation, grammar, capitalization, and spelling are correct.

Specific reports may undergo a peer review process administered by the project coordinators. Such a peer review process is intended to complement the verification of numerical analyses and data processing. While verification provides review and confirmation of largely definitive work, peer review provides evaluations and assessment of interpretations, judgments, and decisions made.

The Project Manager will coordinate peer reviews. Reviews will address the following, as appropriate:

- Were the work plans and procedures, as developed, sufficient to control and permit duplication of the project activities?
- Have procedures been correctly used?
- Did the procedures used result in obtaining data quality objectives of the project and have the objectives been properly translated from applicable contractual requirements, industry standards, and federal/state/local regulations?
- Have sufficient data of adequate quality been collected to reach conclusions, which can be justified and verified?
- Are assumptions, interpretations, judgments, or decisions supported by the data, and are they defendable?
- What is the effect of variations upon results?
- Is documentation sufficient to verify the validity and reproducibility of report results?

Peer review will be documented. At a minimum, the review report should include the following:

- Date(s) of review
- Reviewer
- Activities reviewed including interpretations, decisions, and judgments

- Statement of agreement or disagreement with interpretations, decisions, and judgments, including the means for resolving disagreement
- Recommendations for changes, the extension of existing activities, or the establishment of additional studies
- If questions remain unresolved beyond the end of the review, the means for closing the questions will be documented.

Review reports will be transmitted to project management and appropriate QA personnel.

FIELD QUALITY CONTROL

Field activities are the responsibility of the Site Manager. Prior to initiating fieldwork, the Site Manager will discuss the scope of work, contractual and regulatory requirements, and applicable QA/QC procedures with assigned personnel. This may be done by the QA Officer or senior members of the project staff at the request of the Site Manager. Once in the field, survey team members are responsible for all daily QC activities.

PERFORMANCE DOCUMENTATION

To provide evidence of satisfactory work performance and the basis for subsequent activities, the results of field investigations will be completely documented. Whenever possible, information will be recorded on a standardized form. Documentation will include a standard laboratory notebook dedicated to project activities, test and survey data forms, monitoring equipment installation records, photographs, and chain-of-custody forms as applicable.

The Site Manager shall be the central collection point for field records. The Site Manager or designated survey team member shall review all submitted forms for completeness and accuracy. The initials and date of the Site Manager or designee performing this QC check shall be included on the form.

The Site Manager shall keep copies of all records, periodically sending originals to A&A-Knoxville project files.

Members of the survey team working in field operations will keep a standard laboratory notebook dedicated to project activities, either by using the laboratory notebook or a Field Activity Daily Log (Figure 1). Items to be included in the records, as appropriate, are:

- Project identification
- Field activity subject
- Field data and field calculations
- Ancillary information pertinent to the project
- Description of daily activities and events- General work activity, unusual events, and progress or problems
- Changes to plans and specifications

- Action Items
- Communication with the client or others
- Safety Topics Discussed
- records of ISU and A&A personnel on site.

The Site Manager will review laboratory notebooks dedicated to project activities and copies may be routed to other members of the project staff as needed. If laboratory notebooks are not submitted as required, it is the responsibility of the Site Manager, or designee, to contact the survey team members.

As part of field activities, a photographic record or alternately a digital image record (referred to inclusively as photographs below) should be prepared of standard field activities. Photographs are not required otherwise, except to document unusual activities, setups, or events. Photographs should be in color. As examples, photographs should be taken of general site layouts, placement of equipment, and installations, sampling sites, and field testing.

Photographs are to be identified by the project name, date taken, and a brief description. This may be done individually on the back of each photograph or in an album in which the photographs are mounted. Album photographs must be labeled with individual descriptions and dates taken. The client will be notified prior to photographs being taken. Where activities are under way on private or public property, permission should be obtained before pictures are taken.

VERIFICATION OF DATA REDUCTION

The numerical reduction of field data will be formally checked prior to the presentation of results. If it becomes necessary to present or use unchecked results, transmittals or subsequent calculations will be marked "preliminary" until such time that the results are checked and determined to be correct.

All data reduction and resulting tables and graphs should be checked. This includes computer input, if computer performed. Data sheets will be complete, with all requested information addressed.

The verification of field data reduction is the responsibility of project personnel. The assignment of a checker may be made or approved by the Project Manager.

FIELD ACTIVITY DAILY LOG

DATE: ______
SHEET: ____ of ____

PROJECT NAME:

FIELD ACTIVITY SUBJECT:

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

ACTION ITEMS:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
SAFETY TOPICS DISCUSSED:	IMPORTANT TELEPHONE CALLS:

AUXIER & ASSOCIATES, INC. PERSONNEL ON SITE:

SIGNATURE:	DATE:

Figure 1. Field activity daily log form. Note, a standard laboratory notebook dedicated to project activities may be substituted for this particular form.

QUALITY ASSURANCE

To verify compliance with QAPP requirements, the QA Officer and other technically qualified personnel (if required) may perform planned and documented audits of project activities. These audits will comprise, as appropriate, an evaluation of QA procedures and the effectiveness of their implementation, an evaluation of work areas and activities, and a review of project documentation. Audits will be performed in accordance with written checklists and, as appropriate, technical specialists. Audit results will be formally documented and sent to the Project Manager.

Audits may include, but not be limited to, the following areas:

- Field operation work procedures and records
- Laboratory testing and records
- Equipment calibration and records
- Numerical analyses
- Computer program documentation and verification
- Transmittal of information
- Record control and retention
- Final Reports

A report audit may examine, as appropriate, the documentation and verification of field and laboratory data and results; performance, documentation, and verification of analyses; documentation and verification of computer programs; preparation and verification of drawings, logs, and tables; content, consistency, and conclusions of the report; compliance with regulatory and project requirements; and maintenance and filing of project records.

The records of field operations will be reviewed to verify that field-related activities were performed in accordance with appropriate project procedures. Items reviewed will include, but not be limited to, the calibration records of field equipment; laboratory notebook dedicated to project activities; daily field activity logs; photographs; and data, logs, and checkprints resulting from the field operations.

Auditing of analyses may include a complete review of calculations, computer input, sketches, charts, tables, and their associated checkprints that were prepared by the project group.

The report preparation process may be reviewed to verify that:

- The report correctly and accurately presents the results obtained by the project work
- All information presented in the report is substantiated by project work
- The logs, tables, and figures presented in the report are prepared and checked according to applicable requirements
- The report satisfies the scope of work, applicable requirements, and any pertinent regulatory requirements.

A report audit may also, as appropriate, review the maintenance of project documents to verify that applicable procedures have been implemented.

Checklists should be prepared by the auditors and used to conduct all audits. They will be developed to accomplish the review of necessary items and to document the results of the audit.

Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

The procedures that should be used to assess data precision, accuracy, and completeness are included in the sections Management of Technical Data, and Measurement Devices and Techniques. These QC program elements include:

- The proposed requirements of the Compliance Testing are to perform individual measurements at a maximum error of 20 percent at 90 percent confidence
- All documentation associated with measurement data collected during field activities will be reviewed to ensure completeness
- The transfer of data from field documentation to the electronic data base spreadsheets will be given a 100 percent QC check by the QA Officer or designee to ensure that transcriptional errors are eliminated
- Only data from the master data base will be used for dose assessments, technical investigations, or decision making.

Document Control

Project specific documents and drawings should be reviewed, approved, distributed, and revised as necessary.

REVIEW AND APPROVAL OF DOCUMENTS AND DRAWINGS

Prior to use, the following documents and drawings should be reviewed and approved by the personnel identified:

- Other Project Specific Documents (such as the Work Plan, etc.):
  - Project QA Officer
  - Project Manager
  - Premier Technologies Project Coordinators

- Drawings, including computer graphics and maps:
  - Draftsperson/Preparer
  - Checker
  - Project Manager.

Approval of these documents and drawings will be denoted by a signature and date. All documents and drawings will be reviewed and approved by the designated Premier Technologies, ISU, and A&A personnel. Copies of a document or a design drawing provided before it has gone through the complete review and approval process will merit the document or drawing to be marked "Preliminary."

DISTRIBUTION
Documents and drawings will be distributed as requested to Premier Technologies, ISU, and A&A personnel. The QA Officer should maintain the distribution list of all quality-related documents, including the QAPP, Work Plan, and Health and Safety Plan. The Project Manager should maintain the distribution of all other documents and drawings. When a document or drawing is no longer needed, all non-record copies will be destroyed or returned to the issuing group.

REVISION OF DOCUMENTS AND DRAWINGS
Whenever a document or drawing is revised, a new review and approval of the revision should be required in accordance of the original document or drawing.

Revisions should be issued to all holders of the original document or drawing. For the QAPP, Work Plan, and Health and Safety Plan, each copyholder should sign a revision receipt verifying that the revision has been received and properly placed in the document. The receipt should be returned to the project QA Officer. The Project Manager should maintain revisions of all other documents or drawings. Revision receipts should be returned to the Project Manager.

Revisions to documents should include the revision date on the document title page (if reissued), revised signature page (if reissued), and each page that has been revised. Revisions to design drawings should be denoted by including the consecutive number and revision date in the appropriate block on the drawing and revised signature block.

Revisions to QAPP, Work Plan, and Health and Safety Plan should be accomplished by either a general revision in which all pages are replaced, or a limited revision in which only certain pages are replaced. For a general revision, all pages will be identified with the revision date. For a limited revision, each revised page will be identified with the revision date. A revision log sheet that lists all revised pages for that revision will transmit each limited revision. The log sheet is to be filed in front of the revised document. Document title pages and signature pages are not required for limited revisions.

INITIATING CHANGES TO DOCUMENTS
Changes to approved plans and procedures are likely to be necessary during the course of the project performance as a result of new information or events that occur during performance. Changes to previously approved plans and the Project QA Officer must approve procedure changes before the change is implemented.

VARIANCES
A variance is an approved variation from a previously approved project specific procedure, such as the QAPP, Work Plan, Sampling Plan, etc. and does not impact the quality of the work. Variances do not normally result in revisions to project-specific documents. They are a means of accomplishing on-the-spot changes to project specific procedures when the change is necessary for work to proceed. The change is a one-time

change that is valid only for the specific activity described in the Record of Technical Change.

Variances from standard approved field operational procedures and plans will be documented on a Record of Technical Change (Figure 2) or equivalent form. It is recognized that procedures such as Work Plans cannot be prepared which properly foresee all conditions encountered during a field program. Any personnel may initiate a technical change. The Project Manager will maintain a Record of Technical Change to track project variances. Technical changes require the approval of the Project Manager and the QA Officer. Approval by the Project Manager or QA Officer can be initiated on a verbal basis via telephone. The Record of Technical Change should contain: date and nature of the variance, applicable document, personnel initiating the variance, changes to project schedules, and justification of changes. If a variance is proposed by the client, it will be so recorded.

The Project Manager should review the technical changes and, when in agreement, indicate approval by signing and dating each Record of Technical Change. The copy will be forwarded to the QA Officer for review, signing, and dating, then returned to the Project Manager for inclusion in the project files.

RECORD OF TECHNICAL CHANGE

Technical Change No. ____________________ Page ______ of ______

Project Name: ________________________ Date ____________

The following technical changes (including justification) are requested by:

____
(Name)

The project time will be (Increased)(Decreased)(Unchanged) by approximately ________ days.

Applicable Project-Specific Document(s):

cc:

Approved By: ________________________ Date: __________
(Project Manager)

________________________ Date: __________
(Quality Assurance Officer)

Figure 2. Record of technical change form

DOCUMENT CHANGE REQUESTS

A Document Change Request (DCR) is a means of initiating a revision to a previously approved project-specific procedure, such as QAPP, Work Plan, etc. DCRs are recorded on the DCR form shown in Figure 3. Review and approval of the DCRs will be in accordance with the requirements of the original document before they are implemented. For DCRs that involve changes to analytical laboratory activities, review by the responsible laboratory director is appropriate. The Project Manager or the project QA Officer may request oral approval from the other signatories when necessitated by circumstances. If the other signatories orally approve and consent for the DCR to be signed for them, the Project Manager or project QA Officer may sign their *own* name in the other person's signature space and write "for" before the person's title below the signature space.

DCRs always result in revisions to project-specific documents, as opposed to Records of Technical Change, which normally do not result in revisions.

DCRs are typically initiated as follows:

- The requestor (normally the person who identifies the need for the change) completes the DCR form up to the EFFECTIVE DATE OF CHANGE.
- The requestor forwards the DCR to the project QA Officer for evaluation.
- If he/she concurs with the DCR, the project QA Officer enters a number in the REQUEST NO. space and also signs and dates the DCR in the appropriate space. If he/she does not concur, he resolves the disagreement with the requestor.
- The project QA Officer enters the pertinent information in a DCR status and tracking log that shows the DCR number, requestor, request date, subject matter, affected document and section number(s), transmittal and return date from each signatory, distribution date to each document holder, and issue date of revised pages to the document.
- The project QA Officer makes a copy of the DCR and forwards the original to the Project Manager and project coordinators with a request to review, approve, and return to the project QA Officer. The date is recorded in the DCR status and tracking log.
- When the signed DCR is returned from the Project Manager, the project QA Officer makes the appropriate entry in the DCR status and tracking log, and repeats the forwarding process until all required signatures have been obtained. If any signatory refuses to sign the DCR, that signatory is responsible for communicating to the project QA Officer the reasons for not signing. The project QA Officer coordinates the resolution of the disagreement of the DCR, consulting with the Project Manager and project coordinators as necessary. In the event that a decision is made not to proceed with the issue of the DCR, the project QA Officer notifies the requestor and all signatories who have previously signed the DCR of this decision. An appropriate entry to this effect is made in the DCR status and tracking file.

- When required signatures have been obtained, the project QA Officer issues the DCR to everyone listed on the original distribution list. The change described by the DCR is to be implemented on the date specified in the EFFECTIVE DATE OF CHANGE space on the DCR.
- The effective date of change and issuance of the DCR is dependent on project coordinators addressing the section at the bottom of the DCR for EPA notification, EPA approval, or immediate implementation.

Everyone on the distribution list accompanying this document receives the Work Plan and therefore any document changes and a DCR. They are responsible for inserting a copy of the DCR in front (or other appropriate location) of the affected document(s). Until revised document pages are issued, the DCR serves as the official notification that the document has been changed as described in the DCR and is to be maintained in the project files.

Subsequent to issuing a DCR, the project QA Officer should, as soon as feasible, issue revised document pages incorporating the change described in the DCR. A notation will be made on the DCR that the change has been incorporated in the revision.

DOCUMENT CHANGE REQUEST

Safety Involved: Yes No	Request No: ____________ Completed By:

Requestor ______________________ Phone No. ____________ Date ________

Document Title __________________________ Document No. ____________

Section / Paragraph / Page No. ______________________________________

Issue Date ________________________ Last Revision Date

Justification:

Comment of Change:

Cancellation Instructions:
Cancel Document No. __________________________
Reason for Cancellation:

Required Approvals:

______________________________ Idaho State University. Project Manager/Date

______________________________ Premier Technologies Project Coordinator/Date

______________________________ QA Officer/Date

Figure 3. Document change request form

COMPUTER GRAPHICS DEVELOPMENT
The following apply to all computer-generated graphics produced for this project. This specifically includes visual displays generated using statistical, computer aided design, charting, or EXCEL software.

LABELING
Graphics will be titled so as to clearly identify the parameter or parameters displayed. Reporting units must be included on each. Standard two-dimensional (X-Y) or three-dimensional plots must have a scale showing the range of values being displayed.

All graphics that contain data that has not been completely verified should include the label:

"Preliminary Data: Not for Distribution or Publication"

Also labels for:

"Validation Level I" and "Validation Level II"

Validation Level I. All data transferred electronically will be manually verified against signed, hard copy reports.

Validation Level II. Result of technical analysis of all data to date.

Graphics produced during the development of software programs to be used for demonstration purposes should be labeled according as above and should also include the label "Developmental."

NONCONFORMANCE/CORRECTIVE ACTION AND VARIANCES
NONCONFORMANCE/CORRECTIVE ACTION
Nonconforming items and activities are those, which do not meet the project requirements, procurement document criteria, or approved work procedures. Nonconformances may be detected and identified by:

- Project Staff: During the performance of field investigation and testing, performance of field inspections, and preparation and verification of numerical analyses
- Laboratory Staffs: During the preparations for and performance of laboratory testing, calibration of equipment, and QC activities
- QA Officer: During the performance of audits and other quality assurance activities.

The personnel identifying or originating will document each nonconformance affecting quality. For this purpose, a Nonconformance Report form (Figure 4), testing procedure record, results of laboratory analysis QC tests, audit report, inspection report, internal memorandum, or letter will be used as appropriate. Documentation should include:

- Identification of the individual(s) identifying or originating the nonconformance
- Description of the nonconformance
- Required approval signatures
- Method(s) for correcting the nonconformance (corrective action) or description of the variance granted
- Schedule for completing corrective action.

Documentation in the form of the Nonconformance Report should be made available to project management and the QA Officer. It is the responsibility of the Project Manager, Site Manager, and/or QA Officer to then notify appropriate personnel of the nonconformance. In addition, the Project Manager should notify Premier Technology of reoccurring nonconformances that could impact the results of the work and indicate the corrective action taken or planned. Completion of corrective actions for significant nonconformances should be verified by the QA Officer as part of future auditing activities.

Any recurring nonconformances will be evaluated by the Project Manager, laboratory management, and/or the QA Officer to determine its cause and appropriate changes instituted in project requirements and procedures to prevent future recurrence. When such an evaluation is performed, the results will be documented.

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 -1999 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

NONCONFORMANCE REPORT

Project Name ______________________ Page ____ of ____

Phase/Task ______________________ Date ____________

Nonconformance: Identified By: Date:
Corrective Action Required: To Be Performed By: __________ Date: __________ To Be Verified By: __________ Prepared By: Date:
Corrective Action Taken: Performed By: __________ Date: __________ Verified By: Date:

Approved By: ______________ Date: ________

Title ______________

Figure 4. Nonconformance report form

VARIANCES

Variances from standard, approved field operational procedures and plans should be documented on a Record of Technical Change Form (Figure 2) or in an activity specific laboratory note book. It is recognized that procedures such as work plans cannot be prepared which properly address all conditions encountered during a field program. A variance is a difference or a partial change in a procedure or plan.

Any project personnel may initiate a Record of Technical Change. Technical changes require the approval of the Project Manager, or his designee, and the QA Officer. Approval by the Project Manager and QA Officer can be initiated on a verbal basis via telephone. The Record of Technical Change should contain: date and nature of the variance, applicable document, and the person (e.g., project staff, QA Officer) initiating the variance. If the client proposes a variance, it will be so recorded.

Formal approval of the change documentation should be in writing. The Project Manager will be provided with a copy of all technical changes. Upon receipt, the Project Manager will review a copy of the technical change and, when in agreement, indicate approval by signing and dating the log or applicable activity specific laboratory note book. This will be followed by appropriately revising all associated documents to reflect the changes. A notification of such changes should be forwarded to the QA Officer for review, signing, and dating and then returned to the Project Manager for inclusion in the project files. Originals of the Record of Technical Change should also be kept in the project files.

QUALITY ASSURANCE REPORTS TO MANAGEMENT

There are many forms of quality reporting to various levels of management. Adequate provisions have been made within the QAPP for reporting of quality-related considerations. Quality-related reports submitted to management include:

- The reporting by project personnel of nonconformances to project management
- Reporting of the QC coordinator to the laboratory management concerning data accuracy and precision achieved through QC sample analyses and analyses of performance evaluation samples
- Reporting of the QC coordinator to laboratory management of nonconformances observed during internal laboratory system audits
- Audits conducted by the QA Officer.

Following completion of an audit, the auditors will prepare and submit an audit report to the Project Manager. This report will serve to notify management of audit results. The report may also be sent to individuals contacted during the audit.

The report will be prepared as soon as possible (within 30 days) after the audit and contain, as appropriate:

- Date(s) of the audit
- Identification of audit participants
- Identification of activities audited
- Audit results
- Description of items requiring corrective action
- Due dates for completion of corrective actions and/or audit response
- Means for audit response (in writing).

If corrective action is required in the audit report, the corrective action will be undertaken and completed on schedule. If required, the QA Officer is empowered to stop work on the project pending resolution.

The individuals audited should respond in writing to the audit report. If a response is appropriate it shall clearly state the corrective action taken or planned. If all corrective actions have not been completed prior to issuance of the audit response, a scheduled date for completion shall be provided. It is noted that all requests for corrective action must be addressed to the satisfaction of the QA Officer.

Completion of corrective action will be verified by the auditors through written communication, re-audit, or other appropriate means. After acceptance and verification of corrective actions, an audit closure report will be issued to the same individuals who received the audit report.

RECORDS ADMINISTRATION

This project will require the administration of A&A-Knoxville, TN office project record files. Final depository will be the A&A-Knoxville project files. The records systems will provide adequate control and retention for project-related information. Record control will include receipt from external sources, transmittal and transfer to storage, and indication of record status. Retention will include receipt at storage areas, indexing and filing, storage and maintenance, and retrieval.

AUXIER & ASSOCIATES, INC.-KNOXVILLE OFFICE PROJECT FILES

RECORD CONTROL

The control of records provides for the flow of information both internally and externally. Following receipt of information from external sources, completion of the field phases of the project, completion of analyses, and issuance of reports or other transmittals; associated records will be submitted to the project files at the A&A-Knoxville office. Records will be legible and easily identifiable. In addition, field records and records transmitted between A&A and A&A field personnel should be adequately protected from damage and loss during transfer (e.g., hand carrying, making copies prior to shipment).

Field records and checkprints; documentation and verification of computer programs; numerical calculations and checkprints; reports and other data transmittals; copies of proposals, purchase orders for project services and contracts; correspondence including incoming and outgoing letters, memorandums, and telephone records; photographs; reference material; and drawing checkprints as deemed necessary by the project manager should be transferred to the A&A-Knoxville office file.

Records submitted to the A&A-Knoxville file, with exception of correspondence, should be bound, placed in folders or binders, or otherwise secured for filing.

RECORD STATUS

All individuals on the project staff are responsible for reporting obsolete or superseded project-related information to the Project Manager. In turn, the Project Manager will notify the project staff and the QA Officer of the resulting status change in project documents, such as drawings and project procedures. Notification of personnel of status changes in QA procedures will be the responsibility of the QA Officer.

In general, outdated drawings and other documents will be marked "void." However, the Project Manager may request that the copies be destroyed. It is recommended that one copy of void documents be maintained for the project files with the reasons for and date of voiding clearly indicated.

To denote calculations, drawings, and other material which have not been formally checked, or are based on information which has not been checked, or do not contribute to the final project information; these documents will be marked "preliminary."

RECORDS RETENTION

Information associated with the project should be retained in the project control files.

These files should include the following:

- Project file (project material except drawing originals, records related to laboratory analysis)
- Original drawing file
- Quality assurance file.

Project records will be received at the various storage areas by designated personnel. Designated personnel will check that incoming records have proper identification for filing, are legible, and are in suitable condition for storage. Only the designated personnel will perform indexing and filing of records.
For the project file, the individual file folders will be divided into appropriate categories based on content, and numbered and filed sequentially within each category.

A numbered index for the project files will be prepared and maintained. The index will list the individual file folders and identify the records therein to facilitate locating the records. The index will be kept in a separate folder at the front of the file. If appropriate, information on project material not stored in the project files should be included with the index.

Record storage in the project files will utilize facilities that provide a suitable environment to minimize deterioration or damage and that prevent loss. The facilities will, when possible, have controlled access and will provide protection from excess moisture and temperature extremes. Records will be secured in binders, placed in folders or envelopes, or otherwise secured for storage in containers (e.g., steel file cabinets).

Storage systems will provide for the prompt retrieval of information for reference or use outside the storage areas. Sign-out sheets will be maintained so that a record of files removed is available.

DATA QUALITY OBJECTIVES

Data quality objectives require that the factors of precision, accuracy, completeness, representativeness, and comparability be addressed in defining the quality of the data. Data quality also includes consideration of the statistical power of the data and ensuring that the relative uncertainty of the data is as low as possible. Compliance testing under ANSI N13.1 specifies accuracy requirements for the various tests. Many of the tests require specific methods for measurement and require calibration or standardization based on manufacturers' specifications. Procedures derived from the specific methods will be used in those cases. The data quality objectives for those cases are measurement accuracy that meets or exceeds method requirements. Compliance testing that does not require specific methods will be conducted using procedures developed to meet or exceed ANSI N13.1 suggested performance limits. All accuracy requirements will be listed as part of the appropriate procedure for each compliance test.

CONSIDERATIONS OF PRECISION

Precision concerns the repeatability of a measurement or estimation. It is the ability of an instrument or technique to return the same result for the same conditions. Instruments and equipment for compliance testing will be selected based on vendor documentation for precision that will allow verifying compliance to the required accuracy. The selection will generally be made such that the precision errors are less than 5% of the propagated measurement errors.

CONSIDERATIONS OF ACCURACY

Accuracy concerns the correctness of the result of a measurement or technique. Uncertainties of precision are random uncertainties, but accuracy uncertainties are systematic. Accuracy uncertainties are always in the same direction and nearly the same magnitude for a single device or a single set of devices. Accuracy uncertainties are often limited to error of calibration. For some of the compliance cases considered, additional uncertainty is introduced by measurements of temperature, pressure, and gas content. Further error may be introduced by the values of constants used in the calculations. All constants will be taken from the most recent NIST publications and measurements of temperature, pressure, and other primary measures and shall be performed with an accuracy to contribute less than 5% of the total propagated uncertainty of the compliance measurement.

CONSIDERATIONS OF COMPLETENESS

Completeness refers to the percent of collected data that is validated. A data plan is intended to meet a minimum statistical requirement for the entire or part of a sampling plan. Failure to meet the minimum number of data points will introduce uncertainty. The amount of additional uncertainty will be contingent upon the percent of the data set lost. A small data set is more vulnerable than a large data set since the loss of a single datum may be a significant percentage. If the size of the data set as validated cannot meet the compliance accuracy requirements, measurements will be repeated until a sufficient data set is acquired.

CONSIDERATIONS OF REPRESENTATIVENESS

Representative means a faithful replication of the full and general conditions by a sample. The compliance testing requires multiple samples at multiple locations to demonstrate the conditions of the stack at the sampling point that may affect the representative quality of the sample. The multiple samples obviate the need for representative sampling if the sampling system is shown to be non-biasing for the measure of interest. All sampling will be performed on and within the air stream in a manner to minimize bias.

CONSIDERATIONS OF COMPARABILITY

Comparability refers to the likeness, correlation between, or interchangeability of data sets. Single measurement methods shall be used for each type of test. There will be no need to establish comparability between data sets.

DATA MANAGEMENT PLAN

The Data Management Plan specifies the means by which scientific sample analytical data are collected, reviewed, validated, structured, stored, retrieved, and analyzed for the purpose of satisfying data quality objectives for the compliance testing. The Data Management Plan documents the procedures and requirements needed to ensure a high level of data quality. The objective of the data management plan is to characterize the specific elements of the data management system and present the specific methodology for data management.

The compliance testing will qualify the sampling location and the sampling apparatus for the Hanford Tank Farm Project W-314 Exhauster. The acceptance criteria and the testing methods shall be as defined in American National Standards Institute/Health Physics Society ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities" and ANSI/IEEE 42.18, "Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents."

MANAGEMENT OF TECHNICAL DATA

GENERAL ATTRIBUTES OF DATA MANAGEMENT

The management of data for the W-314 Exhauster evaluation requires a system of handling the data that ideally is capable of:

- Incorporating a variety of data types
- Storing data in a manner that provides ease of retrieval and flexibility in the format in which data can be retrieved
- Documenting data review and validation procedures that ensure data quality objectives are met
- Supporting testing activities, technical investigations, and decision making by providing statistical analyses of data and documentation that presents those analyses.

The functional elements of data management for the Compliance Testing include:

- Collection and documentation of testing data for Compliance Testing activities
- Structuring a computer database, entering data into it, maintaining and controlling revisions to it, and producing statistical and calculational analyses of data contained in it
- Resources necessary to implement the elements listed above, including: (1) the personnel needed to collect data in the field and create, quality control, validate, maintain, and use the computer database; (2) the computer hardware and software within which the database functions; (3) documentation of the implementation of the elements listed above.

DESCRIPTIONS OF THE FUNCTIONAL ELEMENTS OF DATA MANAGEMENT FOR COMPLIANCE TESTING

Field activities performed for the Compliance Testing may include collection of the following measurements or tasks:

- Air flow speed
- Air flow direction
- Gas release at known rates
- Gas collection
- Particle generation at known rates
- Particle collection

Detailed descriptions of measurement devices and techniques to be employed during field data collection activities are presented in Equipment Section.

DATA COLLECTION PROCEDURES

The Compliance Testing involves characterization of airflow rates and particle and gas concentrations at specific locations. This includes the use of measurement data collected as part of the activities of this study. The methods for performing data acquisition tasks are proceduralized to ensure that:

- Definition of work performed is clear
- Data collected can be validated
- Data are comparable and consistent
- Representativeness of data can be assessed
- Documentation can be provided that supports defense of the measurements.

Detailed measurement protocols are presented in Procedure Section.

DATA REVIEW AND VALIDATION

Documentation associated with measurement data collected during field activities should be reviewed to ensure completeness. This documentation should include:

- Instrument calibration certificates
- Equipment testing logs and daily logs of instrumentation prior to and following use in the field each day
- Notes recorded in the activity specific laboratory notebook
- Documentation of the date, time, and location of use of equipment
- Completion of Field Activity Daily Logs or activity specific laboratory notebooks.

Data that are not accompanied by the appropriate documentation will be qualified as to the type of documentation that is lacking and may not be considered completely valid. Data that are not completely valid should be used qualitatively if needed.

COMPUTER DATABASE

COMPUTER DATA FILE STRUCTURE

Much of the data collected as part of the Compliance Testing are entered into Excel spreadsheets (or equivalent). Separate spreadsheets will be used for each test group and test series.

In addition to the computer spreadsheets, Compliance Testing data will be maintained in project files. Each file will refer, as appropriate, to test and test series. All measurements and estimates pertaining to that file should be maintained in that file. Files should be searchable for specific types of data and cross-referenceable when specific linkages are noted.

All raw data should be maintained in secured files until quality control is completed on the workbooks. Raw data should then be sealed for archiving or destruction at the end of the study.

DATA ENTRY PROCEDURES

The transfer of data from field documentation to the electronic database spreadsheets should be given a 100-percent quality control check by the quality assurance officer or designee to ensure that transcriptional errors are eliminated. The 100-percent check should be accomplished and documented by data entry by two separate individuals in identical areas on the same spreadsheet. The two sets of data, if generated, should be compared by the auditing functions available on the spreadsheet. The two individuals entering the data in such situations will resolve any differences.

DATA REPORTING

The database spreadsheets will be used to report raw data, perform and report statistical analyses of the raw data, calculate and plot concentration or velocity profiles, and perform and report statistical analyses of calculations.

COMPUTER DATABASE SECURITY

A master copy of each database spreadsheet will be maintained. Data should not be used for technical analysis, or decision making unless retrieved from the master database. All spreadsheets should be password protected.

A backup copy of the computer database should be maintained by backing up the data daily. The backup copy is to be used only in the event that the master copy is destroyed or if there is reason to conclude or suspect that the master copy has been altered or compromised in a manner that jeopardizes the validity of the data and work based on the data.

OPERATION AND SUPPORT

The QA Officer is responsible for ensuring that all data entered into the computer database are reviewed, validated, and checked according to the data management procedure. The QA Officer is also responsible for maintaining the master and backup copies of the computer database and for ensuring that data are reported from the master copy as needed. All data and statistical analyses reported from the computer database will be QC checked and reviewed for completeness by or under the supervision of the QA Officer prior to distribution.

COMPLIANCE TESTING PROCEDURES

Protocols to be used in the compliance testing follow in A&A procedure format. A list of all of the procedures that may be used during this study is followed by each individual procedure.

STANDARD OPERATING PROCEDURE PTE-001; **DETERMINATION OF THE AVERAGE CYCLONIC FLOW ANGLE IN THE PROJECT W-314 EXHAUSTER**

STANDARD OPERATING PROCEDURE PTE-002; **DETERMINATION OF THE STACK GAS VELOCITY AND FLOW RATE IN THE PROJECT W-314 EXHAUSTER STACK**

STANDARD OPERATING PROCEDURE PTE-003; **DETERMINATION OF GASEOUS TRACER UNIFORMITY IN THE PROJECT W-314 EXHAUSTER STACK**

STANDARD OPERATING PROCEDURE PTE-004; **DETERMINATION OF PARTICLE TRACER UNIFORMITY IN THE PROJECT W-314 EXHAUSTER STACK**

STANDARD OPERATING PROCEDURE PTE-005; **DETERMINATION OF SAMPLING NOZZLE TRANSMISSION RATIO IN THE PROJECT W-314 EXHAUSTER STACK**

STANDARD OPERATING PROCEDURE PTE-006; **DETERMINATION OF DEPOSITION LOSSES IN THE TRANSPORT TUBE IN THE PROJECT W-314 EXHAUSTER STACK**

STANDARD OPERATING PROCEDURE PTE-007; **QUALIFICATION OF EFFLUENT MONITORING INSTURMENTATION FOR THE PROJECT W-314 EXHAUSTER STACK**

STANDARD OPERATING PROCEDURE PTE-001

DETERMINATION OF THE AVERAGE CYCLONIC FLOW ANGLE IN THE PROJECT W-314 EXHAUSTER

SCOPE AND OBJECTIVE - This procedure applies to the measurement of average cyclonic flow angle in the Hanford Tank Farm Project W-314 Exhauster stacks.

1. RESPONSIBILITIES

1.1. Project Manager (PM: The PM is responsible for ensuring the implementation of this SOP by personnel trained in its proper use. The PM is the primary point of contact regarding all work performed by Idaho State University (ISU) and Auxier & Associates, Inc. (A&A) and reports to the Premier Technologies project coordinator.

1.2. Quality Assurance Officer (QA Officer: The QA Officer is responsible for ensuring the review of all documents and data generated on the project to ensure that they meet specified quality objectives. The QA Officer is responsible for providing general and independent oversight for the QA/QC activities, and reports results directly to the PM. The QA Officer should perform audits, maintain a database of audit findings, and follow their resolution and closure.

1.3. Site Manager (SM): The SM is responsible for ensuring that all work is performed in a manner that satisfies quality assurance (QA) and quality control (QC) requirements specified in the Compliance Testing Work Plan. The SM oversees the data collection and analysis for the measurement of the cyclonic flow angle in the Hanford Tank Farm Project W-314 Exhauster.

1.4. Testing Team Members: Testing team members are responsible for meeting the requirements of this SOP. Testing team members are responsible for the proper collection of information according to this SOP.

2. EQUIPMENT, MATERIALS, AND CALIBRATION

2.1. Equipment and Materials:

- Type-S pitot-tube constructed of metal tubing (e.g., stainless steel) meeting the dimensional tolerances in EPA Reference 40CFR60 Appendix A, Method 2. An identification number must be assigned to the pitot tube and be permanently marked or engraved on the body of the tube
- Differential pressure gauge as an oil-gauge manometer, Electronic Digital Manometer (EDM), or equivalent. If a device other than an oil-gauge manometer is used (such as an EDM), its calibration must be checked before and after each test series.
- Pitot-tube level
- Pitot-tube square or similar device to verify the orientation of the pitot-tube relative to the stack
- Protractor/angle finder or carpenters angle finder
- Computer and computer software capable of executing Microsoft Excel Version 7.0 (or equivalent).

2.2. Calibration:

2.2.1. The Type-S pitot-tube shall be calibrated according to the requirements of EPA Reference 40CFR60 Appendix A Method 2.

2.2.2. Calibration check will be performed on the EDM (if used) prior to and after each use. The EDM shall have a valid, traceable calibration performed by the manufacturer or other qualified source within 12 months of any measurements taken for compliance testing.

2.2.3. Differential pressure manometers are primary measurement devices that do not require calibration.

3. MEASURING CYCLONIC FLOW

3.1. Measurement location is at the height of sampling nozzle inlet.

3.2. Measurement is performed in two perpendicular traverses.

3.3. Each traverse comprises 8 measurement points (12 inch diameter stack).

- .5 inch
- 1.3 inch
- 2.3 inch
- 3.9 inch
- 8.1 inch
- 9. 7 inch
- 10.7 inch

- 11.5 inch

3.4. Record all measurement data in the activity specific laboratory notebook and transcribe this record for final deposition on the Cyclonic Flow Angle Measurement Form (FTE-001) and the Cyclonic Measurement Input Form (FTE-002), attached.

Record all entries in ink. Correct any errors by striking through the erroneous entry with a single line. Annotate the correct information directly adjacent to the error. Initial the correction.

3.5. Prepare recording forms with date and equipment serial numbers and calibration dates. Fill in the appropriate places on the forms of the following steps as the activity is performed.

3.6. Calculate the distances from the centerline of the pitot-tube nozzle to each traverse point. Use as built drawing information or actual measurements of stack. Mark the pitot-tube with a felt-tipped pen or impose a distance indication with electrical tape to correctly position the nozzle from the stack outside wall.

3.7. Verify that the Exhauster is operating under standard conditions (fan configuration). Verify that ambient air is exhausted during measurement (system intake is well located from a potentially hazardous source such as vehicle exhaust).

3.8. Connect the manometer or other differential device to the pitot-tube following manufacturer's instructions. Perform a leak test.

3.9. Zero and level the manometer and insert and level the pitot-tube after removing appropriate measurement hole-plugs. Seal the opening between the stack wall and the pitot-tube to the extent feasible.

3.10. Verify with a level that the pitot-tube is parallel to the cross-sectional plane of the stack and that the plane of the face opening of the pitot-tube is perpendicular to the stack cross-sectional plane. The level must be attached perpendicular to the centerline axis of the stack. Verify angle finder is a 0° in this configuration. **The pitot-tube must be level and the face openings must be parallel to the axial centerline of the stack.** The pitot- tube is in the 0° reference position.

3.11. Record the differential pressure (VP) at the reference position in the activity specific laboratory notebook and as time permits, transcribe this data to the appropriate Cyclonic Measurement Input Form (see form FTE-002). If the VP reading is not zero, then rotate the pitot- tube (up to the 90° yaw angle) until a null reading is obtained. Using a protractor or other type of angle finder, carefully determine and record the value of the rotation angle to the nearest degree.

3.12. Repeat 3.11 and 3.12 at all traverse points. Reinsert the hole-plug after each traverse has been completed.

3.13. Perform post measurement tests on all equipment, including leak testing and record any conditions that may affect the accuracy or validity of the measurements. Re-perform the measurements if time permits and the conditions can be corrected.

3.14. Remove all equipment and complete all forms.

4. CALCULATING CYCLONIC FLOW

4.1. Perform calculations as follows. Retain at least one estimated number associated with the maximum precision of the measuring scale employed. Round off figures after final calculation. Record the results on the forms in the appropriate spaces.

Average rotation angle: $=(\overset{n}{\underset{i=1}{}} (_{i}^{2})^{1/2})/n$

where:

i = the traverse number
n = the total number of measurement points
must be less than or equal to 20° for the site to be acceptable for either flow measurements or sample collection

5. TRAINING

Persons using this procedure should be trained to the procedure. Training records should include:

- Date, time, title of session, and description of session
- Person(s) performing training, including signature
- Person(s) being trained, including signature.

6. REFERENCES

- 40 CFR 61 Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities"
- Method 1: EPA 40 CFR 60 Appendix A Test Method, "Sample And Velocity Traverses For Stationary Sources"
- Method 1A: EPA 40 CFR 60 Appendix A Test Method, "Sample And Velocity Traverses For Stationary Sources With Small Stacks Or Ducts"

- Method 2: EPA 40 CFR 60 Appendix A Test Method, "Determination Of Stack Gas Velocity And Volumetric Flow Rate (Type S Pitot Tube)"
- Method 2C: EPA 40 CFR 60 Appendix A Test Method, "Determination Of Stack Gas Velocity And Volumetric Flow Rate In Small Stacks Or Ducts (Standard Pitot Tube)"
- Manufacturer's literature for each instrument.

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Quality Assurance Plan and Standard Operating Procedures
Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN#____________

Measurement Date ____/____/____
Fan Exhaust Configuration:
Motor Power frequency ________
Motor current draw ________

1. Equipment used and calibration
Manometer ________ Serial Number ________
Pitot-Tube Type-S Serial Number ________
Traverse spacing pre-marked on pitot tube / pitot tube inspected by:________

2. Location inspection
Location Comments: ________________________

3. Equipment setup
Connect manometer to tubing________ Pre-test leak test performed________
Adjust manometer sensitivity ________ Level and zero the manometer________

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: ________ Run Complete Time: ________

5. Post measurement leak test (at least 3" wg)
successful ______ measurement voided______

6. Record any condition which might affect measurements________________

7. Holes covered
Complete

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
____
b) Inclined manometer Zeroed____________
c) Inclined Manometer leveled____________

B. Other differential pressure measurement devices

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:

________ ________ ____/____/____
Signature Print name Date

QA Review by:

________ ________ ____/____/____
Signature Print name Date

Project Manager approval:

________ ________ ____/____/____
Signature Print name Date

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Cyclonic Measurement Input Form (Form FTE-002)
(Round Stack or Duct)

Premier Technologies W-314 Exhauster SN#____________

Measurement Date ___/___/___

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 0.1 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0
A1				B1			
A2				B2			
A3				B3			
A4				B4			
A5				B5			
A6				B6			
A7				B7			
A8				B8			
Sum α for A1 – A8				Sum α for B1 – B8			
Average α is							

Measurements by:

____________ ____________ ___/___/___
Signature Print name Date

QA Review by:

____________ ____________ ___/___/___
Signature Print name Date

Project Manager approval:

____________ ____________ ___/___/___
Signature Print name Date

STANDARD OPERATING PROCEDURE PTE-002
DETERMINATION OF THE STACK GAS VELOCITY AND FLOW RATE IN THE PROJECT W-314 EXHAUSTER STACK

SCOPE AND OBJECTIVE - This procedure applies to the measurement of stack gas velocity and flow rate in the Hanford Tank Farm Project W-314 Exhauster stacks.

8. RESPONSIBILITIES

8.1. Project Manager (PM): The PM is responsible for ensuring the implementation of this SOP by personnel trained in its proper use. The PM is the primary point of contact regarding all work performed by Idaho State University (ISU) and Auxier & Associates, Inc. (A&A) and reports to the Premier Technologies project coordinator.

8.2. Quality Assurance Officer (QA Officer): The QA Officer is responsible for ensuring the review of all documents and data generated on the project to ensure that they meet specified quality objectives. The QA Officer is responsible for providing general and independent oversight for the QA/QC activities, and reports results directly to the PM. The QA Officer should perform audits, maintain a database of audit findings, and follow their resolution and closure.

8.3. Site Manager (SM): The SM is responsible for ensuring that all work is performed in a manner that satisfies quality assurance (QA) and quality control (QC) requirements specified in the Compliance Testing Work Plan. The SM oversees the data collection and analysis for the measurement of the cyclonic flow angle in the Hanford Tank Farm Project W-314 Exhauster.

8.4. Testing Team Members: Testing team members are responsible for meeting the requirements of this SOP. Testing team members are responsible for the proper collection of information according to this SOP.

9. EQUIPMENT, MATERIALS, AND CALIBRATION

9.1. Equipment and Materials:

- Type-S pitot-tube constructed of metal tubing (e.g., stainless steel) meeting the dimensional tolerances in EPA Reference 40CFR60 Appendix A, Method 2 (ESH-17-127). An identification number must be assigned to the pitot tube and be permanently marked or engraved on the body of the tube

- Differential pressure gauge as an oil-gauge manometer, Electronic Digital Manometer (EDM), or equivalent. If a device other than an oil-gauge manometer is used (such as an EDM), its calibration must be checked after each test series.
- Thermocouple, liquid-filled bulb thermometer, bimetallic thermometer, mercury-in-glass thermometer, or other gage, capable of measuring temperature to within 2 percent of the minimum absolute stack temperature in degrees Rankin. Attach the temperature gage to the pitot-tube. The temperature gage must not interfere with the pitot- tube face openings.
- A piezometer tube and mercury- or water-filled manometer capable of measuring stack pressure to within 0.1 in. Hg. The static tip of a standard type pitot tube or one leg of a Type-S pitot tube (with face opening planes positioned parallel to the gas flow) may be used as the pressure probe.
- A mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 0.1 in. Hg. Alternatively, access to data barometric pressure generated at the nearest National Weather Station
- Pitot tube level
- Pitot tube square or similar device to verify orientation of pitot-tube
- Hand pump capable of pressurizing (vacuum) to at least 3 inches H_2O.
- Computer and computer software capable of executing Microsoft Excel Version 7.0 (or equivalent).

9.2. Calibration:

9.2.1. The Type-S pitot-tube shall be calibrated according to the requirements of EPA Reference 40CFR60 Appendix A, Method 2.

9.2.2. Calibration check will be performed on the EDM (if used) prior to and after each use. The EDM shall have a valid, traceable calibration performed by the manufacturer or other qualified source within 12 months of any measurements taken for compliance testing.

9.2.3. Differential pressure manometers are primary measurement devices that do not require calibration.

10. MEASURING STACK FLOW

10.1. Inspect the pitot-tube in a manner consistent with the Pitot-Tube Inspection Form (Form FTE-003) record any unusual aspects if this inspection in the activity specific laboratory notebook, transcribe this information to FTE-003 when this is completed. The pitot-tube must meet the requirements of Form FTE-003.

10.2. Measurement location is at the height of sampling nozzle inlet.

10.3. Measurement is performed in two perpendicular traverses.

10.4. Each traverse comprises 8 measurement points (12 inch diameter stack).

- .5 inch
- 1.3 inch
- 2.3 inch
- 3.9 inch
- 8.1 inch
- 9. 7 inch
- 10.7 inch
- 11.5 inch

10.5. Record all measurement data in the project specific laboratory note book and transcribe this information to the Velocity Measurement Form (FTE-004) and the Velocity Measurement Input Form (FTE-005), attached.

Record all entries in ink. Correct any errors by striking through the erroneous entry with a single line. Annotate the correct information directly adjacent to the error. Initial the correction.

10.6. Prepare recording forms with date and equipment serial numbers and calibration dates. Fill in the appropriate places on the forms of the following steps.

10.7. Calculate the distances from the centerline of the pitot-tube nozzle to each traverse point. Use as built drawing information or actual measurements of stack. Mark the pitot-tube with a felt-tipped pen to correctly position the nozzle from the stack outside wall.

10.8. Verify that the Exhauster is operating under standard conditions (fan configuration). Verify that ambient air is exhausted during measurement (system intake is well located from a potentially hazardous source such as vehicle exhaust).

10.9. Connect the manometer or other differential device to the pitot-tube following manufacturer's instructions. Perform a leak test.

10.10. Zero the manometer and insert and level the pitot-tube after removing appropriate measurement hole-plugs. Seal the opening between the stack wall and the pitot-tube.

10.11. Verify with a level that the pitot-tube is parallel to the cross-sectional plane of the stack and that the plane of the face opening of the pitot-tube is perpendicular to the stack cross-sectional plane. The level must be attached perpendicular to the centerline axis of the stack. Verify angle finder is a 0° in this configuration. **The pitot-tube must be level and the face openings must be parallel to the axial centerline of the stack.** The pitot- tube is in the 0° reference position.

10.12. Record the velocity pressures and temperature at the traverse points in the activity specific laboratory notebook and transcribe this on the Velocity Measurement Input Form (FTE-005). If the pressure reading is not stable, record the high and low readings at each traverse point: the low reading to the left and the high reading to the right. Reinsert the hole-plug after each traverse has been completed.

10.13. Perform post measurement tests on all equipment, including leak testing and record any conditions that may affect the accuracy or validity of the measurements. Re-perform the measurements if time permits and the conditions can be corrected.

10.14. Measure the static pressure in the stack at the approximate center of the stack. Record this information in the activity specific laboratory notebook and transcribe the result to section 7 of FTE-004. Leak test pitot-tube (optional).

10.15. Remove all equipment and complete all forms.

11. CALCULATING FLOW VELOCITY

11.1. Perform calculations as follows. Retain at least one estimated number associated with the maximum precision of the measuring scale employed. Round off figures after final calculation. Record the results on the forms in the appropriate spaces. Sign the bottom of the forms in the space "Calculations by:" to indicate that all data have been reviewed and verified as described in the block above.

11.2. The following terms are used in flow measurement calculations:

A = Cross-sectional area of the stack or duct, ft^2
B_{ws} = Water vapor in the gas stream, proportion by volume. Use a value of 0% relative humidity for conservatism.
C_p = Pitot tube coefficient, dimensionless.
K_p = Pitot tube constant,

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

M_d = Molecular weight of stack gas, dry basis, lb/lb-mole.
M_s = Molecular weight of stack gas, wet basis, lb/lb-mole.

$$= M_d(1-B_{ws}) + 18.0\,B_{ws} \qquad \text{Note: } (B_{ws} = 0)$$

P_{bar} = Barometric pressure at measurement site, in. Hg.
P_g = Stack static pressure, in. Hg.
P_{ref} = Barometric pressure at reference barometer, inches Hg.
P_s = Absolute stack pressure, in. Hg,

$$P_s = P_{bar} + P_g$$

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

$$^{\circ}R = 460 + t_s$$

T_{std} = Standard absolute temperature, 528°R.
v_s = Average stack gas velocity, ft/min.
Δp = Velocity head of stack gas, in. H_2O.
3,600 = Conversion factor, sec/hr.
18.0 = Molecular weight of water, lb/lb-mole.

11.3. Calculate the average stack gas temperature using data from FTE-005. The average stack gas temperature is:

$$t_{s(ave)} = \frac{\sum_{i=1}^{n} t_i}{n}$$

where "n" is the number of measurement points. The exhaust stack average absolute temperature is:

$$T_{s(ave)} = 460 + t_{s(ave)} \qquad \text{for English units.}$$

11.4. The exhaust stack absolute pressure is given by:

$$P_s = P_{bar} + P_g \text{ inches Hg}$$

where, corrected for elevation, the barometric pressure at the measurement site is:

$$P_{bar} = P_{ref} + \left(Elevation_{profile} - Elevation_{ref}\right)\left(\frac{-0.1\text{" } Hg}{100 ft}\right) \text{ inches Hg}$$

and the stack gas pressure (static pressure) is

$$P_g = P_g\text{" } wg\left(\frac{62.4}{846.9}\right) \text{ inches Hg}$$

11.5. The molecular weight of the gas, wet basis, is given by:

$M_s = M_d(1\text{-}B_{ws}) + 18.0\, B_{ws}$ Note: $(B_{ws} = 0)$

Assuming relatively dry air, the molecular weight of the gas, wet basis, reduces to the molecular weight of the stack gas, dry basis, which is:

M_d= Molecular weight of stack gas, dry basis, lb/lb-mole.

For processing emitting essentially dry air, use:

$M_s = M_d$ = 29.0 lb/lb-mole

11.6. Determine the pitot-tube constant K from the following:

$$K = K_p\left(\frac{60s}{\min}\right)\sqrt{\frac{T_{s(ave)}}{P_s M_s}}$$

where $K_p = 85.49 \frac{ft}{s}\left[\frac{(lb/lb-mole)(in.Hg)}{(^\circ R)(in.H_2O)}\right]^{1/2}$

11.7. Calculate the average velocity head:

$$\left(\sqrt{\Delta p}\right)_{ave} = \frac{\sum_{i=1}^{n}\left(\sqrt{\Delta p}\right)}{n}$$

11.8. Calculate the (actual) average stack gas velocity:

$$v_s = C_p K\left(\sqrt{\Delta p}\right)_{ave} \text{ ft/min}$$

11.9. Calculate the (actual) exhaust stack flow rate:

$$Q_s = v_s A \text{ acfm}$$

11.10. Calculate the average stack gas dry volumetric flow rate

$$Q_{sd} = (1 - B_{ws}) Q_s \frac{T_{std}}{T_{s(ave)}} \frac{P_s}{P_{std}} \text{ scfm}$$

12. TRAINING

Persons using this procedure must be trained to the procedure. Training records shall include:

- Date, time, title of session, and description of session
- Person(s) performing training, including signature
- Person(s) being trained, including signature.

13. REFERENCES

- 40 CFR 61 Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities"
- Method 1: EPA 40 CFR 60 Appendix A Test Method, "Sample And Velocity Traverses For Stationary Sources"
- Method 1A: EPA 40 CFR 60 Appendix A Test Method, "Sample And Velocity Traverses For Stationary Sources With Small Stacks Or Ducts"
- Method 2: EPA 40 CFR 60 Appendix A Test Method, "Determination Of Stack Gas Velocity And Volumetric Flow Rate (Type S Pitot Tube)"
- Method 2C: EPA 40 CFR 60 Appendix A Test Method, "Determination Of Stack Gas Velocity And Volumetric Flow Rate In Small Stacks Or Ducts (Standard Pitot Tube)"
- 40 CFR 60 Appendix A Test Method 3, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight"
- 40 CFR 60 Appendix A Test Method 4, "Determination of Moisture Content in Stack Gases"
- 40 CFR 60 Appendix A Test Method 5, "Determination of Particulate Emissions From Stationary Sources"
- Manufacturer's literature for each instrument.

Type-S Pitot Tube Inspection Form (Form FTE-003)

Pitot Tube ID Number: ______________________________ (permanently marked on pitot tube)
Length of Pitot Tube: _______________ inches

1. Pitot Tube Face Opening Alignment: Examine the pitot tube in top side and end views to verify the face openings of the tube are aligned with the specifications illustrated in ERA Figures 1 and 2. Slight misalignments are permissible (EPA Figure 2).

End View
- □ Face opening planes perpendicular to transverse axis
- □ Face opening planes not perpendicular to traverse axis
  - α_1 = __________ degrees
  - α_2 = __________ degrees
    - □ Acceptable if α_1 and $\alpha_2 \leq$ 10°
    - □ Do not use pitot tube

Top View
- □ Face opening planes parallel to longitudinal axis
- □ Face opening planes not parallel to longitudinal axis
  - β_1 = __________ degrees
  - β_2 = __________ degrees
    - □ Acceptable if β_1 and $\beta_2 \leq$ 5°
    - □ Do not use pitot tube

Side View
- □ Both legs of equal length and centerlines coincident, when viewed from both sides.
- □ Both legs not of equal length and centerlines not coincident, when viewed from both sides.
  - z = __________ inches
  - w = __________ inches
    - □ Acceptable if z ± 1/8 inch and w ± 1/32 inch
    - □ Do not use pitot tube

2. Measure Pitot Tube Dimensions: Measure the external tubing diameter and the base-to-opening plane distances.

External tubing diameter D_t = __________ inches
Base-to-Opening plane distances D_A = __________ inches
D_B = __________ inches

(It is recommended that the external tubing diameter, D_t, be between 3/16 and 3/8 inch. There must be an equal distance from the base of each leg of the pitot tube to its face-opening plane, P_A and P_B. The recommended distance is between 1.05 and 1.50 times the external tubing diameter.)

Type-S Pitot Tube Inspection Form (Form FTE-003)

3. Pitot Tube Coefficient

If [P_A] __________ = __________ [P_B]

and 3/16 inch ≤ [D_t] __________ ≤ 3/8 inch

and $1.05\ D_t < P_{(A\ and\ B)} < 1.50\ D_t$

$1.05\ D_t =$ __________

$1.50\ D_t =$ __________

[$1.05\ D_t$] __________ [$P_{(A\ and\ B)}$] __________ [$1.50\ D_t$] __________

then pitot tube coefficient is 0.84.

Comments

Measurements performed by:

Signature	Print name	Date	____/____/____

Reviewed by:

Signature	Print name	Date	____/____/____

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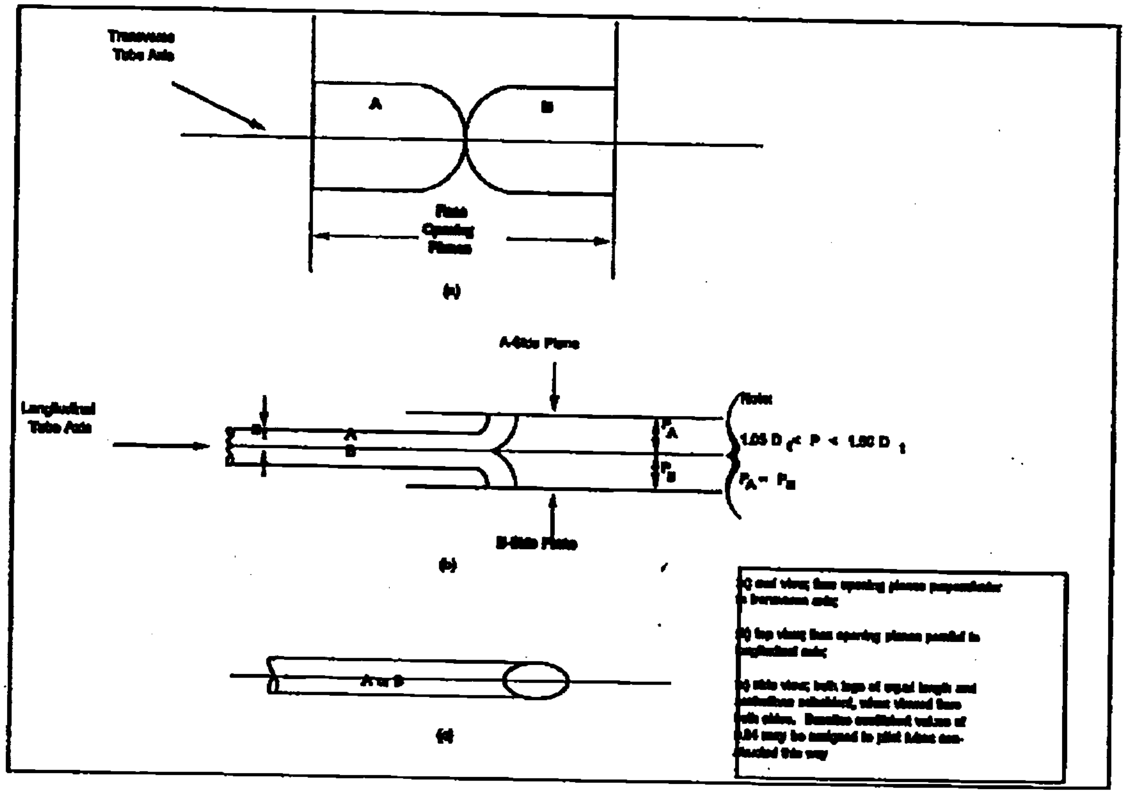
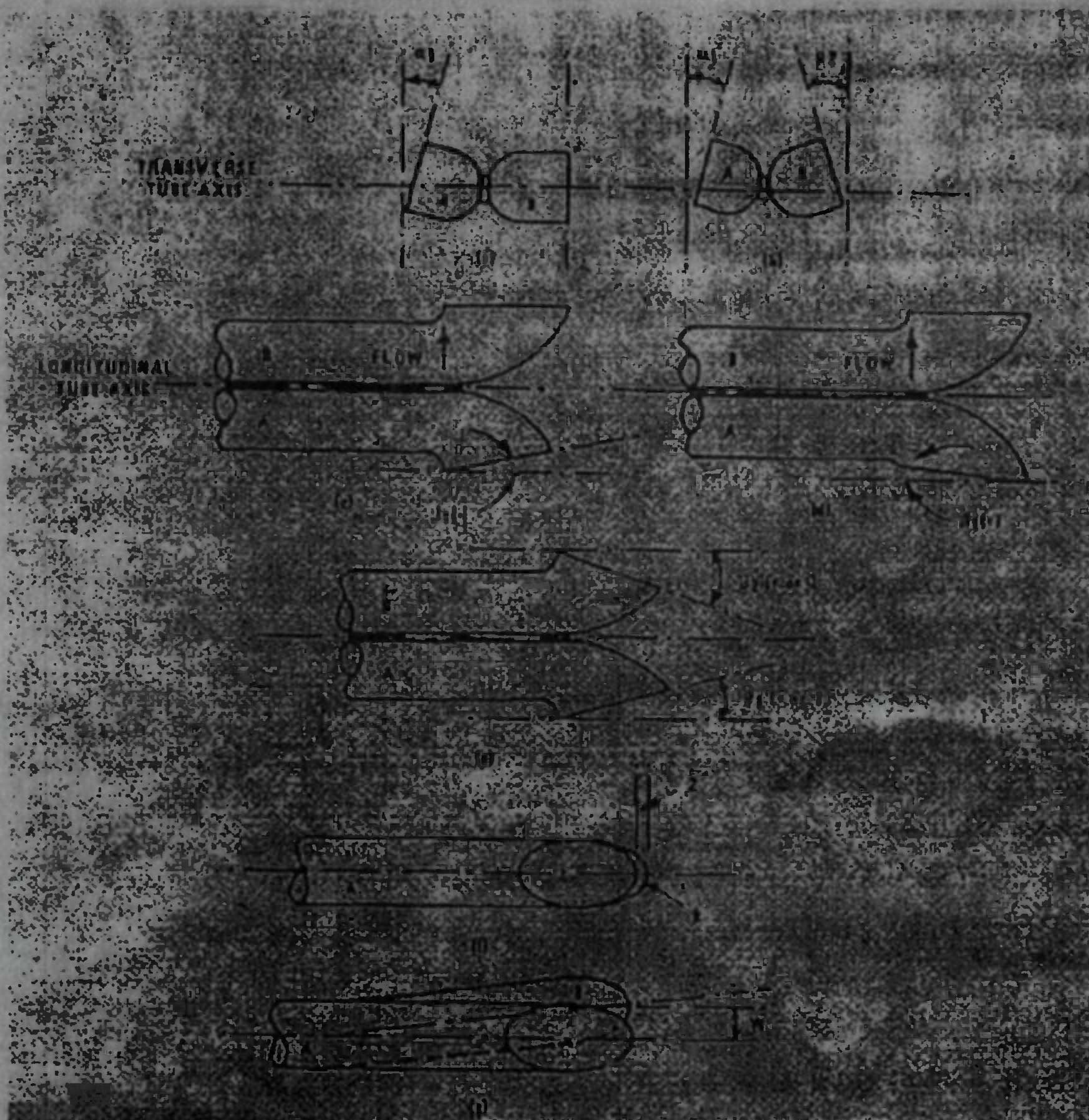
Type-S Pitot Tube Inspection Form (Form FTE-003)



EPA Figure 1. Properly constructed Type-S pitot tube.

Type-S Pitot Tube Inspection Form (Form FTE-003)



EPA Figure 2. Types of face-opening misalignment that can result from field use or improper construction of Type-S pitot tubes.

Premier Technologies Inc. W-314 Exhauster
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Velocity Measurement Form (Form FTE-004)

Measurement Location_________________ Measurement Date ___/___/_____
Fan Exhaust Configuration _________

1. Equipment used and verification

Manometer _________ Serial Number __________

Thermometer _________ Serial Number _________

Pitot-Tube ___________ Serial Number ___________

☐ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location Inspection

Location Comments:

____

3. Equipment setup

☐ Zero the manometer
☐ Connect manometer to tubing
☐ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☐ Yes ☐ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time:______ Run End Time:_______ Average
Average Temperature during period of data collection_______

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: ___________ (in.) Area: ____________ (sq feet)

6. Post measurement leak test (3" wg)

☐ successful ☐ measurement voided

Premier Technologies Inc. W-314 Exhauster
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Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=__________ (" H_2O) RH= __________%

8. Back purge standard pitot tube and verify ☐ Not required

Profile location _________ Reading _______ (in wg) Percent difference _____ %

9. Stack gas dry molecular weight

☐ Reference Method 3 _________ ☐ Room Air (Use 29.0)

10. Conditions that might affect measurements

---

11. Holes covered

☐ Complete

12. Atmospheric Pressure

__________ ("Hg) Barometer Location ________________

14.Post Measurement Verifications

☐ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

_______________ _______________ ____/____/____
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
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Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Input Form (Form FTE-005)

Measurement Location ________________ Measurement Date ___/___/____

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (° F)	Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (° F)
A1				B1			
A2				B2			
A3				B3			
A4				B4			
A5				B5			
A6				B6			
A7				B7			
A8				B8			
CP-A				CP-B			

Measurements by:

____ ____/____/____
Signature Print name Date

Reviewed by:

____ ____/____/____
Signature Print name Date

STANDARD OPERATING PROCEDURE PTE-003 DETERMINATION OF GASEOUS TRACER UNIFORMITY IN THE PROJECT W-314 EXHAUSTER STACK

SCOPE AND OBJECTIVE - This procedure applies to the measurement of stack gas velocity and flow rate in the Hanford Tank Farm Project W-314 Exhauster stacks.

15. RESPONSIBILITIES

15.1. Project Manager (PM): The PM is responsible for ensuring the implementation of this SOP by personnel trained in its proper use. The PM is the primary point of contact regarding all work performed by Idaho State University (ISU) and Auxier & Associates, Inc. (A&A) and reports to the Premier Technologies project coordinator.

15.2. Quality Assurance Officer (QA Officer): The QA Officer is responsible for ensuring the review of all documents and data generated on the project to ensure that they meet specified quality objectives. The QA Officer is responsible for providing general and independent oversight for the QA/QC activities, and reports results directly to the PM. The QA Officer should perform audits, maintain a database of audit findings, and follow their resolution and closure.

15.3. Site Manager (SM): The SM is responsible for ensuring that all work is performed in a manner that satisfies quality assurance (QA) and quality control (QC) requirements specified in the Compliance Testing Work Plan. The SM oversees the data collection and analysis for the measurement of the cyclonic flow angle in the Hanford Tank Farm Project W-314 Exhauster.

15.4. Testing Team Members: Testing team members are responsible for meeting the requirements of this SOP. Testing team members are responsible for the proper collection of information according to this SOP.

16. EQUIPMENT, MATERIALS, AND CALIBRATION

16.1. Equipment and Materials:

- Tedlar bags, pre-marked for each anticipated sample, and connection tubing.
- Sampling pump.
- Sampling probe with pre-marked distances for sampling locations along the sampling traverse.

- Cylinder(s) of SF_6 or CO_2 gas sufficient to provide ample sensitivity after dilution in the stack gas at the sampling location for the anticipated time of the test.
- Metering and flow rate device(s) for the SF_6 or CO_2 cylinder that is capable of delivering the SF_6 or CO_2 at the intended rate and maintain the flow within 1%.
- Infrared spectrometer, mass spectrometer, or FTIR spectrometer capable of measuring SF_6 or CO_2 at the expected concentration.
- Computer and computer software capable of executing Microsoft Excel Version 7.0 (or equivalent).

16.2. Calibration:

16.2.1. No Calibration required. Determine metering rates to stack and sensitivity of Infrared spectrometer, mass spectrometer, or FTIR spectrometer. Test the performance of the metering device and flow rate meter.

17. MEASURING TRACER GAS UNIFORMITY

17.1. Determine concentration of SF_6 or CO_2 necessary for analysis in the Infrared spectrometer, mass spectrometer, or FTIR spectrometer and the delivery rate to the stack to achieve the concentration. Determine the metering rate of SF_6 or CO_2 to the stack using Metering Rate Determination Form (FTE-006).

All information should be recorded in ink in the activity specific laboratory notebook and transcribed to the Metering Rate Determination Form (FTE-006). Correct any errors by striking through the erroneous entry with a single line. Annotate the correct information directly adjacent to the error. Initial the correction.

17.2. Measurement location is at the height of sampling nozzle inlet.

17.3. Measurement is performed in two perpendicular traverses.

17.4. Each traverse comprises 8 measurement points (12 inch diameter stack).
- .5 inch
- 1.3 inch
- 2.3 inch
- 3.9 inch
- 8.1 inch
- 9.7 inch
- 10.7 inch
- 11.5 inch

17.5. Record collection data to the activity specific laboratory notebook and transcribe this to the Tracer Gas Collection Form (FTE-007).

Record all entries in ink. Correct any errors by striking through the erroneous entry with a single line. Annotate the correct information directly adjacent to the error. Initial the correction.

17.6. Prepare recording forms with date and equipment serial numbers and calibration dates. Fill in the appropriate places on the forms.

17.7. Calculate the distances from the centerline of the collection tube nozzle to each traverse point. Use as built drawing information or actual measurements of stack. Mark the collection tube with a felt-tipped pen or employ electrical tape to correctly indicate the position the nozzle is to be orientated from the stack outside wall during sample collection.

17.8. Verify that the Exhauster is operating under standard conditions (fan configuration). Verify that ambient air is exhausted during measurement (system intake is well located from a potentially hazardous source such as vehicle exhaust).

17.9. Inject SF_6 or CO_2 at a single location downstream of the fan but well forward of the sample nozzle inlet location.

17.10. Set the flow rate of the SF_6 or CO_2 and verify that the flow is stable.

17.11. Collect gas tracer samples.

18. TRAINING

Persons using this procedure should be trained to the procedure. Training records shall include:

- Date, time, title of session, and description of session
- Person(s) performing training, including signature
- Person(s) being trained, including signature.

19. REFERENCES

- 40 CFR 61 Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities"
- Method 1: EPA 40 CFR 60 Appendix A Test Method, "Sample And Velocity Traverses For Stationary Sources"
- ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities"
- Manufacturer's literature for each instrument.

Premier Technologies Inc. W-314 Exhauster

ANSI/HPS N13.1 -1999 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Metering Rate Determination Form (Form FTE-006)

1. Infrared Spectrometer Sensitivity

Collect a known volume of SF_6 or CO_2 at atmospheric pressure using either a bubble device, dry gas meter, rotometer and time piece, or syringe.

Briefly describe method and equipment

Spectrometer type: ____________________

Calibration or Standardization date ___/___/___

Perform several dilutions and test the response of the infrared spectrometer. Record the results in the following table. (Successive dilutions may be on the order of the scale of last response.)

SF_6 or CO_2 Concentration	Spectrometer Response

Target SF_6 or CO_2 concentration: __________ unitsr ________

2. Determine Metering Flow to Stack

Stack volumetric flow rate: __________ L/min or ________

Units conversion: ____________________

SF_6 or CO_2 metering pressure: ________
Estimated L/min

Note: 1 ppm = 1 L/1,000,000 L or 1 mL/1,000 L.

Comments

____

Measurements performed by:

____________________ ____________________ ___/___/___
Signature Print name Date

Reviewed by:

____________________ ____________________ ___/___/___
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
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Tracer Gas Collection Form (Form FTE-007)

Measurement Date _____/_____/_____
Fan Exhaust Configuration __________
Motor Parameters ________________

1. Equipment used and verification

Flow Meter ___________ Serial Number _____________

☐ Traverse spacing pre-marked on collection tube

2. Equipment setup

☐ Set the SF_6 or CO_2 metering pressure ____________

3. Perform traverse collections

Run Start Time:__________ Run Complete Time:__________

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 1/8 in)	Collected (check)	Point	Spacing (nearest 1/8 in)	Collected (check)
A1			B1		
A2			B2		
A3			B3		
A4			B4		
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:

Measurements by:

_______________ ____________________________ _____/_____/_____

Signature Print name Date

Reviewed by:

_______________ ____________________________ _____/_____/_____

Signature Print name Date

STANDARD OPERATING PROCEDURE PTE-004 DETERMINATION OF PARTICLE TRACER UNIFORMITY IN THE PROJECT W-314 EXHAUSTER STACK

SCOPE AND OBJECTIVE - This procedure applies to the measurement of tracer particle uniformity in the Hanford Tank Farm Project W-314 Exhauster stacks.

20. RESPONSIBILITIES

20.1. Project Manager (PM): The PM is responsible for ensuring the implementation of this SOP by personnel trained in its proper use. The PM is the primary point of contact regarding all work performed by Idaho State University (ISU) and Auxier & Associates, Inc. (A&A) and reports to the Premier Technologies project coordinator.

20.2. Quality Assurance Officer (QA Officer): The QA Officer is responsible for ensuring the review of all documents and data generated on the project to ensure that they meet specified quality objectives. The QA Officer is responsible for providing general and independent oversight for the QA/QC activities, and reports results directly to the PM. The QA Officer should perform audits, maintain a database of audit findings, and follow their resolution and closure.

20.3. Site Manager (SM): The SM is responsible for ensuring that all work is performed in a manner that satisfies quality assurance (QA) and quality control (QC) requirements specified in the Compliance Testing Work Plan. The SM oversees the data collection and analysis for the measurement of the cyclonic flow angle in the Hanford Tank Farm Project W-314 Exhauster.

20.4. Testing Team Members: Testing team members are responsible for meeting the requirements of this SOP. Testing team members are responsible for the proper collection of information according to this SOP.

21. EQUIPMENT, MATERIALS, AND CALIBRATION

21.1. Equipment and Materials:

- Cascade impactors for particle collection and sizing.
- Air sampling pump for collecting at 20 liters/minute within 10%.
- Sampling probe with pre-marked distances for sampling locations along the sampling traverse. Nozzle to be sized for sampling at the stack flow velocity at a sample rate of 20 liters/minute.

- Polydisperse particle generator sufficient to provide ample sensitivity after dilution in the stack gas at the sampling location for the anticipated time of the test.
- Air pressure regulator for particle generator capable of delivering pressurized air at 15 psi.
- Source of air pressure greater than 15 psi for regulation for the particle generator
- Spectrophotometer in the visible and ultraviolet ranges.
- Soybean oil for particle generation and a soybean oil compatable dye for coloring the oil.
- Computer and computer software capable of executing Microsoft Excel Version 7.0 (or equivalent).

21.2. Calibration:

21.2.1. Air sample pump or metering rotometer capable of metering flow at 20 liters/minute.

21.2.2. Test the spectrophotometer for sensitivity to dye. Determine dilution rate of particles at the stack flow rate and necessary amount of dye collection for ample detection.

22. MEASURING TRACER PARTICLE UNIFORMITY

22.1. Determine concentration of dye necessary for analysis in the spectrophotometer and the delivery rate to the stack to achieve the concentration. Determine particle delivery rate to the stack using Particle Delivery Rate Determination Form (FTE-008).

Entries should be record in ink. Correct any errors by striking through the erroneous entry with a single line. Annotate the correct information directly adjacent to the error. Initial the correction.

22.2. Measurement location is at the height of sampling nozzle inlet.

22.3. Measurement is performed in two perpendicular traverses.

22.4. Each traverse comprises 8 measurement points (12 inch diameter stack).

- .5 inch
- 1.3 inch
- 2.3 inch
- 3.9 inch
- 8.1 inch
- 9.7 inch
- 10.7 inch
- 11.5 inch

22.5. Record collection data in the activity specific laboratory notebook and transcribe this data to the Tracer Particle Collection Form (FTE-009).

Record all entries in ink. Correct any errors by striking through the erroneous entry with a single line. Annotate the correct information directly adjacent to the error. Initial the correction.

22.6. Prepare recording forms with date and equipment serial numbers and calibration dates. Fill in the appropriate places on the forms as the activity is performed.

22.7. Calculate the distances from the centerline of the collection tube nozzle to each traverse point. Use as built drawing information or actual measurements of stack. Mark the collection tube with a felt-tipped pen or employ electrical tape to correctly indicate the position orientation along the nozzle from the stack outside wall.

22.8. Verify that the Exhauster is operating under standard conditions (fan configuration). Verify that ambient air is exhausted during measurement (system intake is well located from a potentially hazardous source such as vehicle exhaust).

22.9. Inject particles at a single location downstream of the fan but well forward of the sample nozzle inlet location.

22.10. Set the air pressure of the particle generator and verify that the pressure is stable.

22.11. Collect particle tracer samples.

22.12. Unload cascade impactor after collection of each sample and place in pre-marked sample storage container following Cascade Impactor Sample Analysis Form (Form FTE-010). Caution should be employed to avoid contaminating or cross contaminating the sample during handling.

22.13. Return samples to laboratory for analysis following Cascade Impactor Sample Analysis Form (Form FTE-010).

23. TRAINING

Persons using this procedure should be trained to the procedure. Training records should include:

- Date, time, title of session, and description of session
- Person(s) performing training, including signature
- Person(s) being trained, including signature.

24. REFERENCES

- 40 CFR 61 Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities"
- Method 1: EPA 40 CFR 60 Appendix A Test Method, "Sample And Velocity Traverses For Stationary Sources"
- ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities"
- Manufacturer's literature for each instrument.

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 -1999 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Particle Delivery Rate Determination Form (Form FTE-008)

1. Spectrophotometer Sensitivity

Place a 0.1 mL of dye solution in a liter of soy oil. Dilute successively 1 mL of the soy-dye mix in hexane and test response of the spectrophotometer in the visible and UV regions.

Briefly describe method and equipment

Spectrophotometer Make and Model: ____________________
Spectrophotometer serial number: ____________________
Calibration or Standardization date ___/___/___

Perform several dilutions and test the response of the spectrophotometer. Record the results in the following table. (Successive dilutions may be on the order of the scale of last response.)

Dye Concentration	Spectrometer Response

Target dye concentration: __________ mL/L or ________

Particle Delivery Rate Determination Form (Form FTE-008)

2. Determine Fraction of Aerosol Generator Production in a Particle Size Range

Set up the aerosol generator to spray the dyed oil solution from step 1. Spray into a volume, e.g., a 55 gal drum, with an inlet and outlet. Allow the volume to equilibrate until a steady particle cloud exits the outlet. Sample the particles with a cascade impactor at the outlet. Analyze the stages with the spectrophotometer using the Cascade Impactor Sample Analysis Form (Form FTE-010). Record the results in the following table:

Stage	50% Cut Point	Spectrophotometer reading
1		
2		
3		
4		
5		
6		
7		

4. Determine Sample Collection Time at the Stack Concentration

Stack volumetric flow rate: ________________ L/min or _________

Time to collect sufficient dye:__________ min. for a dye concentration of _______ mL/L

Comments

Measurements performed by:

Signature	Print name	Date	____/____/____

Reviewed by:

Signature	Print name	Date	____/____/____

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 -1999 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date ____/____/____ Fan Exhaust Configuration ________

1. Equipment used and verification

Rotometer __________ Serial Number __________

- ☐ Traverse spacing pre-marked on collection tube

2. Equipment setup

- ☐ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time:________ Run Complete Time:________

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1			B1		
A2			B2		
A3			B3		
A4			B4		
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:

Measurements by:

____________ ____________ ____/____/____
Signature Print name Date

Reviewed by:

____________ ____________ ____/____/____
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 -1999 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Cascade Impactor Sample Analysis Form (Form FTE-010)

1. Measurement Identification

Measurement or project name: ______________________________ Measurement ID ________

Description of measurement: ____

2. Unload Cascade Impactor

Place seven sample storage containers in a line and mark the lids 1-8, the date, and the measurement identification number.

Unscrew the end pieces of the cascade impactor and press out the stages using the stage removal tool. Place the stages next to the numbered sample storage containers, the top or first stage is number one.

Place each aluminum foil substrate or filter into the corresponding sample storage containers using tweezers. Rinse and dry the tweezers after placing each substrate of filter.

Place 3 mL of hexane in each sample storage container. Gently agitate the solution until the dye is well mixed.

3. Analyze the Dye Solution in the Spectrophotometer

Determine the UV/Visible spectrum of the soy oil dye solution using an aliquot of the sprayed solution. Select wavelength(s) or wavelength range for analysis of the substrate or filter solutions.

UV ______ nm Visible _____ nm or alternately wavelength range___________

Analyze each substrate or filter solution and record in the table below.

Stage	50% Cut Point	Spectrophotometer reading	
		UV	Visible
1			
2			
3			
4			
5			
6			
7			
8			

Comments:

Measurements by:

______________________ ______________________ ____/____/____
Signature Print name Date

Reviewed by:

______________________ ______________________ ____/____/____
Signature Print name Date

STANDARD OPERATING PROCEDURE PTE-005 DETERMINATION OF SAMPLING NOZZLE TRANSMISSION RATIO IN THE PROJECT W-314 EXHAUSTER STACK

SCOPE AND OBJECTIVE - This procedure applies to the measurement of sampling nozzle transmission ratio in the Hanford Tank Farm Project W-314 Exhauster stacks.

25. RESPONSIBILITIES

25.1. Project Manager (PM): The PM is responsible for ensuring the implementation of this SOP by personnel trained in its proper use. The PM is the primary point of contact regarding all work performed by Idaho State University (ISU) and Auxier & Associates, Inc. (A&A) and reports to the Premier Technologies project coordinator.

25.2. Quality Assurance Officer (QA Officer): The QA Officer is responsible for ensuring the review of all documents and data generated on the project to ensure that they meet specified quality objectives. The QA Officer is responsible for providing general and independent oversight for the QA/QC activities, and reports results directly to the PM. The QA Officer should perform audits, maintain a database of audit findings, and follow their resolution and closure.

25.3. Site Manager (SM): The SM is responsible for ensuring that all work is performed in a manner that satisfies quality assurance (QA) and quality control (QC) requirements specified in the Compliance Testing Work Plan. The SM oversees the data collection and analysis for the measurement of the cyclonic flow angle in the Hanford Tank Farm Project W-314 Exhauster.

25.4. Testing Team Members: Testing team members are responsible for meeting the requirements of this SOP. Testing team members are responsible for the proper collection of information according to this SOP.

26. EQUIPMENT, MATERIALS, AND CALIBRATION

26.1. Equipment and Materials:

- Cascade impactors for particle collection and sizing.
- Air sampling pump for collecting at 20 lpm within 10%.
- Cascade impactor sampling probe to mate with sampling nozzle. Cascade impactor sampling probe to be sized for sampling at the nozzle flow velocity at a sample rate of 20 lpm.

- Polydisperse particle generator sufficient to provide ample sensitivity after dilution in the stack gas at the sampling location for the anticipated time of the test.
- Air pressure regulator for particle generator capable of delivering pressurized air at 15 psi.
- Source of air pressure greater than 15 psi for regulation for the particle generator
- Spectrophotometer in the visible and ultraviolet ranges.
- Soybean oil for particle generation and a soybean oil compatable dye for coloring the oil.
- Computer and computer software capable of executing Microsoft Excel Version 7.0 (or equivalent).

26.2. Calibration:

26.2.1. Air sample pump calibrated to 20 lpm

26.2.2. Test the spectrophotometer for sensitivity to dye. Determine dilution rate of particles at the stack flow rate and necessary amount of dye collection for ample detection.

27. MEASURING TRACER PARTICLE CONCENTRATION AT NOZZLE

27.1. Determine concentration of dye necessary for analysis in the spectrophotometer and the delivery rate to the stack to achieve the concentration. Determine particle delivery rate to the stack using Particle Delivery Rate Determination Form (FTE-008).

Record all entries in ink. Correct any errors by striking through the erroneous entry with a single line. Annotate the correct information directly adjacent to the error. Initial the correction.

27.2. Measurement location is at the height of sampling nozzle inlet.

27.3. Measurement is performed in two perpendicular traverses.

27.4. Each traverse comprises 4 measurement points (12 inch diameter stack).

- 2.3 inch
- 3.9 inch
- 8.2 inch
- 9.7 inch

27.5. Record collection data in the activity specific laboratory notebook and transcribe this information to the Tracer Particle Collection Form (FTE-009).

Record all entries in ink. Correct any errors by striking through the erroneous entry with a single line. Annotate the correct information directly adjacent to the error. Initial the correction.

27.6. Prepare recording forms with date and equipment serial numbers and calibration dates. Fill in the appropriate places on the forms as the activity is performed.

27.7. Calculate the distances from the centerline of the collection tube nozzle to each traverse point. Use as built drawing information or actual measurements of stack. Mark the collection tube with a felt-tipped pen or indicate position along the tube using electrical tape so that the nozzle may be correctly positioned relative to the stack outside wall.

27.8. Verify that the Exhauster is operating under standard conditions (fan configuration). Verify that ambient air is exhausted during measurement (system intake is well located from a potentially hazardous source such as vehicle exhaust).

27.9. Inject particles at a single location downstream of the fan but well forward of the sample nozzle inlet location.

27.10. Set the air pressure of the particle generator and verify that the pressure is stable.

27.11. Collect particle concentration samples in stack.

27.12. Collect particle concentration samples from nozzle.

27.13. Unload cascade impactor after collection of each sample and place in pre-marked sample storage containers following Cascade Impactor Sample Analysis Form (Form FTE-010).

27.14. Return samples to laboratory for analysis following Cascade Impactor Sample Analysis Form (Form FTE-010).

28. TRAINING

Persons using this procedure should be trained to the procedure. Training records should include:

- Date, time, title of session, and description of session
- Person(s) performing training, including signature
- Person(s) being trained, including signature.

29. REFERENCES

- 40 CFR 61 Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities"
- Method 1: EPA 40 CFR 60 Appendix A Test Method, "Sample And Velocity Traverses For Stationary Sources"
- ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities"
- Manufacturer's literature for each instrument.

Premier Technologies Inc. W-314 Exhauster

ANSI/HPS N13.1 -1999 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Particle Delivery Rate Determination Form (Form FTE-008)

1. Spectrophotometer Sensitivity

Place a 0.1 mL of dye solution in a liter of soy oil. Dilute successively 1 mL of the soy-dye mix in hexane and test response of the spectrophotometer in the visible and UV regions.

Briefly describe method and equipment

Spectrophotometer Make and Model: ______________________________
Spectrophotometer serial number: ______________________________
Calibration or Standardization date ___/___/___

Perform several dilutions and test the response of the spectrophotometer. Record the results in the following table. (Successive dilutions may be on the order of the scale of last response.)

Dye Concentration	Spectrometer Response

Target dye concentration: ____________ mL/L or ________

Particle Delivery Rate Determination Form (Form FTE-008)

3. Determine Fraction of Aerosol Generator Production in a Particle Size Range

Set up the aerosol generator to spray the dyed oil solution from step 1. Spray into a controlled volume, with an inlet and outlet. Allow the volume to equilibrate until a steady particle cloud exits the outlet. Sample the particles with a cascade impactor. Analyze the stages with the spectrophotometer using the Cascade Impactor Sample Analysis Form (Form FTE-010). Record the results in the following table:

Stage	50% Cut Point	Spectrophotometer reading
1		
2		
3		
4		
5		
6		
7		
8		

4. Determine Sample Collection Time at the Stack Concentration

Stack volumetric flow rate: ________________ L/min _________

Time to collect sufficient dye:__________ min. for a dye concentration of _______ mL/L

Comments

____

Measurements performed by:

________________ ________________________ _____/_____/_____
Signature Print name Date

Reviewed by:

________________ ________________________ _____/_____/_____
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 -1999 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

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Tracer Particle Collection Form (Form FTE-009)

Page 1 of 1

Measurement Date ____/____/____ Fan Exhaust Configuration ________

1. Equipment used and verification

Rotometer __________ Serial Number __________

- ☐ Traverse spacing pre-marked on collection tube

2. Equipment setup

- ☐ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time:_________ Run Complete Time:_________

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1			B1		
A2			B2		
A3			B3		
A4			B4		
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:

Measurements by:

____________________________________ ____/____/____
Signature Print name Date

Reviewed by:

____________________________________ ____/____/____
Signature Print name Date

Cascade Impactor Sample Analysis Form (Form FTE-010)

4. Measurement Identification

Measurement or project name: ______________________ Measurement ID ________

Description of measurement: ____

5. Unload Cascade Impactor

Place seven sample storage containers in a line and mark the lids 1-7, the date, and the measurement indentification number.

Unscrew the end pieces of the cascade impactor and press out the stages using the stage removal tool. Place the stages next to the numbered sample storage containers, the top or first stage is number one.

Place each aluminum foil substrate or filter into the corresponding sample storage containers using tweezers. Rinse and dry the tweezers after placing each substrate of filter.

Place 3 mL of hexane in each sample storage containers. Gently agitate the solution until the dye is well mixed.

6. Analyze the Dye Solution in the Spectrophotometer

Determine the UV/Visible spectrum of the soy oil dye solution using an aliquot of the sprayed solution. Select wavelength(s) or wavelength range for analysis of the substrate or filter solutions.

UV _____ nm Visible _____ nm alternately wavelength range_____________

Analyze each substrate or filter solution and record in the table below.

Stage	50% Cut Point	Spectrophotometer reading	
		UV	Visible
1			
2			
3			
4			
5			
6			
7			
8			

Comments:

Measurements by:

_______________ _______________ ____/____/____
Signature Print name Date

Reviewed by:

_______________ _______________ ____/____/____
Signature Print name Date

STANDARD OPERATING PROCEDURE PTE-006 DETERMINATION OF DEPOSITION LOSSES IN THE TRANSPORT TUBE IN THE PROJECT W-314 EXHAUSTER STACK

SCOPE AND OBJECTIVE - This procedure applies to the measurement of tracer particle uniformity in the Hanford Tank Farm Project W-314 Exhauster stacks.

30. RESPONSIBILITIES

30.1. Project Manager (PM): The PM is responsible for ensuring the implementation of this SOP by personnel trained in its proper use. The PM is the primary point of contact regarding all work performed by Idaho State University (ISU) and Auxier & Associates, Inc. (A&A) and reports to the Premier Technologies project coordinator.

30.2. Quality Assurance Officer (QA Officer): The QA Officer is responsible for ensuring the review of all documents and data generated on the project to ensure that they meet specified quality objectives. The QA Officer is responsible for providing general and independent oversight for the QA/QC activities, and reports results directly to the PM. The QA Officer should perform audits, maintain a database of audit findings, and follow their resolution and closure.

30.3. Site Manager (SM): The SM is responsible for ensuring that all work is performed in a manner that satisfies quality assurance (QA) and quality control (QC) requirements specified in the Compliance Testing Work Plan. The SM oversees the data collection and analysis for the measurement of the cyclonic flow angle in the Hanford Tank Farm Project W-314 Exhauster.

30.4. Testing Team Members: Testing team members are responsible for meeting the requirements of this SOP. Testing team members are responsible for the proper collection of information according to this SOP.

31. EQUIPMENT, MATERIALS, AND CALIBRATION

31.1. Equipment and Materials:

- Detailed engineering drawings of the nozzle and transport tube.
- Sample flow velocities under planned conditions.
- Computer and computer program Deposition 2001a or latest version.

31.2. Calibration:

31.2.1. None required.

32. ESTIMATING PARTICLE LOSS IN TRANSPORT TUBE

32.1. Describe Transport Tube.

Make a table listing in order from the nozzle the components of the transport tube; bends, straight runs, other, and angles of bends and straight runs.

Record all entries in ink. Correct any errors by striking through the erroneous entry with a single line. Annotate the correct information directly adjacent to the error. Initial the correction.

32.2. Open Deposition 2001a or latest version. Enter data in the setup menu.

32.3. Confirm data entry is correct and then run program.

32.4. Print out results and input data.

33. TRAINING

Persons using this procedure should be trained to the procedure. Training records should include:

- Date, time, title of session, and description of session
- Person(s) performing training, including signature
- Person(s) being trained, including signature.

34. REFERENCES

- ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities"

STANDARD OPERATING PROCEDURE PTE-007
QUALIFICATION OF EFFLUENT MONITORING INSTURMENTATION FOR THE PROJECT W-314 EXHAUSTER STACK

SCOPE AND OBJECTIVE - This procedure applies to the Qualification of the Effluent monitoring instrumentation for the Hanford Tank Farm Project W-314 Exhauster stacks.

35. RESPONSIBILITIES

35.1. Project Manager (PM): The PM is responsible for ensuring the implementation of this SOP by personnel trained in its proper use. The PM is the primary point of contact regarding all work performed by Idaho State University (ISU) and Auxier & Associates, Inc. (A&A) and reports to the Premier Technologies project coordinator.

35.2. Quality Assurance Officer (QA Officer): The QA Officer is responsible for ensuring the review of all documents and data generated on the project to ensure that they meet specified quality objectives. The QA Officer is responsible for providing general and independent oversight for the QA/QC activities, and reports results directly to the PM. The QA Officer should perform audits, maintain a database of audit findings, and follow their resolution and closure.

35.3. Site Manager (SM): The SM is responsible for ensuring that all work is performed in a manner that satisfies quality assurance (QA) and quality control (QC) requirements specified in the Compliance Testing Work Plan. The SM oversees the data collection and analysis for the measurement of the cyclonic flow angle in the Hanford Tank Farm Project W-314 Exhauster.

35.4. Testing Team Members: Testing team members are responsible for meeting the requirements of this SOP. Testing team members are responsible for the proper collection of information according to this SOP.

36. EQUIPMENT, MATERIALS, AND CALIBRATION

36.1. Equipment and Materials:

- Detailed engineering drawings of the placement of the instrumentation.
- List of expected radionuclides and relative concentrations.
- List of expected non-radioactive interferents.
- NESHAPs detection requirements for major radionuclides

36.2. Calibration:

36.2.1. None required.

37. EVALUATING EFFLUENT MONITORING INSTRUMETATION

37.1. Review manufacturer's data and test results.
Collection efficiency
Detection efficiency and limit
Background (radon) algorithm
Operating temperature
Flow rate control
Alarms settings
Adjustment, calibration, and maintenance requirements
Electrical requirements
Electromagnetic interference
Vibration and orientation stability

37.2. Compare each result from 3.3 to system requirements in tabular form.

37.3. Make conclusions concerning ability of instrument to perform the required tasks.

38. TRAINING

Persons using this procedure should be trained to the procedure. Training records should include:

- Date, time, title of session, and description of session
- Person(s) performing training, including signature
- Person(s) being trained, including signature.

39. REFERENCES

- ANSI/IEEE N42.18, "Equipment for continuous monitoring of radioactivity in gaseous effluents"
- NESHAPs evaluation of effluent.

Attachment Two

APEX INSTRUMENTS SOURCE SAMPLING EQUIPMENT

S-TYPE PITOT TUBE CALIBRATION SHEET

Reference USEPA Reference Method 2 (40CFR60, App. A, Meth. 2)

PITOT SERIAL# 2072
PITOT TYPE: 6PT4
STD. PITOT TYPE: ELLIPSOIDAL
Cp(std): 1.000
CALIBRATED BY: QMD

CALIBRATION DATE: 10-Jul-02
BAROMETRIC PRESSURE: 29.53 in Hg
STATIC PRESSURE -40 mm H_2O
BLOCKAGE %: n/a
CORRECTION FACTOR: 1.00

	SIDE "A" CALIBRATION			
RUN NO.	Pstd mm H_2O	P(s) mm H_2O	Cp(s)	DEVIATION Cp(s) - avg.Cp(s)
1	19.0	25.0	0.8716	0.116
2	19.0	25.0	0.8716	0.116
3	19.0	25.2	0.8683	-0.231
		AVERAGE	0.871	

	SIDE "B" CALIBRATION			
RUN NO.	Pstd mm H_2O	P(s) mm H_2O	Cp(s)	DEVIATION Cp(s) - avg.Cp(s)
1	19.0	25.0	0.8716	0.288
2	19.0	25.2	0.8683	-0.058
3	19.0	25.3	0.8666	-0.230
		AVERAGE	0.869	

OVERALL AVERAGE 0.870

ACCEPTANCE CRITERIA

AVG. lCp (A) - AVG. Cp (B)l	0.0017	must be less than or equal to 0.01
Standard Deviation A =	0.0020	must be less than or equal to 0.01
Standard Deviation B =	0.0026	must be less than or equal to 0.01

If each of the above criteria are met the overall avg. Cp (Side A or Side B) may be used.

I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards. See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.

Signature ____________ Date 11-18-03

Copy

Attachment Three

N014-96

FLOWMETER CALIBRATION DATA

Tube Number: N014-96(G,S,ST,C,T)
Units : std ml/min

Metering Temperature: [illegible]
Metering Pressure [illegible]

Calibration Conditions [illegible]
Accuracy Standard

SCALE READINGS AT CENTER OF FLOAT

Float Material	Glass (G)	Sapphire (S)	Stainless Steel (ST)	Carboloy (C)	Tantalum (T)
Float Density	2.53 g/ml	[illegible] g/ml	8.04 g/ml	14.98 g/ml	16.58 g/ml

AIR

Glass Scale Readings	Glass Flow (ml/min)	Sapphire Scale Readings	Sapphire Flow (ml/min)	Stainless Steel Scale Readings	Stainless Steel Flow (ml/min)	Carboloy Scale Readings	Carboloy Flow (ml/min)	Tantalum Scale Readings	Tantalum Flow (ml/min)
65	6218	[illegible]	[illegible]	65	12886	[illegible]	17153	65	18211
60	5912	[illegible]	[illegible]	60	11830	60	[illegible]	60	17112
55	5509	[illegible]	[illegible]	55	10838	55	15224	55	16066
50	5188	[illegible]	[illegible]	50	[illegible]	50	[illegible]	50	[illegible]
45	4685	[illegible]	[illegible]	45	[illegible]	45	[illegible]	45	[illegible]
40	4277	[illegible]	[illegible]	40	8323	40	[illegible]	40	[illegible]
35	3852	[illegible]	[illegible]	35	7484	35	[illegible]	35	11604
30	3413	[illegible]	[illegible]	30	[illegible]	30	[illegible]	30	[illegible]
25	3006	[illegible]	[illegible]	[illegible]	[illegible]	25	[illegible]	25	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15	[illegible]
10	1480	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10	[illegible]
5	996	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	[illegible]

WATER

Glass Scale Readings	Glass Flow (ml/min)	Sapphire Scale Readings	Sapphire Flow (ml/min)	Stainless Steel Scale Readings	Stainless Steel Flow (ml/min)	Carboloy Scale Readings	Carboloy Flow (ml/min)	Tantalum Scale Readings	Tantalum Flow (ml/min)
65	147	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
60	137	[illegible]	[illegible]	60	[illegible]	[illegible]	606	60	[illegible]
55	126	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
50	116	50	177	50	[illegible]	50	[illegible]	50	[illegible]
45	105	45	160	45	267	[illegible]	500	45	[illegible]
40	94	40	[illegible]	40	242	40	[illegible]	40	[illegible]
35	83	35	[illegible]	[illegible]	222	[illegible]	[illegible]	35	[illegible]
30	70	[illegible]	112	30	190	30	[illegible]	30	[illegible]
25	59	[illegible]	[illegible]	25	162	[illegible]	[illegible]	25	260
20	45	20	74	20	133	[illegible]	[illegible]	20	[illegible]
15	33	15	54	[illegible]	104	15	[illegible]	15	[illegible]
10	19	[illegible]	32	[illegible]	74	10	[illegible]	10	[illegible]
5	4	5	10	5	42	[illegible]	72	5	[illegible]

FLOWMETER INSTRUCTIONS

GENERAL INFORMATION

Inspect instrument for possible visible damage resulting from shipping. Notify UPS or other carrier as well as the distributor where the flowmeter was purchased of any claims.

Flowmeters always must be installed in a vertical position, any significant deviation from vertical will affect the readings.

Valves should be closed before installation and opened gradually after all connections are carefully inspected. A leak test is highly recommended especially when hazardous fluids are involved.

CAUTION: Excessive tightening of valves may damage the orifice.

It is important that all lines to be connected to the flowmeter are purged of any dust or other residual contamination prior to installing the meter. All P and S style flowmeters are equipped with a filter in the inlet port. In some applications an additional filter should be installed at the inlet of the flowmeter.

STICKING FLOATS

Before installing open the valve of the flowmeter [illegible] check to make sure that the float or floats are moving freely in the flow tube. This is best done by slowly tilting the flowmeter from horizontal to vertical while observing if the float is rolling freely.

All meters are thoroughly inspected at the factory prior to shipping and are sealed in polyethylene bags to prevent dirt from entering into the flow passages. Certain small bore flowtubes have a clearance between the float and the inside walls of the flowtube of only [illegible] thousandths of an inch. In some cases these flowtubes are found to have floats that are sluggish or not moving due to condensation resulting from temperature changes during shipping.

It is advisable to blow a dry clean gas through the meter to free float.

SAFETY INFORMATION

P and S style flowmeters are designed to be operated at pressures not exceeding 200 psig (13.6 bars), or temperatures not exceeding 250 degrees F (121deg.C).

T style flowmeters are designed to be operated at pressures not exceeding 100 psig (6.8 bars), or temperatures not exceeding 150 degrees F (65.5deg.C).

NOTE: When using a T style Teflon flowmeter at a pressure and/or temperature greater than standard the leak integrity approaches 1x10[illegible]. Standard conditions are considered to be 14.7 psia (1 bar) and 70 degrees F (21deg.C).

All meters are factory tested for leakage prior to shipping. [illegible] fluids the flowmeter must be re-tested at the time of installation into the system, prior to usage. It is also important that a leak integrity test is performed periodically to maintain safe operating conditions.

Flowmeters must be protected from breakage due to external conditions such as objects bumping into or hitting the instrument, extreme vibrations, or attack by corrosive materials. It is the responsibility of the [illegible] acquaint the operator(s) of this flowmeter with all [illegible] information.

VALVE ALIGNMENT

The built-in needle valve may be positioned at either the inlet or the outlet of the flowmeter. Valves are factory installed at the inlet of the flowmeter unless otherwise requested.

APPLICATION	VALVE POSITION
Exhaust pressure at Atmospheric conditions	Valve at Inlet
Exhaust pressure other than Atmospheric conditions	Valve at Outlet
Vacuum	Valve at Outlet
Liquid flow	[illegible]

When using a flowmeter with exhaust pressure greater than atmospheric conditions the standard calibrations can not be used. A calibration for the operating pressure must be provided.

OPERATING INSTRUCTIONS

Close valve (if applicable) before initial use, then pressurize the system.

Slowly open the valve until the float is at the desired flow rate. The flow rate is read at the center of the float.

FLOWTUBE INSTALLATION OR REMOVAL

Remove the Front Shield and Back Plate. Do not remove the side panels from the flowmeter.

To remove the flowtube:

P style meters: Insert a 5/32" hex wrench into the Pressure Nut at the top of the flowmeter. While holding the flowtube between your thumb and forefinger, turn the wrench counter clockwise to release the flowtube. [illegible]

S and T style [illegible] nut at the top of the flowtube. While holding the flowtube between your thumb and forefinger turn the [illegible] may be necessary to push the [illegible] remove the flowtube.

To reinstall the flowtube reverse the above procedure. Take care to assure that the flowtube is centered in the meter at the top and bottom before tightening.

T style meters require additional tightening to insure proper sealing [illegible] flowtube ends. The flowmeter should be tightened again 24 hours after initial tightening.

A leak integrity test is recommended after disassembling any flowmeter.

FLOWTUBE CLEANING

If necessary, remove the flowtube from the frame as explained above and clean as follows:

Insert a plastic rod that will fit into the flowtube with no obstruction into the bottom of the flowtube and push the retaining plugs and float out of the flowtube. Use tweezers to handle the float and store the float and the plugs in a lint free container. Before removing note the position of the plugs for reference when reassembling.

Using a suitable solvent clean all the parts including the flowtube, dry them by means of a clean stream of air or gas.

To reassemble the flowtube use the push rod to first install the [illegible]

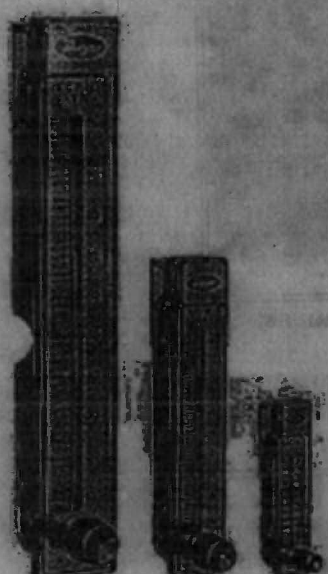
[illegible] the float is moving freely in the flowtube [illegible] install the flowtube in the frame.

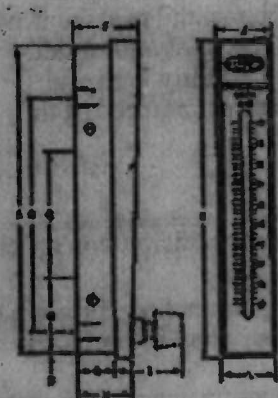
MAINTENANCE

[illegible]

Series RM Rate-Master® Flowmeters

Molded of tough polycarbonate plastic. Used to indicate or manually control air or gas flow from .1-1800 SCFH. .. water flows to 10 GPM





Dimensional Enlargement

Service Manual
Catalog Page

The **Dwyer Rate-Master** line of direct reading precision flowmeters incorporates many unique user features at moderate cost. These low cost flowmeters are ideal for general use.

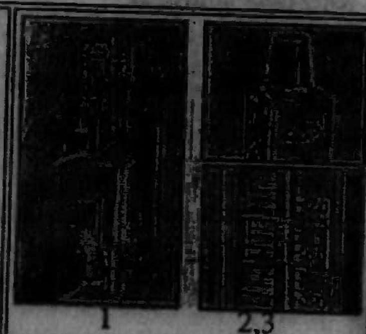
Easy to read design - The direct reading scales eliminate troublesome conversions. The scales are brushed aluminum, coated with epoxy and the graduations are on both sides of the indicating tube. Special integral flow guides stabilize the float throughout the range to keep it from hunting or wandering in the bore. The float is highly visible against a white background.

Construction assures accuracy - All Rate-Master flowmeter bodies are injection molded of tough, clear, shatter-proof polycarbonate plastic around a precision tapered pin. Critical internal diameter of the variable orifice tube is held within ±0.0004" The result is accurate and repeatable readings. The single piece plastic body is mounted to a stainless steel backbone into which pipe thread inserts are welded to absorb piping torque. Precision metering valves of brass or stainless steel (specify BV or SSV on order) are available as an optional extra and permit precise flow adjustments. For vacuum applications, Model RMA units are available with top mounted valves (specify TMV). The small Series RMA models are accurate within ±4% of full scale reading; Series RMB within + 3%; large Series RMC within ±2%.

Installation is simple - The Rate-Master can be neatly through-panel mounted to keep flow tube centers in the same plane as the panel surface or surface mounted on the panel by means of tapped holes in the backbone. When through-panel mounted, the bezel automatically positions the instrument at the correct depth in the panel cutout. Surface mounted units can also be held in place by the piping. All mounting hardware plus installation and operating instructions are included.

Cleaning is easy - To release the plastic flowmeter body from the stainless steel backbone, just remove four screws. Pipe thread flow connections remain undisturbed. Remove the slide cover and the plug ball stop, clean the flow tube with soap and water and reassemble. It's that simple.

Easy-to-interchange bodies - Within a given Series, Rate-Master flowmeter bodies can be instantly interchanged. Simply "un-plug" the body from backbone and replace it with another. "O" rings provide a tight seal on inlet and outlet. Piping remains undisturbed. Interchangeability is useful where different scale ranges are sometimes required at the same location in the laboratory or plant.



Top Mounted Metering Valves - Same precision construction for vacuum applications.

Adjustable pointer flags - Red-lined pointer flags provide quick visual reference to a required flow level. Of clear plastic, they snap into place inside bezel and slide to desired level.

Choose a different selection (if desired), then press the '**Display the product...**' button.

Series RM Rate-Master Flowmeters RMC Models (10" scale) - Stainless Steel Valve

STOCKED MODELS

Model Number	Range	Price
RMC-101-SSV	5-50 SCFH Air	$86.00*
RMC-102-SSV	10-100 SCFH Air	$86.00*
RMC-103-SSV	20-200 SCFH Air	$86.00*
RMC-104-SSV	40-400 SCFH Air	$86.00*
RMC-105-SSV	60-600 SCFH Air	$86.00*
RMC-106-SSV	100-1000 SCFH Air	$86.00*
RMC-107-SSV	120-1200 SCFH Air	$86.00*
RMC-108-SSV	180-1800 SCFH Air	$86.00*
RMC-121-SSV	1-10 SCFM Air	$86.00*

RMC-122-SSV	2-20 SCFM Air	$86.00*
RMC-123-SSV	3-30 SCFM Air	$86.00*
RMC-134-SSV	2-20 Gal. Water per hour	$86.00*
RMC-135-SSV	8-90 Gal. Water per hour	$86.00*
RMC-141-SSV	.1-1 Gal. Water per min.	$86.00*
RMC-142-SSV	.2-2.2 Gal. Water per min.	$86.00*
RMC-143-SSV	.4-4 Gal. Water per min.	$86.00*
RMC-144-SSV	.8-7 Gal. Water per min.	$86.00*
RMC-145-SSV	1.2-10 Gal. Water per min.	$86.00*

***Prices are based in US currency and may change for international customers due to and not limited to customs brokerage fees, export packing and documentation, tariffs, duty and taxes.**

Click the Model Number of the item to add the item to your shopping cart.

VIEW YOUR SHOPPING CART

Home Product Information Free Literature International Distribution Retail Store About Us Careers Contact Us
Terms & Conditions of Sale
Terms of Access

Attachment Four

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

Page 1 of 6

PATENT NO. : 4,919,853

DATED : April 24, 1990

INVENTOR(S) : Joseph L. Alvarez, et al

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The title page showing the illustrative figure should be deleted to appear as per attached title page.

In the Drawing:

Sheets 1, 2, 3 and 4 including Figures 1, 2, 3, 4 and 5 are hereby incorporated into the above-identified United States Patent.

Signed and Sealed this

Twenty-seventh Day of August, 1991

Attest:

HARRY F. MANBECK, JR.

Attesting Officer

Commissioner of Patents and Trademarks

United States Patent [19]

Alvarez et al.

[11] Patent Number: 4,919,853

[45] Date of Patent: Apr. 24, 1990

[54] **APPARATUS AND METHOD FOR SPRAYING LIQUID MATERIALS**

[75] Inventors: Joseph L. Alvarez, Idaho Falls; Lloyd D. Watson, Rigby, both of Id.

[73] Assignee: The United States of America as represented by the United States Department of Energy, Washington, D.C.

[21] Appl. No.: 146,631

[22] Filed: Jan. 21, 1988

[51] Int. Cl.[4] B29B 9/10

[52] U.S. Cl. 264/12; 261/78.2; 261/142; 261/DIG. 78; 425/7

[58] Field of Search .... 264/12, 13, 14; 425/6, 425/7; 261/78.2, 142, DIG. 78

[56] References Cited

U.S. PATENT DOCUMENTS

1,592,982	7/1926	Loepsinger	261/78.2
2,101,922	12/1937	Stoesling	261/142
2,565,691	8/1951	Ketelsen	261/78.2
2,887,181	5/1959	Dillon	261/78.2
2,929,436	3/1960	Hampshire	118/303
2,997,245	8/1961	Nilsson et al.	241/1
3,067,956	12/1962	Tove	241/1
3,524,630	8/1970	Marion	261/78.2
3,605,949	9/1971	Vock	261/78.2
3,817,233	6/1974	Kihn	261/142
3,826,301	7/1974	Brooks	164/46
3,909,921	10/1975	Brooks	164/46
3,931,814	1/1976	Rivere	261/DIG. 78
4,267,131	5/1981	Prudhon et al.	261/78.2
4,483,805	11/1984	Glindsjo	261/78.2
4,485,834	12/1984	Grant	264/12

OTHER PUBLICATIONS

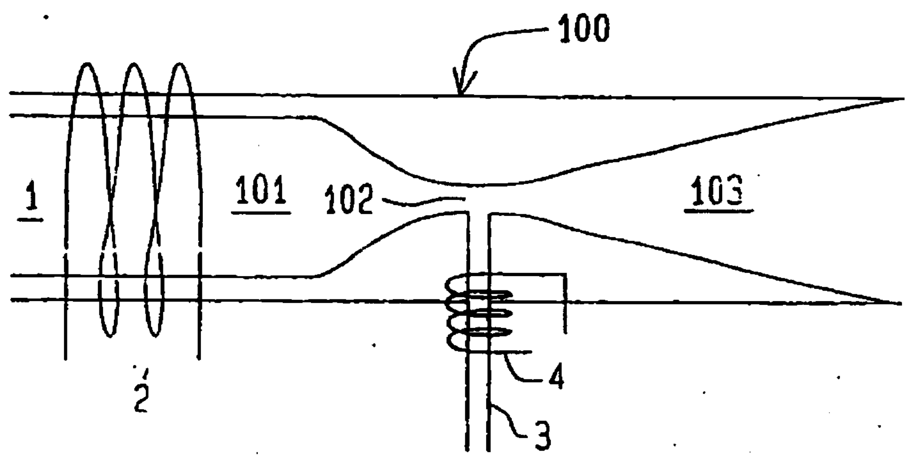
"The Dynamics and Thermodynamics of Compressible Fluid Flow", Ascher H. Shapiro, vol. 1, pp. 84–87 (1953).

Primary Examiner—Jan H. Silbaugh
Assistant Examiner—Mary Lynn Fertig
Attorney, Agent, or Firm—Hugh G. Glenn; Robert J. Fisher; William R. Moser

[57] **ABSTRACT**

A method for spraying liquids involving a flow of gas which shears the liquid. A flow of gas is introduced in a converging-diverging nozzle where it meets and shears the liquid into small particles which are of a size and uniformity which can be controlled through adjustment of pressures and gas velocity.

6 Claims, 4 Drawing Sheets



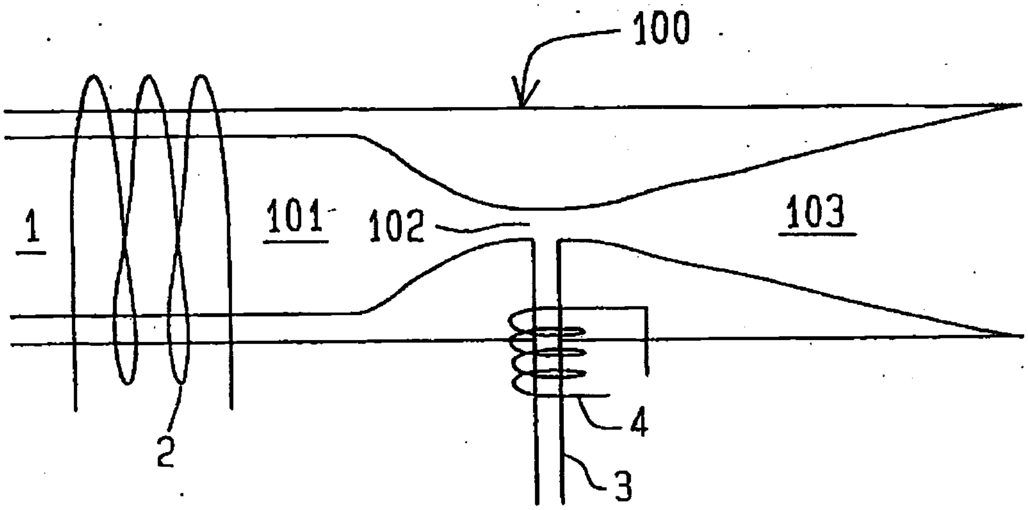


FIG. 1

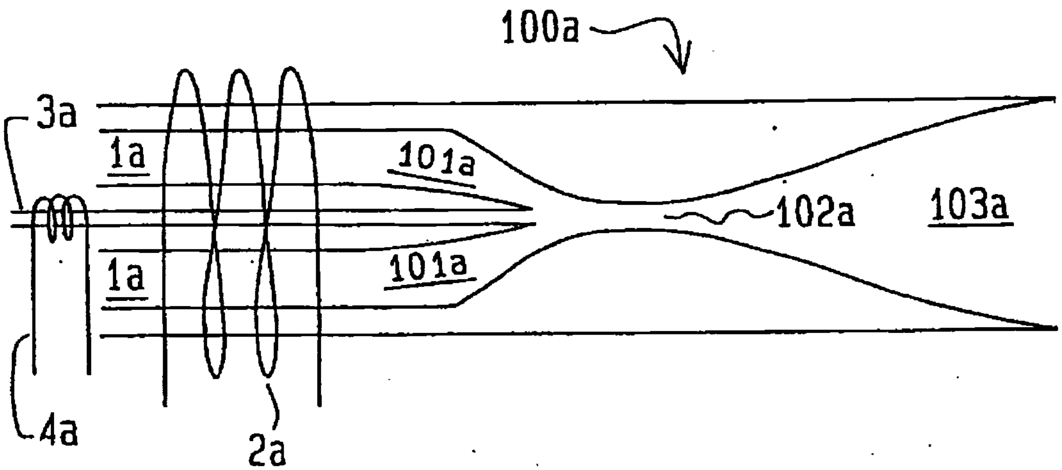


FIG. 2

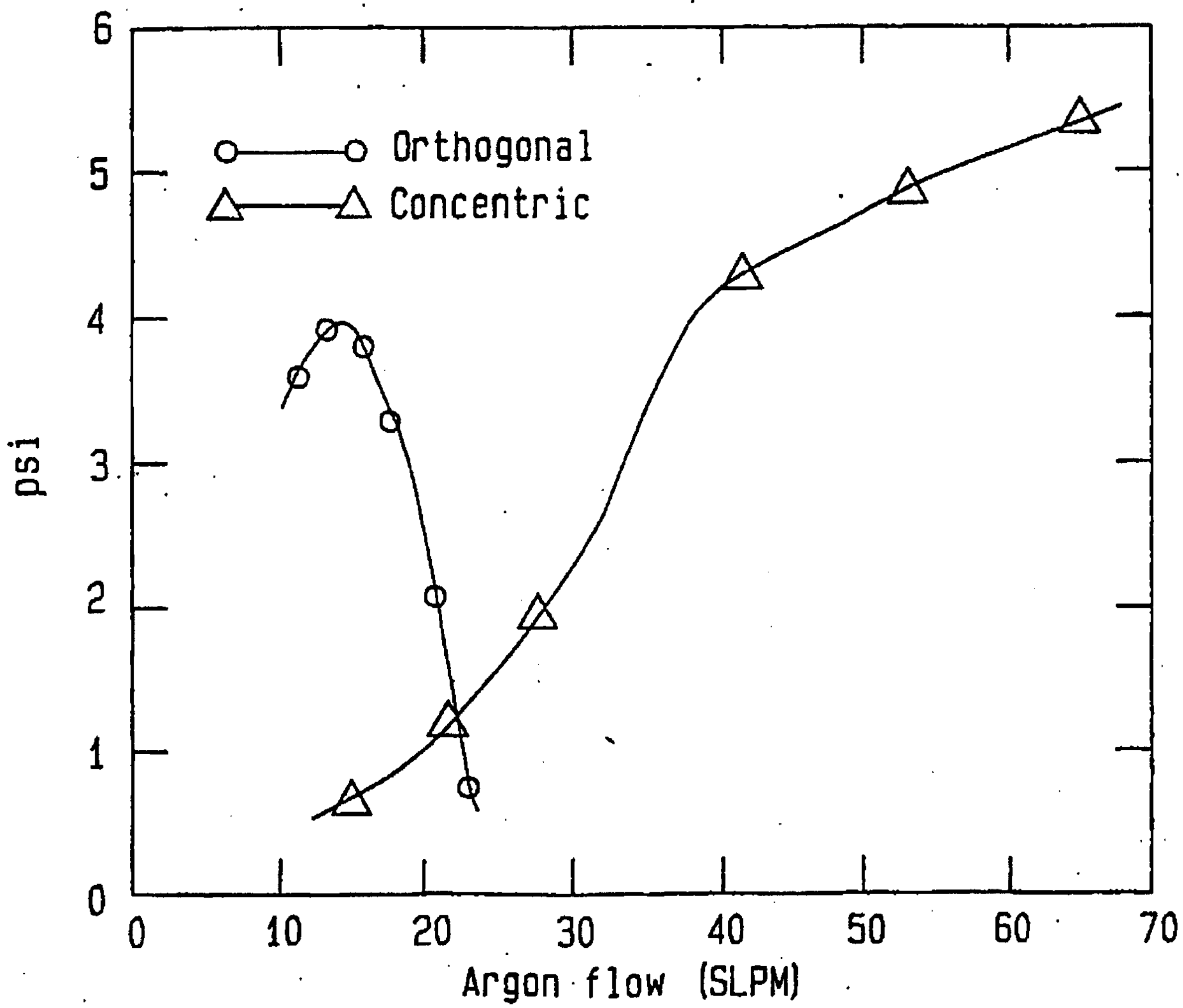

Orthogonal
Concentric
psi
0
1
2
3
4
5
6
0
10
20
30
40
50
60
70
Argon flow (SLPM)

FIG. 3

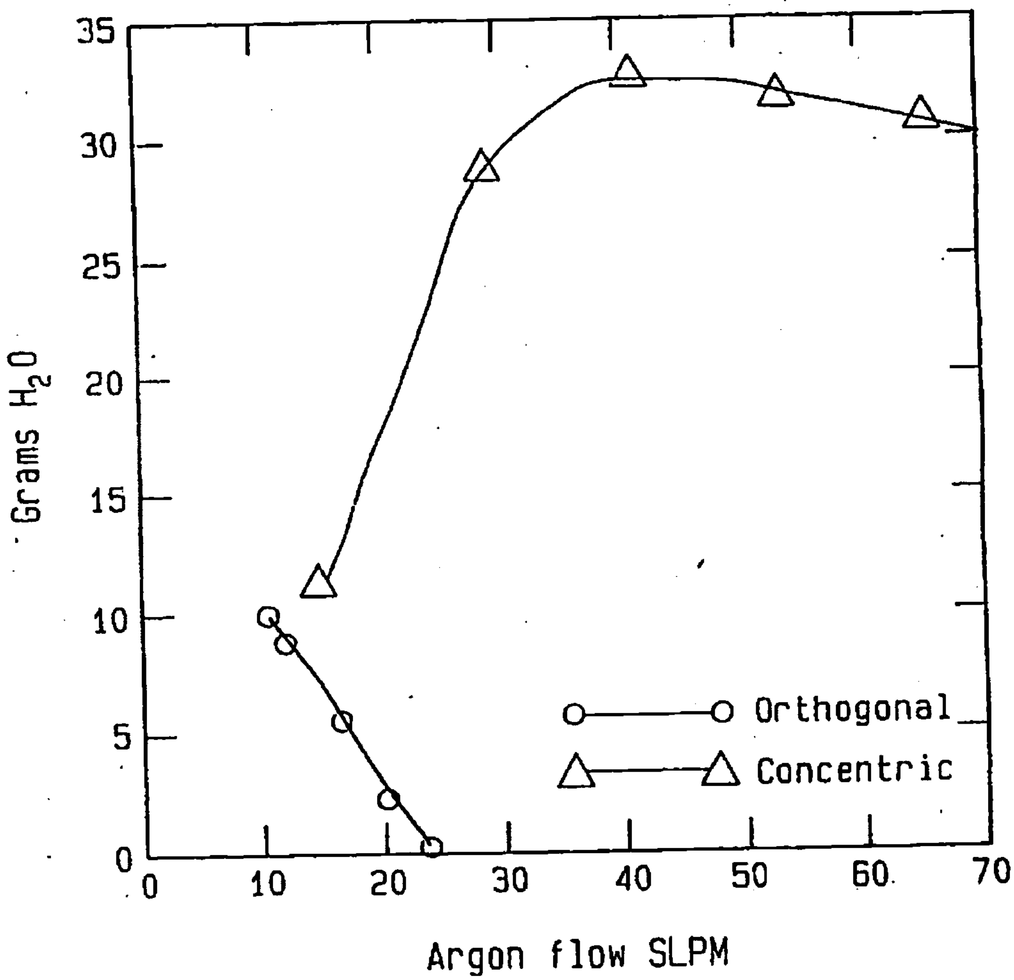

35
30
25
20
15
10
5
0
Grams H_2O
0
10
20
30
40
50
60
70
Argon flow SLPM
Orthogonal
Concentric

FIG. 4

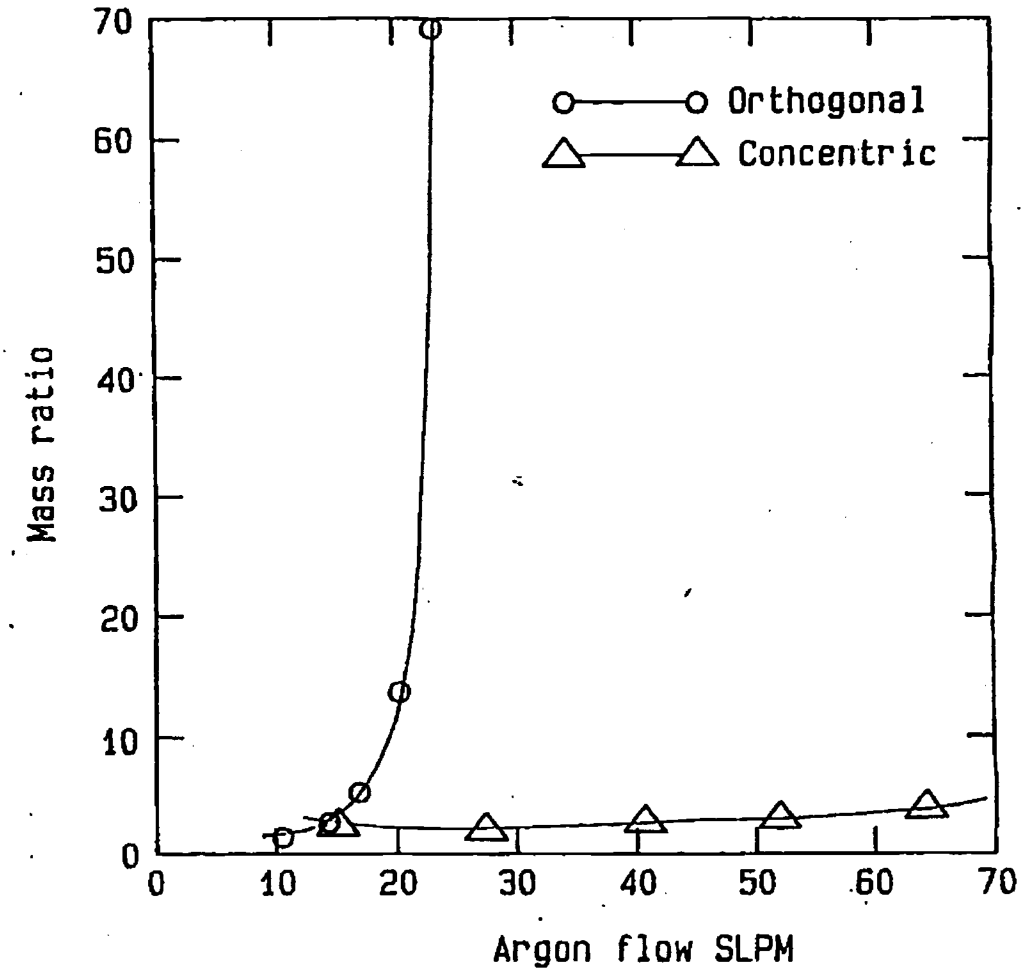
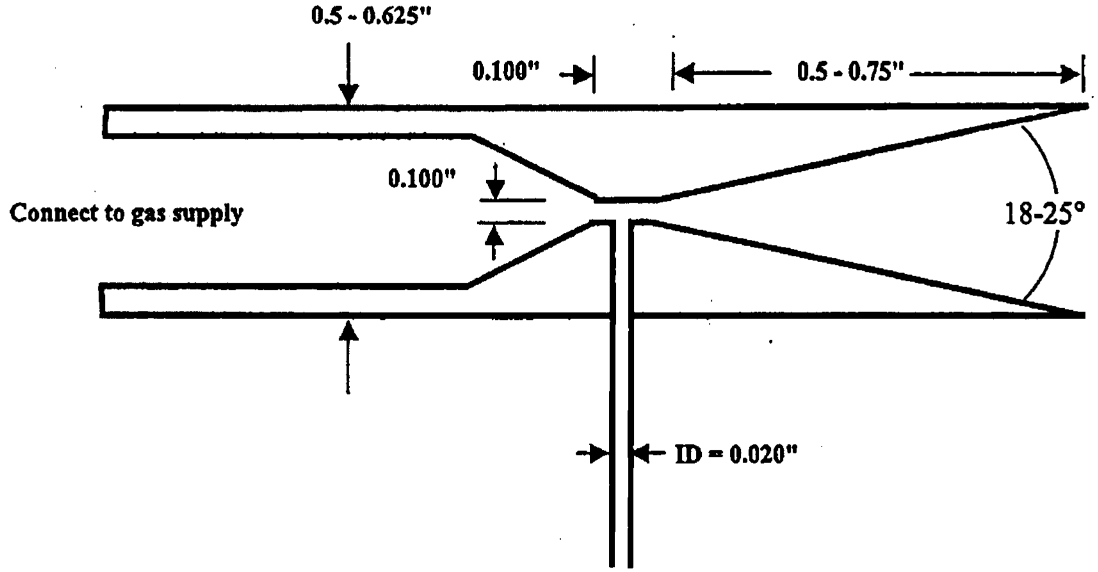

Orthogonal
Concentric
Mass ratio
Argon flow SLPM
0
10
20
30
40
50
60
70

FIG. 5



Not drawn to scale. The dimensions are not critical as the ranges indicate. The lower tube (stainless hypodermic works well) extends into the liquid. The sprayer works in any orientation so it is a matter of ensuring flow. The sprayer lifts water about 20" so length of the feed tube is only critical to heating the liquid.

Attachment Five

IN-TOX PRODUCTS
ITP
1712 Virginia NE
Albuquerque, New Mexico 87110
Phone (505) 299-1810
Fax (505) 293-9506
Developers and Suppliers
Aerosol Equipment for Toxicology & Environmental Research

Mar. 25, 1993

Mr. William J. Carmack;

I am in receipt of your letter dated Mar. 8,1993 and will try to answer your questions as best I can. The Impactor that you make reference to is indeed a 20L/min. Impactor with ECD cuts of 11.2 to.66. I have enclosed a copy of the curve and particle data for you. You will note on the curve that we show particle collection sizes for a short range below and above the designed flow range. This Impactor will function at these ranges and possibly a little farther, but we do not recommend that the user try to operate it at as low a range as you have mentioned. The particles become unstabe as the reynolds number gets lower. We never try to design an Impactor that operates at a reynolds number lower than 500. I el that you would be able to operate this Impactor at 14L/min., but I would not suggest that you go much below that. I am sure that the other four Impactors that you mentuoned are of the same flow rate and particle size range as the one you have that is stamped. You can check them out by sizing the jets with drill balnks or by use of an optical comparator. One of the enclosed sheets has the jet diameters (in inches) listed on it. I have also enclosed the same information for the 1L/min. Impacotr. I am sorry that I can not be more helpful to you, but if you have problems with the jet sizing you can send them to me for sizing.

I have listed the catalog numbers and prices for the other instruments you requested. I do not have a lot of information on the High Temp Impactor, but it is the same model that is used by Lovelace Biomedical. If you wish, you could get more info from George Newton at ITRI, or I will try to get the information you might need. Please let me know if I can help.

Sincerely yours,

Larry E. Bowen

Diffusion Battery: cat. no. 02-2000 Cost: $ 3,950.00
this instrument is machined to be compatable with he Multi-Jet Impactor as a per-cut unit.

High Temperature Impactor; cat. no. 02-300 Cost: $ 6, 975.00
Gold Wire seals are not included at this price.

Diffusion Battery; cat. no. 02-1900 Cost: $ 1,925.00

IN-TOX PRODUCTS ITP

IMPACTOR E.C.D./FLOW CHART

Page 20

STAGE NO. 1

FLOW	E.C.D.	Re. No.
14000 cc.	13.5	1644
16000 cc.	12.6	1879
18000 cc.	11.9	2114
20000 cc.	11.29	2349
22000 cc.	10.7	2584
24000 cc.	10.3	2819

STAGE NO. 2

FLOW	E.C.D.	Re. No.
14000 cc.	8.4	1411
16000 cc.	7.9	1613
18000 cc.	7.4	1814
20000 cc.	7.1	2016
22000 cc.	6.7	2217
24000 cc.	6.4	2419

STAGE NO. 3

FLOW	E.C.D.	Re. No.
14000 cc.	5.3	1467
16000 cc.	5.0	1676
18000 cc.	4.7	1896
20000 cc.	4.4	2095
22000 cc.	4.2	2305
24000 cc.	4.08	2514

STAGE NO. 4

FLOW	E.C.D.	Re. No.
14000 cc.	3.3	1650
16000 cc.	3.1	1886
18000 cc.	2.9	2121
20000 cc.	2.8	2357
22000 cc.	2.6	2593
24000 cc.	2.5	2828

STAGE NO. 5

FLOW	E.C.D.	Re. No.
14000 cc.	2.1	1715
16000 cc.	1.9	1960
18000 cc.	1.8	2205
20000 cc.	1.76	2450
22000 cc.	1.64	2695
24000 cc.	1.61	2940

STAGE NO. 6

FLOW	E.C.D.	Re. No.
14000 cc.	1.33	1780
16000 cc.	1.24	2035
18000 cc.	1.17	2289
20000 cc.	1.11	2543
22000 cc.	1.06	2798
24000 cc.	1.01	3052

STAGE NO. 7

FLOW	E.C.D.	Re. No.
14000 cc.	.83	2001
16000 cc.	.78	2287
18000 cc.	.74	2572
20000 cc.	.70	2858
22000 cc.	.66	3144
24000 cc.	.64	3430

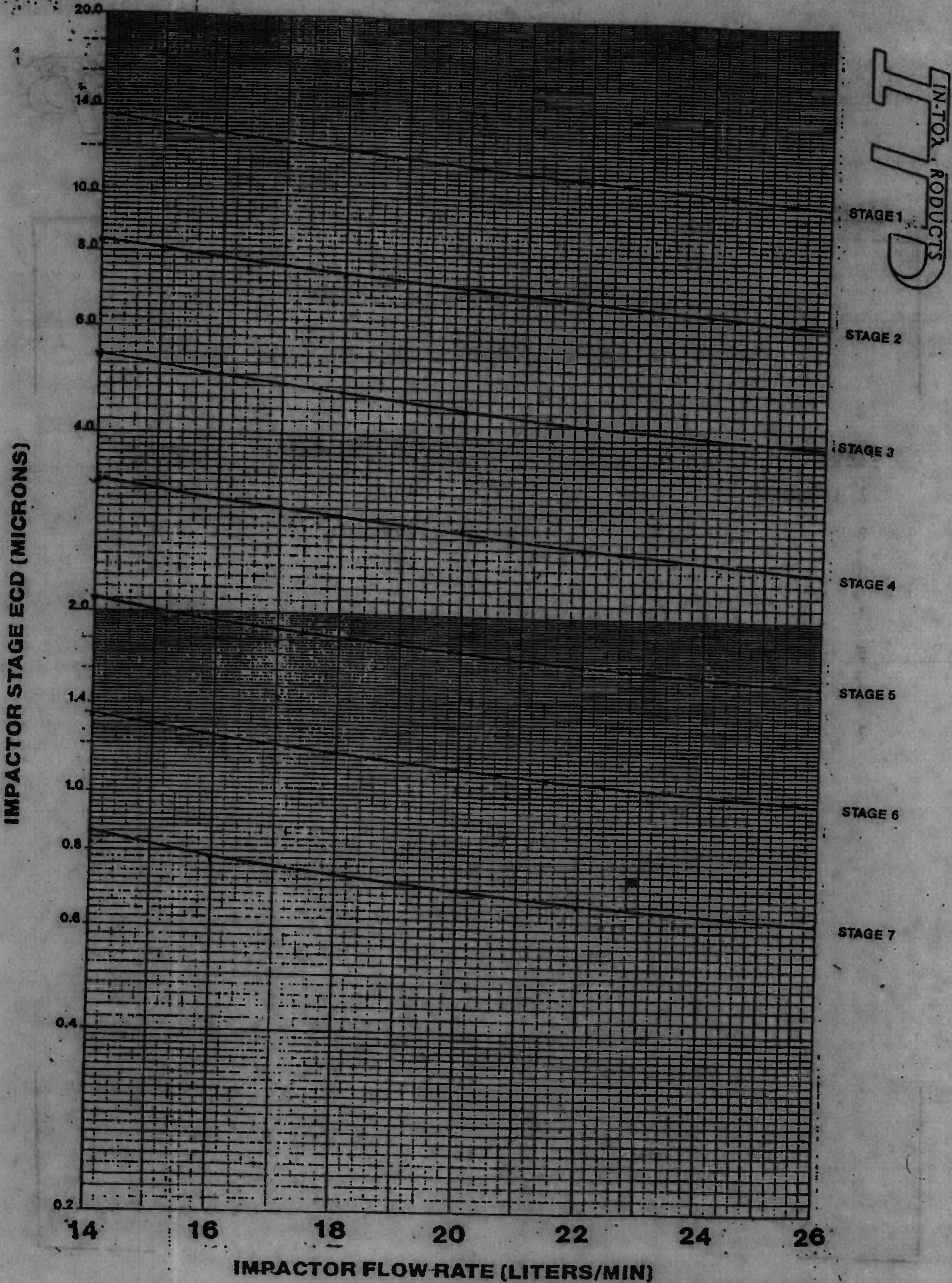
IN-TOX PRODUCTS
ITP

Page 21

IMPACTOR SIZE. 20L/min.

E.C.D. RANGE. 11.3 to .7

STAGE NO.	No. OF JETS.	JET DIA. (inches)	E.C.D.
1 (NOSE)	1	.460	11.29
2	2	.268	7.1
3	3	.172	4.4
4	4	.115	2.8
5	6	.074	1.76
6	9	.047	1.11
7	12	.032	.70


IN-TOX PRODUCTS
STAGE 1
STAGE 2
STAGE 3
STAGE 4
STAGE 5
STAGE 6
STAGE 7
IMPACTOR STAGE ECD (MICRONS)
20.0
14.0
10.0
8.0
6.0
4.0
2.0
1.4
1.0
0.8
0.6
0.4
0.2
14
16
18
20
22
24
26
IMPACTOR FLOW RATE (LITERS/MIN)

IN-TOX PRODUCTS ITP

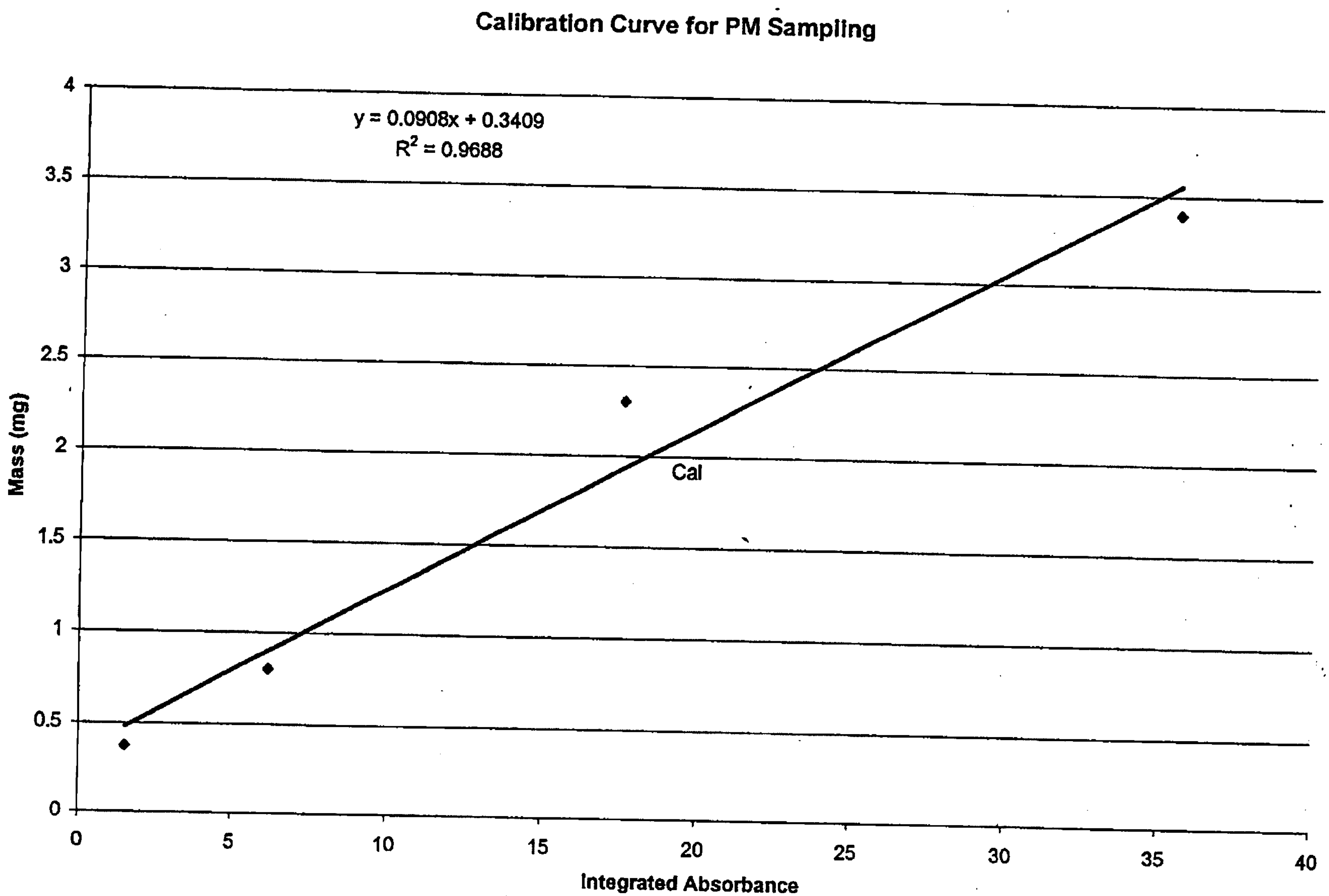
Page 21

IMPACTOR SIZE. 20L/min.

E.C.D. RANGE. 11.3 to .7

STAGE NO.	No. OF JETS.	JET DIA. (inches)	E.C.D.
1 (NOSE)	1	.460	11.29
2	2	.268	7.1
3	3	.172	4.4
4	4	.115	2.8
5	6	.074	1.76
6	9	.047	1.11
7	12	.032	.70

Attachment Six


Calibration Curve for PM Sampling
y = 0.0908x + 0.3409
R2 = 0.9688
Cal
Mass (mg)
0
0.5
1
1.5
2
2.5
3
3.5
4
0
5
10
15
20
25
30
35
40
Integrated Absorbance

Attachment Seven

Attachment Seven - Table 1

25 hz SKID A

Minimum Flow Velocity

Time: 08:30 21 March, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (ft/min)
A1	0.5	3.000	0.020	522
A2	1.3	2.000	0.025	583
A3	2.3	2.000	0.030	639
A4	3.8	0.000	0.038	719
A5	8.1	0.000	0.032	660
A6	9.7	0.000	0.035	690
A7	10.7	1.000	0.030	639
A8	11.5	1.000	0.030	639
Sum Absolute Values		9.00	Sum center (2/3) =	2,709
Average Absolute Values		1.13	Average center (2/3) =	677

Time: 10:30 21 March, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (ft/min)
B1	0.5	0.000	0.020	522
B2	1.3	1.000	0.022	547
B3	2.3	0.000	0.025	583
B4	3.8	0.000	0.029	628
B5	8.1	2.000	0.031	650
B6	9.7	0.000	0.031	650
B7	10.7	0.000	0.031	650
B8	11.5	0.000	0.029	628
Sum Absolute Values		3.00	Sum center (2/3) =	2,511
Average Absolute Values		0.38	Average center (2/3) =	628

Temperature =	8.500	C
	47.300	F
Ts =	507.300	R
Ps[1] =	25.580	in Hg
Ms =	29.000	lb/lb-mole
Cp =	0.870	
Kp =	85.490	
K =	4241.796	

Average FPM over entire stack =	622	feet/min.
Average FPS over entire stack =	10	feet/sec.
Qs(acfm) over entire stack =	489	feet³/min.
Qs(acfs) over entire stack =	8	feet³/sec.
Average FPM center 2/3 =	653	feet/min.
Average FPS center 2/3 =	11	feet/sec.
Qs(acfm) center (2/3) =	513	feet³/min.
Qs(acfs) center (2/3) =		feet³/sec.
	455	

Investigation of Cyclonic Flow

Grand Sum Absolute Values	12.000
Grand Average Absolute Values	0.750

Statement of Test Performance:
Average of Absolute Values
Must be less than 20 degrees — Pass Test

Investigation of Stack Dry Gas Velocity Profile

	Considering middle two thirds of stack
Grand Sum	5,221
Grand Average	653
Grand Standard Deviation	41
COV	0.06

Statement of Test Performance
COV Must Be Less Than 20% (i.e. 0.20) — Pass Test

[1]Averaged over measurement times relative to Pocatello Regional Airport Meterological Station.

Attachment Seven - Table 2

Maximum Flow Velocity

40 hz SKID A

Time: 11:00 21 March, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (ft/min)
A1	0.5	1.000	1.320	4,250
A2	1.3	2.000	1.440	4,439
A3	2.3	0.000	1.500	4,531
A4	3.8	1.000	1.650	4,752
A5	8.1	0.000	1.620	4,709
A6	9.7	-1.000	1.520	4,561
A7	10.7	-1.000	1.450	4,455
A8	11.5	-2.000	1.380	4,314
Sum Absolute Values		8.00	Sum center (2/3) =	18,552
Average Absolute Values		1.00	Average center (2/3) =	4,638

Time: 10:30 21 March, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (ft/min)
B1	0.5	1.000	1.180	4,019
B2	1.3	3.000	1.260	4,153
B3	2.3	0.000	1.330	4,266
B4	3.8	-1.000	1.440	4,439
B5	8.1	-2.000	1.710	4,838
B6	9.7	-2.000	1.630	4,723
B7	10.7	-3.000	1.590	4,665
B8	11.5	-2.000	1.520	4,561
Sum Absolute Values		14.00	Sum center (2/3) =	18,266
Average Absolute Values		1.75	Average center (2/3) =	4,567

Temperature =	9.880	C
	49.784	F
Ts =	509.784	R
Ps[1] =	25.580	in Hg
Ms =	29.000	lb/lb-mole
Cp =	0.870	
Kp =	85.490	
K =	4252.168	

Average FPM over entire stack =	4,480	feet/min.
Average FPS over entire stack =	75	feet/sec.
Qs(acfm) over entire stack =	3,518	feet³/min.
Qs(acfs) over entire stack =	59	feet³/sec.
Average FPM center 2/3 =	4,602	feet/min.
Average FPS center 2/3 =	77	feet/sec.
Qs(acfm) center (2/3) =	3,615	feet³/min.
Qs(acfs) center (2/3) =		feet³/sec.
	3,193	

Investigation of Cyclonic Flow

Grand Sum Absolute Values	22.000
Grand Average Absolute Values	1.375

Statement of Test Performance:
Average of Absolute Values
Must be less than 20 degrees — Pass Test

Investigation of Stack Dry Gas Velocity Profile

	Considering middle two thirds of stack
Grand Sum	36,818
Grand Average	4,602
Grand Standard Deviation	189
COV	0.04

Statement of Test Performance
COV Must Be Less Than 20% (i.e. 0.20) — Pass Test

[1]Averaged over measurement times relative to Pocatello Regional Airport Meterological Station.

Attachment Seven - Table 3

60 hz SKID A

Time: 09:48 20 March, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (ft/min)
A1	0.5	3.000	0.570	2,792
A2	1.3	2.000	0.600	2,865
A3	2.3	0.000	0.655	2,993
A4	3.8	-2.000	0.700	3,094
A5	8.1	-12.000	0.715	3,127
A6	9.7	-11.000	0.750	3,203
A7	10.7	-15.000	0.710	3,116
A8	11.5	-2.000	0.660	3,005
Sum Absolute Values		47.00	Sum center (2/3) =	12,417
Average Absolute Values		5.88	Average center (2/3) =	3,104

Time: 10:30 21 March, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (ft/min)
B1	0.5	3.000	0.540	2,718
B2	1.3	3.000	0.600	2,865
B3	2.3	2.000	0.640	2,959
B4	3.8	-1.000	0.671	3,029
B5	8.1	-2.000	0.790	3,287
B6	9.7	-2.000	0.760	3,224
B7	10.7	-4.000	0.715	3,127
B8	11.5	-3.000	0.650	2,982
Sum Absolute Values		20.00	Sum center (2/3) =	12,499
Average Absolute Values		2.50	Average center (2/3) =	3,125

Temperature =	8.500	C
	47.300	F
Ts =	507.300	R
Ps[1] =	25.470	in Hg
Ms =	29.000	lb/lb-mole
Cp =	0.870	
Kp =	85.490	
K =	4250.945	

Average FPM over entire stack =	3,024	feet/min.
Average FPS over entire stack =	50	feet/sec.
Qs(acfm) over entire stack =	2,375	feet³/min.
Qs(acfs) over entire stack =	40	feet³/sec.
Average FPM center 2/3 =	3,115	feet/min.
Average FPS center 2/3 =	52	feet/sec.
Qs(acfm) center (2/3) =	2,446	feet³/min.
Qs(acfs) center (2/3) =		feet³/sec.
	2,162	

Investigation of Cyclonic Flow

Grand Sum Absolute Values	67.000
Grand Average Absolute Values	4.188

Statement of Test Performance:
Average of Absolute Values
Must be less than 20 degrees — Pass Test

Investigation of Stack Dry Gas Velocity Profile

	Considering middle two thirds of stack
Grand Sum	24,917
Grand Average	3,115
Grand Standard Deviation	117
COV	0.04

Statement of Test Performance
COV Must Be Less Than 20% (i.e. 0.20) — Pass Test

[1] Averaged over measurement times relative to Pocatello Regional Airport Meterological Station.

Attachment Seven - Table 4

Minimum Flow Rate

25 hz SKID B Time: 10:05 18April, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (ft/min)
A1	0.5	0.000	0.015	457
A2	1.3	0.000	0.015	457
A3	2.3	0.000	0.020	527
A4	3.8	0.000	0.020	527
A5	8.1	0.000	0.020	527
A6	9.7	0.000	0.020	527
A7	10.7	0.000	0.015	457
A8	11.5	0.000	0.015	457
Sum Absolute Values		0.000	sum (2/3)	2,109
Average Absolute Values		0.000	average (2/3)	527

Time: 12:10 18 April, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (ft/min)
B1	0.5	0.000	0.020	527
B2	1.3	0.000	0.020	527
B3	2.3	0.000	0.030	646
B4	3.8	0.000	0.030	646
B5	8.1	0.000	0.030	646
B6	9.7	0.000	0.030	646
B7	10.7	0.000	0.025	589
B8	11.5	0.000	0.025	589
Sum Absolute Values		0.000	sum (2/3)	2,583
Average Absolute Values		0.000	average (2/3)	646

Temperature =	11.8	C
	53.2	F
Ts =	513.2	R
Ps[1] =	25.380	in Hg
Ms =	29.000	lb/lb-mole
Cp =	0.870	
Kp =	85.490	
K =	4285.023	

Average FPM over entire stack =	547	feet/min.
Average FPS over entire stack =	9	feet/sec.
Qs(acfm) over entire stack =	430	feet³/min.
Qs(acfs) over entire stack =	7	feet³/sec.
Average FPM center 2/3 =	586	feet/min.
Average FPS center 2/3 =	10	feet/sec.
Qs(acfm) center (2/3) =	461	feet³/min.
Qs(acfs) center (2/3) =		feet³/sec.
	401	

Investigation of Cyclonic Flow

Grand Sum Absolute Values	0.000
Grand Average Absolute Values	0.000
Statement of Test Performance: Average of Absolute Values Must be less than 20 degrees	Pass Test

Investigation of Stack Dry Gas Velocity Profile

Considering middle two thirds of stack

Grand Sum	4,692
Grand Average	586
Grand Standard Deviation	63
COV	0.11
Statement of Test Performance: COV Must Be Less Than 20% (i.e. 0.20)	Pass Test

[1]Averaged over measurement times relative to Pocatello Regional Airport Meterological Station.

Attachment Seven - Table 5

40 hz — SKID B — Maximum Flow Rate

Time: 07:00 April 18, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (feet/min.)
A1	0.5	-10.00	0.820	3,397
A2	1.3	-8.00	1.020	3,788
A3	2.3	-6.00	1.150	4,023
A4	3.8	-3.00	1.275	4,238
A5	8.1	-1.00	1.390	4,422
A6	9.7	1.00	1.270	4,227
A7	10.7	3.00	1.225	4,152
A8	11.5	5.00	1.215	4,135
Sum Absolute Values		37.00	Sum center (2/3) =	16,908
Average Absolute Values		4.63	Average center (2/3) =	4,227

Time: 13:32 April 18, 2003	Insertion inches	α when VP = 0	VP When α = 90	Vs (feet/min.)
B1	0.5	-6.00	0.950	3,656
B2	1.3	-4.00	1.100	3,934
B3	2.3	-3.00	1.210	4,126
B4	3.8	-3.00	1.310	4,293
B5	8.1	2.00	1.240	4,177
B6	9.7	3.00	1.115	3,961
B7	10.7	5.00	1.075	3,889
B8	11.5	6.00	1.050	3,844
Sum Absolute Values		32.00	Sum center (2/3) =	16,557
Average Absolute Values		4.00	Average center (2/3) =	4,139

Temperature =	15.0	C
	59.0	F
Ts =	519.000	R
Ps[1] =	25.330	in Hg
Ms =	29.000	lb/lb-mole
Cp =	0.870	
Kp =	85.490	
K =	4311.552	

Average FPM over entire stack =	4,016	feet/min.
Average FPS over entire stack =	67	feet/sec.
Qs(acfm) over entire stack =	3,154	$feet^3$/min.
Qs(acfs) over entire stack =	53	$feet^3$/sec.
Average FPM center 2/3 =	4,183	feet/min.
Average FPS center 2/3 =	70	feet/sec.
Qs(acfm) center (2/3) =	3,285	
Qs(acfs) center (2/3) =	55	$feet^3$/sec.
	2823.035	

Investigation of Cyclonic Flow

Grand Sum Absolute Values	69.000
Grand Average Absolute Values	4.313

Statement of Test Performance:
Average of Absolute Values
Must be less than 20 degrees — **Pass Test**

Investigation of Stack Dry Gas Velocity Profile

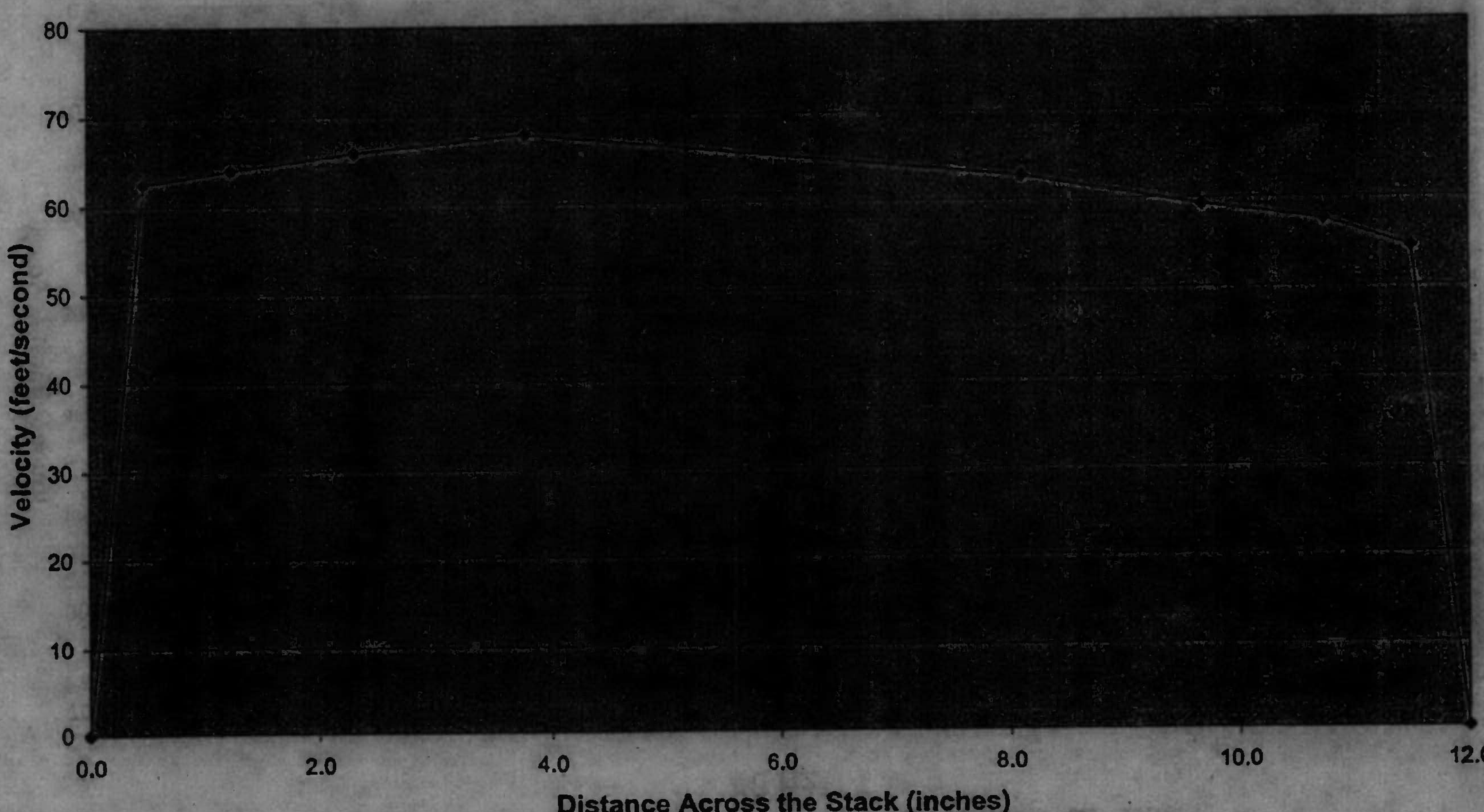
Considering middle two thirds of stack

Grand Sum	33,465
Grand Average	4,183
Grand Standard Deviation	148
COV	0.035

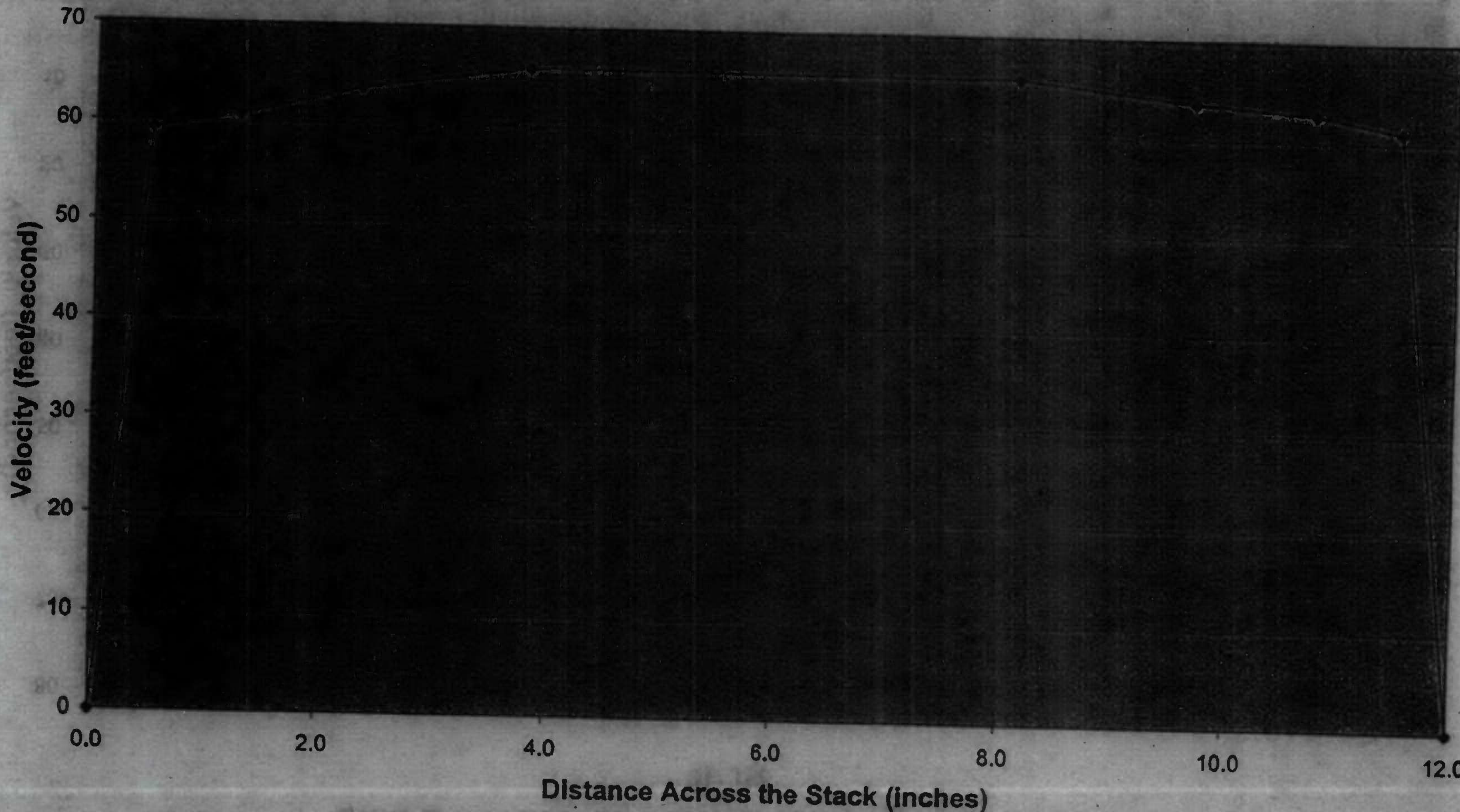
Statement of Test Performance:
COV Must Be Less Than 20% (i.e. 0.20) — **Pass Test**

[1]Averaged over measurement times relative to Pocatello Regional Airport Meterological Station.

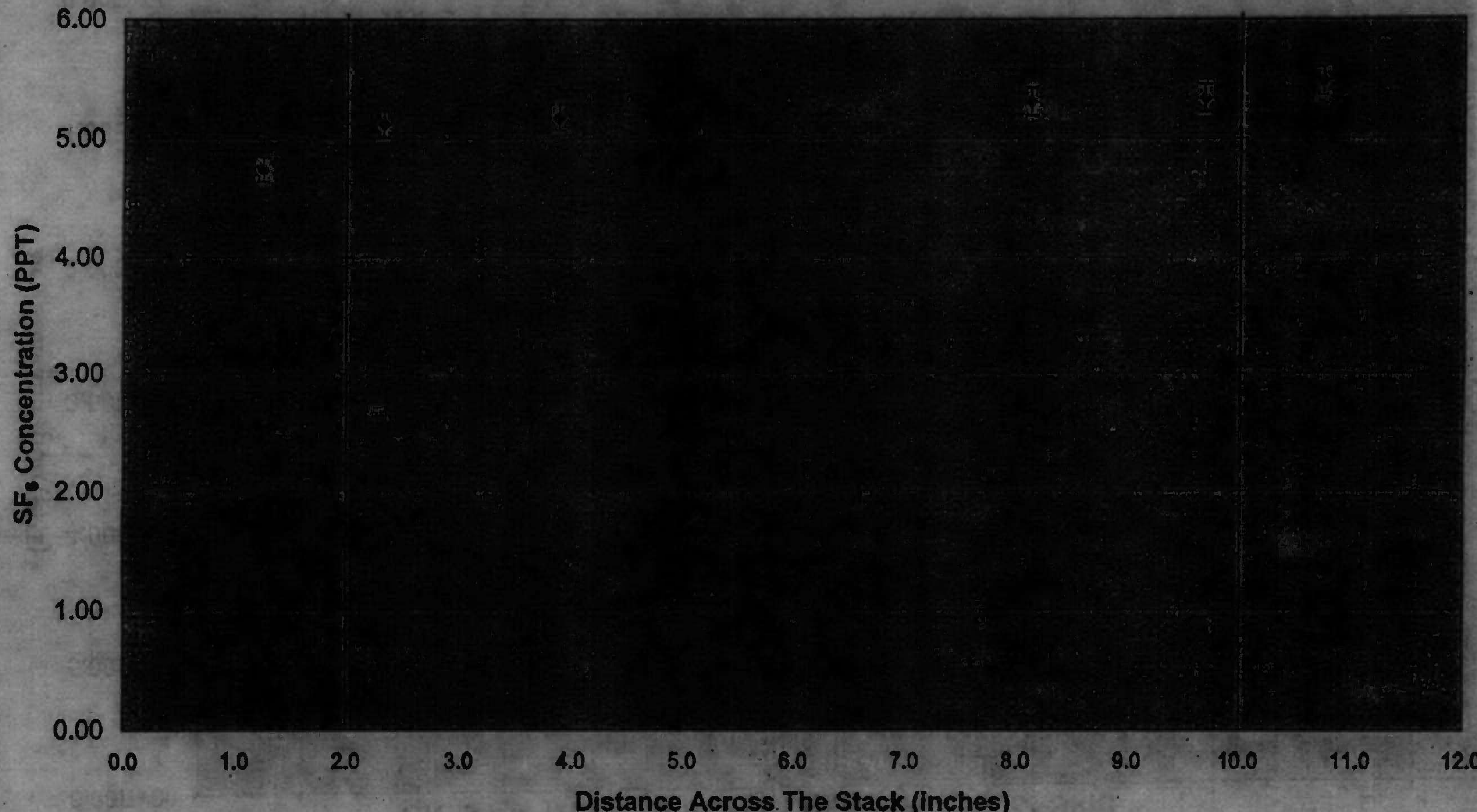
Attachment Seven - Figure 18: Velocity Profile
Skid B - Traverse Parallel to Long Axis of Skid
40 hz



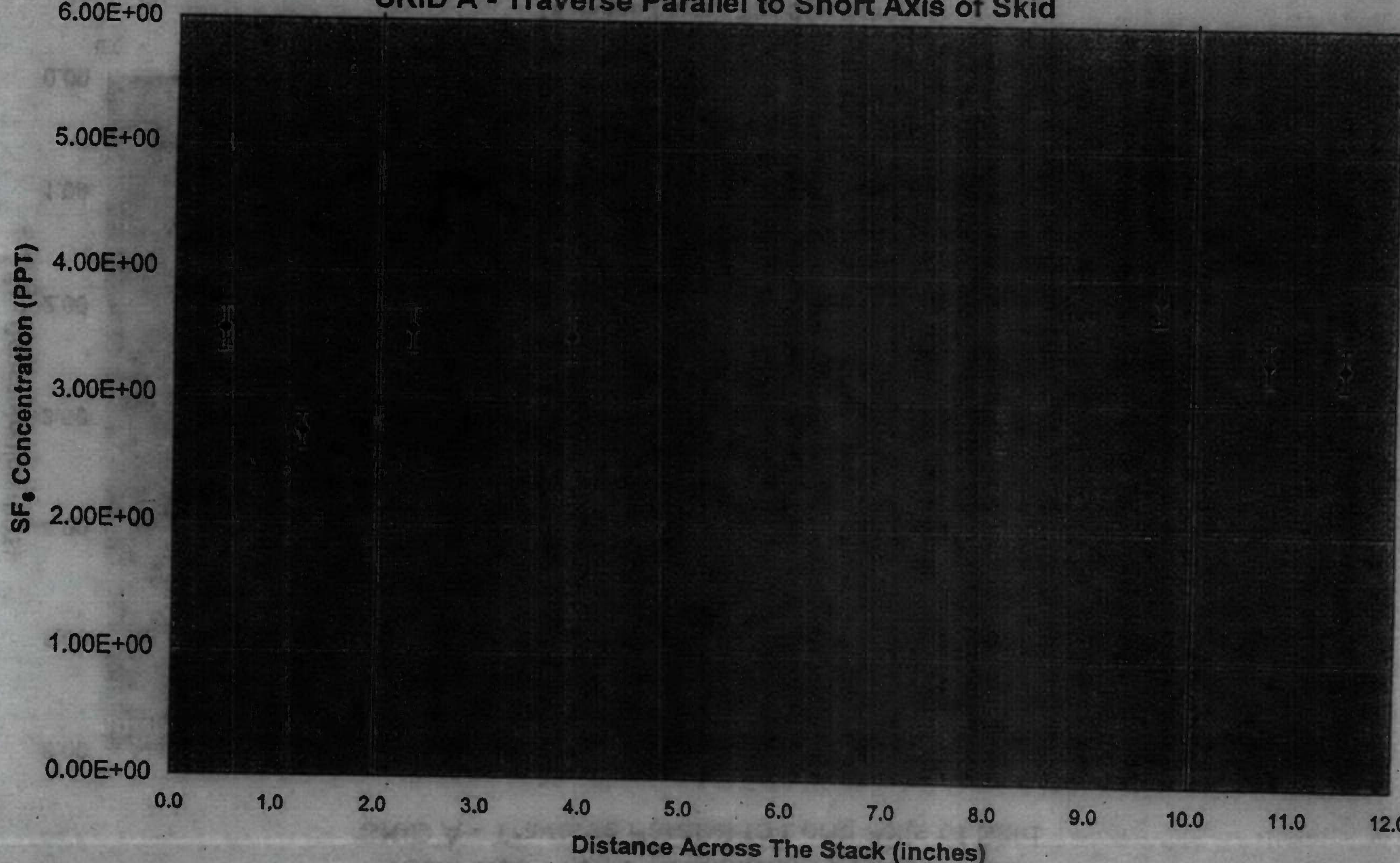
Attachment Seven - Figure 19: Velocity Profile
Skid BW - Traverse Parallel to Short Axis of Skid
40 hz



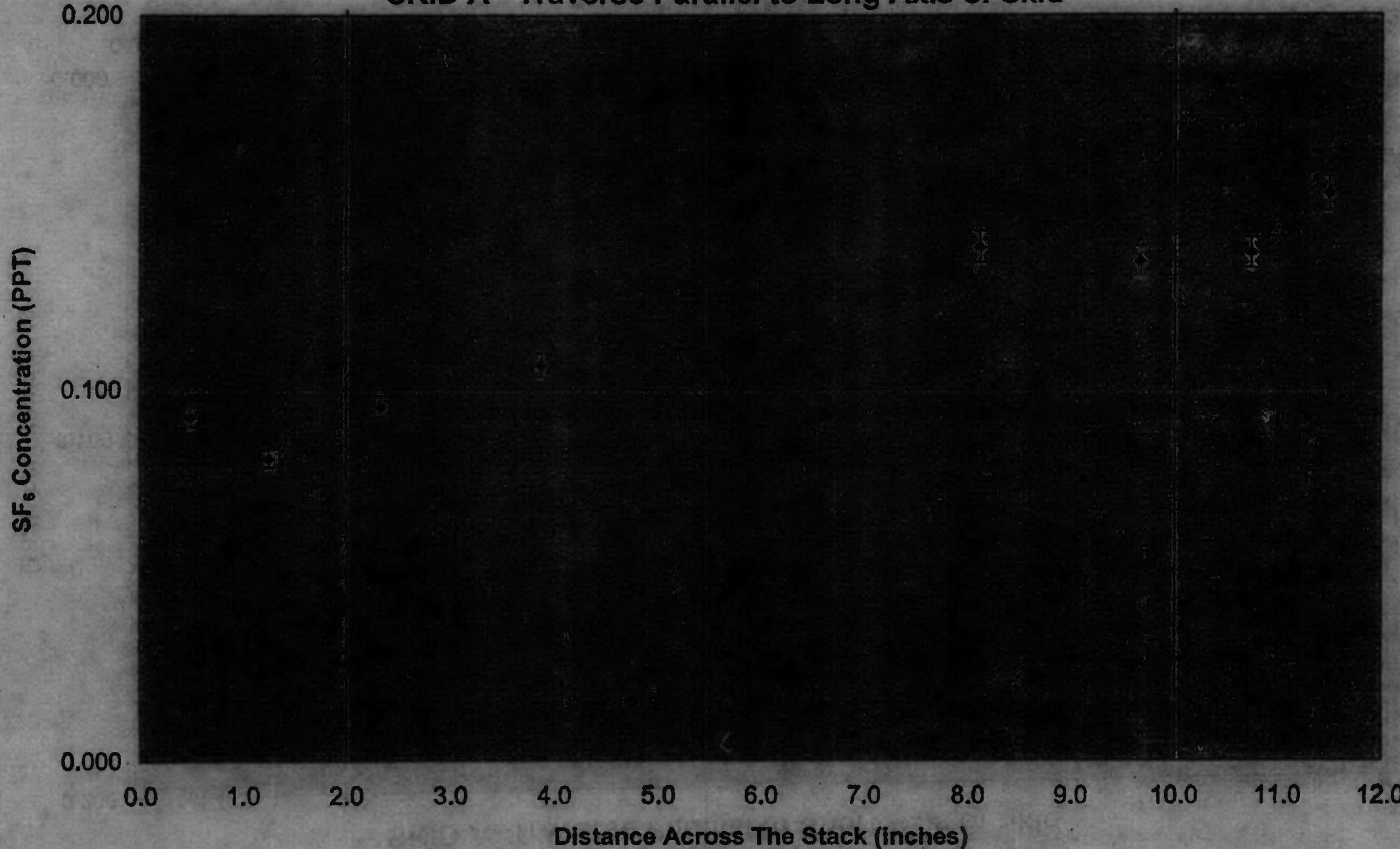
Attachment Seven - Figure 20:
Tracer Gas Profile At Minimum Exhaust Flow
SKID A - Traverse Parallel to Long Axis of Skid



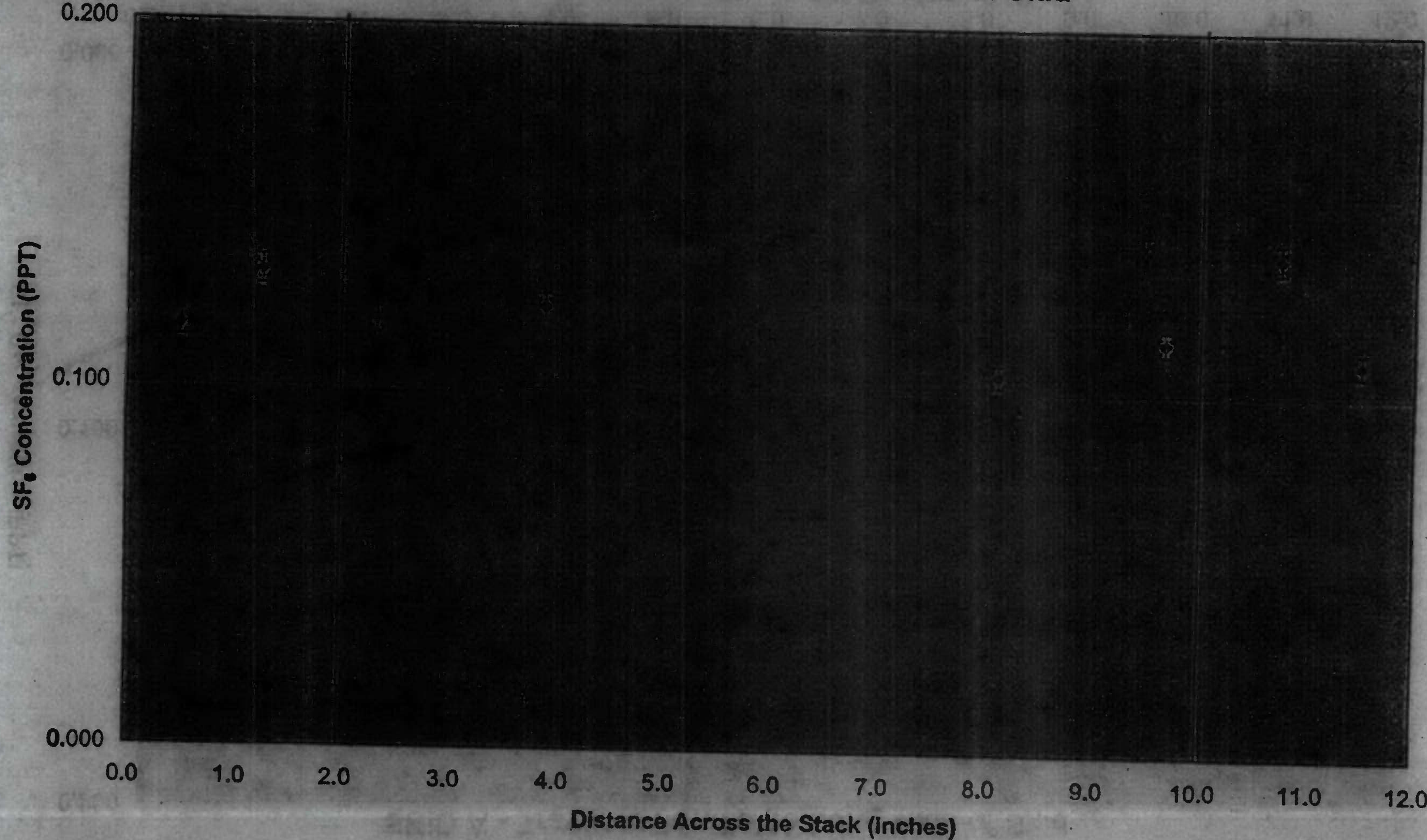
Attachment Seven - Figure 21:
Tracer Gas Profile At Minimum Exhaust Flow
SKID A - Traverse Parallel to Short Axis of Skid



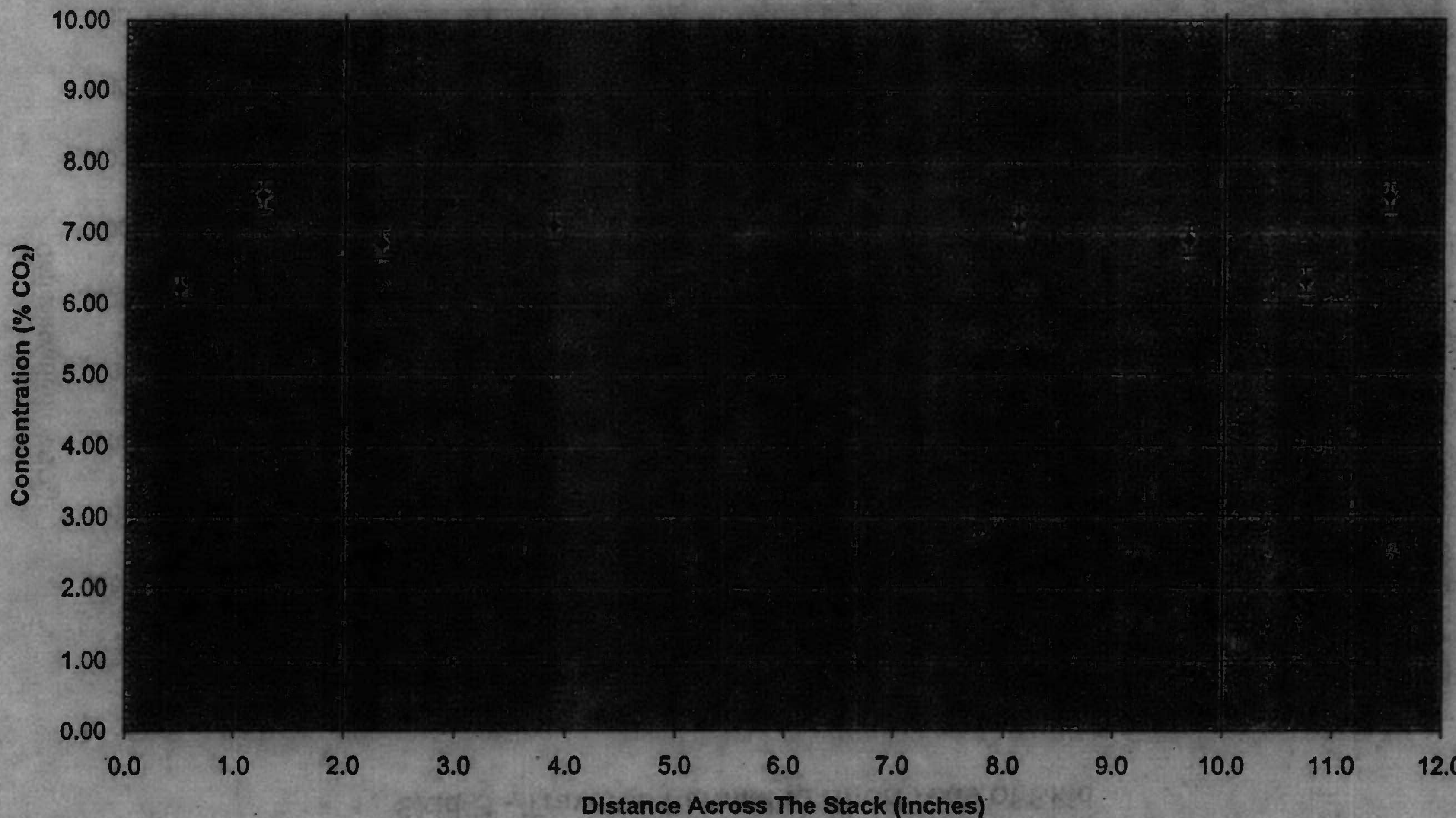
Attachment Seven - Figure 22: Tracer Gas Profile at Maximum Flow Rate SKID A - Traverse Parallel to Long Axis of Skid



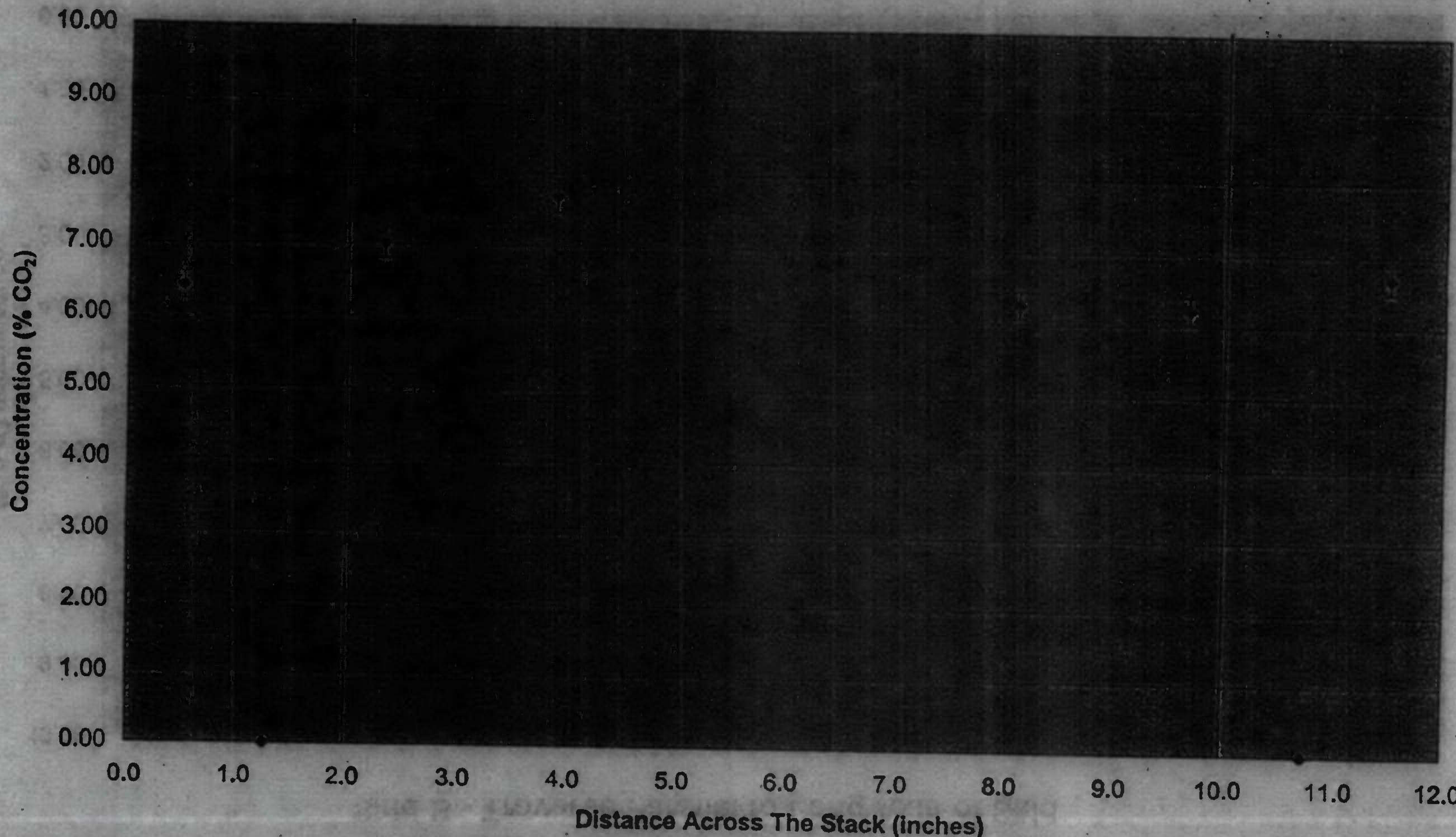
Attachment Seven - Figure 23:
Tracer Gas Profile at Maximum Exhaust Flow
SKID A- Traverse Parallel to Short Axis of Skid



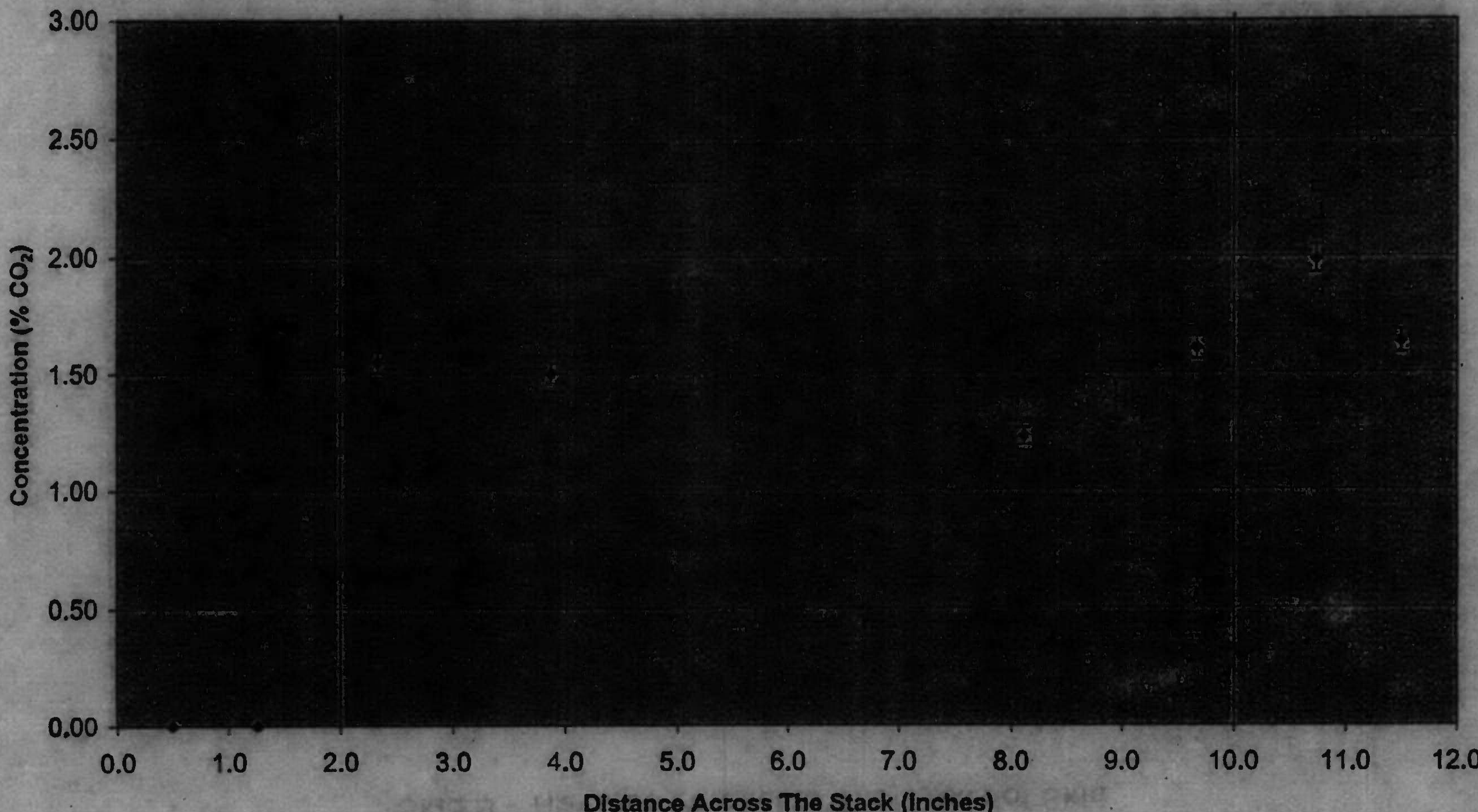
Attachment Seven - Figure 24: Tracer Gas Profile At Minimum Exhaust Flow Skid B - Traverse Parallel to Long Axis of Skid



Attachment Seven - Figure 25:
Tracer Gas Profile At Minimum Exhaust Flow
Skid B - Traverse Parallel to Short Axis of Skid



Attachment Seven - Figure 26:
Tracer Gas Profile At Maximum Exhaust Flow
Skid B - Traverse Parallel to Long Axis of Skid



Attachment Seven - Figure 27:
Tracer Gas Profile At Maximum Exhaust Flow
Skid B - Traverse Parallel to Short Axis of Skid

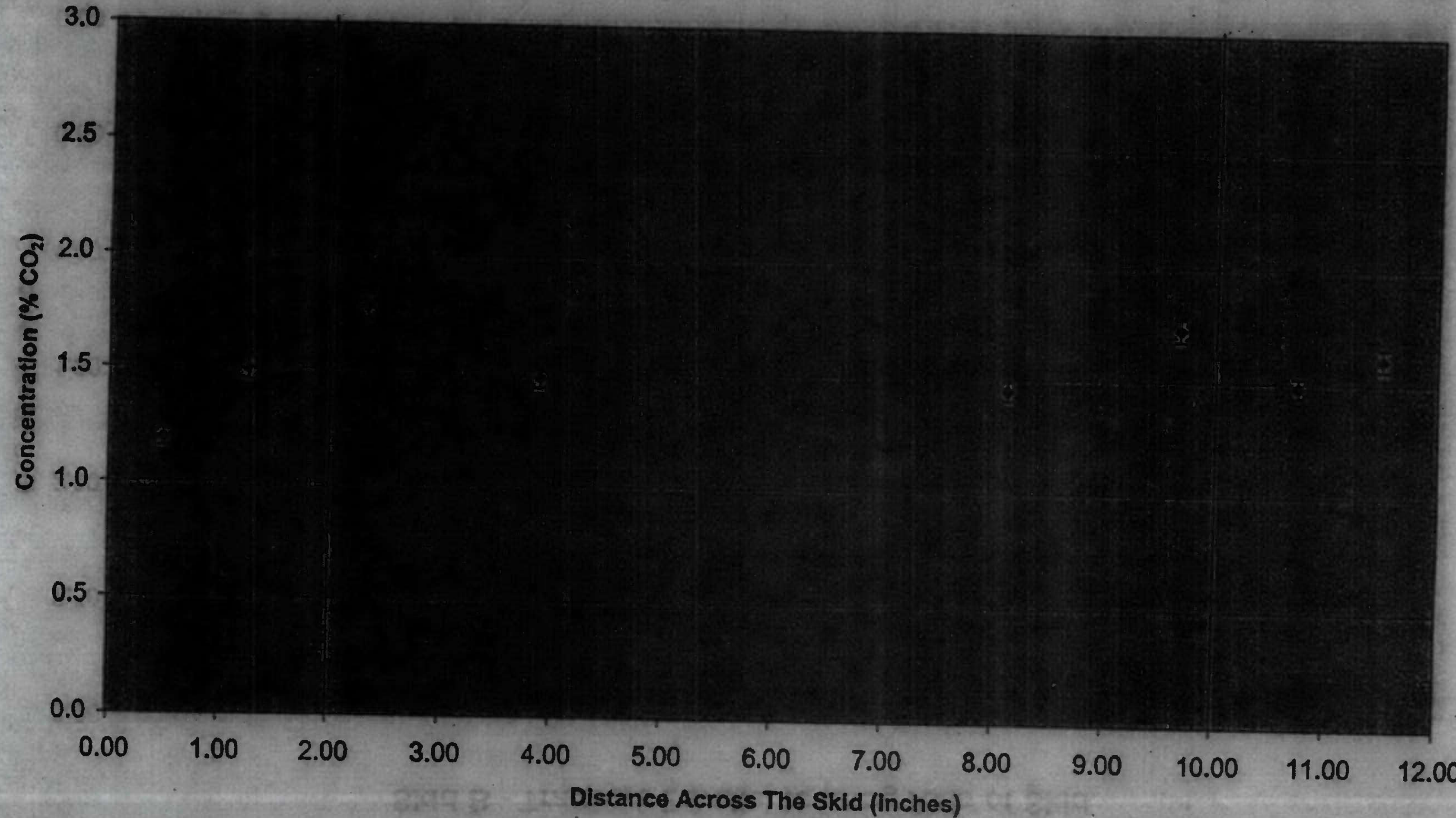


Figure 28
Log Probability Plot of Particle Sizes

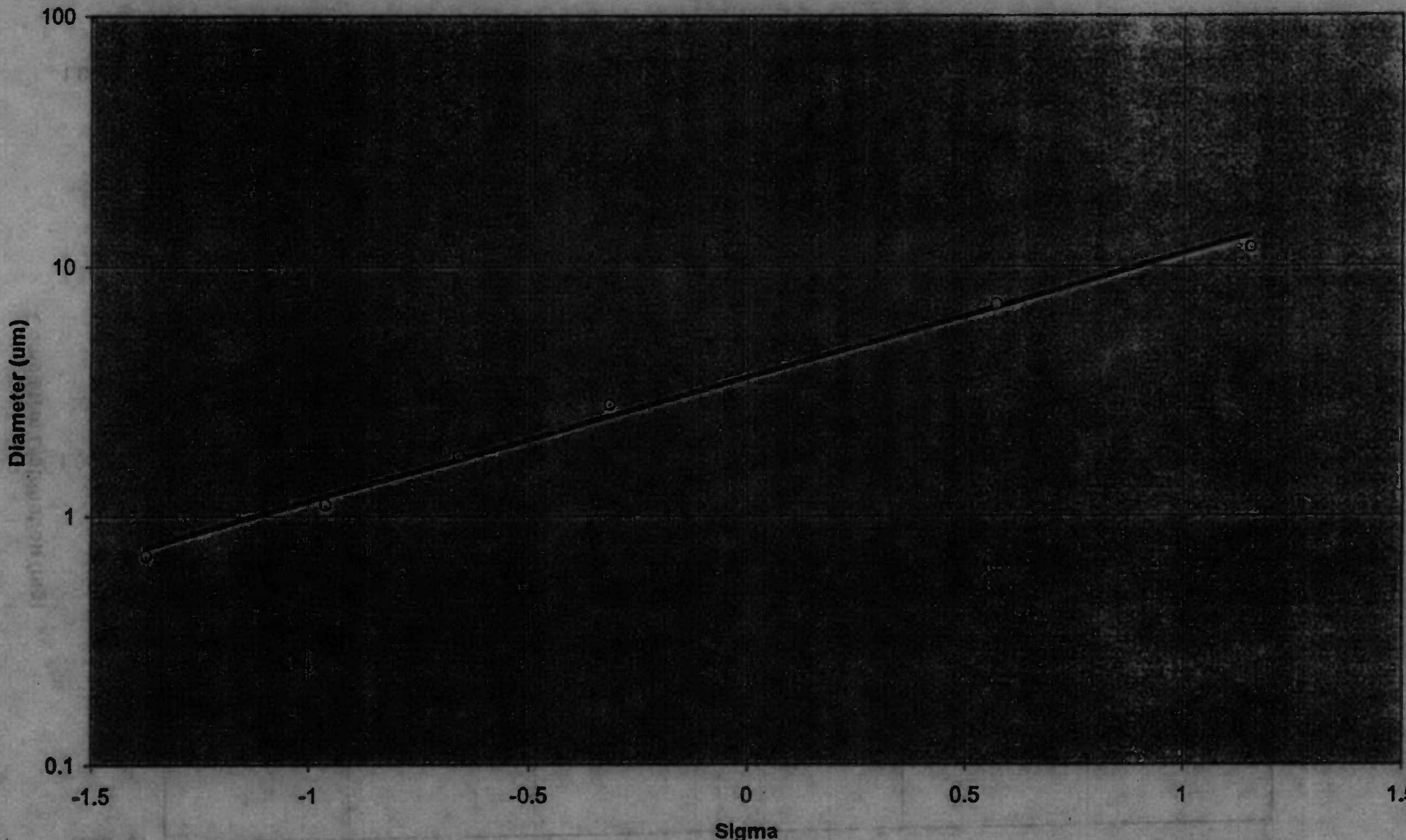


Figure 29
Log Probability Plot

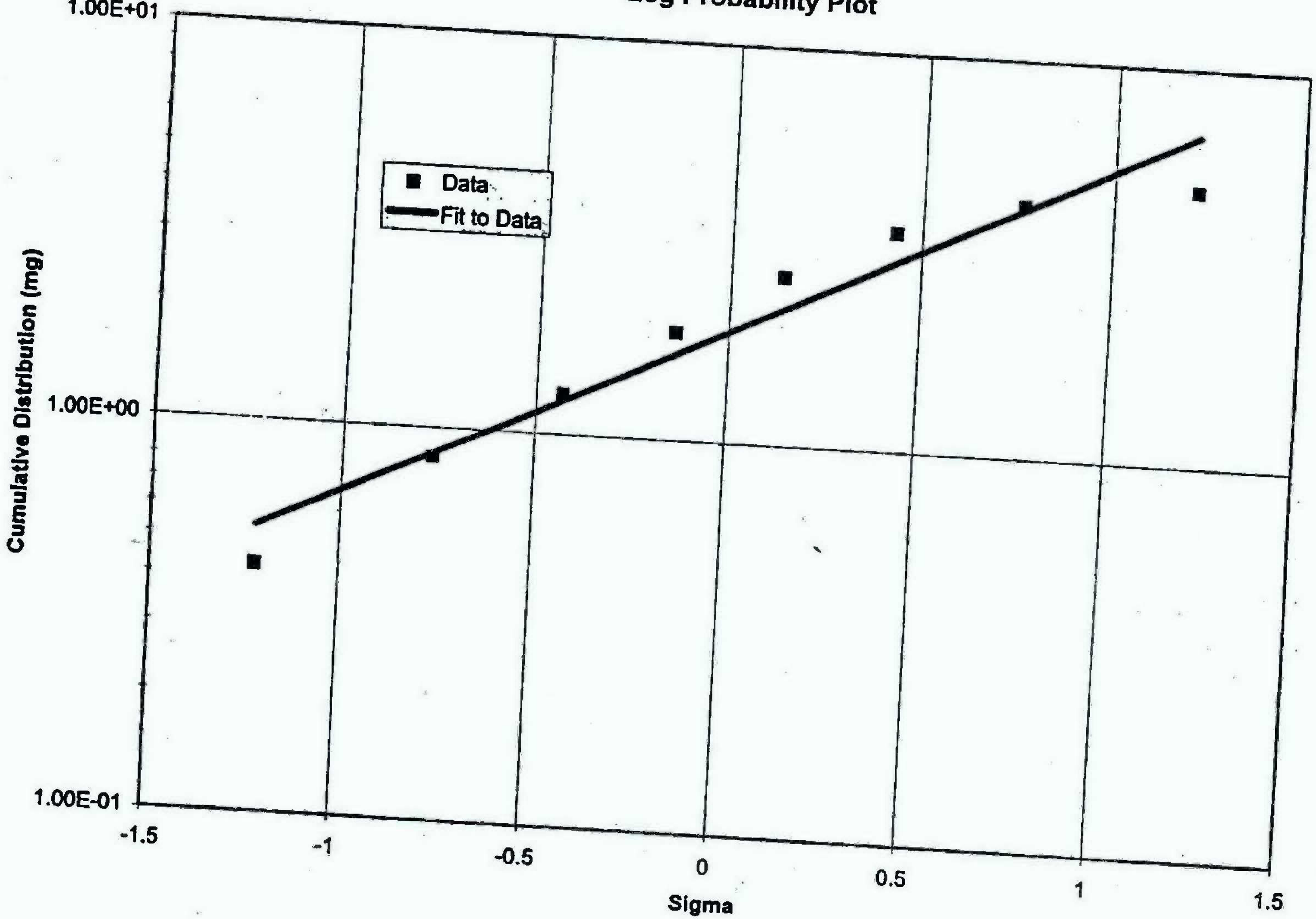


Figure 30
Aersol Particle Deposition Along Horizontal Traverse Skid A Maximum Flow

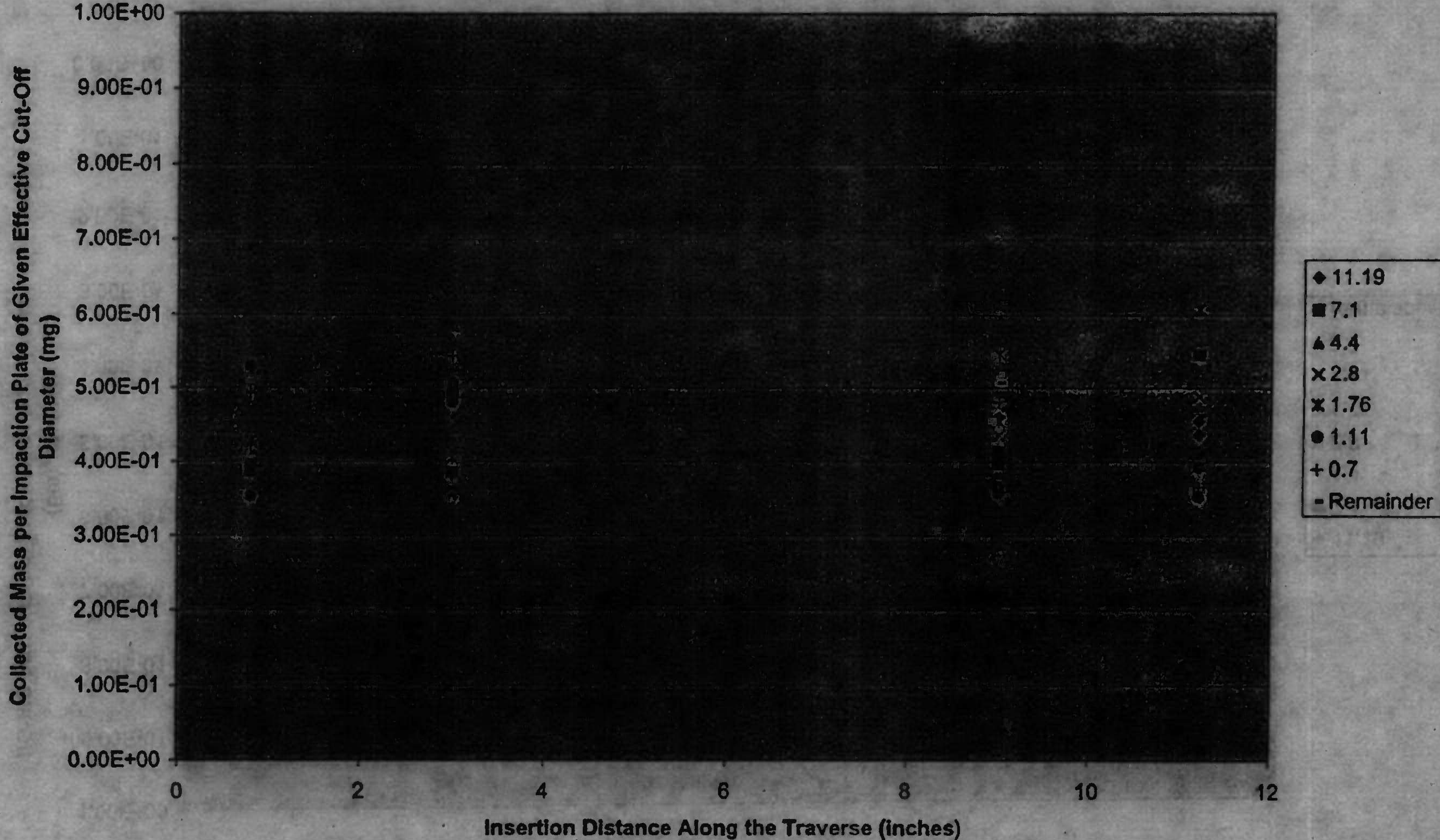


Figure 31
Aerosol Particle Deposition Along Horizontal Traverse Skid A Minimum Flow

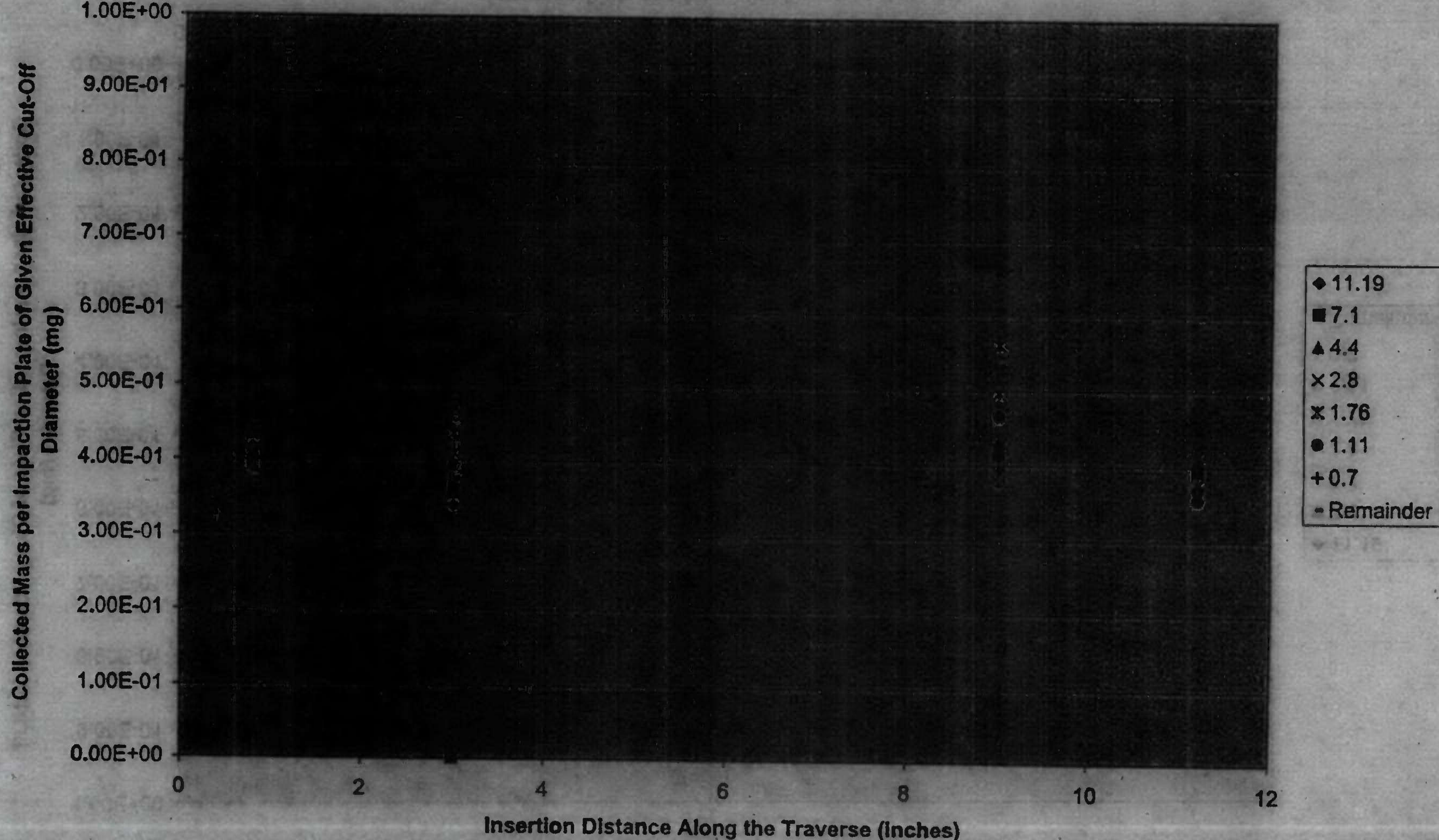


Figure 32
Aerosol Particle Deposition Along Horizontal Traverse Skid B Maximum Flow

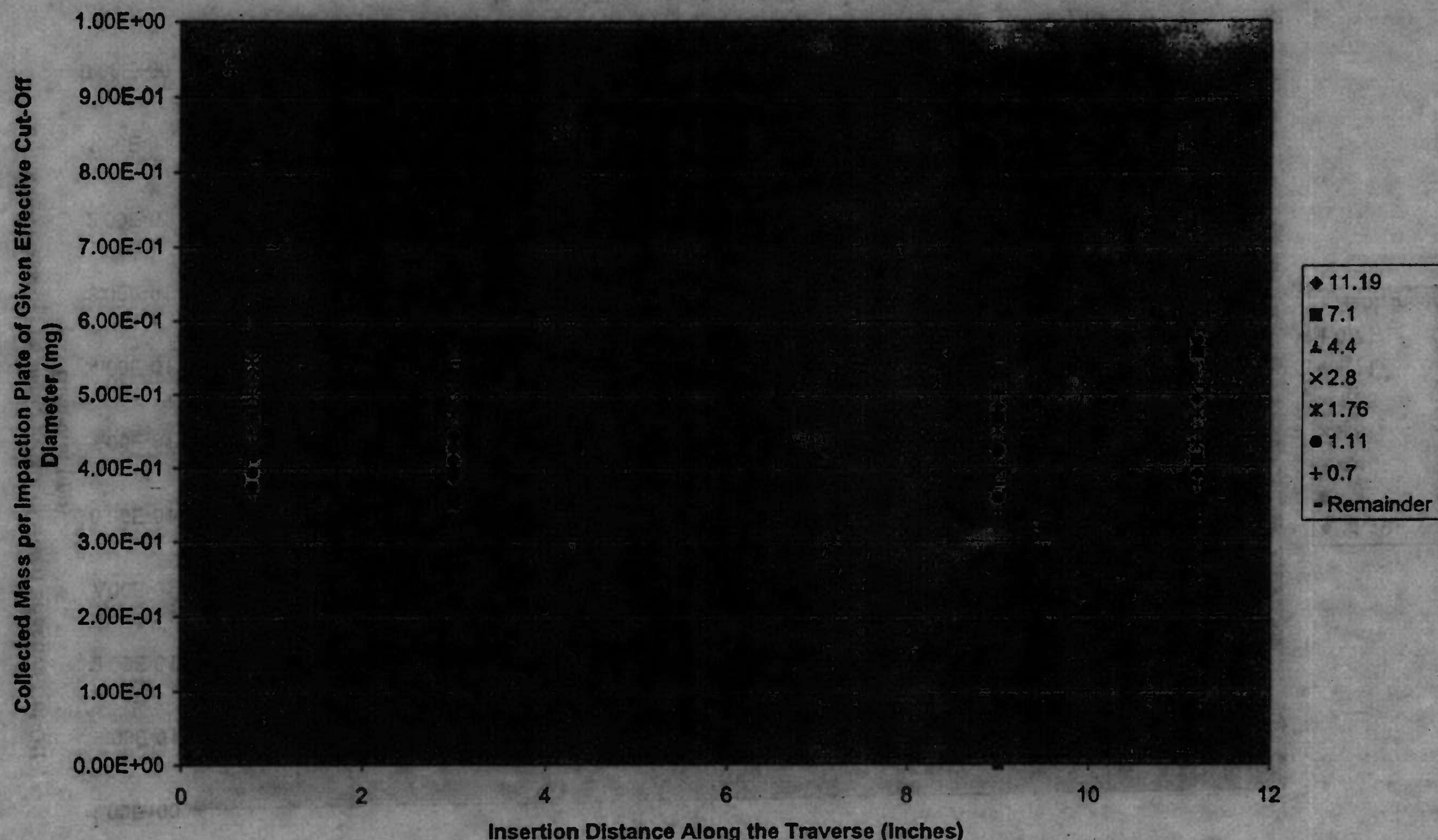
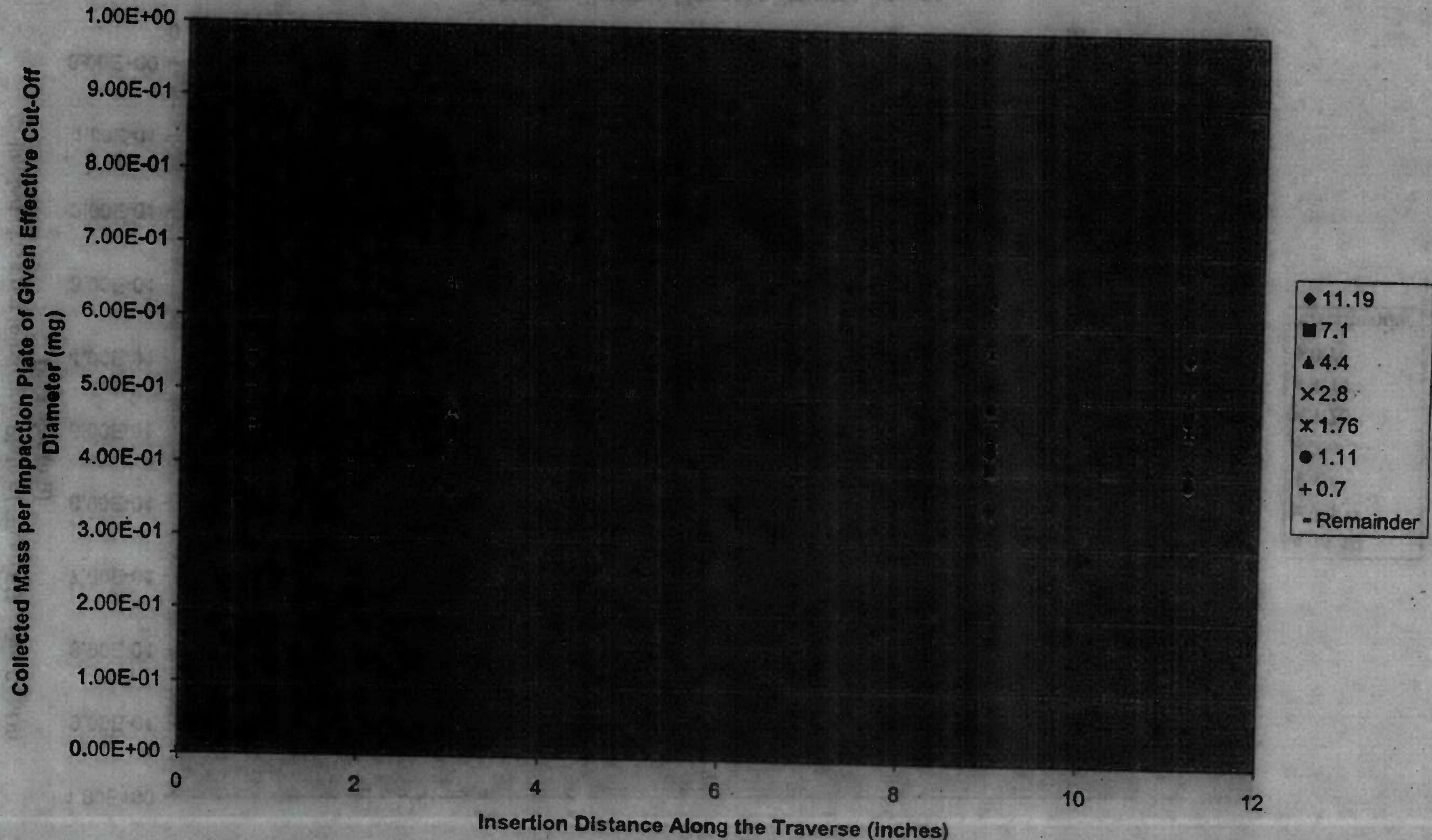


Figure 33
Aerosol Particle Deposition Along Horizontal Traverse Skid B Minimum Flow



Attachment Eight

Assessment of Modifications to the Eberline AMS-4 Beta Continuous Air Monitor Relative to IEEE/ANSI 42.18-1980

15 April, 2003

Idaho State University
Richard R. Brey, Ph.D., C.H.P.

Auxier and Associates
Joseph L. Alvarez. Ph.D., C.H.P.

Assessment of Modifications to the Eberline AMS-4 Beta Continuous Air Monitor Relative to IEEE/ANSI 42.18-1980

1.0 INTRODUCTION

Idaho State University (ISU) in collaboration with Auxier and Associates (AA) Personnel have been requested by Premier Technology Inc. to assess the impact of modifications made to the Eberline AMS-4 Beta Continuous Air Monitor as installed as an off-line monitor in the AN241 Primary Exhauster System (W314). The assessment requested was to consider how changes to the AMS-4 system might impact the system's performance relative to the IEEE/ANSI 42.18-1980 standard entitled: Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents. The working group comprised of ISU and A&A subject matter experts was provided a brief description of the changes made to the AMS-4 system. This oral description provided was accompanied by an inspection of the system by members of the working group. The working group was to base their assessment on professional judgement.

1.1 Description of Changes to the AMS-4 System

During design and construction of the AN241 Primary Exhauster System (W314), Premier Technology's development staff noted a potential problem with high temperature effluent under certain hypothetical operation conditions of the exhauster unit. Specifically, it was feasible that high effluent temperatures could increase the temperature of components in the unit's sampling and detector enclosure. High temperatures of the magnitude anticipated, could conceivably have affect on the radiation detection system's electronics that were destined to be in close proximity to the sampling head and filter. Nominally, the electronic component that is anticipated to be in close proximity to the radiation detectors and subsequently the sampling head and filter would be the radiation detection system's pre-amplifier module component.

To alleviate concerns about possible temperature affects on the electronic components of the AMS-4's radiation detection system, they were removed from the sample head/detector module enclosure to a separate instrument cabinet about 1.5-meters away and into an enclosure incorporating the majority of the radiation detector signal processing electronics. Separate coaxial cables supplying high voltage power to the detectors and conducting the detector signal from the point of origin back to the main radiation detection electronic module, run from the sampling cabinet through a short electrical conduit and into the adjacent instrument cabinet. Figure One is a digital image of the changed system.

Figure One

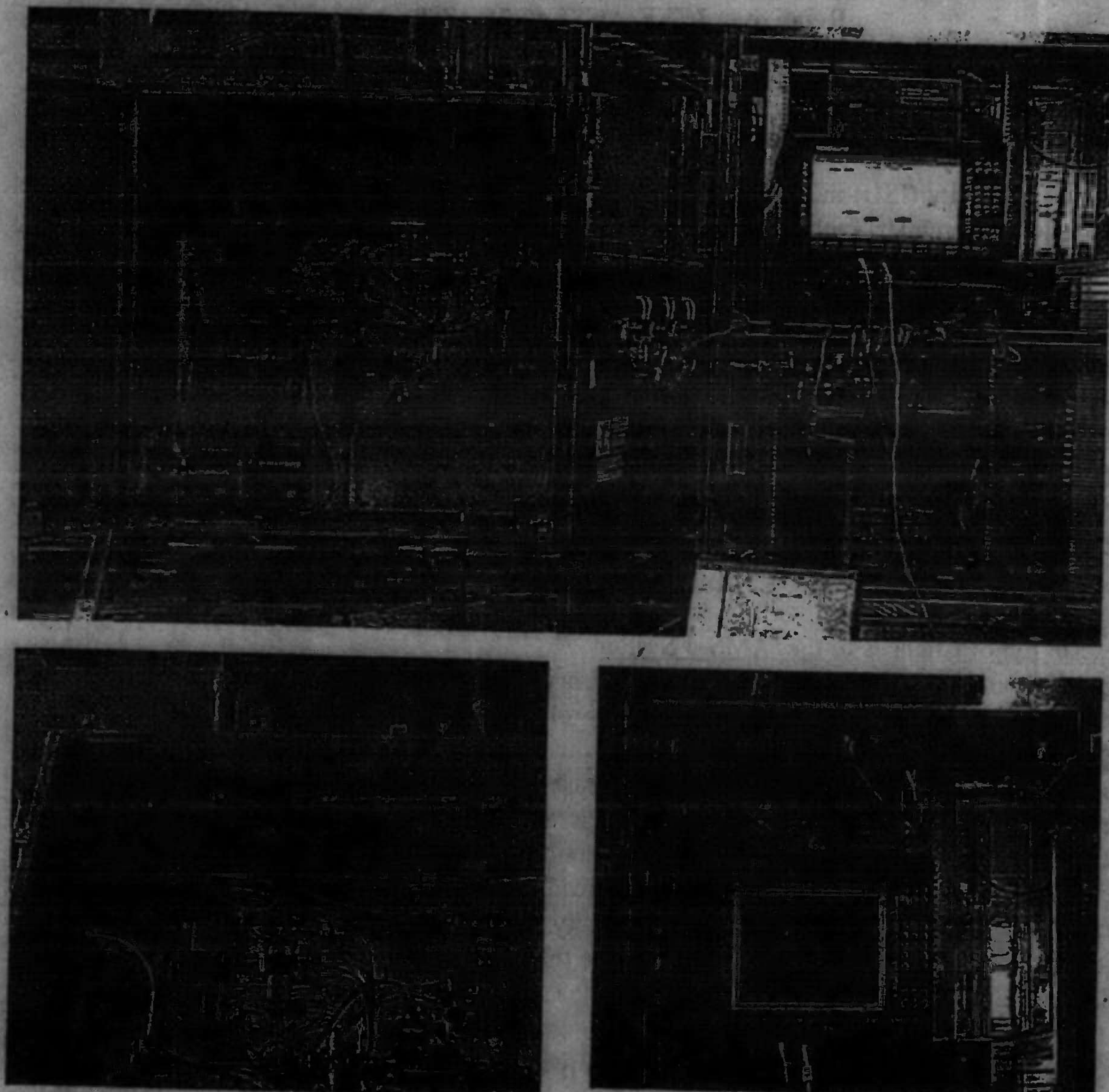


Figure One provides three views of the Modified AMS-4 system. The first and largest view shows the detector-cabinet on the left and the instrument-cabinet on the right. The enclosure in the top left section of the detector-cabinet is the detector and sample head enclosure, note the three coaxial cables exiting the bottom of the enclosure that ultimately leave the detector-cabinet nearest the instrument-cabinet. The small picture on the bottom left (laid on its side) shows the coaxial cable penetration from the detector-cabinet leading through electrical conduit to the instrument-cabinet. The picture on the bottom right attempts to show the radiation detector system's signal processing enclosure within the instrument-cabinet. The radiation detector system's signal processing enclosure appears to have a white label and is tucked behind other modules.

2.0 ANTICIPATED AFFECT OF DESIGN CHANGES

Although the exact function of the electronic components moved were not available to the Assessment Working Group, the group proceeded with an assessment of the impact of the change primarily because the extent of the change was relatively minor. The Assessment Working Group anticipates that the change most likely would improve the range of performance of the system in most respects, in particular the performance characteristics relative to operation when high temperature effluents are being exhausted. The Assessment Working Group herein provides informed speculation on the likely impact on IEEE/ANSI 42.18-1980 operational performance parameters due to changes in the AMS-4 system.

The recognized system changes as defined by the Assessment Working Group include:

1. Changing the mounting arrangement of an electronic circuit board.
2. Mounting the board in a separate and differently designed enclosure.
3. Adding between 1.5 and 2 meters of cable between the detector and electronic signal processing components of the radiation detector system.

These changes provide reason to question the modified AMS-4 system's responses to both temperature and mechanical vibration, and its detection sensitivity. Any performance standards that reflect the quality of the component enclosure integrity or quality of component mount security may be affected. Any performance standards that reflect the quality of the radiation signal may be affected. The additional cable changes the detection system capacitance, may effect impedance matching, may provide an opportunity for environmental conditions like humidity or dryness to impact the system, and provides a potential opportunity for radio-frequency or microwave-frequency electromagnetic radiation interference. Table One from the text Radiation Detection and Measurement provides information on impedance and signal attenuation for common types of coaxial cable and coaxial connectors. Cleary, when one combines the effects of these potential changes to the detection system, it can reasonably be speculated that the additional cable may decrease the radiation detection system signal to noise ratio and hence have a deleterious effect on the minimum detection level capability of the system. **The modified system is unlikely to respond very much differently than the original system with respect to any of the performance parameters, but one can not with unwavering confidence know the final product of these changes without empirical data that measures the net magnitude of changes on the performance parameters.** Further, IEEE/ANSI 42.18-1980 essentially requires that measured information about the systems operational capability relative to the performance parameters needs to be available.

Table One:

TABLE 16-1. Properties of Coaxial Cables

	Insulating Material	Cable Diameter (cm)	Characteristic Impedance (ohms)	Signal[a] Propagation	HV Rating	Cable Capacitance (pF/m)	Signal Attenuation Per Meter MHz	dB
RG-8/U	Polyethelene	1.03	52	0.659	[illegible]	[illegible]	100	0.068
							400	0.154
RG-11/U	Polyethelene	1.03	75	0.659	5000	67.3	100	0.066
							400	0.138
RG-58/U	Polyethelene	0.50	53.5	0.659	1900	93.5	100	0.135
							400	0.312
RG-58C/U	Polyethelene	0.50	50	0.659	1900	100.1	100	0.174
							400	0.413
RG-59/U	Polyethelene	0.61	73	0.659	2300	68.9	100	0.112
							400	0.233
RG-62/U	Semisolid polyethelene	0.61	93	0.840	750	44.3	100	0.102
							400	0.207
RG-174/U	Polyethelene	0.25	50	0.659	1500	101.0	100	0.289
							400	0.656
RG-178/U	TFE teflon	0.18	50	0.694	1900	95.1	400	0.951
Double Shielded Coaxial Cables:								
RG-9/U	Polyethelene	1.07	51	0.659	5000	98.4	100	0.062
							400	0.135
RG-223/U	Polyethelene	0.52	50	0.659	1900	101.0	100	0.157
							400	0.328

[a]Fraction of speed of light in a vacuum (3.00×10^8 m/s).

Data derived in part from Coaxial Cable Catalog, Belden Corporation, Richmond, Ind.

PULSE PROCESSING AND SHAPING 611

TABLE 16-4. Some Properties of Common Coaxial Connectors

	Maximum Voltage	Characteristic Impedance in Ohms	Maximum Frequency (GHz)	Relative Cost	Coupling
UHF	500	Nonconstant	[illegible]	Low	Threaded
BNC	500	50	[illegible]	Low	Bayonet
TNC	500	50	10	Med.	Threaded
General Radio	1000	50	18	High	[illegible] and threaded
APC-7					
Microdot	1500	50, 70, or 93	[illegible]	Med.	Threaded
[illegible] CM	500	50	[illegible]	Med.	Push-on, self-locking
N	5000	50	[illegible]	Med.	Threaded
MHV	5000	Nonconstant	[illegible]	Med.	Bayonet
SHV	5000	50	10	Med.	Bayonet

Data largely obtained from:

Coaxial Connectors, Catalog CC-5, Amphenol RF Division, Amphenol Corp.

Terminal and Connector Handbook, American Pamcor, Inc.

Coaxial Connector Catalog 100-I, M&I CO, Microdot Company

Table One provides information on coaxial cables and coaxial connectors. The impedance of a cable changes with temperature. Source, Radiation Detection and Measurement, Glenn F. Knoll, John Wiley and Sons, New York, 1979. ISBN 0-471-49545-X.

2.1 Details of IEEE/ANSI 42.18-1980 and Consideration of Design Changes.
Table Two provides an outline of all of the **Performance Statements** that must be available for a continuous radiation monitoring system according to recommendations made in IEEE/ANSI 42.18-1980. Table Two also summarizes the **Performance Specification** requirements relative to IEEE/ANSI 42.18-1980. A summary of the Assessment Working Group's evaluations regarding the likely impact of AMS-4 modifications to previously reported IEEE/ANSI 42.18-1980 performance capabilities is provided in Table Two in a binary statement and with an estimate of the relative importance of the changes on a scale of 1 to 10.

3.0 CONCLUSIONS

Table Two provides the details of the Assessment Working Group's analysis of impacts due to changes in the AMS-4 system on the previously reported IEEE/ANSI N42.18- 1989 performance and information requirements. There are four major areas of performance described in IEEE/ANSI 42.18 -1980: Detection Capability, Physical and Electrical Operating Limits, System Reliability, and Calibration.

The category "Detection Capability" includes 12 major **Performance Statement** requirements and several sub-requirements and it involves 6 major **Performance Specification** requirements. The AMS-4 modifications have a potential, even if arguably small, to impact on these areas. Mainly, the addition of a cable might affect the system's signal to noise ratio and timing characteristics to some small extent. Data will be necessary to document the differences in response in this area. There may not be an appreciable change on these areas because of the AMS-4 modification, nevertheless, data to verify this "speculation of minor impact" is not available.

Category two includes Physical and Electrical Operating Limits. The AMS-4 modification is likely to have only a small effect, if any, on these required operating parameters. Empirical data is necessary to determined the magnitude of effect. This category has 15 **Performance Statement** requirements and 7 **Performance Specification** requirements. The key issues associated with the AMS-4 modification with respect to this category include: temperature related response changes, structural or mounting stability changes, and potential enclosure integrity changes.

The third category considers instrument reliability. There are 8 listed **Performance Statement** requirements and 4 **Performance Specification requirements** in the third category. With the exception of potential extracameral effects the AMS-4 modifications are not anticipated to affect the items in this category. Further, the performance criteria concerning potential extracameral effects are only suggested, not required.

Calibration issues represent the subject matter in the fourth category. The fourth category has 2 **Performance Statement requirements** and 6 **Performance Specification requirements.** The AMS-4 modifications will not impact the items in this category.

REFERENCE/BIBLIOGRAPHY

Radiation Detection and Measurement, Glenn F. Knoll, John Wiley and Sons, New York, 1979. ISBN 0-471-49545-X.

IEEE/ANSI N42.18 1980 American National Standard Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents, The institute of Electronics and Electronics Engineers, Inc. 1974

Eberline AMS-4 Beta Particle Monitor Technical Manual, Eberline Instruments, Western Service Center, PO. Box 2108, Sante Fe, NM 87504-2108, 1985

Evaluation of Eberline AMS-3A and AMS-4 Beta Continuous Air Monitors: M.L. Johnson, D.R. Sisk, Battelle, Pacific Northwest National Laboratory PNNL-10938, 1996

IEEE/ANSI 42.18-1980 Performance Specifications

Revelant and Necessary Performance Information Requirements

Corresponding Standards of Performance[2a]

Section	Specification	Item number	Requirement	Section	Standard	Decision on Impact: Will there be an impact on this parameter do to Premier AMB-4 modifications?	Anticipated magnitude of impact: 1 = small to 10 = substantial
5.3.1	Detection Capability			5.4.1.1	Instruments designed to continuously monitor radioactivity in gaseous effluent streams shall have a minimum level of detectability for the radionuclides in question as given in Table 1 of IEEE/ANSI N42.18 1980[2a].	yes	2
5.3.1.1	Type of Radiation	1	The Type of Radiation the Instrument is Capable of Measuring must be Clearly stated.			no	0
5.3.1.2	Energy of Radiation	2	Energy range over which these types of radiation can be detected must be clearly stated and specified in MeV.			yes	1
5.3.1.2	Energy of Radiation	3	The Change in response as a function of energy shall be stated or presented graphically.			yes	2
5.3.1.2	Energy of Radiation	4	The minimum alpha or beta particle energy detected shall be given.			yes	1
			A. The detector wall window thickness shall be given in units of mg/cm2.			no	0
5.3.1.3	Range	5	Dynamic Detection Range shall be expressed as a concentration in either mCi/L or Ci/m³.	5.4.2	The dynamic range of the instrument shall be at least 10[4] minimum detectable levels and should be stated in units of µCi/ml relative to a given radionuclide. The range of the instrument should overlap with the range of emergency instrumentation.	no	0
5.3.1.3	Range	6	Irregular Response (i.e. saturation) at concentrations above the upper detection limit shall be indicated.			yes	1
5.3.1.4	Sensitivity	7	Maximum Sensitivity or Minimum Detectable Level (MDL) shall be stated in terms of:	5.4.3	The sensitivity of an effluent monitoring system should be stated in terms of a signal count rate associated with a specific radionuclide detected at the 95% confidence level in the presence of a specific background count rate.	yes	1
			A. smallest concentration of a specific radionuclide detectable.			yes	1
			B. measured at a given confidence interval			no	0
			C. in a stated time period			yes	1
			D. at a given flow rate			no	0
			E. under specific background conditions			yes	1
5.3.1.5	Accuracy	8	The accuracy of a measured value over the dynamic range shall be given as a percentage of expected value for logarithmic or digital readouts or full scale for each scale employed for linearly responding output devices.	5.4.4	The instrument error (uncertainty) shall not exceed ± 20 percent of reading over the upper 80 percent of its dynamic range.	yes	1
5.3.1.6	Precision	9	Precision shall be expressed as the % deviation up and down from the mean reading at 2 σ = 95% confidence level for mid-scale or mid-decade readings.	5.4.5	The reproducibility of a system for any given measurement over its stated range should be within ± 10 percent at the 95 percent confidence level for a mid-scale or mid-decade reading.	yes	1
5.3.1.7	Response Time	10	The electronic time constant for the system shall be stated.	5.4.6	The response time of the electronic system shall be less than that required to maintain background readings within the required accuracy.	yes	3
5.3.1.7	Response Time	11	The time required for a sample to travel from the instrument inlet port to the detector of the off-line equipment shall be stated.			no	0
5.3.1.8	Radiation Alarms	12	Abnormal and high level radiation alarm capabilities shall be described including:			no	0
			A. time to alarm			yes	1
			B. latching capability			yes	1
			C. the form output mode (relay interface)			no	0
			D. range of alarm set points			no	0
			E. reproducibility of alarm set points			yes	1
			F. Interaction, if any, among multiple alarm systems			no	0

Table Two
page 1

IEEE/ANSI 42.18-1986 Performance Specifications

Revelant and Necessary Performance Information Requirements

Corresponding Standards of Performance[2a]

Section	Specification	Item number	Requirement	Section	Standard	Decision on impact: Will there be an impact on this parameter do to Premier AM8-4 modifications?	Anticipated magnitude of impact: 1 = small to 10 = substantial
5.3.2	Physical and Electrical Operating Limits						
5.3.2.1	Temperature	1	Operating range shall be stated in centigrade units	5.4.7.1	Regardless of the temperature of the effluent stream, the instrument system should be capable of operating with less than 5 percent change in calibration or response over a temperature range of 0 to 50 C. When greater temperature extremes are expected or greater accuracy is required, protection from the environment shall be provided.	yes	1
5.3.2.1	Temperature	2	Temperature dependence per C shall be stated			yes	1
5.3.2.1	Temperature	3	If the range exceeds the design operating range is shall be stated.			no	0
5.3.2.1	Temperature	4	The time to reach thermal equilibrium shall be stated.			yes	1
5.3.2.2	Pressure	5	If system is affected by ambient pressure variations the magnitude of the effect shall be stated over a range of 500 to 800 torr.	5.4.7.2	The instrument should be capable of continuous operation under ambient pressures from ambient pressures from 500 to 800 torr as a minimum with no change in calibration or response.	no	0
5.3.2.2	Pressure	6	If a system or certain components of the system are designed for pressurized operation the design pressure and safety factor shall be stated.			no	0
5.3.2.3	Relative Humidity	7	Humidity effects shall be expressed in percentage of relative humidity	5.4.7.3	The instrument shall be capable of operation in relative humidities of 10 to 95 percent within the accuracy required.	yes	1
5.3.2.3	Relative Humidity	8	The capability of a system to resist moisture and corrosive atmospheres should be stated.			yes	1
5.3.2.4	Electrical Effects			5.4.7.4	Instrument systems and their component parts shall be resistant to corrosive atmospheres when they are used in such atmospheres.	yes	1
5.3.2.4.1	Switching Transients	9	Duration of switching transients shall be in terms of the length of time in seconds required for the instrument to indicate the final value within its stated accuracy on the most sensitive scale or decade.			yes	1
5.3.2.4.2	Power Transients	10	The length of time in seconds for the instrument to indicate the final value within its stated accuracy on the most sensitive scale after a total power interruption of 1.0 second shall be stated.			yes	1
			Any effects on alarms after a 1-second power interruption shall be noted.			no	0
5.3.2.4.4	Magnetic Fields	11	The effect on instrument accuracy due to an external magnetic field shall be stated.	5.4.7.6	Radiofrequency and microwave signals of ≤ 10 μW/cm² shall result in reading variations of no greater than ± 5 percent of the minimum detectable level.	yes	2
5.3.2.5	Mechanical Effects	12	The minimum vibrational level (at loading) or acceleration that perturbs readings or damages components shall be specified over a frequency range of 1 to 30 hz.	5.4.7.7	Accelerations of ≤ 1 g in each of the three mutually orthogonal axes over the frequency range 1 to 30 hz shall result in reading variations of no greater than ± 5 percent of the minimum detectable level.	yes	2
5.3.2.6	Power Requirements	13	The operating power requirements shall be stated, and for AC systems include:	5.4.7.5	Voltage and frequency variations of ± 15 percent within the design values shall result in reading variations of no greater than ± 5 percent of the minimum detectable level.	no	0
			A. operating voltage range			no	0
			B. number of phases			no	0
			C. power			no	0
			D. current requirements			no	0
5.3.2.7	Background Radiation	14	The response of the instrument to ambient beta, gamma, and neutron radiation shall be stated in reference to:			yes	1
			A. ^{90}Sr-^{90}Y beta radiation normalized to 0.5 MeV beta flux			yes	1
			B. ^{60}Co gamma flux assuming 1.2-MeV gamma energy			yes	1
			C. AmBe neutron flux assuming 4.0-MeV average energy			yes	1
5.3.2.7	Background Radiation	15	Response to Rn daughters (in equilibrium) up to a concentration of 3x10⁸ pCi/ml shall be stated -or- instrument background response relative to radionuclides to be measured shall be referenced.			yes	1

Table Two

Attachment Nine

IEEE/ANSI 42.18-1980 Performance Specifications

Revelant and Necessary Performance Information Requirements / Corresponding Standards of Performance[2a]

Section	Specification	Item number	Requirement	Section	Standard	Decision on Impact: Will there be an impact on this parameter do to Premier AMS-4 modifications?	Anticipated magnitude of impact: 1 = small to 10 = substantial
5.3.3	System Reliability	1		5.4.9	The instrument system shall be equipped with an alarm capable of being externally set to annunciate at any point over the stated range.	no	0
5.3.3.1	Attainment of Reliability	2	The methods for attaining reliability should be stated, these methods may include:		A. the alarm shall be both audible and visible	no	0
			A. choice of components		B. the alarm should be capable of adjustment and reset without removing the instrument from service.	no	0
			B. power duration factors			no	0
			C. parallel redundant circuitry			no	0
5.3.3.2	Expendable Components	3	The rated lifetime of expendable components shall be stated along with methods for determing the need for replacement.			no	0
5.3.3.3	Radiation Damage	4	Radiation degradation or failure of the system due to external radiation fields should be stated.			no	0
5.3.3.4	Extraneous Effects	5	Extraneous[1a] effects and the intensity at which these occur should be stated.			yes	1
5.3.3.5	Malfunction Alarms	6	The methods for communicating mechanical or electrical malfunctions, together with an evaluation of possible failure modes that would not be annunciated, should be described.	5.4.9	The instrument shall be equipped with an alarm device that provides appropriate notification at any time the system is incapable of monitoring radiation. A latching contact shall be provided to indicate loss of signal detector operating voltage or circuit power.	no	0
5.3.3.6	System Warranty	7	The warranty terms shall be clearly defined.			no	0
5.3.3.7	Quality Assurance	8	The quality control procedures used in the manufacture of effluent systems shall be available.			no	0
5.3.4	Calibration			5.4.10	A thorough primary calibration of the entire system shall be performed at least once using a radionuclide of known concentration.	no	0
5.3.4	Calibration	1	The exact conditions of calibration shall be specified, including the calibration point(s), range, and traceability to NIST.		A. The (NIST traceable) radionuclide shall permit calibrating the range of energy and rate capabilities intended for the system and related to a secondary source (of equivalent geometry and have dimensions equivalent to the detector window) or method which will be used for periodic in-plant recalibration.	no	0
5.3.4	Calibration	2	The calibration shall encompass the entire system.		B. Off-line systems where the concentration of radioactive material may change significantly between the point of sampling and the detector shall be tested by a known tracer to determine the loss in the sampling lines.	no	0
					C. Flow rate measuring devices associated with the system shall be calibrated to determine actual flow at conditions of temperature and pressure under which the system will be operated. These flow-rate devices shall be periodically recalibrated.	no	0
					D. A check source that is actuated remotely should be installed for integrity checks of the detector and the associated electrical system.	no	0
					E. A calibrated electrical signal should be provided to verify the circuit alignment.	no	0

Notes:
Shall in this context indicates a requirement.
Should indicates a recommended practice but not necessarily a requirement.

[1a] Extraneous effects are defined in IEEE/ANSI N42.18 1980 as: the apparent effects on a system caused by radiation on any other portion of the system than the detector.

[2a] These are the minimum standards of performance for the instrumentation.

[2b] Table 1 from IEEE/ANSI N42.18 specifies detection limits for specific radionuclides.

[b] Since this Primary Exhauster System's radiation detection sub-system is intended for particulate or gaseous radioactive material suspended in air, this analysis will not consider the portions of N42.18 that considers liquid effluent monitoring.

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31 4/17/03 - oil/dye solution prep
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36 Particulate Matter collection Notes, Skid B

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39 Particulate Matter collection Notes, Skid A

40 Met info for 4-18 to 4-19

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ANTICIPATED CONCENTRATIONS COLLECTED ON IMPACTOR

We expect BETWEEN 10 μg and 10,000 μg Deposited per stage on the cascade impactor

$\rho = 0.95\ g/cm^3 \quad 0.95\times10^6\ \mu g/cm^3$

10 μg → 10,000 μg

GENERATION RATE = 4.72 g/min OIL AEROSOL
EXHAUSTER OPERATING AT ~60,000 LPM.

$(4.72\ g/min)/(60{,}000\ L/min) = 7.87\times10^{-5}\ g/L$

→ 78.7 μg/L IS EXPECTED CONCENTRATION WHEN EXHAUSTER IS OPERATED AT 60,000 LPM OR 2,000 CFM.

IF EXHAUSTER OPERATES AT 1,000 CFM OR 30,000 LPM CONCENTRATION COULD BE

$(4.72\ g/min)/(30{,}000\ L/min) = 1.57\times10^{-4}\ g/L$

→ 157 μg/L

IF WE SAMPLE AT 20 ~~CFM~~ LPM RB for 10 MINUTES THE MASS OF OIL COLLECTED SHOULD BE:

$$\left(78.7\frac{\mu g}{L}\right)\left(\frac{20\ L}{min}\right)(10\ min) = 15{,}740\ \mu g$$

$\Rightarrow$ 15.74 mg.

TO

$$\left(157\frac{\mu g}{L}\right)\left(\frac{20\ L}{min}\right)(10\ min) = 31{,}400\ \mu g$$

$\Rightarrow$ 31.40 mg.

THE MASS DEPOSITION PER STAGE OF THE CASCADE IMPACTOR WILL LIKELY RANGE FROM 5% TO 40% OF TOTAL

LOWEST LIKELY MASS ~ 0.787 mg i.e. (15.74 mg × 5%)
HIGHEST LIKELY MASS ~ 12.56 mg i.e. (31.4 mg × 40%)

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We will dilute each impactor plate with 4.0 ml of hexane and then sample 3.0 ml of the 4.0 ml solution.

The range of oil/hexane concentrations anticipated will therefore be:

0.787 mg/4.0 ml = 0.197 mg/ml oil/hexane

TO

12.56 mg/4.0 ml = 3.14 mg/ml oil/hexane

INVESTIGATED 3 COLORS OF DYE
RED, BLUE, YELLOW
TO DO THIS MIXED 2 DROPS OF DYE TO 10 ml HEXANE
i.e. ~ 0.4 ml Dye/10 ml HEXANE
OR 0.04 ml Dye/ml HEXANE

FILES SAVED AS
HEXANE STANDARD
YELLOW STANDARD
BLUE STANDARD] 18 MAR 03 - 1
RED STANDARD 18 MAR 03 - 2

YELLOW DYE ABSORBANCE SPECTRUM STARTED AT ~500 nm.

RED DYE ABSORBANCE SPECTRUM STARTED AT ~600 nm

BLUE DYE ABSORBANCE SPECTRUM STARTED AT ~410 nm AND ANOTHER PEAK THOUGHT TO BE A CONTAMINATE AT ~700 nm.

BECAUSE OF THIS WILL USE EITHER RED OR ~~BLUE~~ RED YELLOW DYE AND NOT BLUE DYE FOR THIS INVESTIGATION.

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* PREPARED 10 LSC VIALS BY ADDING 4.0 ml OF HEXANE TO EACH VIAL.

DETERMINATION OF THE APPROPRIATE OIL DYE RATIO.

WILL ARBITRARILY TRY A 20% DYE OIL SOLUTION (BY VOLUME)

MIXED 8.0 ml OF SOY OIL
WITH 2.0 ml RED SOY DYE.

THE LOWEST CONCENTRATION LIKELY TO BE ENCOUNTERED ON AN IMPACTOR PLATE AFTER DILUTION WITH 4.0 ml HEXANE IS ~ 0.2 mg/ml oil/HEXANE SEE PAGE 6.

HENCE 0.787 mg OF OIL WILL BE ON THE IMPACTOR.

$\frac{0.787 mg}{0.95 \times 10^{3} mg/ml} = 8.28 \times 10^{-4} ml \doteq 0.83 \mu L$ oil

~ 0.8 µL 20% DYE + OIL MIXTURE TO BE ADDED TO 4.0 ml HEXANE.

0.19 mg oil / ~~4.0 ml~~ ml hexane

DATA FROM LSC FILES

$\rho_{HEXANE} = 0.659 g/cm^3$ ↑ U of Illinois

$\rho_{hexane} = 0.6603 g/ml$ (CRC)

Vial + Lid (g)	Vial + Lid + Hexane (g)	Net Wt (g)	Actual Hexane Vol (mL)
14.9568	17.5469	2.5901	3.930349014
14.7558	17.398	2.6422	4.009408194
14.8352	17.4624	2.6272	3.986646434
14.7677	17.399	2.6313	3.992867982
14.7403	17.3872	2.6469	4.016540212
14.7582	17.3543	2.5961	3.939453718
14.764	17.4522	2.6882	4.079210926
14.5445	17.3185	2.774	4.209408194
14.5238	17.2293	2.7055	4.105462822
14.9101	17.6275	2.7174	4.123520486

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WHEN DILUTION WAS COMPLETED
NOTICED USEFUL PEAK AT 514nm MAXIMUM
PEAK HEIGHT. SPECTRUM SAVED AS CAL19
i.e. 0.19 mg Oil Dye IN 4.0 ml hexane
% ABSORBANCE = 0.394 USED VIAL #1
Will Double AND Develop calibration Curve
MEASUREMENTS MADE USING 0.5 to 10μL EPENDORF
0.80 μL X 2 = 1.60 μL into 4.0 ml hexane
USED VIAL #2
% ABSORBANCE = 1.10 CAL38 = file

Double Again

1.60 μL X 2 = 3.20 μL into 4.0 ml hexane
USED VIAL #3 file CAL76
% ABSORBANCE = 1.161

DOUBLED Again

3.20 μL X 2 = 6.40 μL into 4.0 ml hexane
USED VIAL #4 File CAL152
% ABSORBANCE = 1.469

DOUBLED AGAIN

6.40 μL X 2 = 12.8 μL into 4.0 ml hexane
USED VIAL #5 file CAL304
EMPLOYED 10μL to 100μL EPENDORF
% ABSORBANCE = 1.933

HALFED INITIAL CONCENTRATION

0.80 μL / 2 = 0.40 μL INTO 4.0 ml hexane
% ABSORBANCE = 0.827
VIAL #6 FILE CAL 95

REPEAT OF
1.60 μL X2 = 3.20 μL into 4.0 ml hexane
USED VIAL #7 File CAL 76. % ABSORBANCE = 0.743
NOTE, ORIGINAL File not saved

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REPAT OF
0.80 μL / 2 = 0.40 μL INTO 4.0 ml hexane.
% ABSORBANCE = 0.352
VIAL # 8 FILE = CAL 9_5A

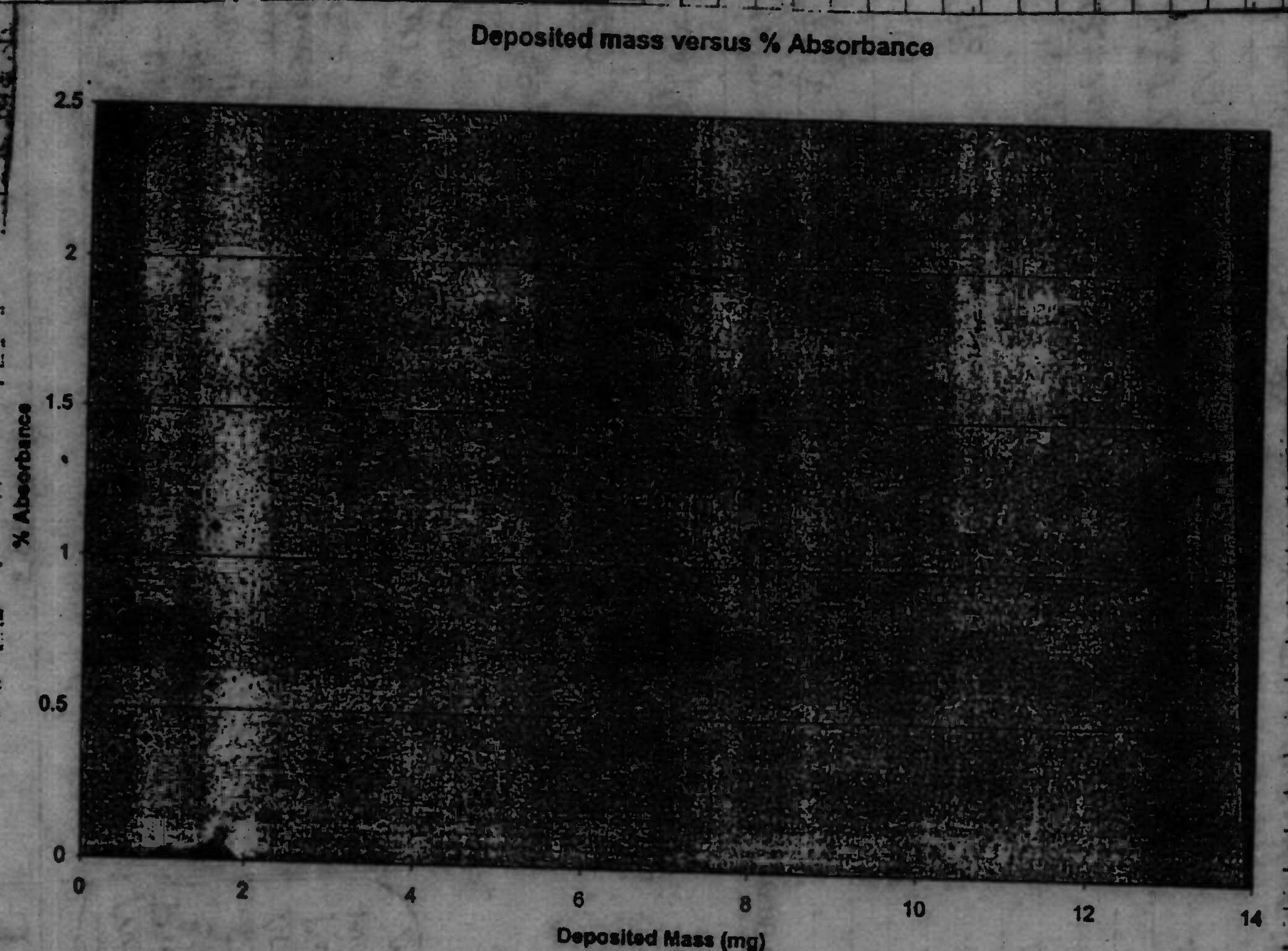
REPEAT OF
1.60 μL X 2 = 3.20 μL INTO 4.0 ml hexane.
USED VIAL #9 FILE: CAL 76B % ABSORBANCE = 0.577

SUMMARY

VIAL	FILE	μL DYE & OIL	** mg dye + oil	C.D.*	% ABSORBANCE
#1	CAL 19	0.80 μL	0.787 mg	0.19	0.394
#2	CAL 38	1.60 μL	1.574 mg	0.38	1.100
#3	CAL 76 (Lost)	3.20 μL	3.148 mg	0.76	1.161
#4	CAL 152	6.40 μL	6.296 mg	1.52	1.469
#5	CAL 304	12.80 μL	12.592 mg	3.04	1.933
#6	CAL 9.5	0.40 μL	0.394 mg	0.095	0.827
#8	CAL 9_5A	0.40 μL	0.394 mg	0.095	0.352
#7	CAL 76 (SAVED)	1.60 μL	1.574 mg	0.38	0.743
#9	CAL 76 B	1.60 μL	1.574 mg	0.38	0.577

* oil in hexane (i.e. 4 ml hexane) Units mg/ml
** MASS EXPECTED ON IMPACTOR PLATE - PROVIDE RELATIVE ABSORBANCE IS OBSERVED.
^ ESTIMATED, NOT TAKEN AS SIGNIFICANT.

A PLOT OF THESE DATA APPEARS ON PAGE # 10.



Deposited mass versus % Absorbance
% Absorbance
0
0.5
1
1.5
2
2.5
0
2
4
6
8
10
12
14
Deposited Mass (mg)

18 MAR 03 **11**

THE PLOT INDICATES THAT THESE DATA ARE UNACCEPTABLE. IT IS SUSPECTED THAT THE 0.5 TO 10 μL EPPENDORF IS NOT FUNCTIONING CORRECTLY. A TRADITIONAL SERIAL DILUTION WILL BE PERFORMED TO ESTABLISH A MORE RELIABLE CALIBRATION CURVE.

May be Did not Shake Dye Adequately Prior to initial mixture

A 20% BY VOLUME MIXTURE OF SOY OIL AND SOY DYE WILL BE CREATED.

1.8 L soy oil @ 0.95 g/cm³ OR

$(1800\ cm^3)(0.95\ g/cm^3) = 1{,}710\ g$

SOY DYE DENSITY ~ 0.95 g/cm³

46.8 g INITIAL MASS OF DYE AND CONTAINER
34.0 g FINAL MASS OF CONTAINER
12.8 g TRANSFERRED MASS

$12.8\ g / (0.95\ g/cm^3) = 13.47\ cm^3$

TO OBTAIN 20% DYE SOLUTION.

$$\frac{13.47\ cm^3}{13.47\ cm^3 + X} = 0.20$$

$$13.47\ cm^3 = 0.20(13.47\ cm^3 + X)$$

$$13.47\ cm^3 - 2.694\ cm^3 = 0.2X$$

$$10.776\ cm^3 = 0.2X$$

$$53.88\ cm^3 = X = \text{volume of oil}$$

Total Volume = $53.88\ cm^3 + 13.47\ cm^3 = 67.35\ cm^3$

DYE MASS = 12.8 g

OIL MASS = $(53.88\ cm^3)(0.95\ g/cm^3) = 51.186\ g$ oil

SO THIS WON'T WORK.

AS WE WILL NOT HAVE ENOUGH TOTAL VOLUME.

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12.80 g OR 13.47 cm^3 IN 2000 cm^3 Solution

$$100\% \left(\frac{13.47\ cm^3}{2000\ cm^3}\right) = 0.6735\%$$

$$\frac{2000 - 13.47}{2000\ cm^3} = 0.9933 = 99.33\%\ Oil$$

IF WE HAVE 0.787 mg OF THIS MIXTURE ON AN IMPACTOR PLATE WE SHOULD HAVE:

$$(0.787\ mg)(0.006735) = 0.0053\ mg\ Dye$$

OR 5.30 μg OF DYE PER Sample.

$$5.30\ \mu g \,/\, [(0.95\ g/cm^3)(1\times10^6\ \mu g/g)(1\ cm^3/1000\ \mu L)]$$

0.0056 μL OF DYE PER Sample

-OR- 787 μg = 0.828 μL

STARTING WITH STOCK 0.6735% Solution Removed 10 cm^3 ALLIQUAT. PLACED THIS IN 100 cm^3 Volumetric and Volumed up.

PREPARED A 10% OF STOCK challenge suspension by diluting 100 cm^3 i.e. 95.0 g OF The 0.6735% STOCK DYE/OIL STOCK SOLUTION INTO 1000 ml Volumetric and Volumed up to 1000 ml.

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NEED the following MASS OF 70% STOCK IN EACH OF 6 VIALS.

Mass	
0.394 mg	APPROXIMATE RESPONSE RANGE EXPECTED
0.787 mg	
1.574 mg	
3.148 mg	
6.296 mg	
12.592 mg	

@ 400nm

VIAL	TARE MASS	VIAL + OIL	OIL MASS	Oil mass mg	% ABS
1	9.0760 g	9.1269 g	0.0509 g	50.9 mg	0.289
2	9.0770 g	9.0908 g	0.0138 g	13.8 mg	0.170
3	10.2292 g	10.2325 g	0.0033 g	3.3 mg	0.030
4	9.0311 g	9.0500 g	Δ= ~~0.0189~~ g	0.023 mg	0.084
5	10.1098 g	10.2148 g	Δ= 0.105 g	0.13 mg	0.164

Number 4 obtained by
TAKING 3.3 mg into 4 ml hexane i.e. 0.83 mg/ml
AND then obtaining

0.83 mg/ml. But

$\rho_{Hexane} = 0.659\ g/cm^3$

$(0.659\ g/cm^3)(4\ cm^3) = 2.636\ g$

AND HENCE

$3.3\ mg / (2.636\ g + 3.3\ mg) = 1.25\ mg/g$

($3.3\ mg \rightarrow 3.3\times10^{-3}\ g$)

so $(0.0189\ g)(1.25\ mg/g) = 0.023\ mg$

MEASURED ABSORBANCE FROM CASCADE IMPACTOR.

STAGE	% ABSORBANCE
1	0.095
2	0.140
3	0.161
4	0.164
5	0.173
6	0.181
7	0.185
8	0.192

[illegible]

DEVELOPMENT OF DEFINITIVE [illegible]
CURVE OF [illegible] YELLOW DYE [illegible]
VERSUS SPECTROPHOTOMETRIC RESPONSE
BASED UPON 10.0 [illegible] STOCK [illegible]
THAT WILL BE USED AS A CHALLENGE [illegible]

VIAL #	TARE	TARE + 0.1	NET g	mg	% ABSORBANCE
1	13.2790	13.2834	0.0044	4.4	0.03[illegible]
2	13.4176	13.4217	0.0041	4.1	0.0[illegible]
3	13.0045	13.0084	0.0039	[illegible]	[illegible]
4	13.2776	13.2940	0.0164	16.4	[illegible]
5	13.1318	13.1435	0.0117	[illegible]	0.090
6	12.9973	13.0072	0.0099	[illegible]	[illegible]
7	13.0676	13.0776	0.0100	10.0	[illegible]
8	13.1084	13.1190	0.0106	10.6	0.086
9	13.0372	13.0443	0.0071	[illegible]	0.073
10	12.8115	12.8335	0.0220	22.0	0.185
11	13.1043	13.1237	0.0194	[illegible]	0.124
12	13.3070	13.3260	0.0190	[illegible]	0.137 (112)
13	13.6793	13.6809	0.0016	1.6	0.015
14	13.2845	13.2853	0.0008	0.8	0.010
15	13.3864	13.3875	0.0011	1.1	0.012
16	12.9471	12.9472	0.0001	0.1	0.009
17	13.3297	13.3298	0.0001	0.1	0.004
18	12.8567	12.8568	0.0001	0.1	0.006

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FIELD MEASUREMENTS

1. INCLINED MANOMETER (LEVELED)
2. PITOT TUBE [illegible]

[illegible]

— [illegible]
NALGENE [illegible] 3020
AT [illegible]
WITHOUT [illegible]
TUBE [illegible] SECONDS

TUBE DISTANCES [illegible]
MARKED [illegible]

15

[illegible] MARCH   Temp 10°C = 50°F

TRAVERSE A   ID # 7 [AN241-VTP-FTP-554]

Point	Spacing		VP @ α=0 in H_2O	Angle α @ ΔP=0
A1	0.5	0.24	~~0.15~~	5° ~~2°~~
A2	1.26	0.16	~~0.16~~	2° ~~2°~~
A3	2.33	0.16	~~0.16~~	2° ~~2°~~
A4	3.88			2° ~~1°~~
A5	8.12		0.17	1° ~~1°~~
A6	9.67		0.17	1° ~~2°~~
A7	10.74			2° 1°
A8	11.50			<1°

@ 1800 RPM

INITIAL AT LESS THAN EXPECTED minimum.

~1236 Ft^3/M

TRAVERSE B

Point	Spacing	VP @ α=0 in H_2O	Angle α @ ΔP=0
B1	0.5		
B2	1.26		
B3	2.33		
B4	3.88		
B5	8.12		
B6	9.67		
B7	10.74		
B8	11.50		

OPERATION CONDITION

40.8 hz x 6.0 = 2448.0 spares RPM

30.0 hz x 60 = 1800.0 RPM   ~573 F/M

AIR VELOCITY = $1096.2 \sqrt{\frac{P_v}{D}}$ ~35 F/M

P_v = Velocity Pressure in inches of Water.

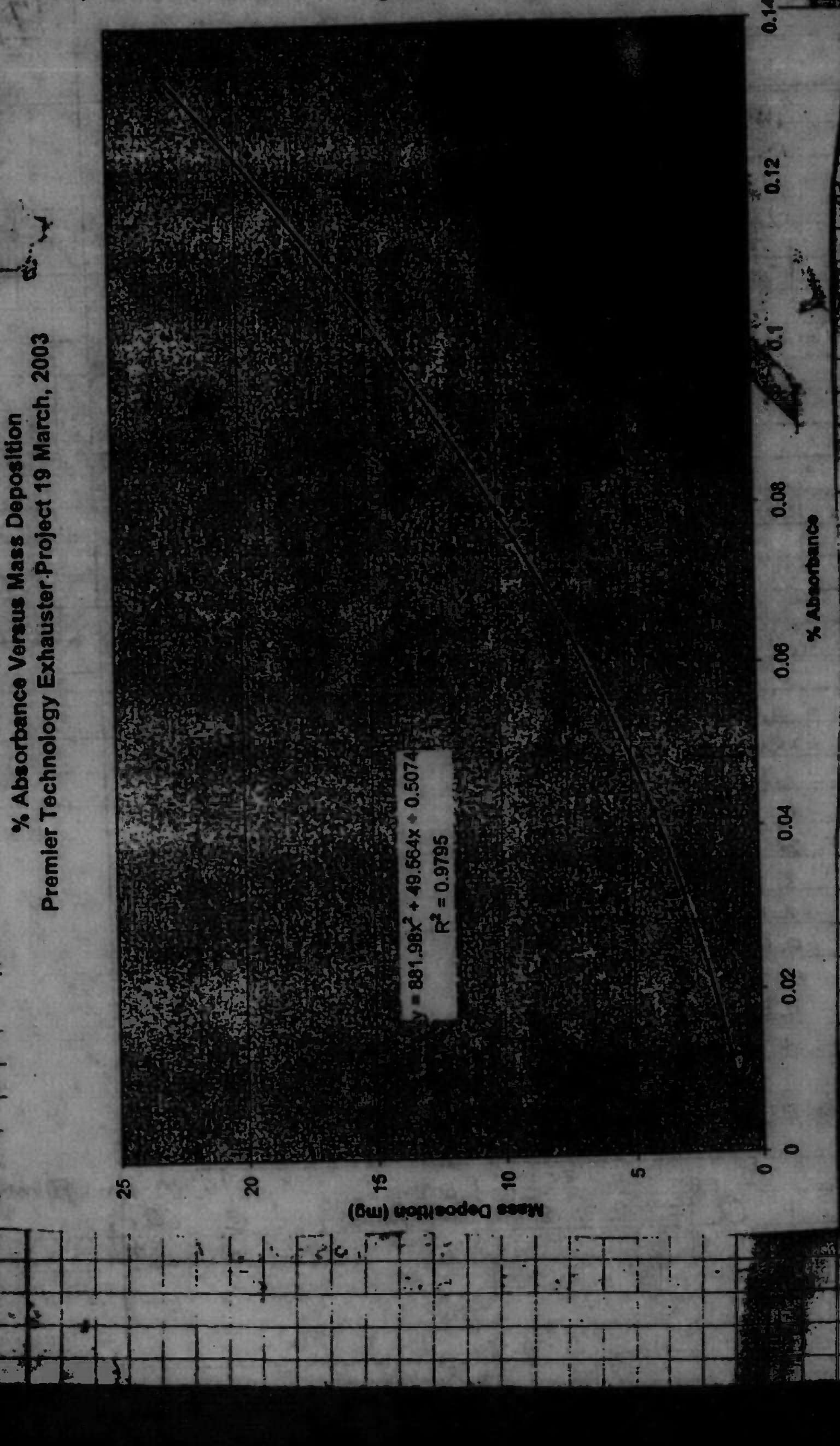
D = air density in /Ft^3

D = 1.325 (P_B/T)

P_B = Barometric Pressure = in Hg

T = Absolute Temp.

T = [illegible] + 460 = 510


% Absorbance Versus Mass Deposition
Premier Technology Exhauster Project 19 March, 2003
y = 881.98x^2 + 49.564x + 0.5074
R^2 = 0.9795
Mass Deposition (mg)
% Absorbance
0
5
10
15
20
25
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14

17

20 March 03

	INSERTION	V_P $\alpha=0$	∡ $\Delta P=0$
A1	0.5	0.15	3°
A2	1.26	0.04	2°
A3	2.33	.0	0
A4	3.88		−2°
A5	8.12		−12°
A6	9.67		−11°
A7	10.74		−15°
A8	11.50		−2°

10°C @ 7 [AN 241 - VTP - FTP - 554]

TEMP: 8.5 °C → 47.3° F @ 9:48 AM

VELOMETER @ 2500 FPM ~ 1960 Ft³/min

$V_{A(FPM)} = 1096.2 \sqrt{(P_v)(12.80)}$ ASSUMES 30" Hg

$CFM = V_A(FPM)(0.785\ Ft^2)$

ΔP 90°

	INSERTION	V_P $\alpha=0$	∡ $\Delta P=0$
AB1	.10.5	.57	
AB2	1.26	.6	
AB3	2.33	.65.5	
AB4	3.88	.7	
AB5	8.12	.715	
AB6	9.67	.75	
AB7	10.74	.71	
AB8	11.50	.66	

CENTER Line Velocity = 0.82 " H_2O

V_{FPM} = 3551 Ft/min 10:30 am 20 MARCH 03

Q = 2788 Ft³/min @ 60 Hz.

Current?

8 10°C

VP ... -0

B1		
B2		
B3		
B4	0.03	-1
B5	.03	-2
B5	.03	-2
B7	.07	-1
B8	.13	-3

ΔP (α=90

B1	~~.45~~.54
B2	.6
B3	.64
B4	~~.6~~.71
B5	.79
B6	.76
B7	.715
B8	.65

60% correct ?

251-1297 Rich's Cell

13:37
RADIOSHACK TEMPERATURE PROBE @ 51.6°F
THERMOMETER @ 10°C.

Post ~~trav~~ traverse pressure check of manometer.
Both sides held 10 in Hg FOR 30 SECONDS WITHOUT OBSERVED LOSS. R B...

1.973 L/M SF_6 Sample Rate.
Sample time ~ 30 S
SAMPLED FROM 14:30 to 14:50
SWAP OF POSITION A & B.

SF_6 REGULATOR PRESSURE AT 300 kPa ON LOW PRESSURE REGULATOR GAUGE.

PM sampling rate:
20 L/min · 60 min/h · ft³/30L = 40 cfh

15:20 12. °C

	Tsbooze	time	Sample rate
Collector #1 →	B4:	1538 to 1558,	40 scfh (18.9 LPM)
Collector #2 →	B5:	1605 to 1625,	40 scfh
Collector #3 →	B7:	1638 to 1658,	40 scfh
#4	A4	1708 1728	40 scfh
#5	A5	1732 1752	40 scfh
#6	A7	1755 1804 1805 1820	40

	B5 U	FILE
1	0.019	
2	0.037	PREMIER/2B5U
3	0.022	PREMIER/3B5U
4		
5		
6		
7		
8		

21

APEX INSTRUMENTS SOURCE SAMPLING EQUIPMENT

S-TYPE PITOT TUBE CALIBRATION SHEET

Reference USEPA Reference Method 2 (40CFR60, App. A, Meth. 2)

PITOT SERIAL#	2072	CALIBRATION DATE:	10-Jul-02
PITOT TYPE:	6PT4	BAROMETRIC PRESSURE:	29.53 in Hg
STD. PITOT TYPE:	Ellipsoidal	STATIC PRESSURE	-15 mm H_2O
Cp(std):	1.000	BLOCKAGE %:	n/a
CALIBRATED BY:	QMD	CORRECTION FACTOR:	1.00

RUN NO.	SIDE "A" CALIBRATION Pstd mm H_2O	P(s) mm H_2O	Cp(s)	DEVIATION Cp(s) - avg.Cp(s)
1	19.0	25.0	0.872	0.116
2	19.0	25.0	0.872	0.116
3	19.0	25.2	0.868	-0.231
		AVERAGE	0.871	

RUN NO.	SIDE "B" CALIBRATION Pstd mm H_2O	P(s) mm H_2O	Cp(s)	DEVIATION Cp(s) - avg.Cp(s)
1	19.0	25.0	0.8718	0.288
2	19.0	25.2	0.8683	-0.058
3	19.0	25.3	0.8666	-0.230
		AVERAGE	0.869	

OVERALL AVERAGE 0.870

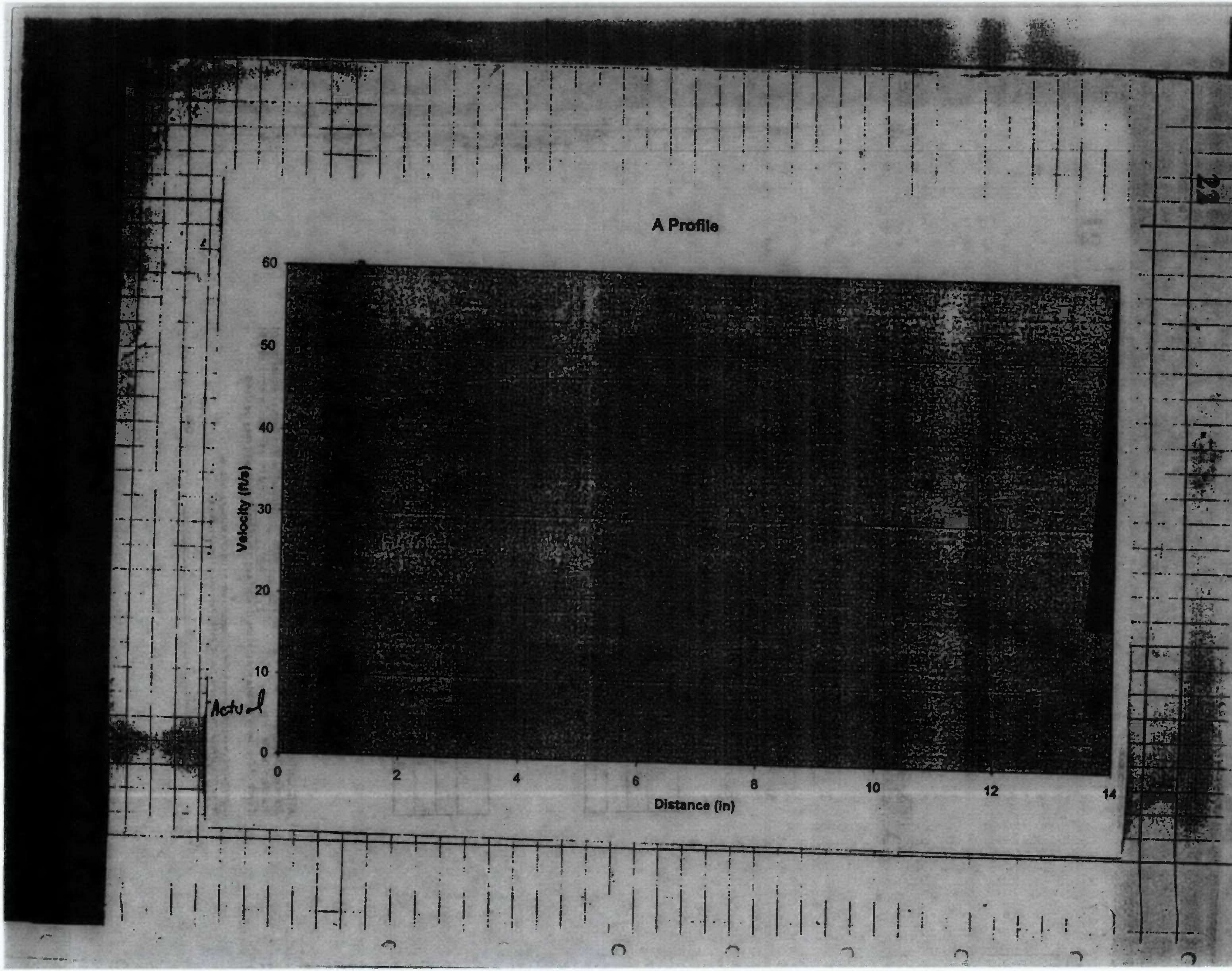
ACCEPTANCE CRITERIA

AVG. |Cp (A) - AVG. Cp (B)|	0.0017	must be less than or equal to 0.01
Standard Deviation A	0.0020	must be less than or equal to 0.01
Standard Deviation B	0.0026	must be less than or equal to 0.01

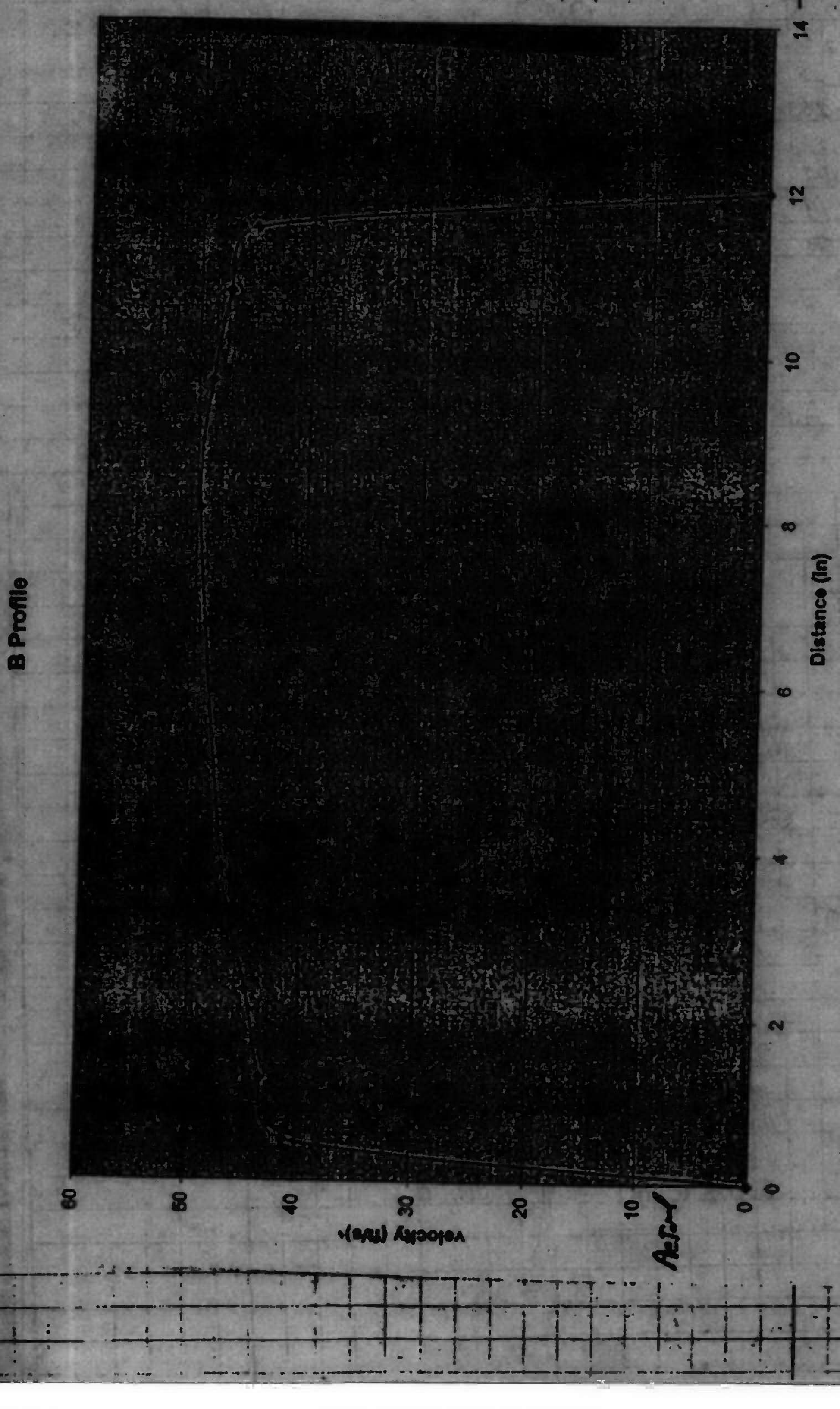
If each of the above criteria are met the overall avg. Cp (Side A or Side B) may be used

I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards.
See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.

Signature ______________________ Date ______________


A Profile
Velocity (ft/s)
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
Distance (in)
Actual

23


B Profile
Distance (in)
velocity (ft/s)
0
2
4
6
8
10
12
14
0
10
20
30
40
50
60
Actual

25

25Hz 21 MARCH 03 8°C 25 hz AIR STREAM Temp

Point	SPACING	Vp @ α=0 (in H2O)	∡ α @ ΔP=0	
A1	0.5	0.02	1°	START 49.5°F 08:00
A2	1.26	0.04	2°	✓
A3	2.33	RB ~~0.02~~ 0.04	RB ~~1°~~ 2°	✓
A4	3.88	RB ~~0.04~~ 0.05	RB ~~2°~~ 2°	✓
A5	8.12	RB ~~0.05~~ 0.05	2°	
A6	9.67	0.03	2°	
A7	10.74	repeated → RB ~~0.08~~ 0.04	~~3°~~ 2°	
A8	11.50	0.03	1°	

Tube # 2073

V_p ℄ = ~~0.03" H_2O~~ (Tube leaking) = 0.23" H_2O STOP 49.7°F

Air Velocity = $1096.2 \sqrt{\frac{V_p ℄}{D}}$

P_B =

D = 1.325 (P_B / T) = 0.08

Q = CFM = (V_A)(0.785 ft²)(0.87)(0.9)

Q = 1875 ft³/min

Pitot coefficient ↑ Average ↑

RAMPED UP (i.e. adjusted system load to obtain maximum flow!)

V_p ℄ = 2.40"

V_A = 6445 ft/m

Q = 3581 ft³/m

25 hz 6.7 Amp 08:30

point	insertion	VP	~~α=0~~ α @ ΔP=0	~~P@α=0~~ P @ α=0
A1	0.5	0.01	3°	~~0.03~~ 0.02
A2	1.26	0.05	2°	~~0.03~~ 0.025
A3	2.33	0.05	2°	~~0.035~~ ~~0.025~~ 0.03
A4	3.88	0.0	0	0.038
A5	8.12	0.0	0	0.032
A6	9.67	0.0	0	0.035
A7	10.74	0.04	1°	0.03
A8	11.50	0.04	1°	0.03

26

~~60 hz~~ 25 hz

point	VP	α=0	α=90	
B1	0	0	0.02	
B2	0.05	1°	0.022	
B3	0	0	0.025	
B4	0	0	0.029	
B5	0.05	2°	0.031	
B6	0	0	0.031	
B7	0	0	0.031	
B8	0	0	0.029	
20 Hz			0.57	8200
25 Hz			0.38	4000
35 Hz			1.77	5600
30 Hz			1.26	4700

~~25 Hz~~ ~~30 Hz~~ 35

	VP	α=0	α=90
B1	+0.08	1°	1.18
B2	0.08	3°	1.26
B3	0	0°	1.33
B4	—	−1°	1.44
B5	—	−2°	1.51
B6	—	−2°	1.63
B7	—	−3°	1.59
B8	—	−2°	1.52

20.0 Amp
— OPERATED @ 40hz —

	VP	α=0	α=90
A1	0.08	~1°	1.32
A2	0.1	2°	1.44
A3	0.06	0°	1.50
A4	0.06	1°	1.65
A5	.01	0	1.62
A6	—	−1°	1.52
A7	−.05	−1°	1.45
A8	+.08	+2°	1.36

Stack temp 49.8°F = 9.88°C

11:39 - leak test complete

10 pound each side held for 30 sec

Position				
A4	Collector #1	12:18	12:28	40 SCFH
A5	Collector #2	12:35	12:45	40 SCFH
	Repeated first sample, aerosols not flowing			
A4	Collector #1	12:47	12:57	40 SCFH
A7	Collector #3	13:02	13:12	40 SCFH
B4	Collector #4	13:26	13:36	40 SCFH
B5	Collector #5	13:38	13:48	40 SCFH
B7	Collector #6	13:51	14:01	40 SCFH

Temp 14:02 11°C

Left Sampling Port
Low Airflow collection

collector #5	~~1500~~	~~1510~~	~~40 SCFH~~	no PM injection
	1602	1612	40 SCFH	

High Flow

collector #6	~~1513~~	~~1533~~	~~40 S[illegible]~~	no PM injection
	1538	1558	40 SCFH	

Temp @ 1606, 11°C

LOW FLOW RATE GAS (SF_6) test

1.973 ℓ/min samplerate
300 kPa SF_6 pressure

lowered to 250 kPa @ sample A7

225	B3		
~~210~~	~~B5~~	180	B5
200	B6		

190 -> final Pressure

28

IR SPEC of Cascade Impactor Plates

Peak @ 401.47

X B5U → TRAVERSE → Sample Point → Stack flow "Upper"

→ Plate #

~~8B5U~~

	ABS	
1 B5U	0.019	← ref peak
2 B5U	0.037	
3 B5U	0.026	
4 B5U	0.023	
5 B5U	0.032	← ref peak
6 B5U	0.016	
7 B5U	0.013	
8 B5U	0.020	
1 B7U	0.018	
2 B7U	0.017	← ref/dark
3 B7U	0.026	
4 B7U	0.021	← ref/dark
5 B7U	0.015	
6 B7U	0.024	
7 B7U	0.017	
8 B7U	0.018	← ref/dark
8 B7U-a	0.018	

4/04 1705

	R/D	A35 @ 401.47
	1B4L	0.010
	2B4L	0.015
RD →	3B4L	0.017
	4B4L	0.006
	5B4L	0.016
RD →	6B4L	0.015
	7B4L	0.012
	8B4L	0.0

R/D 1735

	A5L	
	1	0.002
R/D →	2	0.004
	3	0.000
R/D →	4	0.002
	5	-0.002
	6	-0.002
R/D →	7	0.000
	8	0.001

R/D 1800

	A7L	
	1	0.000
R →	2	0.001
	3	0.002
D →	4	0.003
	5	-0.002
	6	-0.002
→	7	0.003
	8	

R/D 1823

	A4L	
	1	0.007
→	2	0.000
	3	0.000
→	4	0.004
	5	0.001
→	6	0.001
	7	0.001
	8	0.007

30

RD 1855

SPL (Sampling Port)

1	0.001
→ 2	0.001
3	-0.002
→ 4	-0.001
5	0.003
→ 6	0.000
7	0.000
8	-0.003

RD 1920

SPU

1	-0.001
→ 2	0.003
3	0.002
→ 4	0.002
5	0.002
→ 6	-0.005
7	0.000
8	0.001

$2\frac{3}{8}$" = tube

1/4 = Plastic

17 April 03

PREPARATION OF 10% OF STOCK CHALLENGE SUSPENSION. CONSISTENT w/ p 12.

DILUTED STOCK SOLUTION USING FOLLOWING TECHNIQUE.

100 cm^3 (i.e.) 95.0 g OF THE 0.6735% STOCK DYE/OIL STOCK SOLUTION INTO 1000 ml VOLUMETRIC AND VOLUMED UP TO 1000 ml

Actual MASS OF STOCK 95.03 g.
Volumed up to 1.000 L.
ADDED THIS TO THE REMAINS OF THE PREVIOUS BATCH.

0.700

18 April 03

Temp. Ambient 9.5 °C Tube # 2073

	Point	Spacing	VP @ α=0	α @ ΔP=0
1.125	A1	0.5	0	0
1.895	A2	1.26	0	0
2.955	A3	2.38	0	0
4.505	A4	3.88	0	0
8.745	A5	8.12	0	0
10.295	A6	9.67	0	0
11.365	A7	10.74	0	0
12.125	A8	11.50	0	0

EXHAUST Temperature 13.1 °C Base on Radioshak inst. *
Fan motor Frequency = 25 Hz

Flow rate calculation for minimum CFM

Velocity = $1096.2\sqrt{\frac{P}{D}}$

Temperature = 9.8°C (509.3 °R)

P_B = Barometric Pressure = 25.34 in Hg.

Density (D) = $1.325\left(\frac{P_B}{T_{abs}(°R)}\right) = 1.325\left(\frac{25.34}{509.3}\right) = 0.0659$

? BY 25.11 in Hg

$V = 1096.2\sqrt{\frac{0.025}{0.0659}}$ = 675 ~~ACFM~~ FPM

Q = 533 ACFM

* Battery low - data questionable.

T= 13.1

675 cfm

Velocity Profile (25 Hz, traverse A)

Point	P_v (α=90)
A1	0.015
A2	0.015
A3	0.020
A4	0.020
A5	0.020
A6	0.020
A7	0.015
A8	0.015

9:30 am

Centerline P_v = 0.14 = 0.23

2049 cfm

Cyclonic flow (60Hz, traverse A)

Point	Δp (α=0)	α (Δp=0)
A1	<0	4°
A2	<0	2°
A3	<0	4°
A4	<0	5°
A5	<0	6°
A6	<0	4°
A7	<0	6°
A8	<0	5°

T: 23.0°C

Velocity Profile (60Hz, traverse A)

Point	P_v (α=90)
A1	0.165
A2	0.185
A3	0.210
A4	0.225
A5	0.220
A6	0.210
A7	0.210
A8	0.206

[redacted]

33

10:05 am
T = 15.4

centerline
P_v = 1.4

Q = 3966 cfm

Velocity Profile (40 Hz traverse A)

Point	P_v (α = 90°)
A1	0.820
A2	1.025
A3	1.150
A4	1.275
A5	1.350
A6	1.270
A7	1.225
A8	1.215
A9	

Cyclonic flow (40 Hz, trav. A)

(P)(3)

	ΔP (α=0)	α (ΔP=0)
A1	0.440	-10°
A2	0.065	-8°
A3	0.060	-6°
A4	0.050	-3°
A5	0.030	-1°
A6	<0	1°
A7	<0	3°
A8	<0	5°

(negative angle means p side of tube up)

11:30

Cyclonic flow (25 Hz, trav. B)

210
= 25.39
T = 11.86

	ΔP (α=0)	α (ΔP=0)
B1	0.200	-8°
B2	0.025	-6°
B3	0.050	-6°
B4	0.040	-4°
B5	0.045	-3°
B6	0.0	0
B7	<0	2°
B8	<0	4°

34

1251
T = 11.8°C

VELOCITY PROFILE (25 Hz, TRAV B)

	Pv (α=90°)
B1	
B2	0.445
B3	0.495
B4	0.540
B5	0.490
B6	0.450
B7	0.430
B8	0.425

1306
Adjusted Amps (Still 25 Hz)
T = 11.8 °C

Velocity Profile (25 Hz TRAV. B)

	Pv
B1	0.020
B2	0.020
B3	0.030
B4	0.030
B5	0.039
B6	0.030
B7	0.025
B8	0.025

Angular flow

	ΔP (α=0)	α (ΔP=0)
B1	0	0
B2	0	0
B3	0	0
B4	0	0
B5	0	0
B6	0	0
B7	0	0
B8	0	0

35

Velocity PROFILE 40 hz

	Pv
B1	~~1.050~~ 0.950
B2	1.100
B3	1.210
B4	1.310
B5	1.240
B6	1.115
B7	1.075
B8	1.050

ANGULAR FLOW

1337 T=19.0°C

	ΔP	∠
B1	0.175	-6°
B2	0.050	-4°
B3	0.095	-3°
B4	0.050	-3°
B5	<0	2°
B6	<0	3°
B7	<0	5°
B8	<0	6°

Leakage test was conducted with results consistent of previous test.

1347 T= 19.2°C

USING: OMEGA RH31
Thermohygrometer
S/N 61307
Cal dat 3/31/03

Stack temp was 59.7°F w/33.7 %RH

GAS PRESSURE CO_2 @ 80 psi
sample Rate 1.973 L/m
sample time 30.0 seconds EACH.
8-samples per ~~traverse~~ at 25hz and 40hz

36

PARTICULATE Sampling

LEFT SAMPLE LINE (HAMS 4)
25 Hz 6.7A
40 scfh
LABELS
Start 19:36 #LSLL
end 19:46
collector #6

SAMPLING Rate:

$20 \frac{L}{min} \cdot 60 \frac{min}{h} = 120 \frac{L}{h} \cdot \frac{1000\ cm^3}{L} = 1.2\times10^4 \frac{cm^3}{h}$

$1.2E4 \frac{cm^3}{h} \cdot \frac{1}{2.54^3} \frac{in^3}{cm^3} = \frac{1.2E4}{16.19} \frac{in^3}{hr} \cdot \frac{1 ft^3}{12^3 in^3}$

$= \frac{1.2E4}{(16.19)(1728)} \frac{ft^3}{hr} = \frac{1.2E4}{2.797E4}$ cfh

LEFT SAMPLE LINE
40 Hz, 20A
Time 2002 → 2012 #LSLU
collector #3

Right Sample Line

40 Hz, 20A, 10 min #RSLU

25 Hz; 6.7A; 10 min #RSLL

(margin calculations:)
16.19
1728
12952
3238
11333
1619
2797532

2.54
2.54
1016
1270
508
6.4516
2.54
258064
322580
129032
16387064

144
12
288
144
1728

8.02
40 Hz
20A

4/19/03

75b - PM sampling from upper sampling ports

Right Sampling Port Lowspeed
collector #6 #RSPL
25Hz, 6.7A
10 min collection (timed w/stop watch)
~40cfh

T: 8°C Left Sampling Port Lowspeed
collector #2 #LSPL
25Hz, 6.7A
10 min @ 40 cfh

Right Sampling Port Upperspeed
collector #3
40 Hz 20 A #RSPU
10 min @ 40 cfh

Left Sample Port Upperspeed
collector #4
40 hz, 20 A
10 min @ 40 cfh

(were there at 40 ? 42 SCFH.
42 ~ 19.8 l/m
when 20.0 l/m required?)

NOTE: Compressor pressure on line maintained at 15.0 ± 0.5 psi throughout generation period

TRAVERSE PM SAMPLING LOCATION

For 8 D_e down & 2 D_e up from disturbances 8 points required. 4 on A, 4 on B.

Point	% insertion	inches
1	6.7	0.8
2	25.0	3.0
3	75.0	9.0
4	93.3	11.2

900
TRAVERSE A PM SAMPLING

40 Hz, 20 A
10 min @ 40 cfh

A1 →	collector #5	A1U
A2 →	collector #2	A2U
A3 →	collector #3	A3U
A4 →	collector #4	A4U

25 Hz
10 min, 40 cfh

A1 →	coll. #1	A1L
A2 →	coll #6	A2L
A3 →	coll #2	A3L.
A4 →	coll #5	A4L

1109
TRAVERSE B PM SAMPLING

25 Hz
10 min, 40 cfh

	B1 →	coll #3	B1L		
1345 →	B2 →	coll. #4	B2L		
	B3 →	coll. #1	0B3L	redo both, valve closed	coll # 2 B3L
	B4 →	coll. #6	0B4L		coll # 4 B4L

1415	40 Hz		
	B1	#1	B1U
	B2	#6	B2U
	B3	#5	B3U
	B4	Coll #3	B4U

no flow thru stack except for what was created from the [illegible] generator. Visible plume coming [illegible] top of stack

39

· SAMPLING LINES/PORTS EXHAUSTER "A"

1615

25 Hz, 6.7 A
10 min, 40 cfh, collector #2
left sample line (to AMS 4 box)
LSLLA

40 Hz, 20.0 A
10 min, 40 cfh collector #4
left sample line
LSLUA

1700 40 Hz, 20A
10 min 40 cfh collector #6
left sample port
LSPUA

25 Hz, 6.7 A
10 min 40 cfh collector #1
left sample port
LSPLA

Increments of:	1:00 hour	
	pressure	
	18-Apr-03	19-Apr-03
time	inches Hg	inches Hg
1:00	25.056	25.169
2:00	25.059	25.170
3:00	25.065	25.174
4:00	25.068	25.173
5:00	25.076	25.180
6:00	25.085	25.186
7:00	25.094	25.191
8:00	25.106	25.204
9:00	25.111	25.213
10:00	25.112	25.214
11:00	25.116	25.215
12:00	25.117	25.213
13:00	25.116	25.214
14:00	25.108	25.208
15:00	25.108	25.201
16:00	25.102	25.200
17:00	25.102	25.199
18:00	25.107	25.195
19:00	25.120	25.193
20:00	25.136	25.194
21:00	25.144	25.194
22:00	25.160	25.199
23:00	25.166	25.205
Average	25.106	25.196
Standard Deviation	0.029231	0.014696
Grand Average	25.151	
Working Day 07:00 until 19:00 hours:		
Working Day Average	25.109	25.205
Standard Deviation	0.007267	0.008732
% COV	0.028941	0.034646

Average ~ 21.65 in Hg

549.97 mm Hg (14.70 psi / 760 mm Hg)

10 / 21.1 = 10.63

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Time	18 April Pressure	19 April Pressure
01:00	~~29~~ 25.056	25.169
02:00	25.059	25.170
03:00	25.065	25.174
04:00	25.068	25.173
05:00	25.076	25.180
06:00	25.085	25.186
07:00	25.094	25.191
08:00	25.106	25.204
09:00	25.111	25.213
010:00	25.112	25.214
011:00	25.116	25.215
012:00	25.117	25.213
PM 1:00	25.116	25.214
2:00	25.108	25.208
3:00	25.108	25.201
4:00	25.102	25.200
6:00	25.102	25.199
7:00	25.107	25.195
8:00	25.120	25.193
9:00	25.136	25.194
10:00	25.144	25.194
11:00	25.160	25.199
12:00	25.166	25.205

(initials) 18 Ap 10

Sourse Pocatello: National Weather Station (208) -233-0834

To Go Back from absolute, given altimeter data USE:

http://www.csgnetwork.com/stationpressurecalc.html

Conversion Utility

Pocatello/weather @ ~~4,4?? feet~~ 4,454 feet.

42

PIH DATA http://www.met.utah.edu/cgi-bin/roman/meso_base_post.cgi

21 MARCH 03 22 MARCH 03

Time	sea level pressure	Actual	sea level pressure
0:00	30.01 in Hg	0:00	
1:00	30.02	1:00	
2:00	30.03	2:00	
3:00	30.03	3:00	
4:00	30.05	4:00	
5:00	30.07	5:00	
6:00	30.09	6:00	
7:00	30.12	7:00	
8:00	30.12	8:00	
9:00	30.12	9:00	
10:00	30.12	10:00	
11:00	30.11	11:00	
12:00	30.10	12:00	
13:00	30.10	13:00	
14:00	30.07	14:00	
15:00	30.07	15:00	
16:00	30.07	16:00	
17:00	30.07	17:00	
18:00	30.08	18:00	
19:00	30.08	19:00	
20:00	30.08	20:00	
21:00	30.10	21:00	
22:00	30.10	22:00	
23:00	30.10	23:00	
24:00	30.12	24:00	

See ATTACHED PAGES

Very Difficult to Read Printing was found

RB

[redacted]

43

4/30/03

WEED: 1.0394 mg
0.787 mg
1.574 mg
3.148 mg
6.296 mg
12.592 mg

CALIBRATION Curve for Cascade impactor plates

13.3340 g empty vial mass

Vial #	Mass oil added		
1	0.0083 g	8.3 mg	
2	0.0063 g ✓	6.3 mg	
3	0.0037 g ✓	3.7 mg	
4	0.0112 g	11.2	0.00157 g 11.2 mg
5	~~0.0024 g~~ 0.0023 g	0.00315 g ✓	
6	0.0022 g	2.2 mg	0.00630 g ✓
7	~~0.0009 g~~ 0.0011 g	1.1 mg	0.0126 g ✓
8	0.0096 g	9.6 mg	
9	0.0011 g	1.1 mg	
10	0.0015 g	1.5 mg	

~~Vial~~

4 #11 0.6603 g 2.2204

Add 3 ml OF HEXANE to VIALS 4, 5, 6, 7

#9 = 1.1 mg OF #8
#10 = 1.5 mg OF #8
#11 = 1.0 ml OF #10

NOTE: WE OBSERVED THAT THE PROBLEM WITH THE ABSORBANCE RAN OUT IS CONNECTED TO THE LENGTH OF TIME THE SAMPLE (i.e. HEXANE) IS IN CONTACT WITH THE SYRINGE. ONE SAMPLE WAS ANALYZED AND NOTED TO BE HIGHER THAN THE ORIGINAL ANALYSES. AS A TEST WE ~~LEFT THE SAMPLE~~ REMOVED THE SAMPLE FROM THE CUVET AND LEFT IT IN THE SYRINGE FOR ~1 MINUTE. WHEN THE SAMPLE WAS REANALYZED THE SPECTRUM FOR ABSORBANCE WAS GREATER THAN THE ORIGINAL ANALYSES.

4/31/03

SO, CALIBRATION IN QUESTION ABOVE IS VOID DUE TO AN UNCONTROLLED VARIABLE INTRODUCED BY THE PROCEDURE. SPECIFICALLY, PLASTIC MATERIALS IN CONTACT WITH HEXANE ADD CONTAMINANTS THAT INTERFERE WITH MEASUREMENTS OF THE ABSORBANCE OF OIL AND DYE IN HEXANE.

R B

4/31/03

THE FOLLOWING OIL/DYE AND HEXANE SAMPLES IN GLASS LGC VIALS WITH Al IMPACTOR PLATES WERE CREATED.

	CAL. SAMP. #	VIAL MASS	VIAL + Al (MASS)	VIAL + Al + OIL+DYE	VIAL + HEXANE + Al + OIL+DYE
1	4/30/03	16.5605 g	16.6282	16.6293	18.6580
2	4/30/03	16.5530	16.6200	16.6223	18.6156
3	4/30/03	16.4461	16.5136	16.5151	18.5288
4	4/30/03	16.5212	16.5889		18.6285 *
5	4/30/03	16.4725	16.5394		18.5753 **
6	4/30/03	16.5548	16.6226		18.6376 ***
7	5/1/03	16.4721			

TABLE CON'T

	CAL. SAMPLE #	MASS OIL + DYE	MASS HEXANE	CONCENTRATION (MASS OIL DYE/ HEXANE MASS)
1	4/30/03	1.1 mg	2.0288 g	0.542 mg/g
2	4/30/03	2.3 mg	1.9927	1.154
3	4/30/03	1.5 mg	2.0137	
4	4/30/03	0.522 mg	2.0391	
5	4/30/03	0.374 mg	2.0355	
6	4/30/03	0.182	2.0148	

TABLE CON'T   GIVEN $\rho_{HEXANE} = 0.6603$ g/ml REFERENCE CRC

	CAL. SAMPLE #	VOLUME HEXANE	CONCENTRATION (mg/ml) OIL+DYE / HEXANE
1	4/30/03	3.0724 mL	0.358
2	4/30/03	3.0179 mL	0.762
3	4/30/03	3.0372 mL	0.48[illegible]
4	4/30/03	3.0881 mL	0.169
5	4/30/03	3.0827 mL	0.121
6	4/30/03	3.0514	~~[illegible]~~ (0.0597)

vial	mass vial	mass vial + oil/dye	mass vial + oil/dye + hexane
7	16.4721 g	16.4737 g	18.4965

mass oil/dye	Mass hexane	vol hexane
1.6 mg	2.0228 g	3.0634 mL

concentration oil/dye / hexane
0.522 mg/mL

*vial 4 - added 1mL of vial 7 solution & 2mL of hexane

- added 1mL hexane to vial 7

vial 7 mass: 18.4391 g

vial 8	mass	mass vial + oil/dye	mass vial + oil + hex
	16.5141 g	16.5160	19.8743

oil/dye	mass hex	vol hex	conc
1.9 mg	3.3583 g	5.0860 mL	0.374

**vial 5 1mL of vial 8 solution + 2 mL hexane

vial 9	vial	vial + oil/dye	vial + oil/dye + hexane
	15.2031	15.2044	19.9112

oil + dye	hexane mass	hexane vol	conc.
1.3 mg	4.7068 g	7.1272 mL	0.182

*** vial 6 1mL of vial 9 solution + 2mL hexane

Suspect contamination in Vials 1 & 3
replace with vials 10 & 11

Vial sample #	vial	vial + foil	vial + foil + oil	vial + foil + oil + hexane
10 5/1/03	15.2136 g	15.2815 g	15.2849 g	17.3003 g

oil/dye	hexane	Vol hexane	conc	
3.4 mg	2.0514 g	3.1063 mL	1.0944	mg/mL

Vial #	mass vial	mass vial + oil	mass vial + foil + foil	mass vial + foil + foil + hexane
11	15.2486 g	15.2494	15.3170	17.3117 g

Mass Oil	Mass hexane	vol hexane	Conc
~~X~~ 0.8 mg	1.9947 g	3.0209 mL	.2648 mg/mL

PROPAGATION OF ERROR

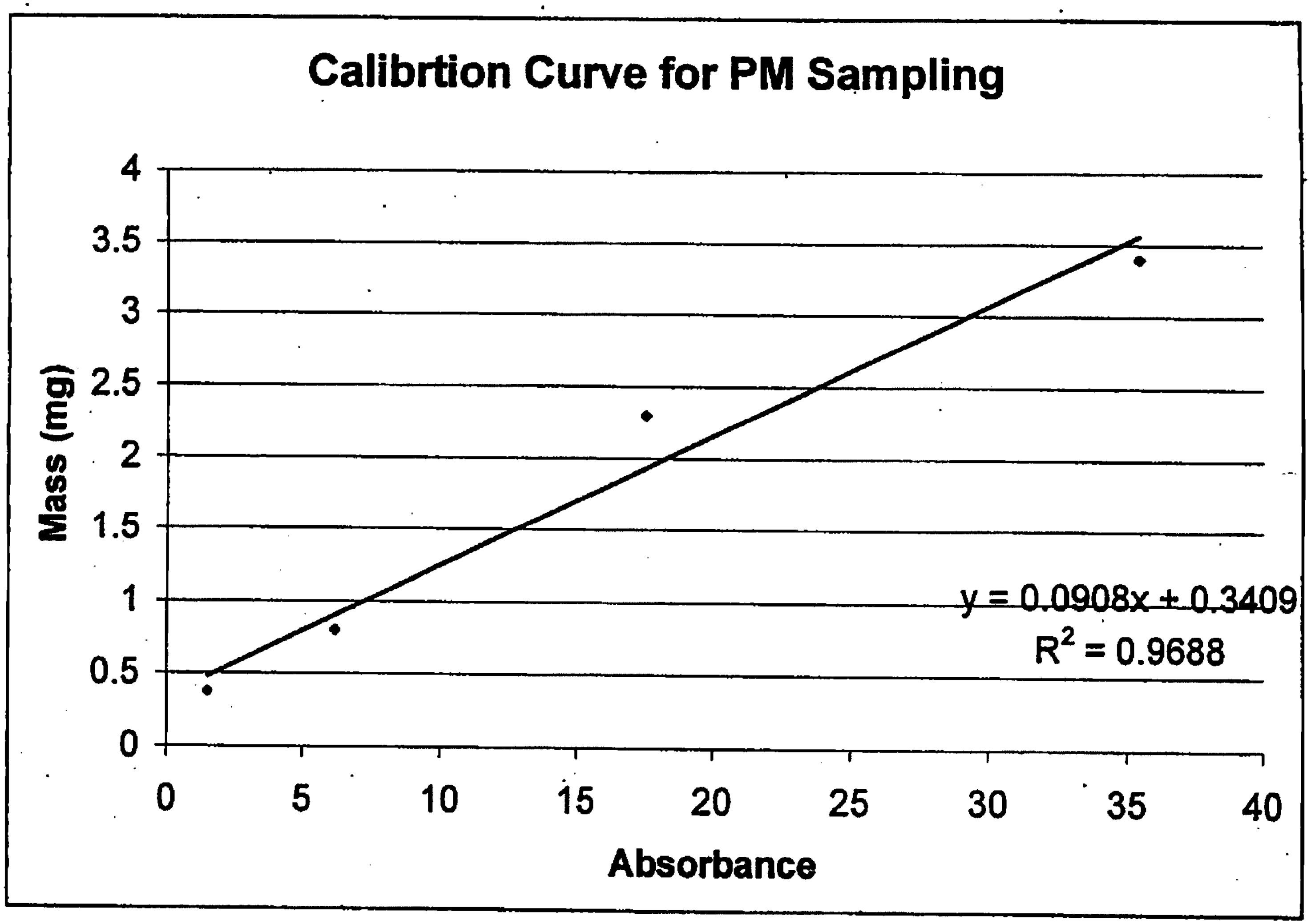
for col 2, 10, 11

Mass oil = (mass vial + Al + oil) − (mass vial + Al)

$\sigma^2 = \sigma^2 + \sigma^2$

σ for masses: ±0.0001 g (0.1 mg)

for col 4, 5, 6


Calibrtion Curve for PM Sampling
Mass (mg)
4
3.5
3
2.5
2
1.5
1
0.5
0
0
5
10
15
20
25
30
35
40
Absorbance
y = 0.0908x + 0.3409
R2 = 0.9688

[redacted]

5/10/03 **51**

Calibration Curve for Stock Solution

Vial #	Mass	w/oil	w/hexane	w/foil
1	16.1878	16.1933	18.1888	18.2462
2	16.4293	16.4319	19.0888	19.1397
3	16.2112	16.2119	19.5507	19.6068
4	16.0945	16.0994	20.0647	20.1184
5	16.2770	16.2781	20.8929	20.9468
6	16.2554	16.2816	21.9235	21.9795

Vial #	Mass oil	Mass hexane	Volume Hexane (ρ = 0.6603 g/ml)
1	.0055	1.9955	3.0221
2	.0026	2.6569	4.0238
3	.0007	3.3388	5.0565
4	.0049	3.9653	6.0053
5	.0011	4.6148	6.9889
6	.0262	5.6419	8.5444

Vial #	Concentration (g/ml)	mg/ml	Mass in 3mL aliquot
1	0.0018199	1.8199	5.4357
2	0.000646155	0.646155	1.938465
3	0.000138436	0.138436	0.415308
4	0.000815946	0.815946	2.447838
5	0.000157392	0.157392	.472176
6	0.003066336	3.066336	9.199008

5/10/03 FIELD TESTING

1330
Skid B
714 scfm
698 acfm
53.0 °F
750 RPM

1st ✓ AMS-4 termination Low speed — BLSLL ∅
(collector #3)
42 cfm
for 10 min

~~AMS-4 term~~
4th — Ancillary Termination Low Speed — BRSLL

3rd ✓ AMS-4 Termination High Speed — BLSLU ∅

2nd ✓ Ancillary Termination High Speed — BRSLU ∅

* After 3 samples we were not seeing a dye peak at all, the oil peaks seem to be smaller than what was seen with 10% solution.

4th Sample BRSLL was done with 10% solution.

* DECISION - USE 10% SOLUTION

REDO the following samples

AMS-4 term. Low speed		BLSLL ✓
AMS-4 term. high speed	BLSLU	~~BRSLU~~ ✓
✓ Ancillary term. high		BRSLU ✓
Ancillary sample probe Low speed		BRSPL ✓
AMS-4 Sampling probe low speed		BLSPL ✓
AMS-4 sampling probe high speed		BLSPU ✓
Ancillary probe high speed		BRSPU *✓
Skid B - Long Axis traverse 11.5" insertion high		B-A4U ✓
Long Axis insertion point 3 highspeed		B-A3U ✓
Long Axis insertion point 2 highspeed		B-A2U ✓
Long Axis 0.5" insertion highspeed		B-A1U ✓

[redacted]

55

Short Axis ~0.25" insertion high speed	BB1U	✓
Short Axis insertion point #2 high	BB2U	✓
Short Axis insertion point #4 high [redacted] !!	BB4U	✓
Short Axis insertion point #3 high	BB3U	
Short Axis insertion point #1 Low speed	BB1L	
Short Axis insertion point #2 Low speed	BB2L	
Short Axis insertion point #3 Low speed	BB3L	
Short Axis insertion point #4 Low speed	BB4L	
Long Axis insertion point #1 Low speed	BA1L	
Long Axis insertion point #2 Low	BA2L	
Long Axis insertion point #3 Low	BA3L	
Long Axis insertion point #4 Low	BA4L	

- All plates move to glass vials
- Plates Rinsed with ~3 mL hexane
- Solution (Hexane + oil) placed in Quartz cuvette
- Sample read w/ Chem 2000 uv/vis spectrophotometer.
- Spectrum converted to Excel file
- Integration of Absorbance from 230 to 330 nm
- Mass deposited calculated using cal curve

* NEED TO REANALYZE BLSU 4,5,8. DUE KR 9:00PM

✓ NEED TO REANALYZE BA2U4

✓ NEED TO REANALYZE BA3U1

✓ NEED TO REANALYZE BB1U4, BB1U7

✓ NEED TO REANALYZE B2L, 6, 7, 8

High flow RATE: 2500 RPM ≈ 2840 ACFM

Low Flow RATE: 750 RPM ≈ 700 ACFM

✓ NEED TO REANALYZE: B3L1

5/12/2003

FIELD TESTING SKID A (PART. MATTER)

1520 - START OF SAMPLING

- All samples 10 min @ 42 scfh
- Lowspeed : 725 rpm ≈ 700 ACFM
- highspeed : 2400 rpm ≈ 2800 Acfm

approx time	collected		file name	Moved to file
		Ancillary Line Terminations		
20 -	✓	Lowspeed	A RSLL	✓
45	✓	High Speed	A RSLU	✓
		AMS-4 Line Terminations		
15 -	✓	Lowspeed	ALSLL	✓
40	✓	Highspeed	A LSL ~~U~~	✓
		Ancillary Probe		
1712	✓	Low	A RSP L	✓
1728	✓	high	A RSP U	✓
		AMS-4 Probe	A LSPL	✓
0	✓	low ALSPL-1 Twisted filter	~~A RSP L~~	✓
10	✓	High	~~A RSP U~~	✓

TRAVERSE SAMPLES

56	✓	A1 high	min. insertion	long axis	A A1 U	✓
45	✓	A2 high	AA2U-6 had 2 filters		A A2U	✓
31	✓	A3 high			A A3U	✓
18	✓	A4 high	max. insertion		A A4U	✓
52		B1 high	min. ins.	short axis	A B1U	✓
41	✓	B2 high	AB2U2 - missing filter		A B2U	✓
31	✓	B3 high			A B3U	✓
26	✓	B4 high	max ins		A B4U	✓

[illegible]	collected ✓	A1 low	AA1L
[illegible] 1924	✓	A2 low	AA2L
[illegible]	✓	A3 low	AA3L
[illegible]:47	✓	A4 low	AA4L
[illegible]	✓	B1 low	AB1L
[illegible]:44	✓	B2 low	AB2L
[illegible]:56	✓	B3 low	AB3L
[illegible] 107	✓	B4 low	AB4L

SAMPLE PROCESSING SAME AS DESCRIBED ON PG. 55.

Attachment Ten

52

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# skid A

Measurement Date 3/20/03
Fan Exhaust Configuration:
Motor Power frequency 25 Hz
Motor current draw 6.7A

1. Equipment used and calibration
Manometer ________ Serial Number 154.1
Pitot-Tube Type-S Serial Number 2072
Traverse spacing pre-marked on pitot tube / pitot tube inspected by: [illegible]

2. Location Inspection
Location Comments: skid A, traverse B

3. Equipment setup
Connect manometer to tubing ✓ Pre-test leak test performed ✓
Adjust manometer sensitivity ✓ Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 1030 Run Complete Time: 1115

5. Post measurement leak test (at least 3" wg)
successful ✓ measurement voided ________

6. Record any condition which might affect measurements None

7. Holes covered
Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 5/3/03
Signature Print name Date

QA Review by:
[signature] R BREY 5/19/03
Signature Print name Date

Project Manager approval:
[signature] R Brey 5/19/03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# Skid A

Measurement Date 03/28/2003
Fan Exhaust Configuration:
Motor Power frequency 25Hz
Motor current draw 6.7A

1. Equipment used and calibration
Manometer ________ Serial Number ISU-1
Pitot-Tube Type-S Serial Number 2072
Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location Inspection
Location Comments: Skid A, traverse A

3. Equipment setup
Connect manometer to tubing ✓
Adjust manometer sensitivity ✓
Pre-test leak test performed ✓
Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 0800 Run Complete Time: 0850

5. Post measurement leak test (at least 3" wg)
successful ✓ measurement voided ________

6. Record any condition which might affect measurements NONE

7. Holes covered
Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices

Pressure measurement verification passed (within 5%) N/A

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 5/3/03
Signature Print name Date

QA Review by:
[signature] R BREY 5/19/03
Signature Print name Date

Project Manager approval:
[signature] R BREY 5/19/03
Signature Print name Date

Cyclonic Measurement Input Form (Form FTE-002) (Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# Skid A
Measurement Date 3 / 21 / 03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 0.1 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	0.01	3°	B1	0.5	0	0
A2	1.3	0.05	2°	B2	1.3	0.005	1°
A3	2.3	0.05	2°	B3	2.3	0	0
A4	3.8	0.0	0°	B4	3.8	0	0
A5	8.1	0.0	0°	B5	8.1	0.005	2°
A6	9.7	0.0	0°	B6	9.7	0	0
A7	10.7	0.04	1°	B7	10.7	0	0
A8	11.5	0.04	1°	B8	11.5	0	0
Sum α for A1 – A8			9°	Sum α for B1 – B8			3°
Average α is 1.5°							

Measurements by:

[signature] Jeremy Hawk 5 / 3 / 03
Signature Print name Date

QA Review by:

[signature] R Berg 5 / 19 / 03
Signature Print name Date

Project Manager approval:

[signature] R Berg 5 / 19 / 03
Signature Print name Date

@ 25 Hz, 6.7A

Premier Technologies Inc. W-314 Exhauster

ANSI/HPS N13.1 Qualification Project

Quality Assurance Plan and Standard Operating Procedures

Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# Skid A

Measurement Date 3 /21 /03

Fan Exhaust Configuration:

Motor Power frequency 60Hz

Motor current draw ________

1. Equipment used and calibration

Manometer ________ Serial Number ISU-1

Pitot-Tube Type-S Serial Number 2072

Traverse spacing pre-marked on pitot tube / pitot tube inspected by: [signature]

2. Location Inspection

Location Comments: Skid A, traverse B

3. Equipment setup

Connect manometer to tubing ✓ Pre-test leak test performed ✓

Adjust manometer sensitivity ✓ Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)

Approximate :Run Start Time: 1030 Run Complete Time: 1100

5. Post measurement leak test (at least 3" wg)

successful ✓ measurement voided ________

6. Record any condition which might affect measurements NONE

7. Holes covered

Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer

a) Inclined differential manometer employed verification not required. ✓

b) Inclined manometer Zeroed ✓

c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices

Pressure measurement verification passed (within 5%) N/A

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:

[signature] JEREMY HAWK 5/ 3/03

Signature Print name Date

QA Review by:

[signature] R. Berry 5/19/03

Signature Print name Date

Project Manager approval:

[signature] R Berry 5/19/03

Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# Skid A

Measurement Date 3 / 20 / 03
Fan Exhaust Configuration:
Motor Power frequency 60Hz
Motor current draw ______

1. Equipment used and calibration
Manometer ______ Serial Number ISU-1
Pitot-Tube Type-S Serial Number 2072
Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location Inspection
Location Comments: skid A, traverse A

3. Equipment setup
Connect manometer to tubing ✓
Adjust manometer sensitivity ✓
Pre-test leak test performed ✓
Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 0948 Run Complete Time: 1030

5. Post measurement leak test (at least 3" wg)
successful ✓ measurement voided ______

6. Record any condition which might affect measurements NONE

7. Holes covered ✓
Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices

Pressure measurement verification passed (within 5%) N/A

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY Hawk 05 / 03 / 03
Signature Print name Date

QA Review by:
[signature] R BREY 5 / 19 / 03
Signature Print name Date

Project Manager approval:
[signature] R BREY 5 / 19 / 03
Signature Print name Date

Cyclonic Measurement Input Form (Form FTE-002)
(Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# Skid A
Measurement Date 3 /20 /03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 0.1 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	0.015	3	B1	0.5	<0	3
A2	1.3	0.04	2	B2	1.3	<0	3
A3	2.3	0.0	0	B3	2.3	<0	2
A4	3.8	<0	-2	B4	3.8	0.03	-1
A5	8.1	<0	-12	B5	8.1	0.03	-2
A6	9.7	<0	-11	B6	9.7	0.03	-2
A7	10.7	<0	-15	B7	10.7	0.13	-4
A8	11.5	<0	-2	B8	11.5	0.11	-3
Sum α for A1 – A8			47°	Sum α for B1 – B8			20
Average α is	4.188°						

Measurements by:

[signature] JEREMY HAWK 5 / 3 /03
Signature Print name Date

QA Review by:

[signature] R BREY 5 /19 /03
Signature Print name Date

Project Manager approval:

[signature] R BREY 5 /19 /03
Signature Print name Date

*60 Hz

Premier Technologies Inc. W-314 Exhauster

ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# Skid A

Measurement Date 3/21/03

Fan Exhaust Configuration:
Motor Power frequency 40 Hz
Motor current draw 20 A

1. Equipment used and calibration
Manometer ____________ Serial Number 154-1
Pitot-Tube Type-S Serial Number 2072
Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location Inspection
Location Comments: Skid A, traverse B

3. Equipment setup
Connect manometer to tubing ✓
Pre-test leak test performed ✓
Adjust manometer sensitivity ✓
Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 1030 Run Complete Time: 1100

5. Post measurement leak test (at least 3" wg)
successful ✓ measurement voided________

6. Record any condition which might affect measurements NONE

7. Holes covered
Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 5/3/03
Signature Print name Date

QA Review by:
[signature] R BREY 5/19/03
Signature Print name Date

Project Manager approval:
[signature] R BREY 5/19/03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# Skid A

Measurement Date 3 / 21 / 03
Fan Exhaust Configuration:
Motor Power frequency 40 Hz
Motor current draw 20 [illegible]

1. Equipment used and calibration
Manometer ________ Serial Number 1541
Pitot-Tube Type-S Serial Number 2072
Traverse spacing pre-marked on pitot tube / pitot tube inspected by: ✓ [initials]

2. Location inspection
Location Comments: Skid A, traverse A

3. Equipment setup
Connect manometer to tubing ✓
Adjust manometer sensitivity ✓
Pre-test leak test performed ✓
Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 1100 Run Complete Time: 1115

5. Post measurement leak test (at least 3" wg)
successful ✓ measurement voided ________

6. Record any condition which might affect measurements NONE

7. Holes covered
Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required. ✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] Signature — JEREMY HAWK Print name — 5 / 3 / 03 Date

QA Review by:
[signature] Signature — R BREY Print name — 5 / 19 / 03 Date

Project Manager approval:
[signature] Signature — R BREY Print name — 5 / 19 / 03 Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Cyclonic Measurement Input Form (Form FTE-002)
(Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# Skid A
Measurement Date 3 /21 /03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 0.1 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	0.08	1	B1	0.5	0.08	1
A2	1.3	0.1	2	B2	1.3	0.08	3
A3	2.3	0.06	6	B3	2.3	0	0
A4	3.8	0.06	1	B4	3.8	<0	-1
A5	8.1	0.0	0	B5	8.1	<0	-2
A6	9.7	<0	-1	B6	9.7	<0	-2
A7	10.7	<0	-1	B7	10.7	<0	-3
A8	11.5	<0	-2	B8	11.5	<0	-2
Sum α for A1 – A8			8	Sum α for B1 – B8			14
Average α is 2.75°							

Measurements by:

Signature: [signature] Print name: Jeremy Hawk Date: 3/13/03

QA Review by:

Signature: R Brey Print name: R Brey Date: 5/19/03

Project Manager approval:

Signature: R Brey Print name: R Brey Date: 5/19/03

@ 40 Hz, 20 A

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date 5 / 12 / 03 Fan Exhaust Configuration
Skid A, 725RPM ≈ 700 ACFM

1. Equipment used and verification

Rotometer Dwyer Ratemaster Serial Number 5100

☑ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 2100 Run Complete Time: 2300

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1	0.8	✓	B1	0.8	✓
A2	3.0	✓	B2	3.0	✓
A3	~~6.8~~ 9.0	✓	B3	9.0	✓
A4	11.2	✓	B4	11.2	✓
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:
Used House Air for particle generation

Measurements by:

[signature] JEREMY HAWK 5 / 19 / 03
Signature Print name Date

Reviewed by:

[signature] R Brey 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date 5 / 12 / 03 Fan Exhaust Configuration
Skid A, 2500 RPM ≈ 2800 ACFM

1. Equipment used and verification

Rotometer Dwyer Ratemaster Serial Number 5-100

N/A ☐ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 1630 Run Complete Time: 1940

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
~~A1~~	AMS-4 line term.	✓	B1		
~~A2~~	AMS-4 Probe	✓	B2		
~~A3~~	Ancillary line term.	✓	B3		
~~A4~~	Ancillary Probe	✓	B4		
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:

Measurements by:

[signature] JEREMY HAWK 5/19/03
Signature Print name Date

Reviewed by:

R Bray R BREY 5/19/03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date 5 / 12 / 03 Fan Exhaust Configuration
Skid A 2400 RPM ≈ 2600 ACFM

1. Equipment used and verification

Rotometer Dwyer Rotameter Serial Number 5-180

☑ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 1830 Run Complete Time: 1940

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1	0.8	✓	B1	0.8	✓
A2	3.0	✓	B2	3.0	✓
A3	9.0	✓	B3	9.0	✓
A4	11.2	✓	B4	11.2	✓
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:

Measurements by:

[signature] Signature JEREMY HAWK Print name Date 5/19/03

Reviewed by:

R. Bray Signature R Bray Print name Date 5/19/03

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date 5 / 12 / 03 Fan Exhaust Configuration
Skid A 725 RPM ≈ 720 ACFM

1. Equipment used and verification

Rotometer Dwyer Rotameter Serial Number 5-100

N/A ☐ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 1520 Run Complete Time: 1630

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1	AMS-4 line term.	✓	B1		
A2	Ancillary line term.	✓	B2		
A3	AMS-4 Probe	✓	B3		
A4	Ancillary Probe	✓	B4		
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:

Measurements by:

[signature] JEREMY HAWK 5 / 19 / 03
Signature Print name Date

Reviewed by:

R Bray R Bray 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Gas Collection Form (Form FTE-007)

Measurement Date 3 / 21 / 03
Fan Exhaust Configuration Skid A
Motor Parameters 25Hz, 6.7A

1. Equipment used and verification

Flow Meter Dwyer Serial Number ___________

☑ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the SF_6 or CO_2 metering pressure 300 kPa

3. Perform traverse collections

Run Start Time: 1430 Run Complete Time: 1450

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 1/8 in)	Collected (check)	Point	Spacing (nearest 1/8 in)	Collected (check)
A1	0.5	✓	B1	0.5	
A2	1.3	✓	B2	1.3	
A3	2.3	✓	B3	2.3	
A4	3.3	✓	B4	3.3	
A5	8.1	✓	B5	8.1	
A6	9.7	✓	B6	9.7	
A7	10.7	✓	B7	10.7	
A8	11.5	✓	B8	11.5	

Comments: 1.973 L/min sample rate, 30 sec. collection time

Measurements by:
[signature] JEREMY HAWK 5 / 3 / 03
Signature Print name Date

Reviewed by:
R Bay R BAEY 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Gas Collection Form (Form FTE-007)

Measurement Date 3 /22 /03
Fan Exhaust Configuration Skid A
Motor Parameters 40Hz, 20A

1. Equipment used and verification

Flow Meter Dwyer Serial Number ____________

☑ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the (SF_6) or CO_2 metering pressure 300 kPa

3. Perform traverse collections

Run Start Time: 1700 Run Complete Time: 1730

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 1/8 in)	Collected (check)	Point	Spacing (nearest 1/8 in)	Collected (check)
A1	0.5	✓	B1	0.5	✓
A2	1.3	✓	B2	1.3	✓
A3	2.3	✓	B3	2.3	✓
A4	3.8	✓	B4	3.8	✓
A5	8.1	✓	B5	8.1	✓
A6	9.7	✓	B6	9.7	✓
A7	10.7	✓	B7	10.7	✓
A8	11.5	✓	B8	11.5	✓

Comments: 1.973 L/min sample rate, 30 sec collection time.

Measurements by:
[signature] JEREMY HAWK 5 / 3 / 03
Signature Print name Date

Reviewed by:
R Brey R BREY 5/19/03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

Measurement Location Skid A Measurement Date 3/21/03
Fan Exhaust Configuration 60 Hz

1. Equipment used and verification

Manometer Incline Serial Number ISU-1

Thermometer Radioshack Serial Number ________

Pitot-Tube Apex Serial Number 2072

☑ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location inspection
Location Comments:
Skid A, traverses A & B

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☑ Yes ☐ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 950 Run End Time: 1030 Average
Average Temperature during period of data collection 47.3°F

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12 (in.) Area: 0.784 (sq feet)

6. Post measurement leak test (3" wg)

☑ successful ☐ measurement voided

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=__________ (" H_2O) RH= __________ %

8. Back purge standard pitot tube and verify ☑ Not required

Profile location ________ Reading _______ (in wg) Percent difference _____ %

9. Stack gas dry molecular weight

☐ Reference Method 3 __________ ☑ Room Air (Use 29.0)

10. Conditions that might affect measurements

---

11. Holes covered

☑ Complete

12. Atmospheric Pressure

25.470 ("Hg) Barometer Location P.I.H

14.Post Measurement Verifications

☑ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

[signature] JEREMY HAWK 5/3/03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Input Form (Form FTE-005)

Measurement Location Skid A Measurement Date 3/21/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)	Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)
A1	0.5	0.570	47.3	B1	0.5	0.540	47.3
A2	1.3	0.600	↓	B2	1.3	0.600	↓
A3	2.3	0.655	↓	B3	2.3	0.640	↓
A4	3.8	0.700	↓	B4	3.8	0.671	↓
A5	8.1	0.715	↓	B5	8.1	0.790	↓
A6	9.7	0.750	↓	B6	9.7	0.760	↓
A7	10.7	0.710	↓	B7	10.7	0.715	↓
A8	11.5	0.660	↓	B8	11.5	0.650	↓
CP-A			↓	CP-B			↓

Measurements by:

[signature] JEREMY Hawk 5/3/03
Signature Print name Date

Reviewed by:

R Bray R Bray 5/19/03
Signature Print name Date

* 60Hz

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

Measurement Location Skid A Measurement Date 3/21/03
Fan Exhaust Configuration 40Hz, 20A

1. Equipment used and verification

Manometer Incline Serial Number ISU-1

Thermometer Radioshack Serial Number ______

Pitot-Tube Apex Serial Number 2072

☐ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location Inspection
Location Comments:
Skid A, traverses A&B

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☑ Yes ☐ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 1030 Run End Time: 1100 Average
Average Temperature during period of data collection 9.88 °C

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12 (in.) Area: 0.785 (sq feet)

6. Post measurement leak test (3" wg)

☑ successful ☐ measurement voided

Premier Technologies Inc. W-314 Exhauster

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ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

Page 2 of 2

7. Static Pressure and Relative Humidity

SP=__________ (" H_2O) RH= __________ %

8. Back purge standard pitot tube and verify ☑ Not required

Profile location ________ Reading ________ (in wg) Percent difference ______ %

9. Stack gas dry molecular weight

☐ Reference Method 3 ________ ☑ Room Air (Use 29.0)

10. Conditions that might affect measurements

NONE.

11. Holes covered

☑ Complete

12. Atmospheric Pressure

25.580 ("Hg) Barometer Location P.I.H

14.Post Measurement Verifications

☑ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

[signature] JEREMY HAWK 5/3/03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster 67

ANSI/HPS N13.1 Qualification Project

Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Input Form (Form FTE-005)

Page 1 of 1

Measurement Location Skid A Measurement Date 3/21/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)	Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)
A1	0.5	1.320	49.78	B1	0.5	1.180	49.78
A2	1.3	1.440	↓	B2	1.3	1.260	↓
A3	2.3	1.500		B3	2.3	1.330	
A4	3.8	1.650		B4	3.8	1.440	
A5	8.1	1.620		B5	8.1	1.710	
A6	9.7	1.520		B6	9.1	1.630	
A7	10.7	1.450		B7	10.7	1.540	
A8	11.5	1.360		B8	11.5	1.520	
CP-A	6		↓	CP-B	6		↓

Measurements by:

[signature] Signature JEREMY HAWK Print name Date 5/3/03

Reviewed by:

R Brey Signature R Brey Print name Date 5/19/03

* 40 Hz, 20A

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

Measurement Location Skid A Measurement Date 3/21/03
Fan Exhaust Configuration 25 Hz, 6.7A

1. Equipment used and verification

Manometer Incline Serial Number ISU-1

Thermometer Radioshack Serial Number ______

Pitot-Tube Apex Serial Number 2072

☑ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location inspection
Location Comments:
Skid A, traverses A & B

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☑ Yes ☐ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 830 Run End Time: 1030 Average
Average Temperature during period of data collection 8.5°C

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12 (in.) Area: ~~3.14~~ 0.785 (sq feet)

6. Post measurement leak test (3" wg)

☑ successful ☐ measurement voided

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=__________ (" H_2O) RH= __________ %

8. Back purge standard pitot tube and verify ☑ Not required

Profile location ________ Reading ______ (in wg) Percent difference _____ %

9. Stack gas dry molecular weight

☐ Reference Method 3 ________ ☑ Room Air (Use 29.0)

10. Conditions that might affect measurements

None

11. Holes covered

☑ Complete

12. Atmospheric Pressure

25.580 ("Hg) Barometer Location PIH

14.Post Measurement Verifications

☑ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

[signature] Signature — Jeremy Hauck Print name — Date 5/3/03

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

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Velocity Measurement Input Form (Form FTE-005)

Page 1 of 1

Measurement Location Skid A Measurement Date 3/21/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F) Avg.	Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F) Avg
A1	0.5	0.020	47.3	B1	0.5	0.020	47.3
A2	1.3	0.025	↓	B2	1.3	0.022	↓
A3	2.3	0.030		B3	2.3	0.025	
A4	3.8	0.038		B4	3.8	0.029	
A5	8.1	0.032		B5	8.1	0.031	
A6	9.7	0.035		B6	9.7	0.031	
A7	10.7	0.030		B7	10.7	0.031	
A8	11.5	0.030		B8	11.5	0.029	
CP-A	6			CP-B	6		

Measurements by:

[signature] Signature JEREMY HAWK Print name Date 5/3/03

Reviewed by:

R Bray Signature R Brey Print name Date 5/19/03

*25 Hz, 6.7A

.Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

Measurement Location Skid B Measurement Date 4/18/03
Fan Exhaust Configuration 60 Hz

1. Equipment used and verification

Manometer Incline Serial Number ISU-1

Thermometer Radioshack Serial Number ________

Pitot-Tube Apex Serial Number 2072

☑ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location inspection
Location Comments:
Skid B, traverses A+B

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☑ Yes ☐ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 0930 Run End Time: 1000 Average
Average Temperature during period of data collection 9.8 °C

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12.0 (in.) Area: 0.785 (sq feet)

6. Post measurement leak test (3" wg)

☑ Successful ☐ measurement voided

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=________ (" H_2O) RH= ________ %

8. Back purge standard pitot tube and verify ☑ Not required

Profile location ______ Reading ______ (in wg) Percent difference ____ %

9. Stack gas dry molecular weight

☐ Reference Method 3 ______ ☑ Room Air (Use 29.0)

10. Conditions that might affect measurements

NONE

11. Holes covered

☑ Complete

12. Atmospheric Pressure

25.350 ("Hg) Barometer Location PIH

14.Post Measurement Verifications

☑ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

[signature] JEREMY HAWK 5/3/03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Input Form (Form FTE-005)

Measurement Location ________________ Measurement Date 4/18/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)	Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)
A1	0.5	0.165	49.6	B1			
A2	1.3	0.185	↓	B2			
A3	2.3	0.210		B3			
A4	3.8	0.225		B4	DATA NOT TAKEN		
A5	8.1	0.220		B5			
A6	9.7	0.210		B6			
A7	10.7	0.210		B7			
A8	11.5	0.200		B8			
CP-A	6.0	0.220	↓	CP-B			

Measurements by:

[signature] Signature Jeremy Hawk Print name Date 5/3/03

Reviewed by:

R Brey Signature R Brey Print name Date 5/19/03

* 60 Hz

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

Measurement Location Skid B Measurement Date 4/18/03
Fan Exhaust Configuration 40Hz, 20R

1. Equipment used and verification

Manometer Inclined Serial Number 15U-1

Thermometer Radioshack Serial Number ______

Pitot-Tube Apex Serial Number 2072

☑ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location inspection

Location Comments:
Skid B, traverses A&B

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☑ Yes ☐ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 0700 Run End Time: 1330 Average
Average Temperature during period of data collection 59.0 °F

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12 (in.) Area: 0.785 (sq feet)

6. Post measurement leak test (3" wg)

☑ successful ☐ measurement voided

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=________ (" H_2O) RH= ________ %

8. Back purge standard pitot tube and verify ☑ Not required

Profile location ______ Reading ______ (in wg) Percent difference ______ %

9. Stack gas dry molecular weight

☐ Reference Method 3 ______ ☑ Room Air (Use 29.0)

10. Conditions that might affect measurements

NONE

11. Holes covered

☑ Complete

12. Atmospheric Pressure

25.330 ("Hg) Barometer Location Pocatello Airport

14.Post Measurement Verifications

☑ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

[signature] Signature — Jeremy Houk Print name — 5/5/03 Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Input Form (Form FTE-005)

Measurement Location Skid B   Measurement Date 4/18/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)	Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)
A1	0.5	0.820	59.0	B1	0.5	0.950	59.0
A2	1.3	1020	↓	B2	1.3	1.100	↓
A3	2.3	1.150		B3	2.3	1.210	
A4	3.8	1.275		B4	3.8	1.310	
A5	8.1	1.390		B5	8.1	1.240	
A6	9.7	1.270		B6	9.7	1.115	
A7	10.7	1.225		B7	10.7	1.075	
A8	11.5	1.215		B8	11.5	1.050	
CP-A	6.0	1.400 ~~0.23~~		CP-B	6.0		

Measurements by:

Signature (signed) Print name JEREMY HAWK Date 5/3/03

Reviewed by:

Signature R Brey Print name R BREY Date 5/19/03

* 40 Hz, 20A

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

Measurement Location Skid B Measurement Date 4/18/03
Fan Exhaust Configuration 25Hz, 6.7A

1. Equipment used and verification

Manometer Incline Serial Number ISU-1

Thermometer Radio shack Serial Number ________

Pitot-Tube Apex Serial Number 2072

☑ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location Inspection
Location Comments:
Skid B, traverses A & B

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☑ Yes ☐ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 1005 Run End Time: 1210 Average
Average Temperature during period of data collection 11.8 °C

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12 (in.) Area: 0.785 (sq feet)

6. Post measurement leak test (3" wg)

☑ successful ☐ measurement voided

Premier Technologies Inc. W-314 Exhauster 66
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=__________ (" H_2O) RH= __________ %

8. Back purge standard pitot tube and verify ☑ Not required

Profile location ________ Reading ________ (in wg) Percent difference ______ %

9. Stack gas dry molecular weight

☐ Reference Method 3 ________ ☑ Room Air (Use 29.0)

10. Conditions that might affect measurements

---

11. Holes covered

☑ Complete

12. Atmospheric Pressure

25.360 ("Hg) Barometer Location P1H

14.Post Measurement Verifications

☑ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

[signature] JEREMY HAWK 5/13/03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster

ANSI/HPS N13.1 Qualification Project

Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Input Form (Form FTE-005)

Measurement Location SkidB Measurement Date 4/18/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)	Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)
A1	0.5	0.015	53.2	B1	0.5	0.020	53.2
A2	1.3	0.015	↓	B2	1.3	0.026	↓
A3	2.3	0.020		B3	2.3	0.030	
A4	3.8	0.020		B4	3.8	0.030	
A5	8.1	0.020		B5	8.1	0.030	
A6	9.7	0.020		B6	9.7	0.030	
A7	10.7	0.015		B7	10.7	0.025	
A8	11.5	0.015		B8	11.5	0.025	
CP-A	6.0	0.025		CP-B	6.0		

Measurements by:

[signature] JEREMY HAWK 5/13/03

Signature Print name Date

Reviewed by:

R Bray R BRAY 5/19/03

Signature Print name Date

* 25 Hz, 6.7 A

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# Skid B

Measurement Date 4 / 18 / 03
Fan Exhaust Configuration:
Motor Power frequency 60Hz
Motor current draw ______

1. Equipment used and calibration
Manometer ______ **Serial Number** ISU-1
Pitot-Tube Type-S Serial Number 2072
Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location Inspection
Location Comments: Skid B, traverse B

3. Equipment setup
Connect manometer to tubing ✓ **Pre-test leak test performed** ✓
Adjust manometer sensitivity ✓ **Level and zero the manometer** ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 1130 **Run Complete Time:** 1200

5. Post measurement leak test (at least 3" wg)
successful ✓ **measurement voided** ______

6. Record any condition which might affect measurements NONE

7. Holes covered
Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 5, 3, 03
Signature Print name Date

QA Review by:
[signature] R BREY 5/19/03
Signature Print name Date

Project Manager approval:
[signature] R BREY 5/19/03
Signature Print name Date

52

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# Skid B

Measurement Date 4 / 19 / 03
Fan Exhaust Configuration:
Motor Power frequency 40 Hz
Motor current draw 20A

1. Equipment used and calibration
Manometer ______ Serial Number 154-1
Pitot-Tube Type-S Serial Number 2072
Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location Inspection
Location Comments: Skid B traverse B

3. Equipment setup
Connect manometer to tubing ✓
Adjust manometer sensitivity ✓
Pre-test leak test performed ✓
Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 1030 Run Complete Time: 1100

5. Post measurement leak test (at least 3" wg)
successful ✓ measurement voided______

6. Record any condition which might affect measurements NONE

7. Holes covered
Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required. ✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 5 / 3 / 03
Signature Print name Date

QA Review by:
R Brey R Brey 5 / 19 / 03
Signature Print name Date

Project Manager approval:
R Brey R BREY 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster

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ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures
Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# skid B

Measurement Date 4 / 18 / 03
Fan Exhaust Configuration:
Motor Power frequency 25 Hz
Motor current draw 6.7A

1. Equipment used and calibration
Manometer ____________ Serial Number 1544
Pitot-Tube Type-S Serial Number 2072
Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location Inspection
Location Comments: Skid B, traverse B

3. Equipment setup
Connect manometer to tubing ✓ Pre-test leak test performed ✓
Adjust manometer sensitivity ✓ Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 1015 Run Complete Time: 1030

5. Post measurement leak test (at least 3" wg)
successful ✓ measurement voided ________

6. Record any condition which might affect measurements NONE

7. Holes covered
Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 4 / 18 / 03
Signature Print name Date

QA Review by:
R Brey R BREY 5 / 19 / 03
Signature Print name Date

Project Manager approval:
R Brey R BREY 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# skid B

Measurement Date 4 / 18 / 03
Fan Exhaust Configuration:
Motor Power frequency 60 Hz
Motor current draw ________

1. Equipment used and calibration
Manometer ____________ Serial Number 15U-1
Pitot-Tube Type-S Serial Number 2072
Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location inspection
Location Comments: skid B, traverse A

3. Equipment setup
Connect manometer to tubing ✓
Adjust manometer sensitivity ✓
Pre-test leak test performed ✓
Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 1100 Run Complete Time: 1130

5. Post measurement leak test (at least 3" wg)
successful ✓ measurement voided________

6. Record any condition which might affect measurements NONE

7. Holes covered
Complete

7.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 5, 3, 03
Signature Print name Date

QA Review by:
R Bray R BRAY 5 /19 /03
Signature Print name Date

Project Manager approval:
R Bray R BRAY 5 /19 /03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster

ANSI/HPS N13.1 Qualification Project

Quality Assurance Plan and Standard Operating Procedures

Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# Skid B

Measurement Date 4 / 18 / 03

Fan Exhaust Configuration:

Motor Power frequency 40 Hz

Motor current draw 20A

1. Equipment used and calibration

Manometer ____ Serial Number ISU-1

Pitot-Tube Type-S Serial Number 2072

Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location inspection

Location Comments: Skid B, traverse A

3. Equipment setup

Connect manometer to tubing ✓

Adjust manometer sensitivity ✓

Pre-test leak test performed ✓

Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)

Approximate :Run Start Time: 1015 Run Complete Time: 1030

5. Post measurement leak test (at least 3" wg)

successful ✓ measurement voided ____

6. Record any condition which might affect measurements NONE

7. Holes covered

Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer

a) Inclined differential manometer employed verification not required. ✓

b) Inclined manometer Zeroed ✓

c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices

Pressure measurement verification passed (within 5%) N/A

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:

[signature] Signature — JEREMY HAWK Print name — 5 / 3 / 03 Date

QA Review by:

R Brey Signature — R BREY Print name — 5 / 19 / 03 Date

Project Manager approval:

R Brey Signature — R BREY Print name — 5 / 19 / 03 Date

Premier Technologies Inc. W-314 Exhauster

ANSI/HPS N13.1 Qualification Project

Quality Assurance Plan and Standard Operating Procedures

Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# skid B

Measurement Date 4 / 18 / 03

Fan Exhaust Configuration:

Motor Power frequency 25Hz

Motor current draw 6.7A

1. Equipment used and calibration

Manometer ________ Serial Number ISU-1

Pitot-Tube Type-S Serial Number 2072

Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location Inspection

Location Comments: skid B, traverse A

3. Equipment setup

Connect manometer to tubing ✓

Adjust manometer sensitivity ✓

Pre-test leak test performed ✓

Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)

Approximate :Run Start Time: 0830 Run Complete Time: 0900

5. Post measurement leak test (at least 3" wg)

successful ✓ measurement voided ________

6. Record any condition which might affect measurements NONE

7. Holes covered

Complete ✓

7.Manometer Verification

A. Inclined Differential Manometer

a) Inclined differential manometer employed verification not required.

✓

b) Inclined manometer Zeroed ✓

c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:

[signature] Signature — JEREMY HAWK Print name — 5/3/03 Date

QA Review by:

[signature] Signature — R BREY Print name — 5/19/03 Date

Project Manager approval:

[signature] Signature — R BREY Print name — 5/19/03 Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Cyclonic Measurement Input Form (Form FTE-002)
(Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# Skid B
Measurement Date 4 / 18 / 03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure at α = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 0.1 in)	Velocity Pressure at α = 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	0	0	B1	0.5	0	0
A2	1.3	0	0	B2	1.3	0	0
A3	2.3	0	0	B3	2.3	0	0
A4	3.9	0	0	B4	3.9	0	0
A5	8.1	0	0	B5	8.1	0	0
A6	9.7	0	0	B6	9.7	0	0
A7	10.7	0	0	B7	10.7	0	0
A8	11.5	0	0	B8	11.5	0	0
Sum α for A1 – A8			0	Sum α for B1 – B8			0
Average α is 0°							

Measurements by:

[signature] Signature — JEREMY HAWK Print name — 5 / 3 / 03 Date

QA Review by:

R Brey Signature — R BREY Print name — 5 / 29 / 03 Date

Project Manager approval:

R Brey Signature — R BREY Print name — 5 / 29 / 03 Date

@ 25Hz, 6.7A

Cyclonic Measurement Input Form (Form FTE-002)
(Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# skid B
Measurement Date 4 / 18 / 03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure at α= 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 0.1 in)	Velocity Pressure at α= 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	0.440	-10°	B1	0.6	0.175	-6°
A2	1.3	0.065	-8°	B2	1.3	0.050	-4°
A3	2.3	0.060	-6°	B3	2.3	0.055	-3°
A4	3.9	0.050	-3°	B4	3.9	0.050	-3°
A5	8.2	0.030	-1°	B5	8.1	<0	2°
A6	9.67	<0	1°	B6	9.7	<0	3°
A7	10.7	<0	3°	B7	10.7	<0	5°
A8	11.5	<0	5°	B8	11.5	<0	6°
Sum α for A1 – A8			37°	Sum α for B1 – B8			32°
Average α is 4.313°							

Measurements by:

Signature: [signature] Print name: JEREMY HAWK Date: 5 / 3 / 03

QA Review by:

Signature: R Brey Print name: R BREY Date: 5 / 29 / 03

Project Manager approval:

Signature: R Brey Print name: R BREY Date: 5 / 29 / 03

* 40 Hz, 20A

* Sum is Absolute Value of α

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Cyclonic Measurement Input Form (Form FTE-002) (Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# Skid B
Measurement Date 4 / 18 / 03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure at α = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 0.1 in)	Velocity Pressure at α = 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	<0	4°	B1	0.5	NOT TAKEN	
A2	1.3	<0	2°	B2	1.3		
A3	2.3	<0	5°	B3	2.3		
A4	3.9	<0	6°	B4	3.9		
A5	8.1	<0	4°	B5	8.1		
A6	9.7	<0	6°	B6	9.7		
A7	10.7	<0	5°	B7	10.7		
A8	11.5	<0	4°	B8	11.5		
Sum α for A1 – A8			36°	Sum α for B1 – B8			
Average α is		4.5					

Measurements by:

[signature] JEREMY HAWK 4 / 17 / 03
Signature Print name Date

QA Review by:

[signature] R BREY 5 / 14 / 03
Signature Print name Date

Project Manager approval:

[signature] R BREY 5 / 19 / 03
Signature Print name Date

* 60 Hz

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date 4 / 19 / 03 Fan Exhaust Configuration
Skid B, 25Hz, 67 A

1. Equipment used and verification

Rotometer Dwyer Serial Number ____________

NA Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 0900 Run Complete Time: 0900

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1	RSP right sample Port	✓	B1		
A2	LSP left sample Port	✓	B2		
A3	RSL right sample Port	✓	B3		
A4	LSL left sample Port	✓	B4		
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:

Measurements by:

[signature] JEREMY HAWK 5 / 3 / 03
Signature Print name Date

Reviewed by:

R Brey R BREY 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster 79
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Page 1 of 1

Measurement Date 4 / 19 / 03 Fan Exhaust Configuration
Skid B 40 Hz, 20 A

1. Equipment used and verification

Rotometer Dwyer Serial Number ________

NA ☐ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 0730 Run Complete Time: 0900

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1	RSP right sample Port	✓	B1		
A2	LSP left sample Port	✓	B2		
A3	RSL right sample line	✓	B3		
A4	LSL left sample line	✓	B4		
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments: 10 min collection Each Sample, 42 scfm

Measurements by:

[signature] Signature JEREMY HAWK Print name Date 5 / 3 / 03

Reviewed by:

R Brey Signature R Brey Print name Date 5 / 19 / 03

Premier Technologies Inc. W-314 Exhauster 79

ANSI/HPS N13.1 Qualification Project

Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Page 1 of 1

Measurement Date 4 / 19 / 03 Fan Exhaust Configuration

Skid B, 25 Hz, 20A

1. Equipment used and verification

Rotometer Dwyer Serial Number ____________

☑ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 1345 Run Complete Time: 1545

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1	0.8		B1	0.8	
A2	3.0		B2	3.0	
A3	9.0		B3	9.0	
A4	11.2		B4	11.2	
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments: 10 min @ each point, 20LPM

Measurements by:

[signature] JEREMY HACOK 5 / 3 / 03

Signature Print name Date

Reviewed by:

R Brey R BREY 5 / 19 / 03

Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date 4 / 19 / 03 Fan Exhaust Configuration
Skid B 40 hz, 20 A

1. Equipment used and verification

Rotometer Dwyer Serial Number ____________

☑ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 0900 Run Complete Time: 1100

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1	0.8	✓	B1	0.8	✓
A2	3.0	✓	B2	3.0	✓
A3	9.0	✓	B3	9.0	✓
A4	11.2	✓	B4	11.2	✓
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments: 10 min @ each point, 20 LPM

Measurements by:

[signature] JEREMY HAWK 5 / 3 / 03
Signature Print name Date

Reviewed by:

R Brey R Brey 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster 72

ANSI/HPS N13.1 Qualification Project

Quality Assurance Plan and Standard Operating Procedures

Tracer Gas Collection Form (Form FTE-007)

Measurement Date 4 / 18 / 03

Fan Exhaust Configuration Skid B

Motor Parameters 25 Hz, 6.7 A

1. Equipment used and verification

Flow Meter Dwyer Serial Number ____________

☒ Traverse spacing pre-marked on collection tube

2. Equipment setup

☒ Set the SF_6 or CO_2 (circled) metering pressure 80 psi

3. Perform traverse collections

Run Start Time: 1430 Run Complete Time: 1450

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 1/8 in)	Collected (check)	Point	Spacing (nearest 1/8 in)	Collected (check)
A1	0.5	✓	B1	0.5	✓
A2	1.3	✓	B2	1.3	✓
A3	2.3	✓	B3	2.3	✓
A4	3.8	✓	B4	3.8	✓
A5	8.1	✓	B5	8.1	✓
A6	9.7	✓	B6	9.7	✓
A7	10.7	✓	B7	10.7	✓
A8	11.5	✓	B8	11.5	✓

Comments: 1.973 L/min, 30 sec. collection

Measurements by:

[signature] JEREMY HAWK 5/3/03

Signature Print name Date

Reviewed by:

R Brey R. Brey 5/19/03

Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Gas Collection Form (Form FTE-007)

Measurement Date 4 / 18 / 03
Fan Exhaust Configuration Skid B
Motor Parameters 40 Hz 20A

1. Equipment used and verification

Flow Meter Dwyer Serial Number ____________

☑ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the SF_6 or (CO_2) metering pressure 80 psi

3. Perform traverse collections

Run Start Time: 1500 Run Complete Time: 1520

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 1/8 in)	Collected (check)	Point	Spacing (nearest 1/8 in)	Collected (check)
A1	0.5	✓	B1	0.5	✓
A2	1.3	✓	B2	1.3	✓
A3	2.3	✓	B3	2.3	✓
A4	3.8	✓	B4	3.8	✓
A5	8.1	✓	B5	8.1	✓
A6	9.7	✓	B6	9.7	✓
A7	10.7	✓	B7	10.7	✓
A8	11.5	✓	B8	11.5	✓

Comments: 1.973 L/min sample rate, 30 sec collection time.

Measurements by:
[signature] JEREMY HAWK 5 / 3 / 03
Signature Print name Date

Reviewed by:
[signature] R BREY 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date 5 / 10 / 03 Fan Exhaust Configuration
SkidB, 2500 RPM ~ 2840 ACFM

1. Equipment used and verification

Rotometer Dwyer Ratemaster Serial Number 5-100

☑ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 1900 Run Complete Time: 2100

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1	0.8	✓	B1	0.8	✓
A2	3.0	✓	B2	3.0	✓
A3	9.0	✓	B3	9.0	✓
A4	11.2	✓	B4	11.2	✓
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments: * B4 sample time 9 min, all others 10 min

Measurements by:

[signature] JEREMY HAWK 5 / 19 / 03
Signature Print name Date

Reviewed by:

[signature] R BREY 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date 5 / 10 / 03 Fan Exhaust Configuration
SKHB, 750 RPM

1. Equipment used and verification

Rotometer Dwyer Ratemaster Serial Number 5-106

☑ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 1700 Run Complete Time: 1900

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
A1	0.8		B1	0.8	
A2	3.0		B2	3.0	
A3	9.0		B3	9.0	
A4	11.2		B4	11.2	
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:

Measurements by:

[signature] Signature JEREMY HAWK Print name Date 5 / 10 / 03

Reviewed by:

[signature] Signature R BREY Print name Date 5 / 19 / 03

Premier Technologies Inc. W-314 Exhauster 79
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Page 1 of 1

Measurement Date 5 / 10 / 03 Fan Exhaust Configuration
SkHB, 2500 RPM ≈ 2840 ACFM

1. Equipment used and verification

Rotometer Dwyer Rotameter Serial Number 5-100

N/A ☐ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 1600 Run Complete Time: 1700

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
~~A1~~	AMS-4 line term	✓	B1		
~~A2~~	Ancillary line term	✓	B2		
~~A3~~	AMS-4 probe	✓	B3		
~~A4~~	Ancillary probe	✓	B4		
~~A5~~			B5		
A6			B6		
A7			B7		
A8			B8		

Comments:

Measurements by:

[signature] JEREMY HAWK 5 / 10 / 03
Signature Print name Date

Reviewed by:

Rich Brey Rich Brey 5 / 19 / 03
Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Tracer Particle Collection Form (Form FTE-009)

Measurement Date 5 / 10 / 03 Fan Exhaust Configuration
SKID B, 750 RPM ≈ 698 acfm

1. Equipment used and verification

Rotometer Dwyer Ratemaster Serial Number 5-100

N/A ☐ Traverse spacing pre-marked on collection tube

2. Equipment setup

☑ Set the generator pressure at 15 psi

3. Perform traverse collections

Run Start Time: 1500 Run Complete Time: 1600

Collection Traverse A			Collection Traverse B		
Point	Spacing (nearest 0.1 in)	Collected (check)	Point	Spacing (nearest 0.1 in)	Collected (check)
~~A1~~	AMS-4 Line. term	✓	B1		
~~A2~~	Ancillary line term.	✓	B2		
~~A3~~	AMS-4 Probe	✓	B3		
~~A4~~	Ancillary Probe	✓	B4		
A5			B5		
A6			B6		
A7			B7		
A8			B8		

Comments: 10% oil/dye solution used.

Measurements by:

[signature] JEREMY HAWK 5 / 19 / 03
Signature Print name Date

Reviewed by:

R Berg RICH BERG 5 / 19 / 03
Signature Print name Date

Velocity Measurement Form (Form FTE-004)

Measurement Location BW Measurement Date 9/1/03
Fan Exhaust Configuration 40 Hz

1. Equipment used and verification

Manometer Dwyer Serial Number 1541

Thermometer _________ Serial Number _________

Pitot-Tube Apex Serial Number 2672

☑ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location inspection
Location Comments:

---

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☐ Yes ☑ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 1525 Run End Time: 1640 ~~Average~~
Average Temperature during period of data collection 34.5(A) 33.6 (B)

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12 (in.) Area: π/4 (sq feet)

6. Post measurement leak test (3" wg)

☑ successful ☐ measurement voided

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=__________ (" H_2O) RH= __________%

8. Back purge standard pitot tube and verify ☐ Not required

Profile location ________ Reading ______ (in wg) Percent difference _____ %

9. Stack gas dry molecular weight

☐ Reference Method 3 ________ ☒ Room Air (Use 29.0)

10. Conditions that might affect measurements

____

11. Holes covered

☐ Complete

12. Atmospheric Pressure

__________ ("Hg) Barometer Location PIH

2.Post Measurement Verifications

☒ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

[signature] Signature JEREMY HAWK Print name 9/1/03 Date

Premier Technologies Inc. W-314 Exhauster 67

ANSI/HPS N13.1 Qualification Project

Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Input Form (Form FTE-005)

Page 1 of 1

Measurement Location BW-40 Hz Measurement Date 9/1/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)	Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (°F)
A1	0.5	0.945	34.6	B1	0.5	0.850	33.5
A2	1.3	0.990	34.6	B2	1.3	0.890	33.6
A3	2.3	1.050	34.6	B3	2.3	0.980	33.6
A4	3.8	1.110	34.9	B4	3.8	1.050	33.6
A5	8.1	0.950	34.8	B5	8.1	1.045	33.6
A6	9.7	0.850	34.8	B6	9.7	0.980	33.6
A7	10.7	0.806	34.7	B7	10.7	0.950	33.6
A8	11.5	0.715	34.7	B8	11.5	0.900	33.6
CP-A	6	1.120	34.9	CP-B	6	1.115	33.6

Measurements by:

J. Hawk — Signature; JEREMY HAWK — Print name; Date 9/1/03

Reviewed by:

R Brey — Signature; RICH BREY — Print name; Date 9/2/03

Velocity Measurement Form (Form FTE-004)

Measurement Location Skid BW Measurement Date 9/1/05
Fan Exhaust Configuration 25 Hz

1. Equipment used and verification

Manometer Dwyer Serial Number 15U I

Thermometer ________ Serial Number ________

Pitot-Tube Apex Serial Number 2072

☑ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location inspection
Location Comments:
TRAVERSES A & B

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☐ Yes ☑ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 1615 Run End Time: 1651 Average
Average Temperature during period of data collection 33° (A) 31.4 (B)

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12 (in.) Area: π/4 (sq feet)

6. Post measurement leak test (3" wg)

☑ successful ☐ measurement voided

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=____________ (" H_2O) RH= ____________%

8. Back purge standard pitot tube and verify ☐ Not required

Profile location _________ Reading _______ (in wg) Percent difference _____ %

9. Stack gas dry molecular weight

☐ Reference Method 3 __________ ☒ Room Air (Use 29.0)

10. Conditions that might affect measurements

---

11. Holes covered

☐ Complete

12. Atmospheric Pressure

____________ ("Hg) Barometer Location P/H

2.Post Measurement Verifications

☒ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

Jeremy Hawk (signature) JEREMY HAWK 9/11/03

Signature Print name Date

Premier Technologies Inc. W-314 Exhauster
ANSI/HPS N13.1 Qualification Project
Quality Assurance Plan and Standard Operating Procedures

Velocity Measurement Input Form (Form FTE-005)

Measurement Location BL-25Hz Measurement Date 9/1/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (~~°F~~) C	Point	Spacing (nearest 0.1 in)	Velocity Pressure (in H_2O)	Temperature (~~°F~~) C
A1	0.5	0.098	32.9	B1	0.5	0.100	31.7
A2	1.3	0.090	32.9	B2	1.3	0.100	31.6
A3	2.3	0.105	32.9	B3	2.3	0.110	31.4
A4	3.8	0.110	32.9	B4	3.8	0.130	31.4
A5	8.1	0.110	33.0	B5	8.1	0.130	31.4
A6	9.7	0.105	33.0	B6	9.7	0.120	31.4
A7	10.7	0.100	33.1	B7	10.7	0.110	31.3
A8	11.5	0.090	33.1	B8	11.5	0.100 (corrected, initialed)	31.3
CP-A	6	0.115	32.9	CP-B	6	0.130	31.4

Measurements by:

[signature] Signature JEREMY HAWK Print name Date 9/1/03

Reviewed by:

[signature] Signature RICH BREY Print name Date 9/2/03

Velocity Measurement Form (Form FTE-004)

Measurement Location Skid Aw Measurement Date 9/1/03
Fan Exhaust Configuration 40 Hz

1. Equipment used and verification

Manometer Bugr Serial Number 15U1

Thermometer ________ Serial Number ________

Pitot-Tube Apex Serial Number 2072

☑ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location Inspection
Location Comments:
AW TRAVERSE A&B

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☐ Yes ☑ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 900 Run End Time: 1300 Average
Average Temperature during period of data collection 26.6°C (A) 33.9°C (B)

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12 (in.) Area: π/4 (sq feet)

6. Post measurement leak test (3" wg)

☑ successful ☐ measurement voided

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=__________ (" H_2O) RH= __________%

8. Back purge standard pitot tube and verify ☑ Not required

Profile location ________ Reading ______ (in wg) Percent difference _____ %

9. Stack gas dry molecular weight

☐ Reference Method 3 ________ ☒ Room Air (Use 29.0)

10. Conditions that might affect measurements

NONE

11. Holes covered

☒ Complete

12. Atmospheric Pressure

__________ ("Hg) Barometer Location PTH

2. Post Measurement Verifications

☒ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

[signature] Signature   JEREMY HAWK Print name   Date 9 / 1 / 03

Velocity Measurement Input Form (Form FTE-005)

Page 1 of 1

Measurement Location AL - 40 Hz Measurement Date 09/01/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 1/8 in)	Velocity Pressure (in H_2O)	Temperature (°C)	Point	Spacing (nearest 1/8 in)	Velocity Pressure (in H_2O)	Temperature (°C)
A1	0.5	0.890	26.6°C	B1	0.5	0.920	33.8°C
A2	1.3	0.980	26.6°C	B2	1.3	0.950	33.8°C
A3	2.3	1.015	26.6°C	B3	2.3	1.040	33.9°C
A4	3.8	1.050	26.7°C	B4	3.8	1.125	33.9°C
A5	8.1	0.935	26.6°C	B5	8.1	1.100	34.0°C
A6	9.7	0.810	26.5°C	B6	9.7	0.995	34.0°C
A7	10.7	0.770	26.5°C	B7	10.7	0.970	34.0°C
A8	11.5	0.720	26.6°C	B8	11.5	0.935	33.9°C
CP-A	6	1.065	26.7°C	CP-B	6	1.170	34.0°C

B traverse start: 1238 end 1248

Measurements by:

[signature] Signature JEREMY HAUK Print name 09/01/03 Date

Velocity Measurement Form (Form FTE-004)

Page 1 of 2

Measurement Location AW Measurement Date 9/1/03
Fan Exhaust Configuration 25H2 6.7A

1. Equipment used and verification

Manometer Dwyer Serial Number 1541

Thermometer ________ Serial Number ________

Pitot-Tube Apex Serial Number 2072

☑ Traverse spacing pre-marked on pitot-tube / pitot-tube inspected

2. Location inspection
Location Comments:
TRAVERSED A + B

3. Equipment setup

☑ Zero the manometer
☑ Connect manometer to tubing
☑ Adjust manometer sensitivity

Pre-test leak check performed (not mandatory): ☐ Yes ☑ No

4. Perform traverse readings (Be sure to record velocity pressure and temperature in table on FTE-005)

Approximate Run Start Time: 1000 Run End Time: 1300 Average
Average Temperature during period of data collection 24.2°C (A) 34.1°C (B)

5. Diameter and cross-sectional area of stack or duct (from previous measurements)

Diameter: 12 (in.) Area: π/4 (sq feet)

6. Post measurement leak test (3" wg)

☑ successful ☐ measurement voided

Velocity Measurement Form (Form FTE-004)

7. Static Pressure and Relative Humidity

SP=__________ (" H_2O) RH= __________%

8. Back purge standard pitot tube and verify ☒ Not required

Profile location ________ Reading ______ (in wg) Percent difference _____ %

9. Stack gas dry molecular weight

☐ Reference Method 3 __________ ☑ Room Air (Use 29.0)

10. Conditions that might affect measurements

---

11. Holes covered

☑ Complete

12. Atmospheric Pressure

__________ ("Hg) Barometer Location P/H

2.Post Measurement Verifications

☑ Manometer verification not required.

☐ Electronic Digital Manometer (EDM) verification passed (within 5%)

Test Number	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
	Manometer	Reference	% Difference	Manometer	Reference	% Difference
1						
2						
3						

Comments:

Measurements by:

[signature] JEREMY HAWK 9/1/03

Signature Print name Date

Velocity Measurement Input Form (Form FTE-005) 25 HZ

Page 1 of 1

Measurement Location AW Measurement Date 09/03/01

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 1/8 in)	Velocity Pressure (in H₂O)	Temperature (→F)	Point	Spacing (nearest 1/8 in)	Velocity Pressure (in H₂O)	Temperature (→F)
A1	0.5	0.050	24.2°C	B1	0.5	0.066	34.0°C
A2	1.3	0.060	24.1°C	B2	1.3	0.060	34.0
A3	2.3	0.066	24.1°C	B3	2.3	0.065	34.0
A4	3.8	0.070	24.2°C	B4	3.8	0.080	34.1
A5	8.1	0.065	24.2°C	B5	8.1	0.080	34.1
A6	9.7	0.060	24.2°C	B6	9.7	0.075	34.0
A7	10.7	0.060	24.2°C	B7	10.7	0.060	34.0
A8	11.5 ~~0.055~~	0.055	24.2°C	B8	11.5	0.050	34.0
CP-A	6	0.070	24.2°C	CP-B	6	0.080	34.1

Measurements by:

[signature] JEREMY HAWK 09/01/03

Signature Print name Date

Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# AW5420

Measurement Date 09 / 01 / 03
Fan Exhaust Configuration:
Motor Power frequency 25Hz
Motor current draw 6.7A

1. Equipment used and calibration
Manometer Dwyer Serial Number 1541
Pitot-Tube Type-S Serial Number 2072
˅ Traverse spacing pre-marked on pitot tube / pitot tube inspected by: JH

2. Location Inspection
Location Comments: skid AW traverses A & B

3. Equipment setup
˅ Connect manometer to tubing ✓
˅ Adjust manometer sensitivity ✓
˅ Pre-test leak test performed no
˅ Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 0921 Run Complete Time: ~1345

5. Post measurement leak test (at least 3" wg)
˅ successful ✓ ˅ measurement voided

6. Record any condition which might affect measurements NONE

7. Holes covered
˅ Complete ✓

1.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 9 / 1 / 03
Signature Print name Date

QA Review by:
R Brey RICH BREY 9 / 2 / 03
Signature Print name Date

Project Manager approval:
R Brey RICH BREY 9 / 2 / 03
Signature Print name Date

Cyclonic Measurement Input Form (Form FTE-002)
(Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# AW 25Hz
Measurement Date 09/01/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 1/8 in)	Velocity Pressure at ∠ = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 1/8 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	0.01	4.0°	B1	0.5	0.04	11.0°
A2	1.3	0.01	5.0°	B2	1.3	0.050	12.0°
A3	2.3	0.02	8.0°	B3	2.3	0.050	15.0°
A4	3.8	0.02	10.0°	B4	3.8	0.040	15.0°
A5	8.1	0.015	6.0°	B5	8.1	0.030	9.0°
A6	9.7	0.015	5.0°	B6	9.7	0.030	9.0°
A7	10.7	0.01	2.0°	B7	10.7	0.025	7.0°
A8	11.5	0.01	4.0°	B8	11.5	0.030	7.0°
Sum ⇨ for A1 – A8				Sum ⇨ for B1 – B8			
Average ⇨ is							

trav. B
1300 #
1385

Measurements by:

[signature] JEREMY HAWK 09/01/03
Signature Print name Date

QA Review by:

R Brey RICH BREY 9/2/03
Signature Print name Date

Project Manager approval:

R Brey RICH BREY 9/2/05
Signature Print name Date

Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# A4

Measurement Date 9/1/03
Fan Exhaust Configuration:
Motor Power frequency 40Hz
Motor current draw

1. Equipment used and calibration
Manometer Dwyer Serial Number 501
Pitot-Tube Type-S Serial Number 2072
˅ Traverse spacing pre-marked on pitot tube / pitot tube inspected by: QA

2. Location inspection
Location Comments: Skid A4 traverses A&B

3. Equipment setup
˅ Connect manometer to tubing ✓
˅ Adjust manometer sensitivity ✓
˅ Pre-test leak test performed ✓
˅ Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 0945 Run Complete Time: 1300

5. Post measurement leak test (at least 3" wg)
˅ successful ✓ ˅ measurement voided

6. Record any condition which might affect measurements NONE

7. Holes covered
˅ Complete ✓

1.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required. ✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:

[signature] Jeremy Hauk 9/1/03
Signature Print name Date

QA Review by:

R Brey R Brey 9/2/03
Signature Print name Date

Project Manager approval:

R Brey R Brey 9/2/03
Signature Print name Date

Cyclonic Measurement Input Form (Form FTE-002)
(Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# Aw 40 Hz ~~60 Hz~~

Measurement Date 09/01/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 1/8 in)	Velocity Pressure at α = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 1/8 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	<0	-5.0°	B1	0.5	<0	-4.5°
A2	1.3	<0	-2.0°	B2	1.3	<0	-1.0
A3	2.3	<0	-2.0°	B3	2.3	0.020	1.0°
A4	3.8	<0	-1.0°	B4	3.8	0.045	2.0°
A5	8.1	0.0	-0.5	B5	8.1	0.060	2.0°
A6	9.7	0.050	2.0	B6	9.7	0.100	4.0
A7	10.7	0.110	1.5°	B7	10.7	0.170	6.0°
A8	11.5	0.185	4.0°	B8	11.5	0.150	5.0°
Sum ⇨ for A1 – A8				Sum ⇨ for B1 – B8			
Average ⇨ is							

Measurements by:

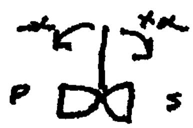
Signature: [signature] Print name: JEREMY HAUK Date: 09/01/03

QA Review by:

Signature: [signature] Print name: RICH BREY Date: 9/2/03

Project Manager approval:

Signature: [signature] Print name: RICH BREY Date: 9/2/03

(– α indicates p-side rotating down )

Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# B W

Measurement Date 9 / 1 / 03
Fan Exhaust Configuration:
Motor Power frequency 25Hz
Motor current draw 6.7

1. Equipment used and calibration
Manometer Dwyer Serial Number 541
Pitot-Tube Type-S Serial Number 2072
˅ Traverse spacing pre-marked on pitot tube / pitot tube inspected by: ✓ JKS

2. Location Inspection
Location Comments: BW skid A & B traverses.

3. Equipment setup
˅ Connect manometer to tubing ✓
˅ Adjust manometer sensitivity ✓
˅ Pre-test leak test performed ✓
˅ Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 1500 Run Complete Time: 1700

5. Post measurement leak test (at least 3" wg)
˅ successful ✓ ˅ measurement voided ______

6. Record any condition which might affect measurements NONE

7. Holes covered
˅ Complete ✓

1.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required.
✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices N/A

Pressure measurement verification passed (within 5%)

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 9 / 1 / 03
Signature Print name Date

QA Review by:
R Bray Rich Brey 9 / 2 / 03
Signature Print name Date

Project Manager approval:
R Bray Rich Brey 9 / 2 / 03
Signature Print name Date

Cyclonic Measurement Input Form (Form FTE-002)
(Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# BW 25 Hz
Measurement Date 9 / 1 / 103

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 1/8 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 1/8 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	0.025	7.0	B1	0.5	0.020	6.0
A2	1.3	0.020	7.0	B2	1.3	0.030	10.0
A3	2.3	0.020	7.0	B3	2.3	0.030	11.0
A4	3.8	0.020	5.0	B4	3.8	0.030	11.0
A5	8.1	0.015	6.0	B5	8.1	0.020	7.0
A6	9.7	0.020	3.0	B6	9.7	0.030	3.0
A7	10.7	0.010	3.0	B7	10.7	0.030	9.0
A8	11.5	0.020		B8	11.5	0.025	7.0
Sum α for A1 – A8				Sum α for B1 – B8			
Average α is							

A: 1500-1513 B: 1652-1705

Measurements by:

[signature] Signature — JEREMY HAUX Print name — 9 / 1 / 103 Date

QA Review by:

R Brey Signature — Rich Brey Print name — 9 / 2 / 03 Date

Project Manager approval:

R Brey Signature — Rich Brey Print name — 9 / 2 / 03 Date

Cyclonic Flow Angle Measurement Form (Form FTE-001)

Premier Technologies W-314 Exhauster SN# BW

Measurement Date 9 / 1 / 03
Fan Exhaust Configuration:
Motor Power frequency 40Hz
Motor current draw ____

1. Equipment used and calibration
Manometer Dwyer Serial Number 154 1
Pitot-Tube Type-S Serial Number 2022
˅ Traverse spacing pre-marked on pitot tube / pitot tube inspected by: ok

2. Location inspection
Location Comments: BW traverse A+B

3. Equipment setup
˅ Connect manometer to tubing ✓
˅ Adjust manometer sensitivity ____
˅ Pre-test leak test performed ✓
˅ Level and zero the manometer ✓

4. Perform traverse readings (record velocity pressure and angle)
Approximate :Run Start Time: 1500 Run Complete Time: 1700

5. Post measurement leak test (at least 3" wg)
˅ successful ✓ ˅ measurement voided ____

6. Record any condition which might affect measurements NONE

7. Holes covered
˅ Complete ✓

1.Manometer Verification

A. Inclined Differential Manometer
a) Inclined differential manometer employed verification not required. ✓
b) Inclined manometer Zeroed ✓
c) Inclined Manometer leveled ✓

B. Other differential pressure measurement devices

Pressure measurement verification passed (within 5%) NA

Test Number	Test Velocity (fpm)	Velocity Pressure (inches wg)			Static Pressure (inches wg)		
		Manometer	Reference	% Difference	Manometer	Reference	% Difference
1							
2							
3							

Measurements by:
[signature] JEREMY HAWK 9 / 1 / 03
Signature Print name Date

QA Review by:
R Brey Rich Brey 9 / 2 / 03
Signature Print name Date

Project Manager approval:
R Brey RICH BREY 9 / 2 / 03
Signature Print name Date

Cyclonic Measurement Input Form (Form FTE-002)
(Round Stack or Duct)

Premier Technologies W-314 Exhauster SN# BW 40Hz
Measurement Date 9/1/03

Measurement Traverse A				Measurement Traverse B			
Point	Spacing (nearest 1/8 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0	Point	Spacing (nearest 1/8 in)	Velocity Pressure at = 0 (in H_2O)	Angle @ ΔP=0
A1	0.5	0.140	3.0	B1	0.5	0.200	4.0
A2	1.3	0.095	4.0	B2	1.3	0.130	6.0
A3	2.3	0.070	3.0	B3	2.3	0.100	4.0
A4	3.8	0.075	3.0	B4	3.8	0.060	3.0
A5	8.1	0.020	1.0	B5	8.1	0.040	1.0
A6	9.7	<0	-1.0	B6	9.7	0.030	1.0
A7	10.7	<0	-1.0	B7	10.7	<0	-1.0
A8	11.5	<0	-2.0	B8	11.5	<0	-1.0
Sum α for A1 – A8				Sum α for B1 – B8			
Average α is							

A: 1535 - 1545 B: 1623 - 1634

Measurements by:

[signature] Signature | Jeremy Hawk Print name | 9/1/03 Date

QA Review by:

Rich Brey Signature | Rich Brey Print name | 9/2/03 Date

Project Manager approval:

R. Brey Signature | Rich Brey Print name | 9/2/03 Date

Premier Technology Inc.
W-314 Exhauster

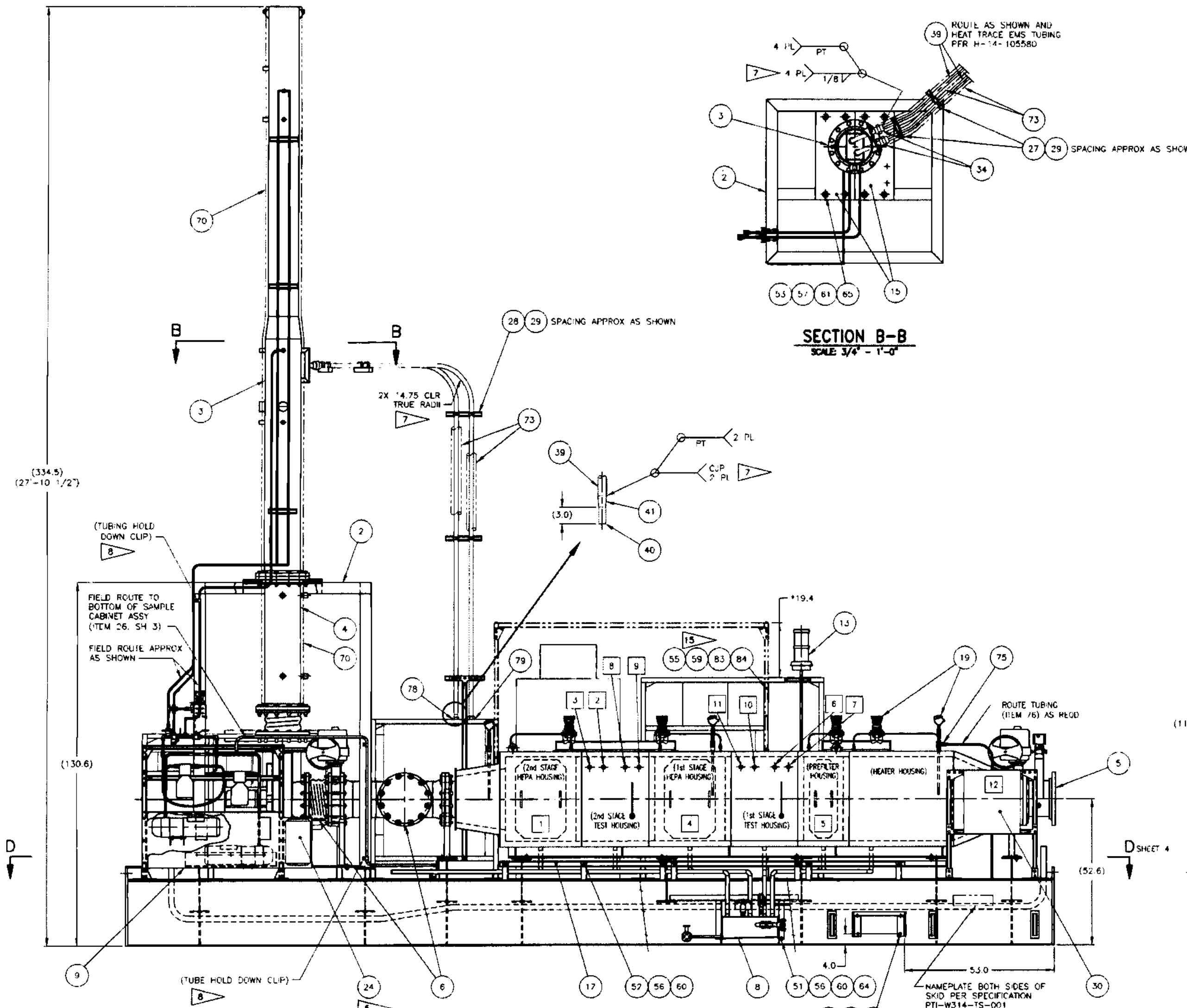
ANSI/HPS N13.1-1999 Qualification Project report
Skids A, AW, B, BW

Department of Physics/Health Physics

Idaho State University

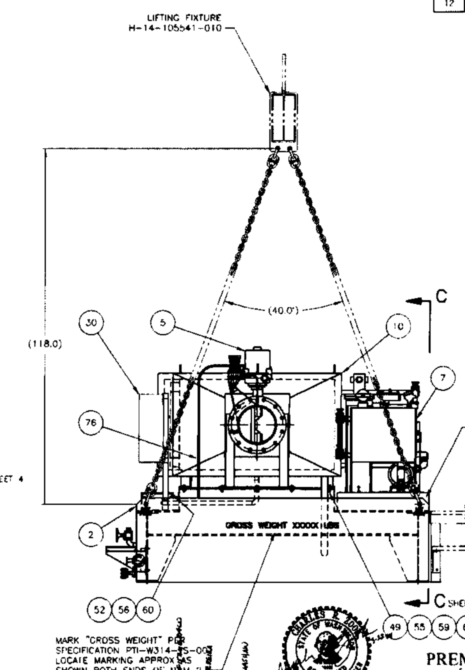
Auxier and Associates

18 November, 2003



VIEW A-A

FROM SHEET 1
SCALE: 3/4" = 1'-0"
(VIEW SHOWN ROTATED 180°)
*** ADJUST AS REQD TO ENSURE PROPER FIT**



X = EQPT IDENT NO	
1	AN241-VTP-FLT-453
2	AN241-VTP-FTP-457
3	AN241-VTP-FTP-454
4	AN241-VTP-FLT-452
5	AN241-VTP-FLT-451
6	AN241-VTP-FTP-451
7	AN241-VTP-FTP-455
8	AN241-VTP-FTP-453
9	AN241-VTP-FTP-456
10	AN241-VTP-FTP-458
11	AN241-VTP-FTP-459
12	AN241-VTP-ENCL-117

FOR PARTS LIST AND GENERAL NOTES SEE SHEET 1

MAR 31 2004 HANFORD RELEASE 8

DIMENSIONING AND TOLERANCING SHALL BE INTERPRETED PER ANSI Y14.5M-1994
DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED

UNSPECIFIED TOLERANCES SHALL BE:
DECIMAL .X ±.1 .XX ±.06 .XXX ±.030
ANGULAR ± 2°

ALL IMPLIED 90° ANGLES SHALL BE PERPENDICULAR WITHIN THE GREATEST TOLERANCE OF THE LINEAR DIMENSIONS

ALL COAXIAL FEATURES SHALL BE CONCENTRIC WITHIN .031 INCH UNLESS OTHERWISE SPECIFIED

DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		REFERENCES	
		NEXT USED ON SHEET 1	

REV NO	DESCRIPTION	REV BY DATE	CHECKED BY	QA	
5	INCORPORATED AS-BUILT	JWL			
4	INCORPORATED DCN-398 & AS-BUILT	JWL	SIGNATURES ON FILE		
3	INCORPORATED DCN-352 & AS-BUILT	JWL	SIGNATURES ON FILE		
2	-321 & AS-BUILT INCORPORATED DCN-273, -287,	ZJF	SIGNATURES ON FILE		
1	-150, -158, -230 & AS-BUILT INCORPORATED DCN-025, -071,	ZJF	SIGNATURES ON FILE		

REVISIONS

NAME: RK FISHER — SIGNATURES ON FILE
D. Bowers

PREMIER Technology, Inc.
GForce

U.S. DEPARTMENT OF ENERGY
Office of River Protection

AN241 EXHAUSTER TRAIN "B" ASSEMBLY

SIZE	BLDG NO	INDEX NO	DWG NO	REV
F	241AN	8900	H-14-105543	5

SCALE SHOWN — 820447 — SHEET 2

21500

H-14-105543

Ownership matrix — Click for copy of Word (native) file

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1.0 PURPOSE AND SCOPE

(7.1.6)

This procedure describes the process used to prepare, verify, approve, release, and revise two and three dimensional engineering drawings initiated by or for Tank Operations Contractor (TOC) personnel. This procedure applies to all H series drawings that are released into the Document Management and Control System (DMCS) by or for the TOC. Any deviation from this procedure must have the approval of the procedure owner. (7.1.2)

2.0 IMPLEMENTATION

This procedure is effective on October 1, 2012.

3.0 RESPONSIBILITIES

3.1 Design Engineering

1. Authorizes drafter/designer access to the DMCS; authorizes checkout of released mylar drawings; authorizes access to DMCS to check out existing drawing files to be used for revision updates and Engineering Change Notice (ECN) incorporation; authorizes access to DMCS to perform final plots and release of new drawings and supports development and maintenance of auxiliary support files and information for the preparation of drawings. The available files and information include:

   - Drawing start models (AutoCAD prototype drawings)
   - Symbol libraries (e.g., architectural, electrical, control systems, Piping & Instrument Diagrams [P&ID]).
   - Files of existing, released drawings.
   - Copies of engineering change notices and associated files.

2. Ensures Facility Modification ECNs that are work completed are incorporated into drawings using the following criteria:

   - Essential drawing - Revise within 30 calendar days of ECN work completion date
   - Support drawing with AutoCAD file - Revise within 60 calendar days from the date of the third work-completed ECN.
   - Support drawing without AutoCAD File - Revise within 90 calendar days from the date of the sixth work-completed ECN.
   - Reference drawing – These drawings are not kept current.

3. Originates new and revised drawings in accordance with this procedure and in compliance with TFC-ENG-STD-10.

4. Creates ECN attachment pages for new modification work to be performed in the Tank Farms facilities, so that the pages are in compliance with this procedure and TFC-ENG-STD-10.

3.2 General Responsibilities for Engineers and Managers

1. The "Design Engineer" is the Design Agent and is responsible for ensuring that the design depicted by the drawing is consistent with the existing facility configuration, related calculations, specifications, related requirements and criteria, and prepared in accordance with the applicable procedure(s). This also includes ensuring the technical accuracy of the drawing, sufficient justification, completeness of design, and identification of applicable affected documents. The design engineer works directly with the designer/drafter to ensure the drawings and engineering work supporting the drawings is performed in a quality manner and in accordance with Washington River Protection Solutions, LLC (WRPS) procedures and standards..

2. The "Engineering Manager" is responsible for the quality of the drawing. This includes ensuring title blocks are filled in correctly, the data presented is logical, and the drawing follows this procedure and TFC-ENG-STD-10.

3. The "Checker" is responsible for checking the drawing in accordance with TFC-ENG-DESIGN-C-52.

4. The "Design Authority" is responsible for:

   - Ensuring the design is technically acceptable
   - Ensuring the design has received the proper reviews and approvals
   - Ensuring the design process was followed
   - Determining project drawings to be as-built.

5. The "Preparer" is the designer/drafter assigned to prepare or modify drawings. This person is responsible for preparing the drawings and modifications in accordance with TOC procedures and standards.

6. The "Project Engineer Design Authority" is the project engineer having Design Authority delegation for a particular project. This person has Design Authority responsibilities listed in item 4 above.

7. The "System Engineer Design Authority" is the Cognizant System Engineer delegated Design Authority for a particular System, Structure, or Component. This person has Design Authority responsibilities listed in item 4 above.

8. The Discipline Engineering Group Lead (DEGL) is the Design Agent's discipline specific lead engineer. This individual approves drawings in place of the Design Authority where the drawing or revision to a drawing does not affect technical baseline (e.g. work-completed ECN incorporations).

4.0 PROCEDURE

(7.1.4.b, 7.1.4.g)

See Figure 1 for drawing process flow diagram.

4.1 General Requirements

1. Drawing Configuration Management: Each active drawing is assigned a project status code to identify the current drawing use. Drawings may be used to support operations of a facility; for project activities (design, fabrication, and construction) or jointly used to support facility

operations and to support project activities. The terms **Facility Status, Project Status, and Shared Status** are the project status codes used. Status codes are established and changed using the DMCS Change Notice Form (A-6003-917).

2. All new drawings or drawing sheets being released with an Engineering Data Transmittal (EDT) or by an ECN incorporation shall be accompanied by a DMCS Change Notice Form (A-6003-917) designating the facility, shared, or project status of the new drawing or drawing sheet. If the new drawing or drawing sheet is being placed in project status or shared status, the project number must be provided on the EDT and the DMCS Change Notice Form. If the project number does not exist in DMCS, it must be added using the DMCS New Object Form (A-6005-659). If a project number has not been established for the project it will be necessary to obtain a new project number. New project numbers are assigned through the Project Navigator system. To access the Project Navigator system, use the link on the WRPS intranet home page to go to the Project Navigator page and follow the available instructions for how to assign and obtain a new project number. The new drawing or drawing sheet shall be designated as either essential, support or reference and this must also be shown on the DMCS Change Notice Form.

3. All new drawings and drawing sheets that either modify existing systems within the Tank Farms or construct new systems shall be designated as project status at the time of their release. The new drawings and drawing sheets shall remain in project status until the project is turned over to operating status at which time they shall be changed to facility status. Any existing drawings that are being modified by a project shall be placed into shared status and remain in shared status until the project is turned over to operating status, at which time they shall be returned to facility status.

4. Each Essential and Support drawing is assigned an Approval Authority Identification Number (System ID). The System ID is used to identify the Primary and Alternate engineers that are assigned approval authority for the drawing. System IDs are established or changed using the DMCS Change Notice Form.

5. Sketches for Lockout/Tagout, or Excavation, Shoring or Trenching are documented and approved using the Lockout/Tagout Sketch Sheet, A-6003-128, or the Excavation, Shoring and Trenching Sketch Sheet, A-6003-916.

   NOTE: Lockout/Tagout and Excavation, Shoring and Trenching Sketches are not to be used to correct errors or inconsistencies in drawings.

6. Drawings are not to be used to control text only information.

7. The DMCS Change Notice form (A-6003-917) is used to establish or change a drawing category, System ID, project/facility/shared status and/or Environmental Permit drawings in DMCS. The DMCS New Object Form (A-6005-659) shall be used to initially establish a new System ID and project number in DMCS.

8. For information on the processing and categories of vendor drawings, see TFC-ENG-STD-10, Section 3.2.4.

9. Drawings that are being changed from reference to either essential or support categories must have all of their outstanding work completed ECNs incorporated and the drawings released as a new revision prior to the category change.

10. The drawing number series listed in Table 1 are to be used for all new tank farm drawings. Existing drawings that are re-categorized or are not H-2 or H-6 drawing number series retain their original numbers. Numbers for new drawings are obtained from the Hanford Document Numbering System (HDNS), except as noted below and are released using an EDT. To add a sheet to an existing drawing that is being created by a work completed ECN incorporation, determine the next available sheet number using DMCS and use the ECN as the releasing document. New drawing sheets being added to an existing set of drawings that depict new work to be performed shall be released using an EDT. Use DMCS to determine the next available sheet number.

Table 1. Drawing Number Series.

Drawing Series	Usage Description
H-2-XXXXX	Used for all 200 Area Tank Farm facility reference, support, and essential drawings except those drawings for the single shell and double shell tank farms.
H-6-XXXXXX	Used for new drawings within WRPS scope that are in the 600 area (outside the 200 East and 200 West areas.)
H-13-XXXXXX	Used for topographic, electrical distribution system and Hanford Facility Resource Conservation and Recovery Act (RCRA) permit maps.
H-14-0XXXXX	Used for new essential drawings for the single-shell and double-shell tank farms. The H-14-0XXXXX drawing numbers are assigned and controlled in accordance with drawing H-14-020000. NOTE: Essential drawings for Tank Retrieval/Closure Projects may be identified as H-14-1XXXXX drawings.
H-14-1XXXXX	Used for new project or facility non-essential or support drawings for the single-shell and double-shell tank farms.
H-15-XXXXXX	Used for three dimensional drawings.
SK-2-XXXXXX	Used for drawings that will not become part of the permanent facility. An SK-2 sketch may be approved and released like an H-series drawing or may be included as a figure or attachment in a released document.

4.2 Preparation of New Drawings and Drawings Sheets

Engineering Manager

1. Assign a qualified design engineer to develop the design and oversee the production of the required drawings. (7.1.1)
2. Assign a qualified designer/drafter to prepare the required drawings.
3. Provide design and schedule requirements to designer/drafter and design engineer.

Preparer

4. For a new drawing, obtain the drawing number from the HDNS or from H-14-020000 as appropriate (see Table 1). A new drawing is the initial release of a drawing depicting new work to be performed or depicting new information. New drawings shall be released with an EDT.

   a. For a new drawing sheet being added to an existing drawing set, obtain the next available sheet number from DMCS. A new drawing sheet is the initial release of a sheet added to an existing set depicting new work to be performed or depicting new information. A new drawing sheet added to an existing set shall be released with an EDT.

   b. For a new drawing sheet being added to an existing drawing set in order to fully incorporate a work completed ECN, obtain the next available sheet number from DMCS. Adding information to an existing drawing by incorporating a work completed engineering change notice that will cause a new drawing sheet to be added to the drawing set is considered a revision. The releasing document for the new sheet will be the work completed ECN.

5. Ensure drawing categories and status are established in accordance with Section 4.5.

6. Prepare new drawing or additional sheet in accordance with TFC-ENG-STD-10. Sketches (SK-2-XXXXX) are not required to follow TFC-ENG-STD-10, with the exception of the title block information.

7. Ensure proper level of protection is identified and provided for all classified and unclassified information in accordance with TFC-BSM-IRM-STD-03, TFC-BSM-IRM_SE-C-03, and TFC-BSM-IRM_DC-C-03.

8. Determine the Drawing Category, Approval Authority ID, and whether the drawing is an Environmental Permit drawing, and then prepare a DMCS change notice (see Section 4.7)

4.3 Drawing Review

This section applies when a new drawing sheet is being prepared. When a revision to an existing drawing occurs or a new sheet to an existing drawing is being added due to ECN incorporation, proceed to Section 4.5.

Design Engineer

1. Determine the review required and provide a copy of the drawing package (drawing sheets with related documentation and background information) to the assigned reviewer(s).

2. Conduct technical reviews in accordance with TFC-ENG-DESIGN-C-52. (7.1.1)

Preparer

3. Review and incorporate the drawing package comments and the checking comments into the CAD file.

   a. Resolve conflicts and discrepancies, as necessary with the reviewer, checker, and the lead discipline design engineer.

   a. As required, provide a copy of the drawing sheet for back checking.

4. Obtain an EDT number from HDNS and enter the EDT number in the drawing title block.

4.4 Drawing Approval and Release

Preparer

1. Submit the CAD data set into the DMCS and Final Plot the drawing for approval and release.

   - Drawing files that are placed in the DMCS must be in the current site approved AutoCAD DWG file format.
   - The Final Plot process checks the drawing data set to ensure assigned line widths are greater than 0.25 mm, assigns a PLOT ID number, performs a plot of the drawing, and stores the PLOT ID number in DMCS.
   - Refer to Final Plot in the DMCS User Help files for software user information.

Drafting Checker

2. Approve the drawing by printing name, signing, and dating the Drafting Approved block.

Design Engineer

3. Approve the drawings by printing name, signing, and dating the Design Engineer Approved block.

Professional Engineer (PE)

5. If a professional engineer signature and stamp is required, affix the stamp to the drawing and obtain the signature of the PE on the drawing prior to the responsible engineer signing the drawing.

   NOTE: Only Architect-Engineers (A-Es) may apply PE stamps/signatures to drawings.

Design Authority

6. For drawings that affect the technical baseline (HNF-1901), approve the drawing by printing name, signing and dating the Engineer block. (7.1.5)

Discipline Engineering Group Lead

7. For drawings that do not affect the technical baseline, approve the drawing by printing name, signing and dating the Engineer block.

8. If the drawing is a new drawing or a new drawing sheet, prepare an EDT and obtain approvals, fill out the DMCS Change Notice Form and the DMCS New Object Form (if required), and release the EDT in accordance with TFC-ENG-DESIGN-C-25.

NOTE: The DMCS Change Notice Form requires a project number to be entered. Project numbers can be obtained from Project Navigator, which is accessed from the WRPS Intranet. See also Section 4.1, Step 2.

4.5 Drawing Revision

Drawing revision consists of incorporation of changes that are documented in work completed ECNs in accordance with TFC-ENG-DESIGN-C-06. Drawing(s) may be revised, submitted and released with the ECN (direct revision).

NOTE: The conversion of a manual drawing to an AutoCAD file does not require the use of an ECN. For these drawing conversions, the drawing revision number shall be incremented, and the revision description on the drawing sheet shall include the following description: "manual to AutoCAD conversion."

Preparer

1. Obtain the Computer-aided design (CAD) data set for the drawing to be revised and the ECNs to be incorporated from DMCS.

   NOTE: ECNs to be incorporated are field work completed Facility Modification ECNs and Document Modification ECNs. Temporary ECNs are not incorporated into drawings.

2. Incorporate the ECN changes into the CAD data set.

   a. Remove "Essential Drawing."

   b. Remove "Impact Levels."

   c. Remove "Confidence Levels."

   d. Remove "For Field Verification" block.

   e. Remove signed stamps, such as: "Professional Engineer (PE), National Association of Corrosion Engineers (NACE) Info, etc."

   f. Update the Title Block to the current DOE Office of River Protection (ORP) Title Block.

   g. Ensure Panel Board Circuit Totals are the sum of the Individual Breaker Circuit Values.

   h. Remove the off-site A-E and vendor logos from the drawing.

3. Provide a hard copy of the revised drawing to a designer/drafter assigned by the lead designer to provide a drafting check and a check of the ECN incorporation.

Drafting Checker

4. Verify that the ECN changes/manual to AutoCAD conversions were incorporated correctly and completely, and that TFC-ENG-STD-10 drafting requirements are met, and approve the drawing (print name, sign, and date the revision block).

DEGL

5. Ensure that the ECNs/manual to AutoCAD conversions listed in the revision block are correctly incorporated in the drawing and approve the drawing (print name, sign, and date in the revision block).

Preparer

6. Incorporate any checker comments, submit the CAD data set into the DMCS, and Final Plot the drawing.

7. Provide approved drawing to the Document Service Center for release.

4.6 Field Verification

Design Authority

1. When requested by Projects, determine drawings that need to be as-built, using Attachment A for guidance.

2. Ensure selected drawings are as-built and released.

4.7 Establishing and Updating Drawing Categories, Approval Authority ID and Environmental Permit Drawings

Design Authority

1. Determine those drawings that need to be categorized as "Essential" using Attachment B for guidance.

2. Determine those drawings that need to be categorized as "Support" using Attachment B for guidance. This determination needs to be worked with step 1.

3. Determine the Approval Authority ID Number for the drawing.

4. Determine those drawings that are Environmental Permit Drawings.

5. Obtain and complete the DMCS Change Notice form (A-6003-917) in accordance with the form instructions and print name, sign, and date the form as Responsible Engineer and submit to the responsible Engineering manager for approval.

   NOTE: All outstanding work completed ECNs shall be incorporated into the drawing and the drawing released as the next revision number prior to Document Control changing the document category.

Engineering Manager

6. Review and approve the DMCS Change Notice form.

Design Authority

8. Submit approved DMCS Change Notice form to the Document Service Center for processing.

4.8 Establishing and Updating Controlled Print Files

Engineering Manager	1.	In conjunction with the Document Service Center, determine Controlled Print File (CPF) document control requirements, obtain the CPF number, and provide adequate funding. NOTE: CPF requirements include how many copies of each document/drawing are required, size of the drawings, location of the file, filing method, CPF audit frequency, and ensuring adequate work space is provided for the Document Service Center staff.
Design Authority	2.	Obtain an DMCS Change Notice number from the HDNS.
	3.	Identify the drawings and documents to be placed into or removed from the CPF, obtain, and complete the DMCS Change Notice form (A-6003-917) in accordance with the form instructions.
Engineering Manager	4.	Approve the DMCS Change Notice form.
Design Authority	5.	Submit approved DMCS Change Notice form to the Document Service Center.

4.9 Establishing and Controlling Facility, Project, and Shared Drawings

This activity involves overlapping responsibilities between the Design Authority on a particular project and the Cognizant System Engineering Design Authority. Each role is specifically identified in the steps below.

Project Engineer Design Authority	1.	Identify the drawings/documents that are to be added to, deleted from Facility, Project, or Shared Status using the DMCS Change Notice form (A-6003-917). • If the drawing changes impact multiple systems or projects, then approvals are required from the engineer and manager responsible for each system or project. • A DMCS Change Notice Form shall be used to place a drawing into project status during its initial release into DMCS.
	2.	Approve the DMCS Change Notice form as the project engineer.
System Engineer Design Authority	3.	Approve the DMCS Change Notice form as the system engineer.
Engineering Manager	4.	Approve the DMCS Change Notice form as the System Engineering manager.

Engineering Manager	5.	Approve the DMCS Change Notice form as the project's Engineering Manager.
Project Engineer Design Authority	6.	Submit approved DMCS Change Notice forms to the Document Service Center.

5.0 DEFINITIONS
(7.1.4.a)

As-Built drawings. A drawing which is an 'Essential' or 'Support' drawing, including all unincorporated ECNs.

Controlled print file. A drawing/document file that provides operating organizations with a controlled set of hard copy drawings/documents and change documentation that is maintained current with released changes by the Document Service Center staff.

Design Engineer. The engineer in charge of the design shown on the drawing medium. The design engineer may provide direction, sketches, and/or calculations as input to the design illustrated on the drawing. This role may be filled by any appropriately qualified TOC engineer or an A-E engineer qualified under the A-E's ASME NQA-1 program.

Drafting Checker. An individual who is trained and knowledgeable with the drafting and layering requirements as contained in this procedure and in TFC-ENG-STD-10 and who holds a designer/drafter qualification or, if for an architect-engineer, is qualified under their Quality assurance (QA) program to perform drafting checking.

Essential drawings. A category of engineering drawings that depict active facility (e.g., nuclear and chemical storage facilities) systems, structures, and components (SSCs) and are necessary to support emergency response actions.

Facility as-building. An engineering activity to integrate newly released project As-Built drawings into the existing facility drawings. This activity is usually funded by the project and performed by the Architect Engineer as a separate contract activity. Facility as-building should be completed prior to placing equipment into service to insure that drawings are readily available for use.

Facility status. The status of drawings/documents that are being used to support operations of a facility or system. Changes to these drawings/documents require approval of the facility responsible engineer.

In DMCS, drawings/documents in facility status will either have no Project field appear on the page or the Project field will appear with a project code, name, and status and the owner will show as "No." For additional help see DMCS-HLP-0043 located in the DMCS help files.

Professional Engineer. An engineer employed by an A&E who is licensed by the State of Washington with full authority to place his stamp and approval signature in his specific discipline on a design drawing when required by the statement of work.

Project status. The status of drawings/documents that are being used for project activities (design, fabrication, and construction). Changes to these drawings/documents require the approval of the project engineer.

In DMCS, drawings/documents in Project Status will have a Project field appear on the page with the project code, name and status of that project. The project that owns the drawings document will have a "Yes" in the owner column. For additional help see DMCS-HLP-0043 located in the DMCS help files.

Project as-building. Activities performed by the constructor include:

- Update project drawings to show current configuration
- Perform field verification of updated drawings
- Update project design documents such as construction specifications, procurement specifications, and design specifications.

Reference drawings. A category of drawings that supplement essential and support drawings and provide construction, additional design, or historical information. Reference drawings may be used as "best available information," but may not be used as the basis for design, maintenance, or operation decisions without confirmation. Reference drawings are not kept current but may be updated to support a facility upgrade or project activities with approval of an engineering manager.

Shared status. The status of drawings/documents that are jointly being used to support facility/ system operation and to support project activities. Changes to these drawings/documents require the approval of both the project engineer and the facility system engineer.

In DMCS, drawings/documents in Shared Status will have a Project field appear on the page with the project code, name and status of that project. The project code will list the project number followed by "/facility" in the project code and the owner will be listed as "Yes." For additional help, see DMCS-HLP-0043 located in the DMCS help files.

Support drawings. A category of drawings that, in addition to Essential, provides Engineering, Maintenance, and Operations the details necessary for plant operations.

Technical Baseline Document. A design or engineering document that serves as the basis or physical description of systems, structures, and components. The technical baseline is the starting point for design modifications to the facility. The technical baseline is updated (as-built, ECNs incorporated, etc.) once modifications are complete. See HNF-1901, "Technical Baseline Summary Description."

6.0 RECORDS

The following records are generated during the performance of the procedure.

- Drawings
- Sketch drawings ("SK" series)
- Document Management Control System Change Notices form (A-6003-917)
- Lockout/Tagout Sketch Sheet (A-6003-128)
- Excavation, Shoring and Trenching Sketch Sheet (A-6003-916).

The record custodian identified in the Company Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.

7.0 SOURCES

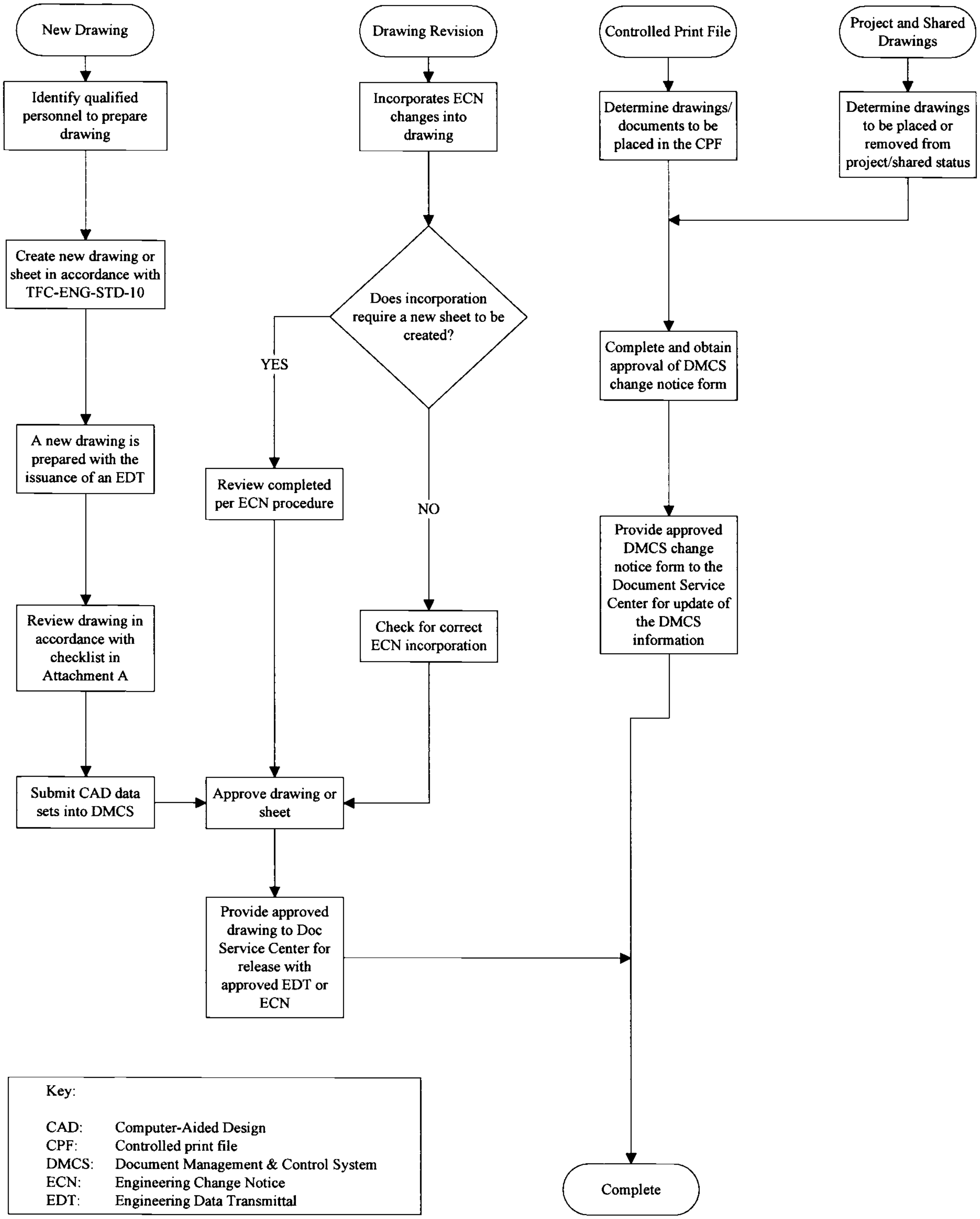
7.1 Requirements

1. 10 CFR 830.122, "Quality Assurance Criteria," Paragraph (f)(4).
2. TFC-PLN-03, "Engineering Program Management Plan."
3. PER-2007-1327.19- JON 4.4, "Establish an Engineering Standard on Confinement for all Tank Farm Designs."
4. RPP-PLAN-39432, "As-Built Program Description."
   a. Section 3.0, "Terms and Definitions."
   b. Section 5.1, "Identification and Application of Criteria."
   c. Section 5.1.1, "Essential Drawings."
   d. Section 5.1.2, "Support Drawings."
   e. Section 5.1.3, "Reference Drawings."
   f. Section 5.1.4, "Criteria for As Built Drawings."
   g. Section 5.2, "Closeout Process."
5. RPP-PLAN-39434, "Construction and Acceptance Testing Program," Section 4.0, "Responsibilities."
6. TFC-PLN-02, "Quality Assurance Program Description."

7.2 References

1. HNF-1901, "Technical Baseline Summary Description for the Tank Operations Contractor."
2. TFC-BSM-IRM_DC-C-02, "Records Management."
3. TFC-BSM-IRM_DC-C-03, "Information Clearance."
4. TFC-BSM-IRM_SE-C-03, "Data Security."
5. TFC-BSM-IRM-STD-03, "Unclassified Information Identification Standard."
6. TFC-ENG-DESIGN-C-06, "Engineering Change Control."
7. TFC-ENG-DESIGN-C-25, "Technical Document Control."
8. TFC-ENG-DESIGN-C-52, "Technical Reviews."
9. TFC-ENG-STD-03, "Waste Transfer Confinement Configuration."
10. TFC-ENG-STD-10, "Drawing Standard."

Figure 1. Drawing Process.



ATTACHMENT A – CRITERIA FOR AS-BUILT DRAWINGS

(7.1.4.f)

The responsible engineer should work with the project engineer to determine those drawings developed during the project phase of a facility modification that need to be as-built when the project is completed.

The following criteria are used to select drawings required to be as-built, prior to release:

Drawing sheets are to be "As-Built" if they depict structures, systems, or components (SSCs) that:

- Are important to safety
- Are used to establish or verify safe operating condition
- Require routine maintenance to preserve an SSC in a condition so that it can be relied upon
- Are installed in portions of a facility with restricted access or are buried/embedded.
- Are Waste Transfer Confinement Systems (7.1.3)

Criterion 1: Important to Safety

Drawings that depict safety class or safety significant SSCs, as identified in the Safety Equipment Compliance Database (SECD) or HNF-SD-CP-SEL-001 (222-S Laboratories Facilities Safety Equipment List), must be as-built.

Criterion 2: Establish or Verify Safe Operating Condition

The following additional guidelines should be considered in determining which drawing sheets need to be as-built.

- Operability – Drawings depicting SSCs that are required to operate within established design tolerances, such as:
  - Equipment line-up and valve positions (operating configuration)
  - Pressure limits of equipment/system (e.g., pressure relief valve)
  - Electrical power systems (one-line diagrams, motor control centers)

Criterion 3: Require Maintenance

SSCs that require maintenance to ensure that it is in a condition that can be relied upon should be shown on as-built drawings. The following guidelines should be considered in determining which drawing sheets need to be as-built.

- Maintenance - Drawings depicting SSCs that are require maintenance, such as:
  - Instrumentation or equipment requiring in the field calibration (e.g., flow transmitters)
  - Equipment requiring periodic replacement (e.g., to support planning)
  - Equipment used for hoisting or lifting (e.g., cranes, hoists, etc.).

ATTACHMENT A - CRITERIA FOR AS-BUILT DRAWINGS (cont.)

Criterion 4: Restricted Access

Areas within a facility with physical restrictions for access to an SSC that may be required to support planned or unplanned maintenance, modification, or emergency response should be shown on as-built documentation. The following guidelines should be considered in determining which drawing sheets need to be as-built.

- Confined Spaces – For tank farms, these could include tanks, pits, and other underground structures.
- Difficult to Access – The SSC locations that require scaffolding, man-lift, or similar means to gain access, such as towers, high-bay lighting, and buried tanks.
- Hazardous Environments – The SSC locations that are unsafe due to radiological or toxicological conditions, such as waste tanks, pits, or cells.

Criterion 5: Buried/Embedded

Buried or embedded SSCs are not readily accessible for visual inspection. . The following guidelines should be considered in determining which drawing sheets need to be as-built.

- Hazard Potential – The subsurface SSCs that could constitute a safety or environmental hazard, such as buried utility power lines and process piping.
- Sensitive – The subsurface SSCs that, if inadvertently damaged, could cause a significant negative impact on company operations, such as computer networks and fiber optic cables.

Criterion 6: Waste Transfer Confinement Systems

Drawings that depict Waste Transfer Confinement Systems as defined in TFC-ENG-STD-03, "Waste Transfer Confinement Configuration." (7.1.3)

- Utilities – Difficult to detect and locate SSCs in areas of frequent re-excavation, such as buried piping.

Drawing sheets depicting systems not important to safety (e.g., not safety class or safety significant SSCs) that are readily visible, such as support facilities, fences, non-buried instrumentation normally do not require as-builting.

ATTACHMENT B – DRAWING CATEGORIES

(7.1.4.c, 7.1.4.d, 7.1.4.e)

The following drawing categories apply to TOC facility drawings. The category is determined and controlled accordance with Section 4.7 of this procedure. The managers make this determination in collaboration with Operations, Emergency Preparedness, and the system engineer. The drawing category is tracked in DMCS and is not identified on the drawing face.

Essential drawings: A category of engineering drawings that depict active facility (e.g., nuclear and chemical storage facilities) SSCs and are necessary to support emergency response actions.

Essential drawings include:

- Drawings that are required as a ready reference to operations and emergency response personnel when evaluating and responding to an event condition

- Drawings that are called out by emergency or alarm response procedures.

- Drawings used to identify the correct isolation boundaries for personnel protection while working on deactivated or de-energized systems. The identification of these isolation boundaries is necessary in the cases for electrical or high-pressure fluid systems to implement the lock and tag program.

The following types of drawings are examples that should be considered when selecting essential drawings:

- Piping and Instrumentation Diagrams (P&ID)
- Electrical one-line diagrams
- Ventilation flow diagrams
- Active waste transfer piping diagrams
- Electrical Panelboard Schedules.

Support drawings: A category of drawings that, in addition to essential, provides Engineering, Maintenance, and Operations the details necessary for plant operations.

Support drawings include:

- Drawings that clearly and completely represent the configuration to enable the user to make valid, informed, and timely decisions that directly support the safe conduct of operations

- Drawings required for compliance with active environmental permits

- Drawings required to ensure that process routings and operational readings were being performed correctly and safely within the authorization basis.

ATTACHMENT B – DRAWING CATEGORIES (cont.)

The following types of drawings are examples that should be considered when selecting support drawings:

- Electrical elementary and schematic diagrams
- Piping and equipment arrangement diagrams
- Ventilation and exhaust system diagrams
- Process monitoring and control system diagrams.

Reference drawings: A category of drawings that supplement essential and support drawings and provide construction, additional design, or historical information. Reference drawings may be used as "best available information," but may not be used as the basis for design, maintenance, or operation decisions without confirmation. Reference drawings are not kept current but may be updated to support a facility upgrade or project with approval of an engineering manager.

Reference drawings include construction and fabrication drawings. Change impacts to these drawings are not normally documented and these drawings are not routinely revised. Reference drawings can be obtained using DMCS.

Voided/superseded drawings: A category of drawings that have been superseded by another drawing or drawing revision or have been voided. DMCS image files continue to be available.

These include drawings for cancelled projects and for buildings or facilities that have demolished.

Ownership matrix   Click for copy of Word (native) file

1.0 PURPOSE AND SCOPE

This procedure presents the requirements for managing Tank Operations Contractor (TOC) documents. The document control program is comprised of a collection of document control procedures and processes that use a graded approach for the preparation, review, approval, receipt, processing, issuance/release, distribution, use, superseding, cancelling revision, storage, maintenance, and retrieval to disposition of controlled documents generated or received in support of TOC work.

The requirements apply to those documents that require control (as defined in Section 5.0 of this procedure) regardless of the media, format, or method employed for distribution or publication. Documents may be hard copy (paper) or electronic and may be distributed or posted for use in either media.

2.0 IMPLEMENTATION

This procedure is effective on the date shown in the header.

3.0 RESPONSIBILITIES

3.1 Records and Document Control Manager

Establishes, maintains, and manages the TOC Records & Document Control program in accordance with applicable laws, regulations, and U.S. Department of Energy (DOE) policy as required by Washington River Protection Solutions LLC Contract DE-AC27-08RV14800. (7.1.1)

3.2 Managers

1. Ensure documents generated or used by their organization are managed with the appropriate controls identified within this procedure.

2. Ensure personnel comply with requirements and direction provided by the respective implementing documents for the document types.

3. Ensure the document and records requirements of quality assurance standards (are adequately conveyed and implemented. (7.1.2)

4. Ensure records requirements are managed in accordance with TFC-BSM-IRM_DC-C-02.

5. Ensure organizations that develop and maintain controlled documents assign technically qualified personnel or groups to the development task.

6. Ensure authorized personnel review controlled documents, including revisions, for adequacy, completeness, and correctness and compliance with established requirements before approval and release.

7. Ensure reviewing organization that reviewers are technically versed in the subject matter of the documents they review, that they conduct their reviews to appropriate criteria, and

that important comments, identified as such in the comments submittal, are resolved to their satisfaction before approval. (7.1.2)

8. Ensure documents that define processes, specify requirements, or establish design shall be identified, prepared, reviewed, approved, issued, distributed, used, revised, superseded, and canceled, when necessary. (7.1.2)

3.3 TOC Personnel

1. Support and work to the document control procedures and processes.

2. Determine if a document requires control.

3. Work to the latest or applicable revision of a document. For Procedures check the Procedure web page. For changes in the current copy of a procedure check the procedure change package in IDMS.

4. Prevent the unintended use of obsolete documents by applying suitable identification to them such as stamping or marking them with 'Reference only' or 'Obsolete', and consider applying dates, or revision numbers, to informational materials that is likely to change. Such materials might include posters, handouts, pamphlets, etc. If appropriate, document the location of posted material so that when revisions occur, all outdated material can be replaced.

3.4 Document Service Center

1. Receives approved documents for distribution.

2. Distributes controlled documents.

3. Ensures the latest approved revisions are provided to personnel using these documents.

4. Maintain controlled documents, including superseded or canceled revisions, as records for their specified retention period in accordance with TFC-BSM-IRM_DC-C-02. (7.1.2)

5. Provide hard copy distribution of documents to support facility operations during periods when the Intranet is not accessible. Hard copy distribution may be completed from Central Files or the files located at various locations on the site.

6. The Emergency Operations Center (EOC) may have hard copies or electronic copies of vital records. It is preferable to use electronic with distribution going to an external hard drive which can be moved in case of an emergency in the EOC or alternate EOC. (7.1.2.)

4.0 PROCEDURE

4.1 Document Control Requirements

Controls are required for all documents that prescribe requirements, define processes, establish design, direct work activity, or provide the controls necessary to ensure compliance with applicable requirements. The degree of control employed for each document type depends on the content and use of the information contained within the document.

Controlled documents are controlled by Document Service Center (DSC) or as directed by governing procedures.

4.1.1 Preparation and Review

Procedure Author

1. Describe the responsibilities and authorities, the preparation, review, approval, use, superseding, cancelling and revision process.
2. Define review and approval requirements and identify and document approval authorities within implementing procedures. (7.1.2)
3. Prescribe style and format requirements for controlled documents.
4. Define the process for evaluating the impact of new or revised documents on other documents and incorporating changes that may be required to minimize significant impacts to TOC work. (7.1.2)
5. Identify records that are generated.
6. Identify the records repository to which completed records are submitted.

Document Author

7. Obtain unique identifiers (document numbers):
   - Through the Hanford Document Numbering System at HDNS.
   - Through the Procedures group in accordance with TFC-BSM-AD-C-01 and TFC-OPS-OPER-C-13 (7.1.2)
   - Through the procedure, standard or guideline which controls the document.

   NOTE: Issued/released documents shall have as a minimum, a unique identifier, revision identifier, title, author, release date or publication date or effective date.

4.1.2 Approval

Document Author

1. Ensure the typed or printed name of the individual responsible for preparing, approving, and/or validating the record, when appropriate, is included in the signature portion of the record. When the typed or printed name of the individual is not provided, the use of initials or stamps (not intended to be signature stamps) may be used, provided a log is maintained as a record that clearly relates the initials or stamps to the individuals and organizations using them.

4.1.3 Issuance and Distribution

Document Author

1. Ensure documents are accurate and complete and in a form that can be controlled, protected, and retained for the required duration. (7.1.2)
2. Submit documents to the records repository identified in the applicable implementing procedure.

Document Service Center	3.	Maintain controlled documents, including superseded or canceled revisions, as records for their specified retention period in accordance with TFC-BSM-IRM_DC-C-02. (7.1.2)

4.1.4 Document Changes

Procedure Author	1.	Ensure implementing documents define the method used to incorporate changes. If the defined method is other than reissue of the entire revised controlled document as a revision, the implementing document shall define the maximum number of changes permitted prior to requiring reissue of the entire controlled document as a revision. The maximum number of changes permitted needs to be based on readability and usability of the document by users.
	2.	When a normal change process would cause unreasonable delays, apply an expedited change processes as long as the following requirements are met: • After the expedited change has been authorized, the changes shall be processed through the normal change process in a timely manner consistent with the type and nature of the document being changed. • Implementing documents shall describe the process to control expedited changes to include identification of the level of management authorized to make expedited changes; time limits for processing expedited changes through the normal change process; and evaluation of the work if a change resulting from the normal review process is different from the expedited change. (7.1.2)
Document Author	3.	Ensure changes to documents, other than those defined as minor changes are reviewed and approved by the same organizations or technical disciplines that performed the original review and approval, unless other organizations are specifically designated. NOTE: The reviewing organizations shall have access to pertinent background data or information upon which to base their approval. Specifically designating other organizations is permitted in cases where organizational responsibilities and authorities have changed or review/approval requests are no longer valid.
	4.	To avoid a possible omission of a required review, delineate the type of minor changes that do not require review and approval of the original document and the person who can authorize such a decision within implementing procedures. NOTE: Minor changes to documents, such as inconsequential editorial corrections, shall not require that the revised documents receive the same review and approval as the original documents.

Minor changes shall be limited to the following:

- Correcting grammar or spelling
- Re-numbering sections or attachments that do not affect the sequence of work.
- Changing the title or number of the document
- Updating organizational titles (does not include and organizational title change accompanied by a change in responsibilities).

5. Evaluate other documents affected by a new or revised document for impact and revise, if necessary, in a time frame commensurate with impact significance on TOC work.

4.2 Documents and Information Types

The Records Management and Document Control website (WRPS Home Page/Chief Information Office/ Records Management and Document Control) presents a crosswalk for documents and the applicable procedures.

5.0 DEFINITIONS

Controlled Document. Are controlled by the DSC or as directed by governing procedures. Documents are required to be controlled if they:

- Satisfy or demonstrate compliance with contractual, legal, fiscal, regulatory, design, or operational requirements.
- Make or capture commitments/agreements or establish schedules (e.g., contracts, formal letters, memorandums of understanding, etc.).
- Define or direct work (i.e., require a current copy for users to conduct work properly).
- Establish or define a plan or program.
- Specify requirements, standards, or activities that affect quality, safety, security, or operations.
- Present or define the results of analyses or interpretations, or technical, legal, or fiscal decisions (e.g., studies, reports, etc.).
- Establish design or define a process?
- Represent a formal presentation, journal article, or exhibit.
- Documents that specify requirements or prescribe activities that affect industrial, environmental, or nuclear safety.

Controlled-use information. Information accessible or available under limitations of regulations or controls.

Controlled forms. Forms that meet the following criteria:

- Cross organizational contractor or agency departmental lines or boundaries
- Collect information required by law, DOE Order, company policy, or company or agency procedure
- Become part of an official record required for audit traceability (TFC-BSM-IRM_DC-C-02).

Document. Any recorded information, regardless of its physical form or characteristics, including, without limitation, written or printed matter, data processing cards, tapes, charts, maps, paintings, drawings, engravings, sketches, photographic prints, exposed or developed film, working notes and papers; reproductions of such things by any means or process; and sound and video recordings by magnetic, optical, or any other electronic means.

Document Management Control System. The DMCS serves as the primary document issuance and change control database and maintains the status for controlled documents (i.e., plans, drawings, specifications, supporting documents, and standards).

Document Service Center. Stations strategically located throughout the site that provide the release, issuance, and retrieval of TOC documents. Also, known as the IRM Service Provider.

Integrated Document Management System (IDMS). An information database designed to search and retrieve document images. Documents located within the electronic records area are considered records.

Issued (Released). Document is made available to the project for use through an official system such as the Records Holding Area (RHA), a designated Records Storage Area (RSA), IDMS, or the DMCS.

Records. Completed documents, reports, papers, e-mail, photographs, machine-readable materials, books, maps, or other documentary materials, regardless of physical form or characteristics, that have been created or received in the course of business. Such materials are preserved because of their informational value or as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities. This definition is adapted from 44 USC 3301. Records consist of Quality Assurance and Non-Quality Assurance Records.

As such, information resources in any media that are generated or received under the TOC are records when they are or should be preserved because they constitute evidence or contain information of administrative, legal, fiscal, or historical value.

Scientific and technical information. Information in any format or medium that is derived from scientific and technical studies, work, or investigations that relate to research, development, demonstration, and other specialized areas such as, environmental and health protection and waste management. Scientific and technical information may be unclassified unlimited, unclassified sensitive, classified, or declassified. DOE-funded scientific and technical information originates primarily from research and other activities performed by contractors for management, operation, or integration of DOE-owned/leased facilities, direct DOE-executed prime procurements, DOE-operated research activities, and financial assistance recipients, in addition to DOE employees.

Released (Issued). Document is made available to the project for use through an official system such as the RHA, a designated RSA, IDMS, or the DMCS.

Work package. Work packages contain controlled documents such as technical operating procedures, maintenance and test procedures, process standards, or engineering documents.

6.0 RECORDS

No records are generated during the performance of this procedure. However, all records generated by the governing procedure for a specific activity or document type shall be maintained in accordance with the requirements for records management identified in TFC-BSM-IRM_DC-C-02.

7.0 SOURCES

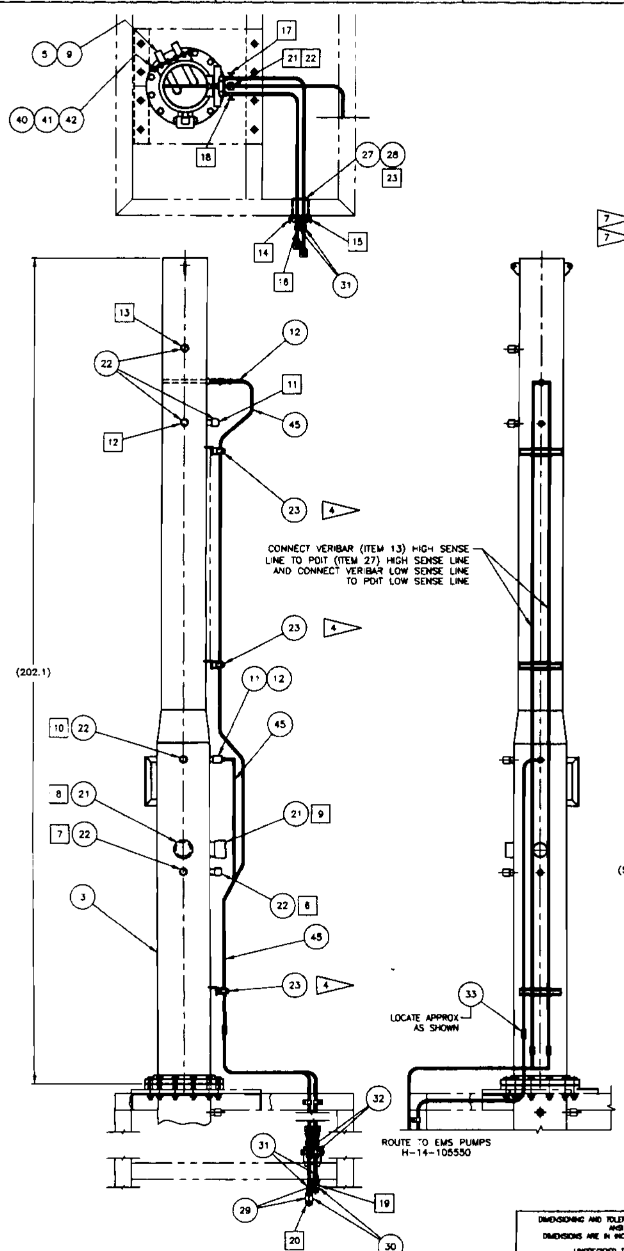
7.1 Requirements

1. Contract DE-AC27-08RV14800.
2. TFC-PLN-02, "Quality Assurance Program Description."

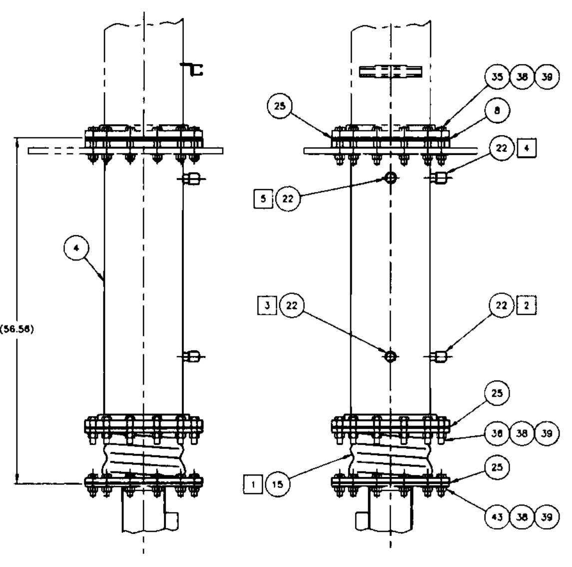
7.2 References

1. HNF-GD-8959, "Publication Practices."
2. HNF-RD-12223, "Protecting and Controlling Classified Matter."
3. TFC-BSM-AD-C-01, "Administrative Document Development and Maintenance."
4. TFC-BSM-AD-C-03, "Correspondence Preparation and Control."
5. TFC-BSM-AD-STD-02, "Editorial Standards for Technical Documents."
6. TFC-BSM-IRM_DC-C-02, "Records Management."
7. TFC-BSM-IRM_DC-C-03, "Information Clearance."
8. TFC-BSM-IRM_DC-C-04, "Public Information Repository and Administrative Record Files."
9. TFC-BSM-IRM_DC-C-07, "Vendor Processes."
10. TFC-BSM-IRM-STD-03, "Unclassified Information Identification Standard."
11. TFC-ENG-DESIGN-C-25, "Technical Document Control."
12. TFC-ESHQ-ENV-STD-03, "Air Quality – Radioactive Emissions."
13. TFC-ESHQ-RP_ADM-CD-03, "Radiological Control Logbooks."

14. TFC-OPS-MAINT-C-01, "Tank Operations Contractor Work Control."
15. TFC-OPS-OPER-C-13, "Technical Procedure Control and Use."
16. TFC-OPS-OPER-C-17, "Operating Logbooks."
17. TFC-OPS-OPER-STD-01, "Technical Procedure Format and Preparation Standard."
18. TFC-PLN-26, "Test Program Plan."
19. TFC-PLN-29, "Nuclear Maintenance Implementation Program."
20. TFC-PRJ-CM-D-02, "Construction and Commissioning Document Control Processes."



① UPPER STACK ASSEMBLY
SCALE: 1" = 1'-0"



② LOWER STACK ASSEMBLY
SCALE: 1/8

PARTS LIST/MATERIAL LIST

Flag	QTY -050	QTY -040	QTY -030	QTY -020	QTY -010	PARTS / DASH NUMBER	NOMENCLATURE/DESCRIPTION	MATERIAL/REFERENCE	SHEET	ITEM NO
					X	-010	UPPER STACK ASSEMBLY		1	1
				X		-020	LOWER STACK ASSEMBLY		1	2
			X		1	-030	UPPER STACK WELDMENT		2	3
		X		1		-040	LOWER STACK WELDMENT		3	4
	X				1	-050	PROBE WELDMENT		3	5
										6
										7
				1		-001	FLANGE, PLATE, 7 GA OR 3/16 THK	ASTM A240 TYPE 304L	3	8
					1	-002	GASKET, 1/4" THK 40-45 DURO	NEOPRENE ASTM D2000	2	9
										10
					1		REDUCER, 1" X 1/2" NPT CLASS 3000	ASTM A182 GR F 304L		11
					3	SS-810-1-8	MALE CONNECTOR, 1/2" TUBE X 1/2" NPT	SWAGELOK		12
			1			V100-10-V-D-WNS-C2GC	VERABAR FLOW SENSOR WITH INTEGRAL RTD	VERIS, INC.		13
										14
				1		SEE NOTE 10	12" NOM BY 9" OAL, EXPANSION JOINT	HYSPAN		15
		2	1				PIPE FLANGE, SLIP-ON, 12" CLASS 150, FF	ASTM A182 GR F 304L		16
										17
										18
			1				PIPE, REDUCER, 12-10 CLASS 150, BW	ASTM A403 WP 304L		19
										20
					2		CAP, 3" NPT, CLASS 3000	ASTM A182 GR F 304L		21
				4	6		CAP, 1" NPT, CLASS 3000	ASTM A182 GR F 304L		22
8					6	P2026	TUBING CLAMPS	UNISTRUT		23
8			3			P1000	CHANNEL, 1 5/8" X 1 5/8" X 10.0 L	UNISTRUT		24
				4			GASKET, 12" 150#, FULL FACE 1/8" STYLE 3000	GARLOCK		25
	2					35-712-111	SHROUDED SAMPLE PROBE TIP, 2CFM	THERMO ANDERSON		26
					1	EJA120A-EES4B-92EC/FS1-D1-HAC-F1	DIFFERENTIAL PRESSURE SMART TRANSMITTER, DP HART, 4-20mA	YOKOGAWA		27
					1	GP3TC-T-LSS-MB	VALVE, 3-WAY MANIFOLD	D/A MFG CO.		28
					2	SS-63TF8	3-PIECE BALL VALVE, 1/2 FNPT	SWAGELOK		29
					2	SS-8-P	PIPE PLUG, 1/2 MNPT	SWAGELOK		30
					4	SS-810-11-8	BULKHEAD MALE CONNECTOR	SWAGELOK		31
					2	SS-810-3	UNION TEE, 1/2	SWAGELOK		32
					3	SS-810-6	UNION, 1/2	SWAGELOK		33
										34
				12			HEX BOLT, HVY, 7/8-9 UNC-2A 5-1/2 LONG	ASTM A193 GR B8		35
				12			HEX BOLT, HVY, 7/8-9 UNC-2A 4 LONG	ASTM A193 GR B8		36
										37
				36			HEX NUT, HVY, 7/8-9 UNC-2B	ASTM A194 GR 8F		38
				36			LOCK WASHER, 7/8, (SERIES AND TYPE OPTIONAL)	18-8 SST		39
					16		HEX BOLT, 3/8-16 UNC-2A X 1" LONG	ASTM A193 GR B8		40
					16		HEX NUT, 3/8-16 UNC-2B	ASTM A194 GR 8F		41
					16		PLAIN WASHER, 3/8, (SERIES AND TYPE OPTIONAL)	18-8 SST		42
				12			HEX BOLT, HVY, 7/8-9 UNC-2A 3 LONG	ASTM A193 GR B8		43
	AR						TUBE, 1 1/2 OD X .065 WALL, SMLS	ASTM A269 TYPE 304L		44
					AR		TUBE, 1/2 OD X .049 WALL, SMLS	ASTM A269 TYPE 304L		45
		AR	AR				PIPE, 12" SCHED 40S	ASTM A312 GR TP 304L		46
			AR				PIPE, 10" SCHED 40S	ASTM A312 GR TP 304L		47
7			2				PIPE, 3" SCHED 40S X 2.0 LONG TOE	ASTM A312 GR TP 304L		48
7		4	7				PIPE, 1" SCHED 40S X 2.0 LONG TOE	ASTM A312 GR TP 304L		49
			AR				PLATE, 1/2 THK	ASTM A240 TYPE 304L		50
			AR				ANGLE, 2 1/2 X 1 1/2 X 1/4 THK	ASTM A276 TYPE 304L		51
			3				ANGLE, 2 X 2 X 1/4 THK X 5.0 L	ASTM A276 TYPE 304L		52
	AR						PLATE, 11 GA	ASTM A240 TYPE 304L		53

[X] = EQUIP IDENT NO.
(SEE NOTE 5)

1	AN241-VTP-EJ-651
2	AN241-VTP-FTP-651
3	AN241-VTP-FTP-652
4	AN241-VTP-FTP-653
5	AN241-VTP-FTP-662
6	AN241-VTP-FTP-663
7	AN241-VTP-FTP-654
8	AN241-VTP-FTP-656
9	AN241-VTP-FTP-657
10	AN241-VTP-FTP-658
11	AN241-VTP-FTP-659
12	AN241-VTP-FTP-660
13	AN241-VTP-FTP-661
14	AN241-VTP-V-680
15	AN241-VTP-V-681
16	AN241-VTP-V-682
17	AN241-VTP-V-683
18	AN241-VTP-V-684
19	AN241-VTP-V-686
20	AN241-VTP-V-685
21	AN241-VTP-TE-651
22	AN241-VTP-FE-651
23	AN241-VTP-PDIT-651

GENERAL NOTES:

1. FABRICATION AND WELDING SHALL BE IN ACCORDANCE WITH THIS DRAWING AND SPECIFICATION PTI-W314-TS-001.
2. ABBREVIATIONS ARE IN ACCORDANCE WITH ANSI Y1.1.
3. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
4. (flag) SPACE THE TUBING CLAMPS (ITEM 23) AS NECESSARY TO FIT TUBING (ITEM 45).
5. NAME TAGS DENOTING EQUIPMENT IDENTIFICATION NUMBERS WILL BE PROVIDED BY CUSTOMER. TAGS SHALL BE LOCATED ON THE IDENTIFIED ASSEMBLY COMPONENTS IN LOCATIONS THAT ARE CLEARLY VISIBLE AFTER FINAL ASSEMBLY.
6. (flag) FOR SAMPLE TUBING RUNS (FROM PROBES TO CAM AND RECORD SAMPLER):
   - THERE SHALL BE NO INWARD FACING STEPS AT THE TUBING CONNECTIONS THAT CAUSE MORE THAN A 1% REDUCTION IN TUBE DIAMETER.
   - THE TUBING ENDS SHALL BE FREE OF BURRS AND CRIMPING.
   - BENDS SHALL HAVE A CURVATURE RATIO (RADIUS OF CURVATURE OF THE BEND DIVIDED BY THE TUBE DIAMETER) OF AT LEAST 3.0.
   - FLATTENING OF THE BEND CAUSED BY A BENDING PROCESS SHALL NOT EXCEED 15%, WHERE FLATTENING IS DEFINED IN TERMS OF THE ORIGINAL AND MINOR AXES OF THE TUBE CROSS SECTION AT THE ANGULAR MIDPOINT OF THE BEND.

   SPECIAL FABRICATION TECHNIQUES MAY BE REQUIRED TO MEET THESE SPECIFICATIONS (ANSI/HPS N13.1-1999).
7. (flag) ITEMS 48 AND 49 MAY BE PURCHASED AS PIPE NIPPLES PER ASTM A733 GR TP 304L AND TRIMMED TO LENGTH AS SPECIFIED. THREADED PORTION ON ONE END OF PIPE NIPPLES MUST BE COMPLETELY REMOVED.
8. (flag) UNISTRUT MAY BE TYPE HG (HOT DIPPED GALVANIZED), PG (PRE-GALVANIZED), OR EG (ELECTRO-GALVANIZED). APPEND TO THE END OF UNISTRUT PART NUMBERS AS REQUIRED.
9. 7/8 HEX BOLTS (ITEMS 35, 36, & 43) MAY BE REPLACED WITH THREADED ROD, 7/8-9 UNC-2A LENGTH AS REQD, ASTM A193 GR B8 OR GR B8M WITH ADDITIONAL HEX NUTS AND LOCK WASHERS IF REQD TO ACCOMMODATE SPACE RESTRAINTS.
10. EXPANSION JOINT MAY BE EITHER PART NUMBER 2509/10L-080-7.0 OR 57194.
11. REVISION 4 OF THIS DRAWING WAS FIELD WALKED DOWN IN OCTOBER 2010. FOR CHANGES MADE AND FOR ITEMS NOT VERIFIED IN FIELD, SEE ECN-11-000365.

DIMENSIONING AND TOLERANCING SHALL BE INTERPRETED PER ANSI Y14.5M-1994
DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
UNSPECIFIED TOLERANCES SHALL BE:
DECIMAL .X ± .1 .XX ± .06 .XXX ± .030
ANGULAR ± 1°
ALL IMPLIED 90° ANGLES SHALL BE PERPENDICULAR WITHIN THE GREATEST TOLERANCE OF THE LINEAR DIMENSIONS
ALL COAXIAL FEATURES SHALL BE CONCENTRIC WITHIN .031 INCH UNLESS OTHERWISE SPECIFIED

DWG NO	TITLE
	DRAWING TRACEABILITY LIST

REF NUMBER	TITLE
NEXT USED ON H-14-105543	REFERENCES

REVISIONS: 5 — DIRECT REV PER ECN-11-000365
SEE REVISION 0

FEB 24 2011 — HANFORD RELEASE — ID 11

U.S. DEPARTMENT OF ENERGY
Office of River Protection

AN241-VTP (W-314)
EXHAUSTER TRAIN "B" UPPER & LOWER STACK ASSEMBLIES

F | 241AN | 8900 | H-14-105545 | 5
SCALE SHOWN | 820447 | SHEET 1 OF 3

Ownership matrix

Click for copy of Word (native) file

TABLE OF CONTENTS

TABLE OF ATTACHMENTS

1.0 PURPOSE AND SCOPE

(7.1.2, 7.1.3)

This procedure describes the processes and controls for managing the identification, collection, processing, protection, storage, retrieval, and disposition of Tank Operations Contractor (TOC), record material regardless of the media or format, in accordance with statutory, regulatory, and contractual requirements. (7.1.1, 7.1.10)

The TOC records system is made up of TOC Records Storage Areas (RSAs), the Document Service Centers (DSCs), Records Holding Area (RHA), or under the Integrated Document Management System (IDMS).

2.0 IMPLEMENTATION

This procedure is effective on the date shown in the header.

3.0 RESPONSIBILITIES

3.1 Records & Document Control Manager

1. Establishes, maintains, and manages the TOC records management program in accordance with applicable laws, statutes, regulations, and U.S. Department of Energy (DOE) policy as required by contract. (7.1.2)

2. Originates Management Assessments pertaining to records.

3. Identifies company level Records Specialist.

4. Approves different file format for submission of records to the IDMS as identified in Section 4.3.2.

5. Oversees the destruction of records when required. This applies to hard copy records held in the RHA, RSA or electronic records within IDMS.

3.2 Managers

(7.1.11)

1. Assign responsibilities within the organization for the development or receipt and processing of records.

2. Ensure complete and accurate record, quality assurance (QA) record, and vital record materials are created, appropriately reviewed and approved, properly managed, and protected. Ensure applicable organizational implementing documents:

   a. Identify the specific records required. (7.1.1)

   b. Provide the process controls necessary to ensure complete, accurate, and legible records are generated.

   c. Provide direction for transfer to predetermined approved storage locations.

d. Include format and content requirements to ensure that records are traceable to associated items and activities, reflect completed work, and demonstrate compliance to applicable requirements. (7.1.1)

e. Ensure that records are submitted to an RSA or record repository, either IDMS or RHA.

3. Ensure organizations work with the Company Records Specialist to update the TOC Company Records Inventory and Disposition Schedule (RIDS).

4. Ensure employees responsible for generating, processing, protecting, and storing records receive proper training.

5. Ensure document and records requirements of other quality assurance programs are adequately conveyed and implemented via project specific Quality Assurance Program Plans and procedures, when applicable.

6. Ensure documents and records used to demonstrate compliance with State and Federal regulations are prepared and maintained appropriately.

7. Identify and process vital records as follows:

a. Ensure applicable vital records, regardless of media, are established and identified by completing a Vital Records Justification Form (RL-F-243.2.1).

b. Submit form to the Company Records Specialist, for processing into IDMS and the Document Management and Control System (DMCS).

c. Submit identified vital records to a DSC for issuance and distribution.

d. Verify and document vital records verification in the Hanford Emergency Operations Center (EOC) on an annual basis. This verification includes the determination of necessary additions or deletions pertaining to vital records. Any changes must be provided to the Company Records Specialist and Document Release Station distribution lists must be updated.

e. Vital records in the EOC may be in paper or electronic form. (7.1.3)

8. Aid in the review and destruction of hard copy or electronic records which have reached their destruction date per the RIDS.

3.3 TOC Personnel

Support and work to the TOC record requirements.

3.4 Company Records Specialist

- Supports the Records & Document Control Manager at the company level.
- Aids TOC personnel in identifying record material.
- Reviews RSA and reviews eligibility for destruction reports, and prepares Electronic Record Authorization(s).

- Receives Vital Records Justification form(s), obtains approval from Emergency Preparedness Organization representative, and forwards the form to IRM Service Provider for approval and inclusion in the record. (7.1.3)

- Forwards a copy of the approved Vital Records Justification form to DSC for identification of the Vital Record in DMCS.

- Performs annual audit of EOC and alternate EOC by March of each year.

- Reviews all TOC procedures for record and retention periods for TOC records.

- Processes hard copy or electronic records through the destruction process in support of the RIDS, Section 4.5.

- Participates as a member on the Site Records Disposition Board (SRDB).

- Completes the TOC Records Destruction Approval Form.

3.5 IRM Service Provider (IDMS Administrator or RHA Management)

- Maintains IDMS, including backup files, to ensure records are preserved and useable throughout the prescribed retention periods. (7.1.4, 7.1.7)

- Provides consultation and training to system users as needed to permit efficient transfer of records into the system, accurate indexing, and timely retrieval of stored electronic records.

- Provides provisions that prevent damage from harmful conditions (such as excessive light, stacking, electromagnetic fields, temperature, and humidity), as applicable to the specific media utilized for record storage. (7.1.4, 7.1.7)

- Establishes provisions to ensure that no unacceptable degradation of the electronic record media occurs during the established retention period.

- Establishes inspections of records to detect deterioration, is provided, the locations should be sufficiently remote from each other to minimize the risk of exposure to a simultaneous hazard. Sufficiently remote depends on the type of hazard, such as earthquakes, fires, tornadoes, etc., and the probability for occurrence of these hazards. (7.1.9)

- Monitors the schedule disposal date for records, hardcopy and electronic, according to the assigned records schedule, and notifies the Records & Document Control Manager upon the expiration of the retention period.

3.6 Record Owner

Determines when records reach their destruction date whether the records should be destroyed or the retention period reassigned using the process established within this procedure.

4.0 PROCEDURE

4.1 Record Material Classification and Identification

The controlling document's (e.g., management directives, administrative and technical procedures, guidance documents) Records section, for the work being performed, shall identify any record and quality assurance material that will be generated in performance of the work. If no records are generated the Records section shall contain a statement to that effect. (7.1.9)

Manager or Employee	1.	Categorize material in accordance with Attachment A, Record Material Classification as: • Non-record • Record • QA Record • Vital record.

4.2 Managing Records

TOC organizations that implement records management activities are required to implement formal record material controls that ensure compliance with the requirements specified in this procedure, additionally in Attachment B, TFC-PLN-02, and the laws or regulations applicable to the area of work.

TOC organizations obtain records management support services from the IRM Service Provider by working through the Records Specialists. Services include records inventory and scheduling, consulting services, record storage and retrieval, record systems/database development and administration, and program management. The internal procedures used by the IRM Service Provider to control the services, processes, and systems used to manage records are consistent with applicable TOC procedures.

4.3 Use of the IDMS for Electronic Record Storage

4.3.1 Set Up of IDMS Storage of Electronic Records

Manager	1.	Assign an IDMS point-of-contact (POC).
IDMS POC	2.	Identify electronic record candidate(s) to be stored within the IDMS.
	3.	Contact the Company Records Specialist to initiate the import of electronic record candidate(s) into IDMS and the appropriate documentation required.
Company Records Specialist	4.	Prepare the Electronic Record Authorization (available through the Records Management Access Portal (RMAP)).
	5.	Coordinate completion of required actions, documentation, submittal process, and approvals identified on the Electronic Record Authorization.
	6.	Submit completed Electronic Record Authorization and supporting documentation for the records candidate(s) to the IDMS Administrator to facilitate the creation of record folders within IDMS.

7. Determine in conjunction with the managers, who will perform the processing of the IDMS electronic records: IRM Service Provider, IDMS POC, or internal department records processor.

IDMS Administrator (IRM Service Provider)

8. Create a designated records staging area, records folders and prescribed retention period identified on the Electronic Record Authorization and the RIDS within IDMS for each record type.

4.3.2 Processing of IDMS Electronic Records

Employee

1. Prepare an Active Records Transmittal form (A-6003-520) for all records to be scanned from <u>hard copy</u> documents into IDMS as electronic records. Indicate "Scan for Record Purposes" on the transmittal form.

   NOTE: Records submitted electronically, or generated through automated workflows and other automated processes, are not required to be submitted using a transmittal form.

2. Deliver transmittal form and hard copy records to the DSC, or transmit electronic records to the DSC, IDMS POC, or internal department records processor. (7.1.9)

3. Submit electronic records to IDMS for records retention in a Portable Document Format (PDF), a neutral format. If the record cannot be rendered to PDF then one of the following neutral formats may be used. (7.1.4)

   - Tagged Image File Format (TIFF)
   - Graphics Interchange Format (GIF)
   - Joint Photographic Experts Group (JPEG)
   - Extensible Markup Language (XML)
   - Windows Media Video (WMV)
   - Moving Picture Expert Group (MPEG)
   - HyperText Markup Language (HTML)
   - Text File (TXT)
   - Portable Network Graphic (PNG)
   - Comma Separated Value (CSV)
   - Message (e-mail) (msg).

4. Obtain approval for any deviation from one of the above file formats from the Records & Document Control Manager.

NOTE 1: If native file format documents are attached to PDF or other neutral format renditions of records within IDMS, they may be accessed and downloaded by TOC personnel to facilitate use as a master for future revisions.

NOTE 2: When generating any information in a native file format, e.g., .doc, .xls, the record must be capable of rendering to a neutral format and the final rendered record must be in a format that can be printed as a record to hard copy. This requires the initial native file to be formatted correctly before submittal to IDMS, e.g., insertion of page breaks, no special characters in the file name.

IRM Service Provider or Internal Record Processor

5. Process documents per company procedures to capture record material provided by the TOC.

6. Scan hard copy or transfer electronic files into the designated records staging area.

NOTE: In some instances, records generated through automated workflows and other automated processes may be directly transferred into a records folder, eliminating the need for a staging area.

7. Index records transferred to IDMS in accordance with the established Electronic Record Authorization created for each given record type (available in IDMS).

8. Perform at a minimum, a 25% verification of each record transferred to IDMS after import to verify the document was transferred correctly and not corrupted or otherwise rendered unreadable during transfer. If the verification shows errors then an increase of 5% will be imposed on the records being verified. Defective records identified during verification will be removed from the staging area and return to step 3.

9. Transfer indexed, verified records from the staging area into the appropriate designated records folders. When the record is placed in the designated folder in the managed area of IDMS the electronic version will be managed as the record.

NOTE: Once the hard copy records are imported into the managed area of IDMS for preservation in electronic format, the hard copy may be destroyed. Source files for those records imported in electronic format may also be deleted, provided the duplicate information is not needed for other purposes.

4.4 Records Storage Area

4.4.1 General

Inactive records shall be retired to the RHA, a DOE-designated storage facility for long-term storage, unless the record is maintained in an approved electronic record system such as IDMS. The RHA is located in building 3220 on the Hanford Site in Richland, Washington.

NOTE: The RHA is the primary long-term designated storage facility for inactive records. Permanent and long-term storage is also provided at the Federal Records Center (FRC) in Seattle, Washington. Transfer to, and retrieval from the FRC is facilitated through the RHA. Retirement, receipt, maintenance, retrieval, and destruction of records are managed in accordance with this procedure.

WRPS Record storage boxes shall not be removed from the RHA. WRPS personnel may review the boxes at the RHA or request copies of the material from the boxes. Any deviation from this process shall be approved by the Company Records Specialist. Transfers of active records between organizations, facilities, and active storage locations shall be documented on the Active Records Transmittal form (Site Form A-6003-520).

NOTE: The Active Records Transmittal form is used exclusively for transferring completed record files. It is not intended for use with in-process documents or distribution of controlled documents. Retirement of inactive records to the RHA is documented and approved on the Records Transfer Form (RTF) (available through RMAP).

The TOC Records Storage Area (RSA) Approval Form is required for all offices or locations where completed records are temporarily stored. Management expectations are: RSAs are to be established if records are stored for more than <u>one week</u>. RSAs are intended as collection and turnover points and as such are not authorized to store completed records or completed packages such as procurement files for more than <u>one year</u>.

4.4.2 Set Up of an RSA

Manager	1.	Assign a file custodian and backup to collect, receive, process, protect, control access, maintain, retrieve, and disposition file material in accordance with company RIDS.
	2.	Designate a location for the RSA.
File Custodian	3.	Using the TOC Records Storage Area (RSA) Approval Form (A-6004-360) guide, set up your RSA.
	4.	Complete a TOC Records Storage Area (RSA) Approval Form (A-6004-360) to demonstrate the RSA meets the minimum requirements for operation.
Manager	5.	Review and sign the TOC Records Storage Area (RSA) Approval Form.

Records & Document Control Manager or Company Records Specialist

6. Assess the RSA for operational approval.
   a. If compliant, approve the TOC Records Storage Area (RSA) Approval Form.
   b. If not approved, note the corrections required, communicate the corrections to the Manager and File Custodian for modification, and return to step 3.

File Custodian

7. Print a copy of the approved TOC Records Storage Area (RSA) Approval Form and post the form in the RSA where it will be readily available for viewing, auditing, and assessments.

4.4.3 RSA Operations

File Custodian

1. Receive records in accordance with procedures governing the preparation or submittal of each specific document. (7.1.9)
2. Verify that records received agree with the transmittal document (if one is provided) and that the records are legible.
3. Verify that received records are those designated.
4. Enter the record on the index within two business days of receipt.
5. File the record in accordance with the filing method described on the approved TOC Records Storage Area (RSA) Form. (7.1.9)
6. Maintain an index of records stored in the RSA.

   NOTE: The index may be hard copy or electronic and will contain at a minimum document number (if applicable) and/or title of document.
7. File supplemental record in accordance with the filing method described on the approved TOC Records Storage Area (RSA) Form. (7.1.12)
8. Maintain a current list of authorized personnel allowed unaccompanied access and responsibility for records. The backup file custodian shall be indicated on the list.

   NOTE: This list will be kept to a minimum, and typically consists of the Manager, custodian and backup custodian.

9. Maintain access and accountability control to include:

    - Records remain under lock and key (in a locked room or locked in a cabinet when unattended)

    - Access to records is by authorized personnel. When access to a record is required by project personnel there are two methods available to gain access:

        – Copy of record provided to requestor.
        – Requestor may access the record requested in the RSA.

10. Maintain files in accordance with this procedure. (7.1.9)

11. Review files to identify records that no longer require maintenance as active records.

12. Retire records to the designated location/system to be maintained for the length of the assigned retention period when:

    - When a full box has been generated,

    - At the completion of a project or activity if above criteria cannot be met, or

    - Within one year of record or record package completion. (7.1.2)

13. During the processing of records to the RHA, maintain records in DOE approved storage boxes and stored in a secure location.

    NOTE: When not working with the box, the lid will be attached. Records being transferred must be transferred within 30 days of removal from the file cabinets. Within the 30 days the boxes will be packed, Records Transfer Form completed, records specialist review performed, movers contacted for pickup, and pickup completed. While records are in the boxes, there is minor risk of water damage which WRPS is willing to assume.

14. Contact the Company Records Specialist for further direction on the retirement of inactive records.

15. When an RSA moves location, complete a new RSA form and submit for approval by the Records & Document Control Manager or Company Records Specialist.

4.5 Records Disposal – Notification, Review, and Destruction of Records

TOC records that reach their destruction date, according to the established retention period on the RIDS, are identified, reviewed, and approved for disposal. The following process applies to records maintained by the IRM Service Provider in the RHA/FRC or electronic records maintained in IDMS and in Records Storage Areas located in the field.

4.5.1 Notification for Records that have Reached their Destruction Date Housed in the RHA or IDMS

IRM Service Provider

1. Monitor the destruction dates for all retired TOC records.

2. When records reach their destruction date, notify the Records & Document Control Manager with the following information:

   - Identification of applicable Box Number(s).
   - Identification of applicable records using the Record Transfer Form (RTF) description.
   - Identification of record format: hardcopy or electronic.
   - Identification of record retention schedule driving disposal.

   NOTE: The notification is considered a record and must be captured.

4.5.2 TOC Review and Approval Process

Records & Document Control Manager

1. Receive notification from the IRM Service Provider that records have reached their destruction date.

Records Specialist

2. Review the records eligible for destruction report and prepare a TOC Records Destruction Approval form.

3. Forward the records eligible for destruction report and TOC Records Destruction Approval form to the record owner or responsible manager.

Record Owner

4. Review the records eligible for destruction report, and if necessary, the actual records located at the RHA or in IDMS, to determine if there is a continuing regulatory or business purpose to retain the records or if the records can be destroyed.

   NOTE: The Records Specialist can aid in making this determination

5. Complete the TOC Records Destruction Approval form to either:

   a. Authorize destruction of the records
   b. Apply an appropriate records schedule.

6. Return the TOC Records Destruction Approval form to the Records Specialist.

Records Specialist

7. Depending on the determination by the record owner, process the TOC Records Destruction Approval form to:

   a. Notify the IRM Service Provider of the new retention schedule, or notify the IRM Service Provider to initiate records disposal

b. Scan the TOC Records Destruction Approval form into IDMS as a record of action taken.

8. Notify the Records & Document Control Manager of the determination.

Records & Document Control Manager

9. Request General Counsel (Legal) and other subject matter expert assistance to ensure appropriate records retention and disposal.

4.5.3 RHA and IDMS Records Repository Actions

IRM Service Provider

1. Upon receipt of a completed TOC Records Destruction Approval form.

   a. Update the repository database to apply the appropriate records schedule and revised retention period, or

   b Destroy the identified records.

   c. Maintain information on records destroyed from the repositories.

4.5.4 Records Storage Area Repository Destruction Process

WRPS personnel are required to submit records to RSAs for intermittent storage on an ongoing basis prior to going to the RHA or IDMS.

This process is to be used by WRPS Record Storage Area (RSA) custodians who are responsible for processing records to the RHA. Per this procedure records within the RSAs are to be off loaded within a year.

RSA Custodian

1. Identify records in the RSA that reached their retention period.

2. Contact the records specialist to aid in processing records for destruction or rescheduling of record retention period.

Records Specialist

3. Review the records eligible for destruction report and prepare a TOC Records Destruction Approval form.

4. Check for any other relevant record destruction moratoriums such as Tobacco Litigation or Epidemiological Investigations (EPI).

5. Forward the records eligible for destruction report and Records Destruction Approval form to the record owner (responsible manager).

Record Owner

6. Review the records eligible for destruction report, and if necessary the actual records located at the RHA or in IDMS, to determine if there is a continuing regulatory or business purpose to retain the records or if the records can be destroyed.

   NOTE: The Records Specialist can aid in making this determination

7. Complete the TOC Records Destruction Approval form to either:

   a. Authorize destruction of the records or

b. Apply an appropriate records schedule.

8. Return the TOC Records Destruction Approval form to the Records Specialist.

Records Specialist and Records Custodian

9. Depending on the determination by the record owner, process the TOC Records Destruction Approval form to:

a. Destroy the identified records by shredding or placing in a locked shredding bin or

b. Ship the records to the RHA or scan the documents into IDMS with the newly identified retention schedule.

c. Scan the TOC Records Destruction Approval form into IDMS as a record of action taken.

d. Maintain a log of destroyed records which includes but is not limited to:

- Document Type
- Date of Document Collection
- Record Owner/Manager which approved destruction
- Date Destroyed.

4.5.5 Long-Term Stewardship

DOE/RL-2010-35, Hanford Long-Term Stewardship Program Plan, describes how records need to be properly scheduled and preserved to support long-term stewardship. Long-term stewardship pertaining to the TOC contractor is applicable when the final geographical area is identified and will fall under DOE/RL-2010-35. At that time the process for identification of applicable records which fall under long-term stewardship will be generated and implemented.

5.0 DEFINITIONS

Active records. Completed records necessary to conduct business and frequently accessed for their informational content.

Classification. To assign a record to a category (e.g., Record, Non-record, QA lifetime, QA non-permanent)

Controlled-use information (CUI). Sensitive information, as defined in TFC-BSM-IRM_DC-C-03 and TFC-BSM-IRM-STD-03, such as applied technology, export controlled information, business sensitive information, export controlled information, patentable subject matter, personal/ private information, official use only information, etc., that is required to be protected from unauthorized access or disclosure.

Digital signature. A digital signature or digital signature scheme is a mathematical scheme for demonstrating the authenticity of a digital message or document. A valid digital signature gives a recipient reason to believe that the message was created by a known sender, and that it was not altered in transit. Digital signatures are commonly used for software distribution, financial transactions, and in other cases where it is important to detect forgery and tampering.

Disposition. Action taken regarding information/records no longer needed for current business. Following the determination of the information's value, the actions include transfer to a storage facility, microfilming, scanning, or disposal.

Document. Any recorded information, regardless of its physical form or characteristics, including, without limitation, written or printed matter, data processing cards, tapes, charts, maps, paintings, drawings, engravings, sketches, photographic prints, exposed or developed film, working notes and papers; reproductions of such things by any means or process; and sound and video recordings by magnetic, optical, or any other electronic means.

Document Service Center. Stations strategically located throughout the site that provide the release, issuance, retrieval of TOC documents. Also known as the IRM service provider.

DOE records schedules. Records retention schedules issued and controlled by the DOE for application on records generated by or for the DOE. DOERS are approved by the NARA.

Dual storage. The storage of two copies of a record at locations sufficiently remote from each other to eliminate the chance of exposure to a simultaneous hazard.

Electronic approval. Electronic approval authenticated by system sign-on and passwords. Approval is maintained by the electronic system tying the authentication to the individual name.

Electronic record. A record that contains machine readable, as opposed to human-readable information, and consisting of character coded electronic signals that can be processed and read by a computer. A record maintained on electronic storage media.

Electronic Records Management Software Applications. Software that has been certified to DOE-STD-4001-2000, "Design Criteria Standards."

Electronic records system. An approved system authorized to maintain, store, and disposition computer-based records on digital storage media (Presently only IDMS is an approved electronic records system).

Electronic signature. A computer data compilation of any symbol or series of symbols executed, adopted, or authorized by an individual to be the legally binding equivalent of the individual's handwritten signature

Emergency operating records. The type of vital records essential to the continued functioning or reconstitution of an organization during and after an emergency. Included are emergency plans and directives, orders of succession, delegations of authority, staffing assignments, selected program records needed to continue the most critical agency operations, as well as related policy or procedural records that assist Emergency Operations Center personnel in conducting operations under emergency conditions and for resuming normal operations after an emergency.

Extensible Markup Language (XML). An acceptable neutral format used to create web documents. Documents formatted by the set of rules for encoding machine readable documents.

Finding aids. Key words, unique identification codes, document numbers, titles, or nomenclatures that facilitate retrieval. Also, databases, lists, and indexes that aid in locating and retrieving documents.

File custodian. Individual (manager, supervisor, specialist, engineer, clerk, etc.) responsible for the control, protection, and disposition of file material, and for ensuring record material received is legible and reproducible.

File management. The process for ensuring documents are legible, complete, protected, and have been placed into folders or envelopes for storage, or scanned into IDMS as an electronic record. If the files are specially processed records (e.g., radiographs, photographs, negatives, microfilm, and magnetic and optical media), they are stored to prevent damage. Establish measures to preclude entry of unauthorized personnel into records storage areas.

Filing units. Series of identical or equivalent file items characterized by a consistent method of assembly and handling (e.g., personnel folders, purchase orders); a common arrangement of the component items; uniformity of subject, type of information recorded, or kinds of transactions reflected.

Graphics Interchange Format (GIF). The preferred file format for scanned images such as illustrations containing color and various resolutions.

HyperText Markup Language (HTML). An acceptable neutral format used to create documents on the World Wide Web.

Inactive records. Those completed records that are not frequently accessed because of their age, subject matter, or because the information is available from other sources, such as electronic information systems, reference libraries, working files, etc., but which are retained for a required retention period. Such records are retired from active files to a records storage facility.

Index. A listing, catalog, or directory of summary information for the records to aid in timely retrieval of relevant files.

In-process documents designated to become records. Documenting material, books, maps, papers, checklists, or other documents used by an agency of the U.S. Government to document a transaction, discussion, activity completion, etc. before completion with an authenticating stamp/ signature.

Joint Photographic Experts Group (JPEG). Preferred file format for color images such as Photographs.

Legal and financial rights records. Type of vital records essential to the protection of legal and financial rights of the agency, Government, and individuals directly affected by its activities (also known as rights and interests records). Examples include accounts receivable records, social security records, payroll records, retirement records, and insurance records.

Long-term storage. Storage of completed inactive records in an RL-approved designated record storage facility operated by the IRM Service Provider.

Moving Picture Experts Group (MPEG). A standard for defining compression of audio and visual digital data.

Metadata. Data describing stored data: that is, data describing the structure, data elements, interrelationships, and other characteristics of electronic records. Record profile data or data about data.

Message (msg). The E-mail message (format type) submitted to records in IDMS.

National Archives and Records Administration (NARA). An agency within the U.S. General Services Administration that is directly responsible for the management and quality of records created by or for the Federal Government.

Neutral Format. A format providing an electronic "snapshot" of a file rendered from a native file which does not allow the file to be easily edited or changed e.g. PDF, TIFF, GIF, JPEG, XML etc. Once a neutral format is submitted to the IDMS records area the files are preserved by the records module.

Nonpermanent records. See Attachment A Section 3.0.

Non-record material. See Attachment A Section 2.0.

Portable Document Format (PDF). The preferred file format for text documents and the conversion most suitable for text documents created and submitted in non-neutral formats.

Quality Assurance (QA) records. See Attachment A Section 3.0.

Raw in-process information. Numeric, textual, or graphic information generated, calculated, manipulated, and/or maintained within a technical data system that is not yet considered to be record material by virtue of the fact that a record has not been produced and authenticated.

Record. See Attachment A Section 1.0.

Record material. See Attachment A Section 1.0.

Record material controls. The processes that ensure records are stored and maintained in a manner that minimizes the risk, loss, damage, or deterioration.

Record owner. The organization or function that generated, retired, or is currently responsible for the maintenance of a particular record. When records become eligible for destruction at the expiration of the established retention period per the RIDS, the record owner reviews and approves the continued retention or disposal of the records.

Records Holding Area. The RHA is the DOE-authorized record storage facility employed for the storage of completed inactive records generated by or for the DOE. The RHA provides an environmentally controlled and security-approved environment for protecting records. TOC records are transferred to the RHA when they reach the end of their active life. The RHA is used unless the record is maintained in an approved electronic management system, such as IDMS.

Records Inventory and Disposition Schedule (RIDS) Form. A federally mandated listing of the filing units, general files, and quality assurance record files of an organization, setting forth their mandatory disposition in terms of retirement, disposal, or transfer to permanent storage after specified retention period in the office. The RIDS includes all file material, i.e., record (including record and non-record material), classified and unclassified information.

Tagged Image File Format (TIFF). Group 4 compression technique with non-proprietary image file-header label – The preferred file format for scanned images and the conversion option for document created in non-neutral formats that cannot be rendered to PDF format.

Temporary storage. Storage of completed active records at selected locations throughout TOC organizations and facilities (e.g., project files, operations, startup/operations readiness review files, training files). Temporary record storage includes the storage of records temporarily removed from a record storage facility. Records are transferred to long-term storage once they become inactive.

Text documents. Narrative or tabular documents such as letters, plans, procedures, instructions, studies, reports, etc.

Timely Retrieval. Retrievability of records within a period of time commensurate with the importance and impact of the information contained in the record. (7.1.1)

Vital Records. See Attachment A Section 4.0.

Windows Media Video (WMV). A video compression format for video developed by Microsoft.

6.0 RECORDS

The following records are generated during the performance of this procedure:

- Active Records Transmittal form (A-6003-520)
- Electronic Record Authorization (An electronic form retained by LMSI)
- TOC Record Storage Area (RSA) Approval Form (A-6004-360)
- Vital Records Justification Form (RL-F-243-2.1)
- Records Transfer Form (An electronic form retained by LMSI)
- Records Disposal Notification (Maybe performed by email)
- TOC Records Destruction Approval Form (A-6005-889).

The record custodian identified in the Company Level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.

7.0 SOURCES

7.1 Requirements

1. ASME NQA-1-2007 Edition, "Quality Assurance Program Requirements for Nuclear Facility Applications."
2. DOE O 243.1, "Records Management Program."
3. DOE O 243.2, "Vital Records."
4. DOE-STD-4001-2000, "Design Criteria Standard for Electronic Records Management Software Applications."
5. 36 CFR 1234.24, "Electronic Records Management" "Standards for Managing Electronic Mail Records."
6. 36 CFR 1234.28, "Electronic Records Management," "Security of Electronic Records."

7. 36 CFR 1234.32, "Electronic Records Management," "Retention and disposition of electronic records."

8. TFC-BSM-IRM_DC-C-03, "Information Clearance."

9. TFC-BSM-IRM-STD-03, "Unclassified Information Identification Standards."

10. TFC-PLN-02, "Quality Assurance Program Description."

7.2 References

1. DOD 5015.2, "Design Criteria Standard For Electronic Records Management Software Applications."

2. DOE O 205.1A, "Program Cyber Security Plan."

3. DOE/RL-2010-35, "Hanford Long-Term Stewardship Program Plan."

4. Records Restoration Guidance for the Hanford Site, The User's Handbook (attached to DOE Letter 9602774, dated 9/16/96).

5. RPP-13033, "Tank Farms Documented Safety Analysis," Chapter 12, "Procedures and Training."

6. TFC-BSM-AD-C-01, "Administrative Document Development and Maintenance."

7. TFC-BSM-IRM_DC-C-01, "Document Control."

8. TFC-BSM-IRM_SE-C-05, "Marking Sensitive Unclassified Information."

9. TFC-ESHQ-ENV-STD-07, "Environmental Records."

10. TFC-ESHQ-EP-C-01, "Emergency Management."

11. TFC-ESHQ-Q_C-C-01, "Problem Evaluation Request."

12. TFC-OPS-OPER-C-13, "Technical Procedure Control and Use."

13. TFC-PLN-17, "Document Control and Records Management Program Description."

ATTACHMENT A - RECORD MATERIAL CLASSIFICATION

1.0 RECORD MATERIAL

Federal law (44 USC 3301) states that records are those classes of documentary material that may be disposed of only after archival authority is obtained. The statutory definition of "records" is:

> "...books, papers, maps, photographs, machine-readable material, or other documentary materials, regardless of physical form or characteristics, made or received by an agency of the United States Government under federal law or in connection with the transaction of public business and preserved, or appropriate for preservation, by that agency or its legitimate successor as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities of the government or because of the informational value of the data in them."

Federal Regulations, 36 CFR 1220, Federal Records, Subchapter B, 1220.18, What definitions apply to the regulations in Subchapter B?

> "As used in subchapter B-- *Adequate and proper documentation* means a record of the conduct of Government business that is complete and accurate to the extent required to document the organization, functions, policies, decisions, procedures, and essential transactions of the agency and that is designed to furnish the information necessary to protect the legal and financial rights of the Government and of persons directly affected by the agency's activities."

Records consist of Quality Assurance and Non-Quality Assurance Records.

As such, information resources in any media that are generated or received under the TOC are <u>records</u> when they are or should be preserved because they constitute evidence or contain information of administrative, legal, fiscal, or historical value.

Record copy material is information that needs to be preserved because of its administrative, legal, research, scientific, or historical value. For a specific office it is information generated or received documenting that organization's functions, policies, decisions, procedures, and essential transactions.

The Records Management and Document Control website presents a decision flowchart of the factors to be considered in identifying record material.

The following factors are considered in identifying record copy material for your organization and establishing retention periods.

- Your office has primary record retention responsibility

ATTACHMENT A – RECORD MATERIAL CLASSIFICATION (cont.)

- Original source of the information (was it created or received by your office and is it related to carrying out your office's responsibilities?)
- The importance of the material as an integral segment of historical information
- The need of the material to support a legal claim or verify TOC and/or DOE position
- The value of the material for investigation or audit purposes
- The value of the material in support of another record.

2.0 NON-RECORD

Non-records are defined as:

Informational materials that do not meet the definition of "records." As such, non-record material includes:

- Copies of documents that are maintained for information, reference and/or operating convenience for which another office has primary responsibility.
- Preliminary drafts that do not represent or explain significant steps in the development of the document.
- Stocks or inventories of published or issued documents maintained for distribution purposes.
- Personal papers that are not used in or related to the transaction of Government business.

3.0 QUALITY ASSURANCE RECORD

Quality assurance record material is a completed document or other media that provides documentary evidence that items, services, activities or processes meet specified quality requirements. (7.1.10)

1. Quality assurance records are classified as "lifetime" or "nonpermanent" by the cognizant document owner or their agent when authorized, in accordance with the following criteria. (7.1.10)
2. Lifetime records are those that meet one or more of the following criteria:
   a. Those that would be of significant value in demonstrating capability for safe operation of the item
   b. Those that would be of significant value in maintaining, reworking, repairing, replacing, or modifying the item
   c. Those that would be of significant value in determining the cause of an accident or malfunction of an item

ATTACHMENT A – RECORD MATERIAL CLASSIFICATION (cont.)

d. Those that would provide required baseline data for in-service inspections of the item.

3. Lifetime records are required to be maintained by the plant Owner for the life of the particular item while it is installed in the plant or stored for future use.

4. Nonpermanent records are those required to provide evidence that the QA program has been properly executed, or show evidence that an activity was performed in accordance with the applicable requirements but need not be retained for the life of the item because they do not meet the criteria specified above for lifetime records. Nonpermanent records shall be maintained for the identified retention period. (7.1.11)

For programmatic nonpermanent QA records, the retention period shall be considered to begin on completion of the activity.

For product nonpermanent QA records, the retention period shall be considered to commence upon completion of delivery.

3.1 Typical Lifetime Quality Assurance Records

A list of typical lifetime records containing information meeting NQA-1-2004, Part 1 Requirement 17, is located on the Record and Document Control website.

4.0 VITAL RECORD

The term "vital records" denotes records essential for Emergency Operations Center personnel to maintain the continuity of government activities during an emergency. Vital records are maintained as copies in the work location. The original vital record material is retained in a secure repository away from the immediate work environment. Vital records are revised as frequently as needed. (7.1.3)

The vital records program includes two basic vital records categories: emergency operating records and legal and financial rights records (commonly known as rights and interest records.)

Because it is impossible to ensure the availability of every important document, sound judgment must be used to identify vital records for protection.

Vital records are often sensitive in nature and must be identified, marked, and protected in accordance with TFC-BSM-IRM_SE-C-05.

Only the most recent and complete source of the vital information needs to be treated as vital records.

1. Emergency Operating Records. These records, used by Emergency Operations Center personnel, outline the essential functions of a facility or operation during or following an emergency. Not included in this category are those records used in normal facility management, which can include alarm response procedures and abnormal operating procedures.

ATTACHMENT A – RECORD MATERIAL CLASSIFICATION (cont.)

2. General Management Records. These records would be used to re-establish control following emergency situations. Examples include:

   - Building Emergency Plans
   - Hazard Assessments
   - Safety Analyses
   - Drawings
   - Procedures
   - Disaster Recovery Plans
   - Contingency Plans
   - Call Lists
   - Equipment Specifications
   - Plant Layouts
   - Floor Plans
   - Essential Drawings.

   Records included in the vital records category are determined by respective managers and approved by the Emergency Management organization in accordance with TFC-ESHQ-EP-C-01.

3. Rights and Interests Records. These records are required for the preservation of the rights and interests of individual citizens and employees.

   Legal Rights Records. Records for which the company is the statutory office of record. These include records such as payroll information, financial interest (beneficiary designation, next of kin, benefits records, etc.), equity in retirement funds, proof of ownership, and legal proceedings and decisions.

   Fiscal Records. Departments and agencies should safeguard copies of periodic summaries of financial status, records of significant amounts of money owed to the company, and records of debt owed by the company. Procurement records are not included in this category.

ATTACHMENT B - RECORDS MANAGEMENT REQUIREMENTS

1.0 GENERAL

The records management requirements identified below are applicable to records and the systems, processes, and storage facilities employed to manage records. Implementation of the controls necessary to meet these requirements will satisfy requirements currently invoked for compliance for record types, including those classified as Quality Assurance (QA) records in accordance with TFC-PLN-02

Records and non-record material pertaining to current or pending litigation and investigations or Freedom of Information Act (FOIA) matters or to exceptions taken by the Government Accountability Office (GAO) shall be retained until the litigation is settled, the FOIA matter resolved, or the GAO exception is cleared.

Records maintained on individuals shall be protected from disclosure in accordance with the requirements established in "The Privacy Act of 1974." Requests for records covered under the "The Privacy Act of 1974", other than by the individual to who the records pertain or the employees that maintain and process the records, shall be coordinated with the WRPS Office of General Counsel.

Create or receive documents in accordance with procedures governing the preparation or submittal of each specific document. (7.1.10)

Apply appropriate document control requirements based on TFC-BSM-IRM_DC-C-01.

Originals or copies may be designated as record material. The records system should provide methods for authenticating copies of original records when the original record is contaminated or lost and a copy of the original record is available.

2.0 REQUIREMENTS

2.1 Authentication

Statements of authenticity, handwritten signatures, electronic signatures, or any other means that ensures traceability to a specific individual or organization of authentication and associated date are acceptable methods of authentication. If initials or codes are used for identification, then a system should be established to ensure traceability to the authenticating individual or organization. Electronic documents shall be authenticated with comparable information identified above, as appropriate: (7.1.1)

- With identification on the media; or
- With authentication information contained within or linked to the document itself

1. For hard copy records, include in the signature portion of the record the typed or printed name of the individual responsible for preparing, approving, and/or validating the record when appropriate and ensure the signature is entered using a permanent ink pen. Use of pencil or water-soluble ink (most felt tip pens not inscribed as "permanent") is prohibited in record material.

ATTACHMENT B - RECORDS MANAGEMENT REQUIREMENTS (cont.)

2. Documents shall be considered valid records only if stamped, initialed, or signed and dated by authorized personnel or otherwise authenticated. If the nature of the record (such as magnetic or optical media) precludes stamping, initialing, or signing, other means of identifying the record as complete by authorized personnel are permitted. (7.1.10)

3. Blocks or fields on forms that will become records that are not filled in shall be marked as not applicable (N/A) or have a line drawn through to eliminate any perception of missing data or an incomplete record. In instances where it is not practical to mark or line out unused blocks, procedures that address completion of the form shall provide the detail necessary to demonstrate that a completed record contains all required information, data approvals, etc.

4. Records shall be legible, accurate, and traceable to associated items and activities and shall reflect completed work and demonstrate compliance with applicable requirements. When total legibility cannot be achieved, try to obtain a better copy if unsuccessful records shall be identified as "best available copy."

5. Maintenance of records shall include provisions for correction, replacement, retention, protection, preservation, traceability, accountability, and retrievability.

2.2 Correcting Records

1. Records may be corrected in accordance with procedures that provide for appropriate review or approval by the originating organization. Such corrections shall include the date and identification of the person authorized to issue such corrections. (7.1.11)

2. Corrections to completed inactive records that have been retired to the Records Holding Area (RHA) shall be accomplished by supplementing the record with the correct information. Supplements shall be documented on a "Records Transfer Form" (available through the Records Management Access Portal (RMAP)) and shall identify the record being supplemented and the reason for the supplement. The information being modified by the supplement shall not be removed from the original record. Supplements and superseded records will be identified as such on the records retrieval index.

3. Corrections to hard-copy documents designated to become records shall be made by drawing a single line through the incorrect information and entering the correct information as close as possible to the original information. Incorrect data shall not be obliterated by the use of "white out," correction tape, scribbling, erasures, or any other method. The signature or initials of the authorized individual making the corrections and the date of the change shall be recorded adjacent to the correction.

4. Corrections to completed records shall be approved by the record's originating organization. If the originating organization is no longer responsible, the new responsible organization shall be identified. (7.1.10)

ATTACHMENT B - RECORDS MANAGEMENT REQUIREMENTS (cont.)

2.3 Storage

1. Submit record material to the one of the following for file management.

   - Document Service Center (DSC)
   - IRM Service Provider, Internal IDMS POC Internal Department records processor for processing into IDMS
   - Approved Records Storage Area (RSA)
   - Records Holding Area (RHA).

   NOTE: It is preferred, to the extent possible, that hard copy records be processed and stored electronically in the Managed Information, Electronic Records area of IDMS.

2. As a good business practice, e.g., multiple page records will be paginated (number and sequence of pages identified or by program generating record) in a manner that allows for easy reassembly of the record in the correct order.

3. Procedures that generate or process records shall:

   a. Identify the records generated through use of the procedure
   b. Identify the file management area or record keeping system
   c. Specify any special handling, storage or turnover requirements to be employed for in-process documents or active storage of completed records.

4. RSAs must store records in one-hour fire rated containers, unless dual storage facility requirements are met.

5. Dual facilities, containers, or a combination thereof shall be at locations sufficiently remote from each other to eliminate the chance exposure to a simultaneous hazard.

6. RSAs must store records at a predetermined location(s) in containers, or a combination thereof, constructed and maintained in a manner which minimizes the risk of loss, damage or destruction from the following:

   a. Natural disasters such as winds, floods, or fires;
   b. Environmental conditions such as high and low temperatures and humidity;
   c. Infestation of insects, mold, or rodents.
   d. Dust or airborne particles.

7. Activities and items detrimental to the records shall be prohibited in the storage area including food and drink.

8. Access to the processing, storage, and retrieval of records shall be limited to authorized personnel.

9. Provisions shall be made to prevent damage from harmful conditions (such as excessive light, stacking, electromagnetic fields, temperature, and humidity), as applicable to the specific media utilized for record storage.

ATTACHMENT B - RECORDS MANAGEMENT REQUIREMENTS (cont.)

10. The storage arrangement shall provide adequate protection of special processed records (such as radiographs, photographs, negatives, microfilm, and magnetic media) to preclude damage from moisture, temperature, excessive light, electromagnetic fields, or stacking, consistent with the type of record being stored.

11. Transfers of active records between organizations, facilities, and active storage locations shall be documented on the Active Records Transmittal form (Site Form A-6003-520).

    NOTE: The Active Records Transmittal form is used exclusively for transferring completed record files. It is not intended for use with in-process documents or distribution of controlled documents. Retirement of inactive records to the RHA is documented and approved on the Records Transfer Form (available through RMAP).

2.4 In-Process Records

1. Protect in-process records using a graded approach.

   A graded approach to the protection and storage of record material for example, if the record would be very difficult, costly, or impossible to recreate, it should be stored in a one hour fire rated cabinet. If a record could be recreated in a few minutes, special handling may not be necessary. For most instances, it is recommended that in-process documents designated to become records be kept in file cabinets, desk drawers, or covered bookcases, when not in use and at the end of the day. (7.1.9)

2. In-process records must be protected from damage or loss.

3. Expedite the development of in-process documents to lessen the loss of quality-affecting information.)

2.5 Records Inventory and Disposition Schedule (RIDS)

1. DOE records shall be assigned an appropriate retention schedule selected from the NARA General Records Schedule (GRS) or the DOE Records Schedule (DOERS) and the records shall be maintained in accordance with the retirement, retention periods, and destruction direction provided within the assigned schedule. DOE authorization for the disposition of records is granted via approval of records retention schedules.

2. NARA approval of records schedules and revisions to approved schedules is requested and documented on Standard Form SF 115, "Request for Records Disposition Authority."

3. DOE approval is required for new and revised DOE records schedules. Approvals are requested and documented on DOE F 1324.5, "Request for Records Disposition Authorization" forms.

4. The unauthorized destruction, alienation, or damage of records shall be reported to the Records & Document Control Manager in order to comply with the requirements 36 CFR 1228.104, "Reporting."

ATTACHMENT B - RECORDS MANAGEMENT REQUIREMENTS (cont.)

5. IRM Service Provider periodically generate reports from IDMS regarding records that have reached the end of the prescribed retention periods and transmit these to the

   Company Records Specialist for approval to destroy (this step includes the expiration of all holds placed on affected records).

6. Review eligibility for destruction report with Responsible Manager, Records and Document Control Manager and Office of General Council and indicate approval or justification for continued retention on the report and return to IDMS Administration.

   NOTE: At anytime if there is a moratorium or legal holds pertaining to records destruction it takes precedence over any scheduled destruction of records.

7. Remove/delete expired records that are approved by the responsible manager and the Records & Document Control Manager for destruction from IDMS. Flag records for extended retention based on the Records & Document Control Manager's justification.

2.6 Lost or Damaged Records

1. Records damaged as a result of fire, water, etc., shall be restored, to the degree practical.

2. Lost or damaged records shall be replaced, when practicable. Replacement records will be verified by the record authority (original generator, recipient or designee) as true and accurate representations. Lost or damaged records that cannot be replaced will be documented.

3. The willful and unlawful removal, destruction, damage, or alienation of government records shall be subject to the criminal sanctions (fines and imprisonment) mandated by Federal law.

4. If a record is lost or damaged contact the Records & Document Control Manager immediately for specific direction on how to replace, restore, or substitute the lost or damaged record.

2.7 Contractor/Supplier Records

1. Contract specifications shall protect the government's legal title and control over audiovisual media and related documentation.

2. Deferred ordering and delivery-of-data clauses and rights-in-data clauses shall be included in subcontracts issued by the TOC whenever necessary to ensure adequate and proper documentation or because the data have reuse value to the Government. The documentation required, the quantities of copies of record material, and the media on which the record is to be submitted to the TOC shall be contractually specified. A transmittal form that identifies the following information relative to the records being submitted shall be used for submittals:

   - Title or subject identifying the contents of the record
   - Record date
   - Name of the submitting company and originating organization or function
   - Document number, or tracking number aiding in record retrieval.

ATTACHMENT B - RECORDS MANAGEMENT REQUIREMENTS (cont.)

3. Contracts that include electronic data deliverables shall require delivery of sufficient technical documentation to permit the TOC to use the data.

4. Records maintained by suppliers at the supplier's facility or other locations shall be accessible to the TOC or designated alternate.

5. Records accumulated at various locations, before transfer, are accessible to the owner directly or through the TOC organization. Submittals are inventoried, receipt acknowledged, and processed in accordance with this procedure and implementing documents.

6. The supplier's nonpermanent records will not be disposed of until following conditions are met (as applicable):

   - Items are released for shipment, a Code Data Report is signed, or a Code Symbol stamp is affixed
   - Regulatory requirements are satisfied
   - Operational status permits
   - Warranty consideration is satisfied
   - Purchaser's requirements are satisfied.

ATTACHMENT C - ELECTRONIC RECORDS REQUIREMENTS

1.0 GENERAL

Electronic records are generated in a variety of ways. Text type documents and data are received from both internal and external sources and are developed using a host of office automation packages such as electronic mail, word-processors, spreadsheets, databases, desktop publishers, and electronic data interchange systems, with a variety of file formats. Data is generated, processed, or collected within data systems as the result of data manipulation or calculation protocols programmed into the data systems. The "Best Basis Inventory" records created within the Tank Waste Information Network System (TWINS) and process control system records are examples of records derived from data systems.

2.0 ELECTRONIC RECORDS

1. Record material transmitted or received via electronic mail or text messages shall be preserved in hardcopy media and maintained within appropriate record files or in electronic media in approved electronic record storage systems. This includes identities of sender, addressee(s), date and time messages were sent, date and time of receipt, and/or acknowledgement of receipt or access by addressee(s). (7.1.4 7.1.5)

2. Computer hardware and software used to maintain, index, store, or access records shall be maintained and access controlled to ensure accountability, reproducibility, and protection from loss.

3. Documentation pertaining to electronic systems used to generate data designated to become record information shall be managed.

4. Processes must be in place to ensure that the electronic records are accessible and readable throughout the retention period.

5. Data and/or information are considered to be in-process information from the time of creation until it is used. At the time of use, the electronic data becomes record information and, as such, is required to be captured and authenticated within a hard-copy record, or transferred to an approved electronic records system.

   NOTE: Procurement and financial records are generated and stored in the Business Management System (BMS) which has been approved by the RL Records Officer for storage of these records. The BMS is an authorized exception to the requirement for certification to DOE-STD-4001-2000.

ATTACHMENT C – ELECTRONIC RECORD REQUIREMENTS (cont.)

Regardless of the source of the data or information selected for preservation as an electronic record, the requirements identified are applicable. Their purpose is to ensure that electronic records are maintained in a manner that affords the following:

1. The integrity and authenticity of electronic records is maintained and demonstrable from the point of generation through use, storage, and final disposition.

2. Electronic records are preserved in a retrievable and usable manner throughout their scheduled retention period and no records are destroyed before expiration of their prescribed retention period as stated on their Records Inventory Disposition Schedule (RIDS)

3. Software and hardware changes to accommodate evolving technology are compatible with legacy records.

4. All WRPS electronic records are stored within approved systems authorized by the DOE Office of River Protection (ORP) Records Officer and the WRPS Records & Document Control Manager for the storage of electronic records.

5. All records series approved by the WRPS Records & Document Control Manager for storage within an electronic records system are documented on a DOE F 1324.5 form.

While many information management systems are in use throughout TOC operations that facilitate creation, import, processing, and interim storage of information, most do not have the functionality and controls necessary to meet the needs for archival storage of electronic records.

This attachment identifies the requirements invoked by 36 CFR 1234, "Electronic Records Management" and the recommended standards identified in DOE-STD-4001-2000, "Design Criteria Standard for Electronic Records Management Software Applications" that are derived from U.S. Department of Defense (DOD) Standard DOD 5015.2 of the same title. These requirements pertain to all WRPS electronic records and the data systems used to generate, manipulate, and maintain in-process raw data designated to become record material.

The Integrated Document Management System (IDMS) is designated as the primary repository for storage of TOC electronic records. The IDMS is implemented using a commercial-off-the-shelf (COTS) product (Open Text™ Livelink®). Because the records management module provided through the software is certified to DOD 5015.2, specific requirements directly related to the storage system functionality and structures are not addressed within this procedure. Any other systems authorized to store electronic records will be certified to DOD 5015.2, or otherwise verified, to provide the controls and functionality necessary to satisfy all requirements identified within that standard. IDMS meets the requirements pertaining to dual storage in electronic format. It is backed up weekly to tape and the tape is shipped offsite. For everyday processing of information into the system, it is written to a server located in Building 339 on the Hanford site and also onto a server located at the Federal Building at 825 Jadwin. This is a distance of four miles and meets the distance requirements. Hard copy records can be reproduced from IDMS when required.

ATTACHMENT C – ELECTRONIC RECORD REQUIREMENTS (cont.)

3.0 CREATION OF ELECTRONIC RECORDS

1. Text documents designated to become records upon completion are converted to a neutral format and submitted to an approved electronic records system for storage at the time of completion.

2. Raw in-process technical data maintained in a database or other electronic data interchange system is not electronic record material. Output produced from the data is considered electronic record material. The output is captured in a document (in a preferred format) and transferred to an approved electronic records system at the time it is actively used to quantify or measure a tolerance or a reading, support or arrive at a decision, report a condition, demonstrate compliance, etc.

3. Required approvals, authorizations, and concurrences are documented through the use of digital or electronic approvals and through access authentication via personal identification numbers (PINs), passwords, etc. The degree of authentication required for a given record is predicated on its content, use, and historical significance. Records that contain contractual (legal) information or executive-level management transactions and decisions will require either electronic or hard copy handwritten signatures for authentication. Handwritten signatures may be imported into the electronic records system as a TIFF image through scanning of hard copy documents for future reference. Those records that document routine business transactions and work activities may employ less rigid forms of electronic authorizations, approvals, and concurrences authenticated through the use of the following access controls:

    a. Preservation of the workflow histories for documents processed within a document management system such as IDMS, retaining a record of participant activities associated with the workflow process.

    b. Use of PINs, passwords, and network authentication controls to manage access security to the degree necessary to validate and authenticate actions to responsible individuals.

4. Use of digital or electronic signatures is accomplished through use of the following:

    a. The E-Sign module provided with the IDMS produces a certificate of authentication.

    b. Electronic and digital signatures provided with documents submitted from other systems.

    c. If an electronic signature technology separates the signature from the rest of the record, it must be associated in some way and captured in the record system to preserve the complete content of the record. In these instances, submittal of electronic signature records and metadata along with the electronic record will facilitate preservation and association within IDMS.

ATTACHMENT C – ELECTRONIC RECORD REQUIREMENTS (cont.)

4.0 TRANSFER/IMPORT TO ELECTRONIC RECORDS SYSTEM

1. When record copies of email messages have been transferred to the electronic record system for archival storage, the identical email version has no continuing value to the email system user and may be deleted. (7.1.6, 7.1.10)

2. Records created in non-neutral formats such as Microsoft® Word, Excel, PowerPoint, etc., must be converted to a PDF file format or other neutral format by the organization responsible for submittal to the records system. If the organization cannot render to PDF, the Information Service Provider using a module providing renditions will perform the task upon request. (7.1.5)

3. If the record cannot be rendered to PDF then one of the following neutral formats may be used. (7.1.4)

   - Tagged Image File Format (TIFF)
   - Graphics Interchange Format (GIF)
   - Joint Photographic Experts Group (JPEG)
   - Extensible Markup Language (XML)
   - Windows Media Video (WMV)
   - Moving Picture Expert Group (MPEG)
   - HyperText Markup Language (HTML)
   - Text File (TXT)
   - Portable Network Graphic (PNG).
   - Comma Separated Value (CSV)
   - Text (TXT)
   - Message (MSG).

4. Organizations retiring records in non-neutral formats that contain complicated structures, special characters, subscript, or superscript will obtain prior approval from the RM/DC Manager to use formats. (7.1.10)

5. Documents containing controlled-use (sensitive) information (CUI) will be identified with the appropriate required identifiers and restrictive legends to ensure that access is controlled. (7.1.6, 7.1.10)

6. Obtain approval for any deviation from one of the above file formats from the Records & Document Control Manager.

5.0 STORAGE OF ELECTRONIC RECORDS

1. All TOC electronic records will be stored in systems (records management applications) certified to DOD 5015.2 as required by DOE-STD-4001-2000. Non-certified systems may only be used for interim storage of electronic records when specifically authorized by the WRPS Records & Document Control Manager. (7.1.4)

2. The IDMS maintained by the IRM service provider, is the designated electronic records storage system for TOC electronic records. (7.1.9, 7.1.10)

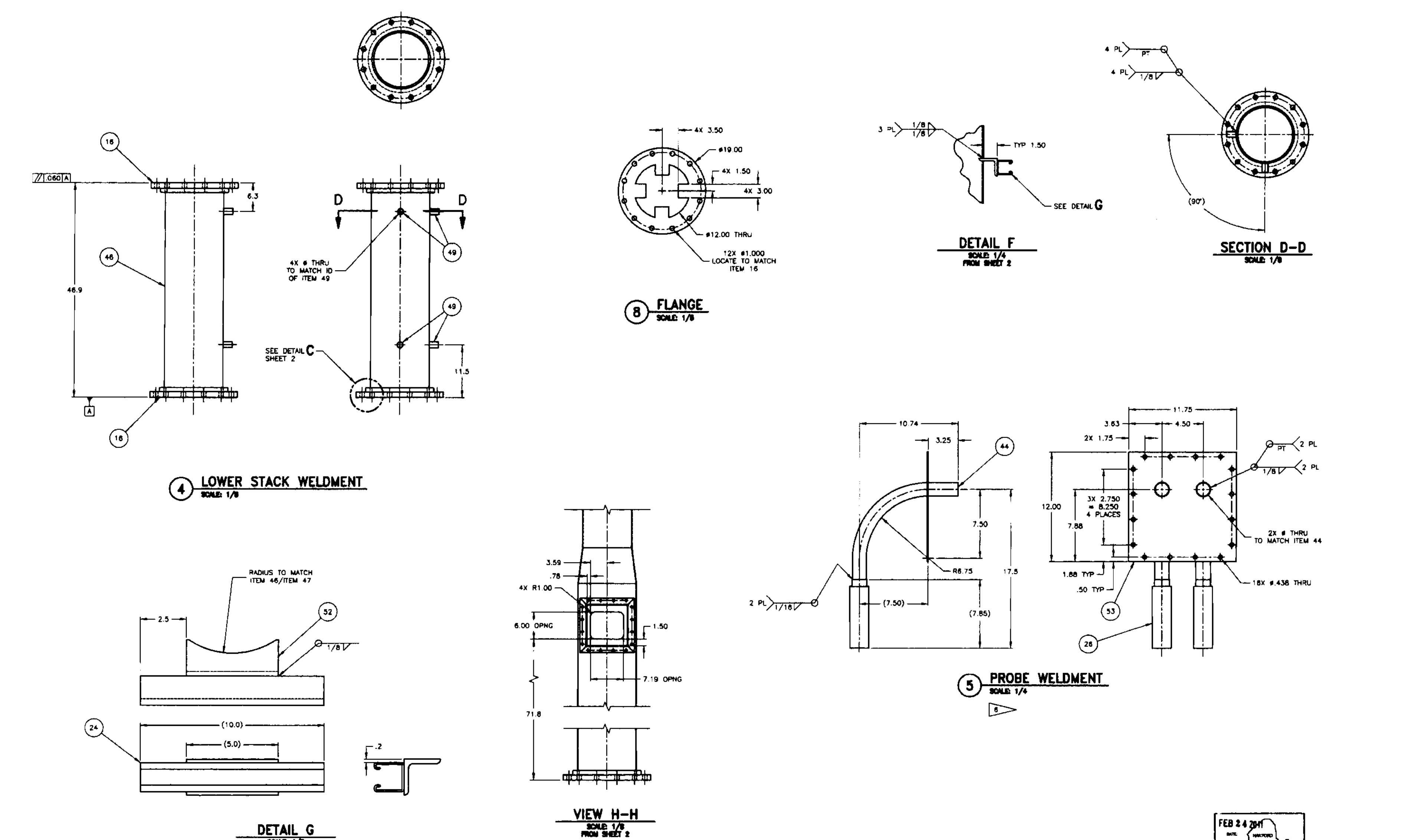
ATTACHMENT C – ELECTRONIC RECORD REQUIREMENTS (cont.)

3. Record content, legibility, and retrievability will be maintained when records are duplicated or transferred to the same or different media for the purpose of maintenance or storage. Such duplications or transfers will be authorized by the Records & Document Control Manager. (7.1.4)

4. Tank Operations Contactor personnel will have direct access through their work stations to the IDMS for submitting records for archival storage and for "read only" access to stored records throughout their prescribed retention periods. (7.1.4)

5. If native file format documents accompany PDF or other acceptable formats of records within IDMS, they may be accessed and downloaded by TOC personnel to facilitate use as a master for future revisions.

6. Electronic records that contain controlled-use (sensitive) information are protected from unauthorized disclosure through the use of access permission features within the IDMS. (7.1.6, 7.1.10)



NOTES:

1. FOR PARTS LIST AND GENERAL NOTES SEE SHEET 1.
2. REVISION 4 OF THIS DRAWING WAS FIELD WALKED DOWN IN OCTOBER 2010. FOR CHANGES MADE AND FOR ITEMS NOT VERIFIED IN FIELD, SEE ECN-11-000385.

DIMENSIONING AND TOLERANCING SHALL BE INTERPRETED PER ANSI Y14.5M-1994
DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED

UNSPECIFIED TOLERANCES SHALL BE:
DECIMAL .X ± .1 .XX ± .06 .XXX ± .030
ANGULAR ± 1°

ALL IMPLIED 90° ANGLES SHALL BE PERPENDICULAR WITHIN THE GREATEST TOLERANCE OF THE LINEAR DIMENSIONS

ALL COAXIAL FEATURES SHALL BE CONCENTRIC WITHIN .031 INCH UNLESS OTHERWISE SPECIFIED

DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		NEXT USED ON SHEET 1	

REFERENCES

5	RB 5	DIRECT REV PER ECN-11-000385	

REVISIONS

FEB 24 2011
HANFORD RELEASE
STA: 4
ID: 11

SEE REVISION 0

U.S. DEPARTMENT OF ENERGY
Office of River Protection

AN241-VTP (W-314)
EXHAUSTER TRAIN "B" UPPER & LOWER STACK ASSEMBLIES

SIZE			DWG NO	REV
F	241AN	8900	H-14-105545	5
SCALE SHOWN		820447	SHEET 3	