



Field Standard Operating Procedures for the Federal Lead (Pb) Performance Evaluation Program: High Volume Pb-TSP Audits

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina

**Field Standard Operating Procedures for the
Federal Lead (Pb) Performance Evaluation Program:
High Volume Pb-TSP Audits**

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Foreword

This document describes detailed standard operating procedures (SOPs) for the field activities related to high volume Pb-TSP audits for the Lead (Pb) Performance Evaluation Program (PEP).

This document is accessible as a PDF file on the Internet on the Ambient Monitoring Technology Information Center (AMTIC) Bulletin Board under the Quality Assurance (QA) area of the Lead Monitoring Information (available at <http://www.epa.gov/ttn/amtic/pbpep.html>). The document can be read and printed using Adobe Acrobat Reader software, which is freeware available on many Internet sites, including the U.S. Environmental Protection Agency's (EPA) Web site. The Internet version is write-protected. Hardcopy versions are available by writing or calling:

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This is a living document, which means it may be revised as program objectives and implementation procedures evolve. Comments on technical content and presentation of this document may be sent to Gregory Noah. EPA Regional Contract Officer Representatives (CORs), FSs, and LAs will use a process described herein. If serious errors are identified, then they will be corrected immediately with a Quality Assurance Bulletin. Less dramatic evolutionary changes will be made through a revision cycle that usually concludes in the fall of each year.

The document mentions trade names or brand names. Mention of corporation names, trade names, or commercial products does not constitute endorsement or recommendation for use.

Acknowledgements

This compendium of field standard operating procedures (SOPs) is the product of the combined efforts of the U.S. Environmental Protection Agency's (EPA's) Office of Air Quality Planning and Standards (OAQPS); EPA's Regional Offices; State, local, and Tribal organizations; and associated FSs and LAs who perform the daily operations. This revision was led and directed by Gregory Noah of OAQPS.

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Acronyms and Abbreviations

AFC	Agency File Code
AMTIC	Ambient Monitoring Technology Information Center
AQS	Air Quality System
CFR	<i>Code of Federal Regulations</i>
CMD	Contracts Management Division
CO	Contracting Officer
COC	chain of custody
COR	Contract Officer's Representative
CS	Contracting Specialist
DAS	Data Acquisition System
DOCOR	Delivery Order Contract Officer's Representative
DOT	U.S. Department of Transportation
DQA	Data Quality Assessment
DQOs	Data Quality Objectives
EDO	environmental data operation
EMAD	Emissions, Monitoring, and Analysis Division
EPA	U.S. Environmental Protection Agency
ESAT	Environmental Services Assistance Team
FDS	Field Data Sheet
FAA	Federal Aviation Administration
FEM	Federal Equivalent Method
FRM	Federal Reference Method
FS	Field Scientist
GFCI	ground fault circuit interrupter
GLP	Good Laboratory Practice
Hi-Vol	High-volume
LA	Laboratory Analyst
LAN	Local Area Network
MQAG	Monitoring and Quality Assurance Group
MQOs	Measurement Quality Objectives
NAAQS	National Ambient Air Quality Standards
NAMS	National Air Monitoring Station
NIST	National Institute of Standards and Technology
OAQPS	Office of Air Quality Planning and Standards


Acronyms and Abbreviations (continued)

Pb	lead
PC	personal computer
PD	percent difference
PE	Performance Evaluation
PEP	Performance Evaluation Program
PO	Project Officer (EPA Headquarters)
PQAO	Primary Quality Assurance Organization
PTFE	polytetrafluoroethylene
QA	quality assurance
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
QMP	Quality Management Plan
RPO	Regional Project Officer
SLAMS	State and Local Ambient Monitoring Stations
SOP	standard operating procedure
SOW	statement or scope of work
STAG	State and Tribal Air Grants
TOCOR	Task Order Contract Officer's Representative
TSA	Technical Systems Audit
TSP	total suspended particulate
WACOR	Work Assignment Contract Officer's Representative

Approvals

Title: Field Standard Operating Procedures for the Federal Lead (Pb) Performance Evaluation Program: High Volume Pb-TSP Audits.

The attached Field Standard Operating Procedures (SOPs) for the Lead (Pb) Performance Evaluation Program (PEP) are hereby approved and commit the participants of the program to follow the sections described within.

Signature: 
Name: Gregory W. Noah, EPA OAQPS

Date: 9/9/14

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Introduction

The purpose of this section is to provide the Environmental Services Assistance Team (ESAT) Field Scientists (FSs) with background information on the Federal Lead (Pb) Performance Evaluation Program (PEP) as an introduction to standard operating procedures (SOPs) for field personnel involved in the Pb-PEP.

Lead (Pb) Program

In 1970, the Clean Air Act (CAA) was signed into law. Under the CAA, the ambient concentrations of six criteria pollutants (particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead) are regulated. The CAA requires monitoring organizations to monitor these criteria pollutants through the Ambient Air Quality Surveillance Program as defined in 40 CFR Part 58.

On November 12, 2008 EPA substantially strengthened the national ambient air quality standards (NAAQS) for lead (see 73 FR 66934). EPA revised the level of the primary (health-based) standard from 1.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) to $0.15 \mu\text{g}/\text{m}^3$, measured as total suspended particles (TSP) and revised the secondary (welfare-based) standard to be identical in all respects to the primary standard. In conjunction with strengthening the lead (Pb) NAAQS, EPA identified the need for states to improve existing lead monitoring networks by requiring monitors to be placed in areas with sources that emit one ton per year (tpy) or more of lead and in urban areas with more than 500,000 people. Depending on specific circumstances, States may have the option of using monitoring for either lead in TSP (Pb-TSP) or lead in PM_{10} (Pb- PM_{10}) using approved Federal Reference Methods (FRM's) or Federal Equivalent Methods (FEM's) to demonstrate compliance.

Throughout this document, the term “decision maker” will be used. This term represents the individuals who are the ultimate users of ambient air data and therefore may be responsible for activities such as setting and making comparisons to the NAAQS and evaluating trends

With the end use of the air quality measurements as a prime consideration, various networks can be designed to meet one of the following six basic monitoring objectives:

- Determine the highest concentrations to occur in the area covered by the network
- Determine representative concentrations in areas of high population density
- Determine the impact on ambient pollution levels of significant source or source categories
- Determine general background concentration levels
- Determine the extent of Regional pollutant transport among populated areas and in support of secondary standards
- Determine the welfare-related impacts in more rural and remote areas.

The monitoring network consists of four major categories of monitoring stations that measure the criteria pollutants. These stations are described below.

The SLAMS and Tribal Monitoring Network¹ consists of ~4,000 monitoring stations whose size and distribution are largely determined by the needs of State, local, and Tribal (SLT) air pollution control agencies to meet their respective Tribal Implementation Plan (TIP) and State Implementation Plan (SIP)

¹ <http://www.epa.gov/ttn/amtic/slams.html>

requirements. A SLAMS monitor is involved in measuring criteria pollutant concentrations for the purpose of determining whether the area hosting the monitor is meeting the NAAQS for the pollutant in question.

The NCore Network² is a multi-pollutant network that integrates several advanced measurement systems for particles, pollutant gases and meteorology. EPA is coordinating with its SLT partners, who will operate the NCore sites, on a list of possible site locations. There are approximately 80 of these sites.

The Special Purpose Monitoring Stations (SPM) network provides for special studies needed by the monitoring organizations to support their SIPs and other air program activities. The SPMS are not permanently established and, thus, can be easily adjusted to accommodate changing needs and priorities. The SPMS are used to supplement the fixed monitoring network as circumstances require and resources permit. If the data from SPMS are used for SIP purposes, they must meet all QA and methodology requirements for SLAMS monitoring.

The Photochemical Assessment Monitoring Station³ (PAMS) network is required to measure ozone precursors in each ozone non-attainment area that is designated as serious, severe, or extreme. The required networks have from two to five sites, depending on the population of the area. The current PAMS network has approximately 80 to 90 sites and is likely to change.

Since the data for the SLAMS and Tribal monitoring networks can be used for NAAQS comparisons, the quality of this data is very important. Therefore, a quality system has been developed to control and evaluate the quality of data in order to make NAAQS determinations within an acceptable level of confidence. The EPA used the data quality objective process to determine the allowable measurement system imprecision and bias that would not significantly affect a decision maker's ability to compare pollutant concentrations to the NAAQS. Due to the promulgation of the lower Pb NAAQS, EPA made some changes in the QA requirements in 40 CFR Part 58 Appendix A. The following are the highlights of the changes that occurred in Appendix A:

- **DQO Goals** - Measurement quality objectives for precision will be 20% for a 90% confidence limit coefficient of variation and an overall absolute bias upper bound goal of 15%. Goals will be assessed on 3 years of data at the PQA level of aggregation.
- **Flow Rates**-No changes occurred to flow rate. Flow rate verification will be implemented quarterly (TSP Hi-Vol) and flow rate performance evaluations will be implemented every six months.
- **Monitoring at Local Conditions** – The prior Pb standard required sampling calculated to standard temperature and pressure (STP). The new rule requires Pb sampling at local standard conditions or ambient conditions.
- **Collocated Monitoring**-No changes occurred to the collocation requirements. Collocation will continue to be required at 15% of each method designation within a primary quality assurance organization at a 1-in-12 day sampling frequency. EPA added language encouraging monitoring organizations to site the first collocated sampler in each network at the highest concentration site. This will allow the site to operate over the longest time period, while still allowing a substitution of collocated data for the primary monitor if the site is a NAQQS location, in order to maintain completeness for the program. Routine/collocated data pairs will be used when Pb concentrations

² <http://www.epa.gov/ttn/amtic/ncore/index.html>

³ <http://www.epa.gov/ttn/amtic/pamsmain.html>

of both samples are greater than or equal to 0.02 $\mu\text{g}/\text{m}^3$. Prior to 2008, this cutoff value was 0.15 $\mu\text{g}/\text{m}^3$.

- **Pb Strip Audits**-The requirement for the analysis of 6 Pb audit strips per quarter (3 strips at 2 concentration ranges) has not changed. However, the audit concentrations ranges have changed. The lower concentration range is 30-100% of the NAAQS and the higher concentration range is 200-300% of the NAAQS. This activity does not affect the Pb-PEP field operations; however, the service lab for PEP will participate in inter-laboratory comparative performance evaluations.
- **Pb-Performance Evaluation Program (Pb-PEP)**-The implementation of a program similar to the PM_{2.5}-Performance Evaluation program (PM_{2.5}-PEP) is a new requirement, and it provides some assessment of overall bias but with additional focus on the laboratory analysis and the local primary sampler operating proficiency. It will be a mix of one or two conventional PEP-like audits with additional collocated sampling.

The Pb-PEP Description

- A performance evaluation is defined as a type of audit in which the quantitative data generated in a measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of the analyst or laboratory. In the case of the Pb-PEP, the goal is to evaluate total measurement system bias, which includes measurement uncertainties from the field and the laboratory activities. The pertinent regulations for this performance evaluation are found in 40 CFR Part 58, Appendix A, section 3.3.4.4. The number of audits required is based on the number of routine sites within a primary quality assurance organization (PQAO). The program will require the same number of audit samples as required for PM_{2.5}, however the responsibility for collecting the PEP samples may be shared between EPA and the SLT monitoring agencies:
 - PQAOs with ≤ 5 sites require 5 audits (1 EPA or independent audit, 4 SLT site-collocated audits)
 - PQAOs with > 5 sites require 8 audits (2 EPA or independent audits, 6 SLT site-collocated audits)

The Lead (Pb) QAPP focuses on one QA activity, the Pb-PEP, which is associated with Pb monitoring. The background and rationale for the implementation of the Pb FRM/FEM monitoring network can be found on the Office of Air and Radiation Website⁴.

The strategy is to collocate a portable Pb TSP air sampling instrument within 2 to 4 meters of a routine SLAMS air monitoring instrument, operate both monitors in exactly the same manner, and then compare the results. In addition to collocation with a portable audit sampler, 4 or 6 filter samples (depending on number of collocated sites within a PQAO as described in 40 CFR Part 58, Appendix A, section 3.3.4.3) will be sent to the Pb-PEP laboratory. EPA expects that these collocated samples would be submitted on a quarterly basis to the audit laboratory.

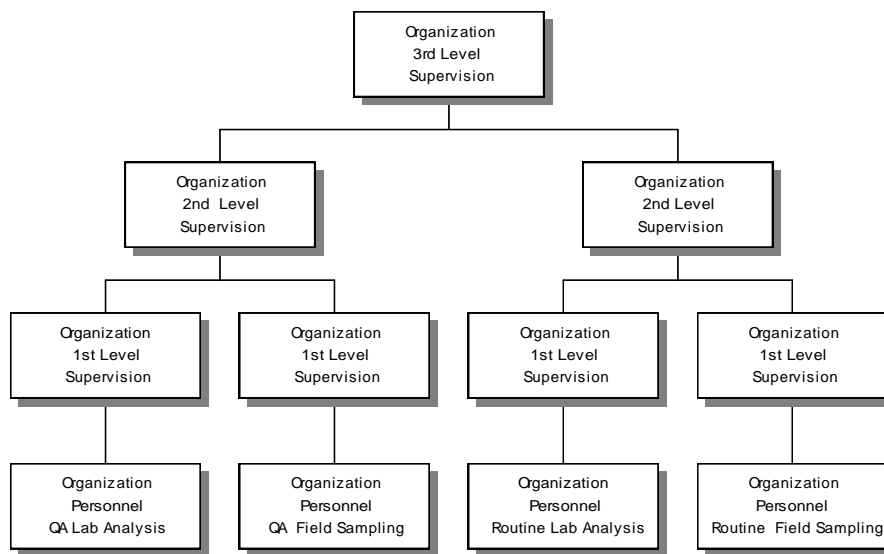
The implementation of the Pb-PEP is a monitoring organization responsibility. However, similar to the PM_{2.5}-PEP program, EPA has developed a federally-implemented Pb-PEP and provides monitoring organizations the option to self-implement or utilize the federally-implemented program. Self implementation will require monitoring organizations to meet a level of independence and adequacy.

⁴ <http://www.epa.gov/air/lead/>

In general terms, a PE is a type of audit in which the quantitative data generated in a measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of the analyst or laboratory. In the case of the Pb-PEP, the goal is to evaluate total measurement system bias, which includes measurement uncertainties from both field and laboratory activities. Independent assessment is stipulated by 40 CFR part 58 Appendix A, Section 2.2. Figure 1 was derived to describe an appropriate level of independence

Independent assessment—An assessment performed by a qualified individual, group, or organization that is not part of the organization that is directly performing and accountable for the work being assessed. This auditing organization must not be involved with generating the routine ambient air monitoring data. An independent organization could be another unit of the same agency, which is sufficiently separated in terms of organizational reporting and can provide for independent filter analysis and PE auditing.

An organization can conduct the PEP if it can meet the above definition and has a management structure that, at a minimum, allows for the separation of its routine sampling personnel from its auditing personnel by two levels of management. In addition, the analysis of audit filters must be performed by separate laboratory facility using separate laboratory equipment. Field and laboratory personnel would be required to meet the PEP field and laboratory training and certification requirements. The SLT organizations are also asked to consider participating in the centralized field and laboratory standards certification process.



Organizations that are planning to implement the PEP must submit a plan that demonstrates independence to the EPA Regional Office responsible for overseeing QA-related activities for the Ambient Air Quality Monitoring Network.

Figure 1. Definition of independent assessment

With respect to Pb sites in the national monitoring network include those using FRM high volume or low volume PM₁₀ samplers.

EPA will use the Environmental Services Assistance Team (ESAT) contract that is currently in place in each Region to provide the necessary field and laboratory activities for the federally-implemented program. Each EPA Regional Office will implement the field component of this activity. The EPA Region 9 Laboratory located in Richmond, CA will be responsible for the lab analysis of high volume (Hi-Vol) glass fiber filters. OAQPS's technical support contractor will provide data management support including development and maintenance of web-enable data entry forms, web reporting utilities, and posting final results to AQS. Note that some Agencies can assume the responsibility of conducting the independent audits in their jurisdiction if they can meet the independence and adequacy requirements.

The following information provides a brief description of the activities as pertains to the Pb-PEP Hi-Vol sample collection. Figure 2 provides a basic description of the Pb-PEP in the following steps:

1. EPA will distribute Hi-Vol filters directly to EPA Regions where they will be inventoried, inspected and prepared for the field.
2. The FS staff will take the filters and Chain-of-Custody (COC)/Field Data Sheet (FDS) forms to the field and operate the portable TSP Pb sampler.
3. The FS will send the Hi-Vol filters and signed copies of the COC/FDS Forms to the Region 9 Pb-PEP Laboratory (as well as keeping a set of data and records).
4. The FS will enter the data from the COC/FDS Forms (via web-enable data entry forms) and upload the raw sampler data files using OAQPS's data management website for Pb-PEP.
5. The Region 9 Pb-PEP Laboratory will receive, inspect, and analyze the Hi-Vol filters. The lab will validate the analytical results and submit analytical results along with copies of the signed COC/FDS Forms to OAQPS's data management contractor via the AIRQA Web site located at <https://www.sdas.battelle.org/AirQA/>.
6. OAQPS's data management contractor will process the electronic data submitted by the field and lab, associate the related data elements in the Pb-PEP database, perform automated data validation checks against the Pb-PEP acceptance criteria, and submit data for EPA's final review and approval.
7. The Regional Pb-PEP leads and National Pb-PEP Lead (or designated QA Officer) will review validated Pb-PEP results, indicate approval or rejection, and initiate investigation of any questionable data.
8. OAQPS's data management contractor will prepare the approved data for upload to EPA's Air Quality System (AQS).

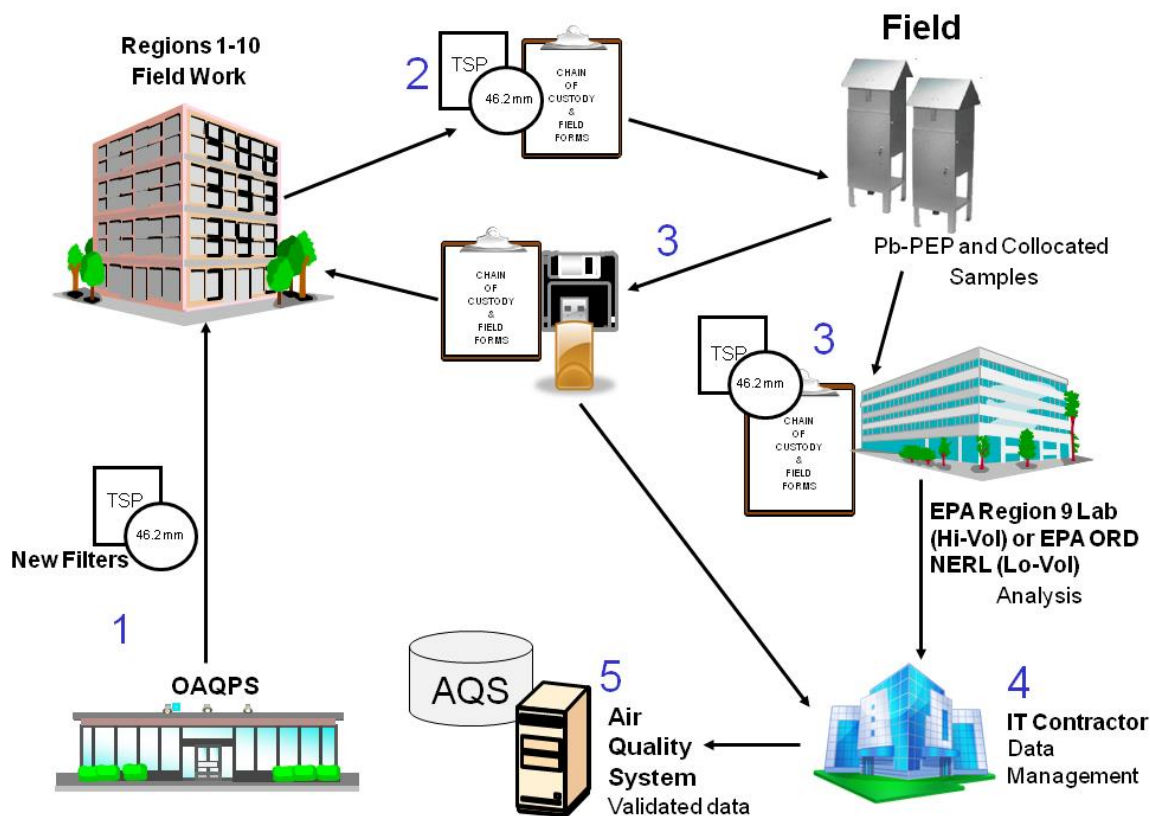


Figure 2. Pb Overview

Field Activities

The portable audit samplers are used in a collocated manner to perform the evaluations. These samplers have been approved by EPA as a FRM sampler and are designed to be durable, rugged, and capable of frequent transport. These samplers are constructed in sections with rolling cases for portability and storage. While these samplers have been specifically designed to perform these evaluations, precautions must still be taken to ensure data quality. Basic instructions are found in the Pb QAPP and specific instructions are detailed in the Pb Field SOPs. A brief summary of the field activities follows:

- One fully trained operator will transport a portable Pb FRM PE sampling device to an established Pb site as selected by the EPA Regional Lead.
- The operator will assemble the instrument; collocate the sampler; conduct a leak check; perform time, barometric pressure, temperature, flow verifications; install a filter; and operate the instrument from midnight to midnight on the same scheduled sampling day as the monitoring organization's sampler.
- If scheduling permits, the operator will leave this location to set up additional audits (Pb or PM_{2.5}) at other routine sampling locations. If the schedule does not allow for another set up, the operator may perform additional activities at the site, such as scheduling subsequent audits, reviewing and verifying data from previous Pb-PEP audits, and completing associated paperwork.

- The operator shall return to each site within a specified time following the 24-hour sampling time, review the run data, download the stored electronic monitoring data, remove and properly store the filter for transport, and disassemble the instrument.
- The operator shall properly package the filter, FDS and COC forms, and the data storage media following the SOPs for shipment to the predetermined analytical laboratory.

Laboratory Activities

The Pb-PEP requires extensive laboratory activities such as filter handling, sample extraction, analysis, data entry/management and archival tasks. EPA Region 9 has implemented the Pb-PEP laboratory for Hi-Vol filter analysis. Specific detailed instructions will be found in the Pb-PEP QAPP and the Region 9 Laboratory SOP which is included in the Pb-PEP QAPP as an appendix. In addition to the Good Laboratory Practices (GLP) which must be followed, the following activity must also be observed concerning the laboratory activity:

- Adherence to the vendor's operations manual should be followed to ensure analytical equipment is used as designed, and all extractions are completed effectively.
- Adherence to the SOPs for the program.
- Adherence to the standards, principles, and practices outlined Pb-PEP QAPP.
- Special attention must also be given to any activity involving filter handling. This area contains the greatest potential for measurement uncertainty and care must be given to the proper handling of the TSP filters.

For generating a concentration, the critical lab measurement is the Pb concentration in $\mu\text{g}/\text{filter strip}$. This information can then be used to calculate the Pb concentration on the full TSP filter that, when divided by the air volume in cubic meters (m^3) pulled through the filter, provides a final concentration ($\mu\text{g}/\text{m}^3$). In addition to these critical measurements, supporting laboratory data will also be collected to help identify the samples, ensure proper COC, holding times, and data quality. These additional parameters are described in detail in the Laboratory SOPs.

Purpose of this Document

The purpose of the Pb-PEP Field SOPs is to provide detailed procedures to follow when performing the following field activities:

- Overview
- Planning, Preparation, and Communication for Sampling Event
- Equipment Inventory and Maintenance
- Filter Receipt, Storage, and Handling
- Sampler Transport and Placement
- Sampler Assembly and Maintenance
- Verifications (Leak Check, Barometric Pressure, Ambient Temperature, Flow Rate)
- Calibrations (Leak Check, Barometric Pressure, Ambient Temperature, Flow Rate)
- Sampling Event, Filter Handling, and Post Event Activities
- Data Forms (Field Data Sheet and Chain-of-Custody)
- Quality Assurance/Quality Control (QA/QC)
- Information Retention.

All methods are to be followed completely. Any deviation must be reported in writing and submitted to the WACOR/TOCOR/DOCOR. Method improvements are encouraged and should follow the same submittal process for approval from the Pb-PEP National Lead before implementing.

Each SOP section is written as a stand-alone procedure to assist in training and certification activities and can be removed from the document and made readily available at the station where the activity takes place. The SOPs follow the format for technical SOPs outlined in EPA's *Guidance for the Preparation of Standard Operating Procedures (SOPs) EPA QA/G-6*. The *QA/G-6* requirements include the following topics:

- A. Scope and Applicability
- B. Summary of Method
- C. Definitions (acronyms, abbreviations, and specialized forms used in the SOPs)
- D. Health and Safety Warnings
- E. Cautions
- F. Interferences
- G. Personnel Qualifications
- H. Apparatus and Materials
- I. Instrument or Method Calibration
- J. Sample Collection
- K. Handling and Preservation
- L. Sample Preparation and Analysis
- M. Troubleshooting
- N. Data Acquisition, Calculations, and Data Reduction
- O. Computer Hardware and Software
- P. Data Management and Records Management.

Prerequisites

Training and Certification

All field personnel funded by the OAQPS PEP Work Assignment must be trained and certified to perform the activities. Training and recommendation for certification can be provided by the Regional WACOR/TOCOR/DOCOR or by OAQPS. Details on the training requirement and content are documented in the Pb-PEP QAPP posted on the AMTIC website at <http://www.epa.gov/ttn/amtic/pbpep.html>.

Background Literature

Prior to implementing field activities, field personnel are expected to be familiar with the documents listed in Table 1. The knowledge level is rated from 1, having in-depth knowledge, to 5, having a basic understanding.

Table 1. Required Reading for the Performance Evaluation Program

Document	Knowledge Level
Pb-PEP Field SOPs	1
Pb-PEP QAPP	1
Portable Sampler Operating Manuals	1
Pb-PEP Laboratory SOPs	3
DQO Process	3
QA Handbook Vol. II Part 1	3
40 CFR Part 50, Appendix G	4
40 CFR Part 58, Appendix A	4

Definitions

Appendix A contains a glossary of the terms used in the Pb-PEP. Acronyms and abbreviations can be found in the front of this compendium.

Cautions

Filters

Care in all aspects of filter cassette handling cannot be overemphasized. Additional details of filter cassette handling are discussed in **Section 3, *Filter Receipt, Storage, and Handling***.

Section 1

Overview of FRM Performance Evaluation Field Activities

1.1 Overview of FRM Performance Evaluation Field Activities

1.1.1 Scope and Applicability

This SOP applies to performing field operations for the Pb-PEP FRM and provides an overview of the detailed SOPs that follow.

1.1.2 Summary of Method

A PE is used to determine the total bias for total suspended particulate (TSP) sample collection and lead (Pb) analysis. For EPA or independent audits, this type of event involves collocating a portable FRM/FEM sampler adjacent to a monitoring site's routine sampler and sampling for a 24-hour period. SLT site-collocated audits will utilize fixed samplers already located at the sampling location. The concentrations measured by the two samplers are then compared to assess bias. FRM/FEM PEs will be conducted as follows:

- The number of audits required is based on the number of routine sites within a primary quality assurance organization (PQAO). The Pb-PEP will require the same number of audit samples as required for the PM_{2.5}-PEP, however the responsibility for collecting the PEP samples may be shared between EPA and the SLT monitoring agencies:
 - PQAOs with ≤ 5 sites require 5 audits (1 EPA or independent audit, 4 SLT site-collocated audits)
 - PQAOs with > 5 sites require 8 audits (2 EPA or independent audits, 6 SLT site-collocated audits)
- 100% completeness (meaning whatever it takes to get five or eight valid samples)
- All samplers must be audited in a 6 year period.

Special priority will be given to those sampler locations documented or expected to have concentrations near the annual NAAQS for lead (40 CFR Part 58, Appendix A, Section 3.4.4.4). The basic operations involved with conducting the field portion of the Pb-PEP are described below.

1.1.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

1.1.4 Health and Safety Warnings

To prevent personal injury, all personnel must heed any warnings associated with the installation and operation of the FRM sampler and any supporting equipment and supplies. Specific health and safety warnings will generally be found at the point in the operating manual or troubleshooting guide where they are most applicable.

1.1.5 Cautions

- Because the portable sampler will be moved from site to site, it is of critical importance that it be maintained and calibrated as required, and that all aspects of its operation be checked and verified after it is set up at each new site. To function as a reliable standard of comparison, the sampler's

operational parameters must be kept within tight control limits. Consequently, procedures for verifying a portable sampler's calibration and operability are an important part of the field SOPs.

- The sampler will be installed and dismantled many times during the course of the PE trips, and caution must be taken to install and maintain the sampler properly to prevent damage. Be particularly attentive to performing maintenance on the pump. Refer to the Sampler's Operations Manual for exact instructions on packing the portable sampler, and pack the sampler components securely for safe transport by vehicle or by air. Immediately after installation, a leak check must be performed and verification checks of temperature, barometric pressure, and flow rate must be made and recorded. All necessary corrective actions must be taken before sampling can begin with the portable FRM/FEM device.
- For Hi-Vol sampling, exercise care in handling new and exposed glass fiber filters. Never touch the filter surfaces with bare hands. Always wear powder-free nitrile or vinyl gloves when handling filters. Care should be taken when placing the glass fiber filter in the filter holder and placing the protective transport cover on the sample holder. The removal of exposed filters from the sample holder should only be performed indoors to prevent loss or destruction of the exposed filter.
- If instructions for labeling and transporting filters are not followed precisely, errors will result. Rough handling of exposed filters during packaging or transport should be avoided.
- When the sampler is dismantled, be sure to remove any debris that adheres to the base or legs before storing the sampler for transport. To minimize contamination, pack the base or leg portion of the sampler separately from the sampler collection module.
- Protect all barometers from mechanical shock and sudden pressure changes.

1.1.6 Interferences

The interferences associated with this method are those factors that can cause alterations to the flow rate of the sampler or in the amount of Pb present on the filter. Interferences can be avoided by following these guidelines:

- Avoid handling unexposed or exposed filters in any way that could contaminate the sample. For example, avoid the following: rough handling which could cause material loss or tearing of the filter; exposing of the filter to dusts or other contaminants; or allowing the face of the filter to touch surfaces which could cause contamination.
- Following a sampling period, package the filter promptly and send it to the Pb-PEP Laboratory in EPA Region 9 within the specified time.
- Ensure proper cleaning of the sampler inlet surfaces and interior of the sampler unit, inspection of the filter holder frame and rubber gasket, and optimal operation of the brushless blower and mass flow controller.

1.1.7 Personnel Qualifications

All personnel responsible for conducting FRM/FEM PEs at field sites must be certified annually by EPA as having completed the required training program. These persons are designated as Field Scientists (FS) in the Pb-PEP. During this training program, the operators of the samplers must successfully complete an extensive, hands-on training session specified by EPA's Office of Air Quality Planning and Standards (OAQPS). An FS must also complete a written exam with a passing score of 90% or better. These training programs will be conducted as required at locations throughout the United States to ensure that all operators of the portable samplers are certified and that an adequate number of PE FS staff are available in each EPA Region. The hands-on practical examination for annual recertification may be

replaced, pending the satisfactory completion of the field evaluation of the FS during a Technical Systems Audit (TSA). For more information about training schedules and locations, contact EPA's Regional Office or OAQPS. The FS shall be prepared to transport the FRM/FEM device to various sampling platforms, including the tops of buildings or distant rural settings. For ease of operation and the safety of the operators, the portable FRM/FEM sampler was designed in sections, with each individual sections contained in roller boxes. Field personnel must be able to lift and carry these sections up stairs and/or ladders.

1.1.8 Equipment and Supplies

Each organization that is responsible for performing the PE will develop standard "kits" of equipment, materials, and supplies that are suitable for the make and model of the portable FRM/FEM sampler to be used. The contents of these kits will also be determined by the different requirements of the sites to be visited for PEs. For example, mounting equipment will, in part, be dictated by how the sites are constructed and where/how they are mounted (e.g., building roof, concrete pad, wooden platform).

Section 2.1, *Equipment Inventory and Storage*, contains an example Field Inventory Form (INV-01) and discusses the procedures for field equipment and resupply. The example form must be translated into a specific checklist of equipment and materials for each organization. Communications between the FS and site personnel prior to the visit are essential and assist greatly in knowing what will be required at each site.

1.1.9 Procedures

The FS will perform the following activities, as illustrated in Figure 1-1:

- Receive equipment and consumables, inventory each item, and ensure that supplies are adequate to perform field activities.
- Assist in developing a plan for the implementation of field activities and gather pertinent information for each site on a Site Data Sheet.
- Transport the appropriate sampling equipment to sites.
- Assemble the portable sampler, collocate the PEP sampler with a sampler from the monitoring organization, perform verifications following SOPs, install a filter, and operate the instrument for 24 hours (midnight to midnight).
- If scheduling allows, leave the original location to set up additional 24-hour PEs at other routine sampling locations or to perform additional activities at the site if so tasked. The FS may also perform any required maintenance or repair of the portable sampling device.
- Return to each site after the 24-hour sampling period, remove and properly store the filter for transport, download the stored electronic monitoring data, enter additional information as required, and disassemble and pack the sampler.
- Properly package and ship the filters and the signed COC/FDS forms to the Hi-Vol Pb-PEP Laboratory in EPA Region 9.
- Enter the data from the COC/FDS Forms (via web-enable data entry forms) and upload the raw sampler data files using the AIRQA Web site.
- Verify that the meta data provided for each audit has been recorded correctly in the data base.
- Participate in or assist with scheduled QA/QC activities of the PEP.

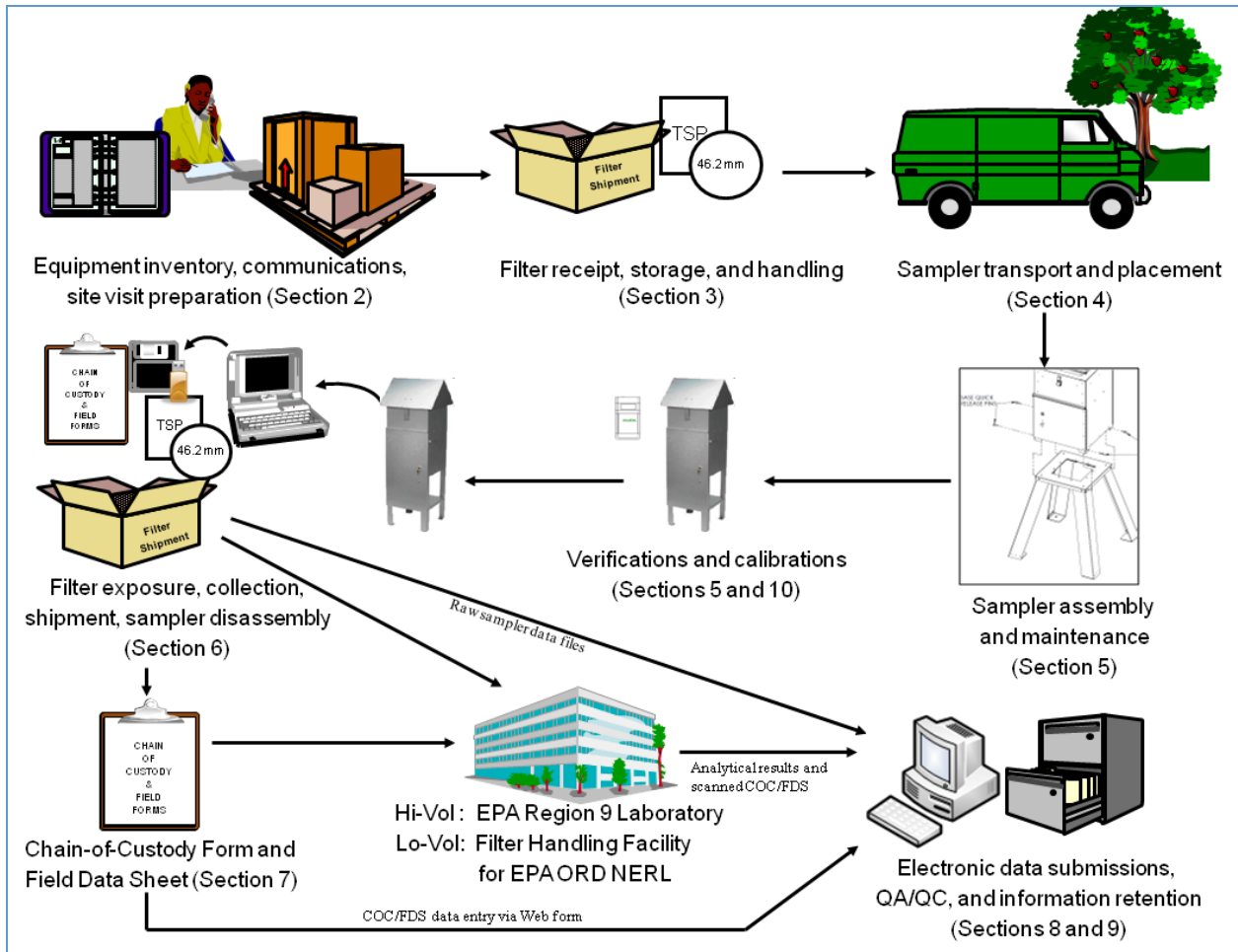


Figure 1-1. Field Activities in Relation to SOPs

Section 2

Planning and Preparing for PEP Sampling Events

2.1 Equipment Inventory and Storage

2.1.1 Scope and Applicability

This SOP explains the activities involved in conducting an inventory of existing field equipment, receiving new equipment and consumables, and maintaining the equipment.

2.1.2 Definitions

Appendix A contains a glossary of the terms used in the Pb-PEP.

2.1.3 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

2.1.4 Equipment and Supplies

The following apparatus and materials are required to perform the procedures in this section:

- Table 2-1, which provides a listing of the equipment and consumables needed for the field
- Field Inventory Form (INV-01)
- Field Procurement Log (PRO-01).

2.1.5 Procedure

2.1.5.1 Equipment Inventory

Table 2-1 provides a listing of the capital equipment and consumables required. The FS will follow the procedure below:

- Select Field Inventory Form (INV-01)
- Take a complete inventory of all equipment and supplies
- Keep an original copy and file it under Agency file code "Pb-PEP/301-093-006.6." Provide a copy of the inventory to the EPA Regional WACOR/TOCOR/DOCOR.

The FS should maintain a 2-month supply of consumables. During the first weeks of implementation, the FS will determine how quickly the consumable equipment supply is used and develop a purchasing schedule to ensure that an adequate supply is maintained.

Table 2-1 is a general list of equipment that has been useful in the PEP. FSs should use this list as a basis for preparing a specific checklist of equipment and materials for their organizations. Communications between the FS and site personnel prior to the visit are essential and assist greatly in knowing what will be required at each site. Equipment provided by EPA for the program are noted in the table.

Table 2-1. Equipment and Supplies

Qty.	Pb-PEP Field Equipment and Supplies	Vendor/Catalog Number	Make/Model Number	T
	<u>Monitoring Equipment and Supplies</u>			
	Transport case for loose equipment/consumables			
	Portable sampler(s) with carrying case	Tisch (Hi-Vol)	TE-5070 VFC+	
	8" x 10" glass fiber filters (based on 40 CFR Part 50, Appendix B, Section 7.1.3)	Whatman	N/A	
	Chain-of-Custody and Field Data Sheet form printed from AIRQA website	https://www.sdas.battelle.org/AirQA/	N/A	
	Hi-Vol filter cassettes with protective covers	Tisch Environmental	N/A	
	Sample Shipping Containers (corrugated bookfolds 12" x 9" x 1")			
	Manila envelopes (5" x 11.5") or equivalent			
	Manila envelopes (9.5" x 12.5") or equivalent			
	Glassine envelopes (11" x 5") or equivalent			
	Custody seals (tape or stickers)			
	Bubble wrap			
	PEP FRM Sampler Operations Manual	Tisch Environmental	TE-5070 VFC+	
	Field notebook(s)			
	Clipboard (8" x 14")			
	Grip binders			
	Data storage media (SD media card) 2 Gb			
	Silicone grease for gasket			
	FRM PEP Field SOPs (this document)			
	Laptop computer with appropriate data acquisition software			
	Magnetic compass or other means of determining site orientation			
	Tape measure (metric)			
	Cellular phone			
	Global positioning system (GPS) device			
	Mechanical pencils Markers (indelible)			
	<u>Mounting Equipment and Tools</u>			
	Ladder and a rope for hoisting equipment			
	Hand truck or cart with wheels and straps for transporting equipment			
	Bubble level for checking the portable FRM sampler			
	Wooden shims or other means for leveling the portable FRM sampler			
	Tool box with basic tools, including the following:			

Table 2-1. Equipment and Supplies (Continued)

Qty.	Pb-PEP Field Equipment and Supplies	Vendor/Catalog Number	Make/Model Number	T
	Allen wrenches (metric and standard)			
	Micro screwdriver set			
	Pliers (multiple sizes and types)			
	Screwdrivers (standard straight and Philips head)			
	Wire cutters			
	Small cable ties			
	Teflon tape			
	Electrical tape			
	Soldering gun/solder			
	Hemostat (for flow rate troubleshooting)			
	Flashlight with spare batteries			
	Heavy-duty, grounded, weatherproof electrical extension cord with multiple outlets (25' length)			
	Heavy-duty, grounded, weatherproof electrical extension cord with multiple outlets (12' length)			
	Tie-down cables, anchors, plywood sheet, and bungee cords to anchor and stabilize the portable FRM sampler and to dampen vibration (optional)			
	Masking tape Packaging tape Strapping tape			
	<u>Calibration/Verification Standards and Related Equipment</u>			
	Extra Hi-Vol filter cassettes and transport cover	Tisch Env	N/A	
2	Temperature, pressure, and flow verification device with external temperature probe (include backup device)	BGI Hi-Vol Cal	TC-12	
	Adapter plate for flow rate verifications (comes with BGI hivolCal units)	BGI	N/A	
	Temperature verification/calibration standard (NIST-traceable) with probe (optional)	BGI Hi-Vol Cal	TC-12	
	Styrofoam cup and deionized ice water for temperature calibrations			
	Hi-Vol flow-check system (filter holder, glass fiber filter, and cover)	Tisch Env	N/A	
	Accurately set timepiece (cell phone)			
	Hand calculator (scientific)			
	<u>Spare Parts and Optional Equipment</u>			
	Spare batteries (for all battery-powered equipment)			
	Fuses, as required by all equipment used			

Table 2-1. Equipment and Supplies (Continued)

Qty.	Pb-PEP Field Equipment and Supplies	Vendor/Catalog Number	Make/Model Number	T
	Voltmeter/ammeter/ohmmeter for troubleshooting			
	Ground fault circuit interrupter (GFCI) tester			
	Portable GFCI device			
	Camera (digital) for site pictures			
	Gaskets for motor housing			
	Gaskets for Hi-Vol filter cassette			
	Materials for stabilizing sampler (cement blocks, bags of sand, wooden splints, etc.)			
	<u>Cleaning Supplies and Equipment</u>			
	Low-lint laboratory wipes for cleaning sampling equipment (Kimwipes)			
	Disposable paper towels			
	Large locking plastic bag for cleanup of debris, wipes			
	Soft brush			
	Supply of deionized water for cleaning and rinsing equipment	Available from EPA labs		
	Isopropyl alcohol to aid in removal of grease and dirt			
	Alcohol wipes for preloading hand wipe			
	Penetrating oil (silicone oil or 3-in-1™)			
	Lint-free pipe cleaners			
	Safety pin/dental pick			
	Lint-free cotton-tipped swabs			
	Spray bottle			
	Gloves (powder free, nitrile)			

2.1.5.2 Procurement

As consumables run low or as new equipment purchases are necessary, the FS will be responsible for helping to procure these items following the policy and requirements described in the ESAT Scope of Work. The ESAT contract is written to allow the contractor to purchase consumables, repair equipment, and replace parts on the samplers to support the program. Funding for these purchases must be included in the ESAT cost estimates, and language must be present in the ESAT Pb-PEP Statement of Work reflecting this responsibility. OAQPS is responsible for the procurement of capital equipment such as audit samplers and calibrators. The FS should continue purchasing consumable equipment with the same model numbers as initially procured unless the EPA Regional WACOR/TOCOR/DOCOR suggests a different item due to improved quality, reduced contamination, improved ease of use, or lower cost (without sacrificing quality). The Regional WACOR/TOCOR/DOCOR will report any equipment changes that could affect the results of sampling events to the National Pb-PEP Leader.

The following activities will be performed:

- Develop procurement requests as per EPA requirements
- Upon order, add items to the Field Procurement Log (PRO-01)

- Once a month, provide a copy of Field Procurement Log (PRO-01) to the WACOR/TOCOR/DOCOR
- File the Field Procurement Log (PRO-01) under Agency file code “Pb-PEP/301-093-006.6.”

2.1.5.3 Receipt of Consumable Equipment

Upon receiving equipment and consumables, the FS will perform the following activities:

- Pull the appropriate purchase order for the incoming items from the files
- Fill out an Equipment/Consumable Receiving Report (REC-01) form, compare the items and quantity against the purchase order, and inspect the condition of each item
- If the items received match the purchase order and the condition of the equipment or consumables is acceptable, signify this on the form and file it under Agency file code “Pb-PEP/301-093-006.6”
- If the quantity, items, or condition are not acceptable, complete REC-01 with appropriate remarks and send a copy of the form to the WACOR/TOCOR/DOCOR
- Sign and date the packing list for the order and return it to the purchaser. A scanned then emailed copy is acceptable for OAQPS purchases
- Add receipt information to the Field Procurement Log (PRO-01).

2.1.5.4 Equipment Storage

When not in use, equipment should be stored in a clean, dry, and safe location. After completion of a field trip and return to the field office, the sampler(s) and associated verification gear should be cleaned, maintained as scheduled, and stored for the next trip. All equipment should be clearly identified and readily available for the next scheduled field trip.

Section 2.1: Equipment Inventory and Storage

Field Data Forms

Field Equipment/Consumable Receiving Report			
Date: _____			
Received From:			
Shipped From:			
Shipped Via:			
Shipping Charge:	Prepaid:	Collect:	Freight Bill Number:
Purchase Order Number			
Quantity	Description of Item		Condition
Remarks: Accept Shipment _____ Problem _____			
Notes:			
Form REC-01			

2.2 Communications

2.2.1 Scope and Applicability

This SOP describes the methods and requirements necessary to communicate technical information between the PEP FS and the organizations intimately involved in the PEP, such as the following:

- ESAT WACOR/TOCOR/DOCOR for the FS
- ESAT WACOR/TOCOR/DOCOR for the LA
- ESAT LAs
- OAQPS

This SOP focuses on FS communications and does not describe additional ESAT communication obligations described in the ESAT Scope of Work. Communications will include reports, e-mails, and phone calls.

2.2.2 Summary of Method

An organized communications framework is needed to facilitate the flow of information. Figure 2-1 represents the principal communications pathways. In general, ESAT contractors will be responsible for informing Regional WACOR/TOCOR/DOCORs and Project Officers (POs) on technical progress, issues, and contractual obligations. On the technical side, the EPA Regional WACOR/TOCOR/DOCORs will be responsible for communicating with SLT agencies and informing OAQPS about issues that require technical attention. Contractual issues will be conveyed from the ESAT contractor through POs to the ESAT Contracts Office and, if necessary, to OAQPS. EPA's website is available at <http://www.epa.gov/ttn/amtic/pbpep.html>.

The ESAT contractors will have frequent communication with the Regional WAMs/TOPOs/DOPOs about the progress of their activities and any problems/issues associated with them. Resolution of these issues should take place in the Regions unless the issue could affect the program at a national level, in which case it should be discussed and resolved through an ESAT Workgroup conference call.

2.2.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

2.2.4 Equipment and Supplies

The following capital and consumable equipment will be required for communications:

- Telephone

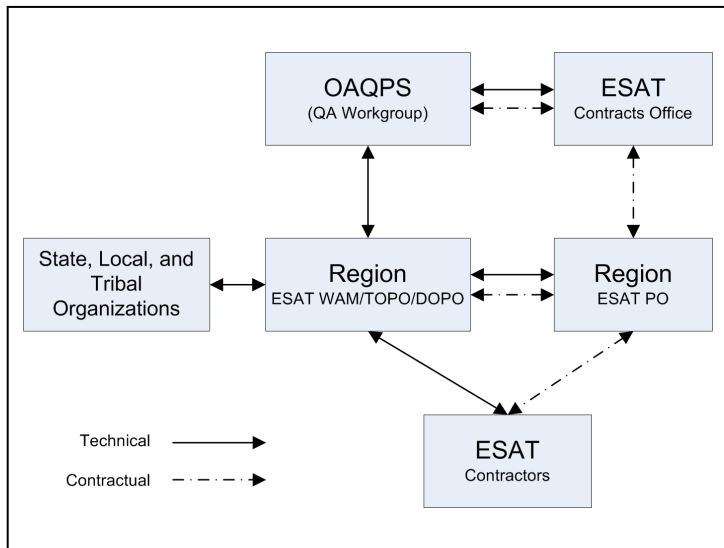


Figure 2-1. Line of Communication

- PC (with Internet and EPA e-mail capabilities)
- Printer
- Field communications notebook (or equivalent filing system)
- Writing utensils
- Forms
 - Phone Communication Form (COM-1)
 - Monthly Progress Report (COM-2).

2.2.5 Phone and E-mail Communications

A communication may be initiated by the WACOR/TOCOR/DOCOR, the FS, or the laboratory at any time to discuss Pb-PEP-related issues. All communications must be documented and filed in a retrievable manner.

During a phone call, the Phone Communication Form (COM-1) may be used to record the highlights of the conversation. Alternately, the initiator of the conversation may document this information in an e-mail to participants, saving a printed copy of the e-mail in the in the field communications notebook (or equivalent filing system). All electronic and hardcopy files should be maintained as described in **Section 9, Information Retention**.

Communication notes will include the following:

- Date
- Time
- Personnel involved
- Issue(s)
- Decision(s)
- Follow-up action(s)
- Follow-up action responsibility
- Follow-up action completed by (date).

If follow-up action is required by the FS, the actions will be included in the monthly progress reports (see Section 2.2.6).

2.2.5.1 Filter Request

EPA OAQPS will ship yearly allotments of Hi-Vol glass fiber filters to each EPA Region (and any agency that assumes the program). As needed, the Regional WACOR/TOCOR/DOCOR (or designee) may contact OAQPS to request additional filters to replenish their supply.

<p>Note: The shelf life of the glass fiber filters is <u>two</u> years.</p>
--

2.2.5.2 Filter Shipment Receipt

EPA OAQPS will ship a box of Hi-Vol glass fiber filters to the Regional field offices yearly or as needed. Upon receipt, the shipment should be checked for gross damage, logged in, and stored in a clean, dry environment within a secure location.

For Hi-Vol Pb-PEP, one filter should be extracted (from approximately the middle of the box) and shipped to the Pb-PEP Laboratory in EPA Region 9 as a representative Lot Blank, following standard Pb-PEP shipping and handling procedures (see **Section 3.1.7 and 3.1.8**).

The Regional WACOR/TOCOR/DOCOR (or designee) will acknowledge receipt of the shipment to OAQPS and submit the following information to OAQPS's data management contractor:

- Air bill number
- Date of receipt
- Condition of shipment
- Filter Lot Number (lot number on cover of box)
- Filter IDs (list the sequence on cover of box)
- Filter ID for Lot Blank

2.2.5.3 ESAT Workgroup Conference Calls

The FS may be asked to participate in ESAT Workgroup conference calls to discuss progress or resolution of issues. The WACOR/TOCOR/DOCOR will inform the FS of any materials or information that needs to be prepared for the call at least 3 days prior to the call. During the call, the FS will use the Phone Communication Form (COM-1) to record issues and action items that pertain to his or her activities. These items will be included in the next monthly progress report.

2.2.5.4 Communicating with Reporting Organizations and Site Operators

Dates for the FRM PE visits should be coordinated with the site's normal operating schedule. This coordination must be done in advance so that both the FS and the site operator have ample notice and time to prepare for the on-site visit. The WACOR/TOCOR/DOCOR (or the FS, as delegated by the WACOR/TOCOR/DOCOR) will contact each site operator prior to the site visit. Contact must be made by telephone if within 30 days of the site visit, but e-mail is sufficient otherwise. Approximately 1 week prior to the actual evaluation, the FS will call the site operator to confirm that the PE visit remains on schedule and to confirm meeting arrangements. It is also a good idea to review the Site Data Sheet for potential changes (especially the AQS Site ID). It is important to cover all details of the planned site visit and evaluation. (See Section 2.3.7.3 for additional details on recommended points of discussion.)

Document the discussions and any action items using the Phone Communication Form (COM-1) or equivalent method. The EPA Region 9 Laboratory also should be notified of when samples are scheduled.

2.2.6 Monthly Progress Reports

The FS will provide a progress report to the WACOR/TOCOR/DOCOR in writing each month (deadline is the 15th calendar day of the following month, unless otherwise specified by the WACOR/TOCOR/DOCOR). The Monthly Progress Report (COM-2) will be used to convey the following information:

- Reporting Date (the beginning and end dates of the reporting period)
- Reporter (the person who is writing report)
- Progress (the progress on field activities)
 - Evaluations scheduled within the reporting date
 - Evaluations conducted within the reporting date
- Issues

- Old issues that have been reported in earlier reports and not yet resolved
- New issues that arise within the reporting date
- Actions—Necessary to resolve issues; includes the person(s) responsible for resolving them and the anticipated dates when they will be resolved
- Extra purchases.

2.2.7 Records Management

Monthly progress reports will be archived in the Field Reporting Package file under “Pb-PEP/404-142-01-173.” Phone communications will be archived in the Field Reporting Package file under “Pb-PEP/301-093-006.4.” For more details, see **Section 9, *Information Retention***.

Section 2.2: Communications

Field Data Forms

FORM COM-1

Phone Communication Form		
Date:	Time:	Recorder:
Personnel on Call:		
Issue(s):		
Decisions(s):		
Follow-up Action(s):		
Follow-up Responsibilities:		
Completion Dates for Follow-up Actions:		

FORM COM-2

Monthly Progress Report		
Reporting Date: Start:	End:	Reporter:
Progress		
Sites Scheduled for Month:	Sites Evaluated During Month:	
Issues		
Old:	New:	
Actions:	Actions:	
Free-form Notes:		

2.3 Preparation for Pb-PEP Sampling Events

2.3.1 Scope and Applicability

This SOP applies to preparing for the FRM PE site visits.

2.3.2 Summary of Method

Preparation for site visits in the FRM Pb-PEP requires attention to many details and interaction among several different organizations. This SOP outlines the planning steps necessary to successfully conduct PEs at one or more sites.

2.3.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

2.3.4 Personnel Qualifications

Personnel who conduct the FRM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

2.3.5 Cautions

- The FS must obey all laws, ordinances, and policies regarding access to monitoring sites and use of the property of others.
- The FS shall not represent himself or herself as an employee of EPA or of the federal government.
- The FS may not gain access to a monitoring site without the knowledge and permission of the site owner or site operator.
- The FS must comply with all applicable laws and regulations in transporting equipment and supplies, including those of the Federal Aviation Administration (FAA) and the U.S. Department of Transportation (DOT).
- The FS must comply with local ordinances, licensing requirements, and “union shop” agreements, where applicable. In general, the FS is expected to perform the tasks necessary to install and operate the FRM PE equipment; however, electrical rewiring or other modifications to monitoring site equipment must be conducted by qualified and properly licensed tradesmen.

2.3.6 Equipment and Supplies

- Sampling schedule
- Site Data Sheet(s) (SD-01)
- Contact information for reporting organization.

2.3.7 Procedure

2.3.7.1 PEP Sampling Schedule

SLT organizations will work with the EPA Regions to select and develop a list of sites for the evaluations conducted in each calendar year on or before December 1 of the previous year. Because changes are likely, EPA recommends reviewing and updating the sampling schedule quarterly. The Regional WAMs/TOPOs/DOPOs will attempt to determine the most efficient site visit schedule. This schedule should be based upon the following:

- CFR requirements for audit frequency
- Meeting the same monitoring schedule as the routine sampler being evaluated
- Site proximity (the sites that are closest in proximity to each other can be visited within the same day or week).

It is difficult to provide a general procedure for scheduling site visits because of the number of variables, such as the number of sites, the number of samplers at each site, the distance between sites, the sampling schedule, and the site access restrictions.

FRM PEs should be implemented on a normal sampling day so that they do not create additional work for the SLT agencies. Thus, for sites that only sample 1 day in 3 days or 1 day in 6 days, this schedule must be taken into account when scheduling a PE site visit. However, if the SLT agency is amenable to perform a PE on a day other than a routine sampling day and is willing to post the result to AQS, then the visit can be scheduled. Accurate reporting of alternate sampling days is critical.

The scheduling approach should attempt to minimize travel costs and maximize the number of sites visited. Some suggestions for efficient scheduling include the following:

- Prioritize sites that are expected to be near or above the NAAQS.
- For sites that have seasonally low concentrations, schedule audits during times when concentrations are expected to be high for that site.
- Select the sites to be evaluated by geographic area so that travel between sites is minimized.
- Build in “downtime” for weather, sickness, or other unplanned delays.

After the sampling schedule is developed, it must be sent to all affected reporting organizations. Based upon this schedule, the FS will make appropriate travel arrangements.

2.3.7.2 Development of the Site Data Sheet

For each site, the FS contractor will develop a Site Data Sheet (SD-01) that contains information such as the following:

- AQS Site ID
- Monitor POC
- Method designation
- Monitor make and model
- Site coordinates*
- Network type (e.g., SLAMS)*
- Reporting organization*
- Reporting organization contact
- Street address*
- Directions to the site (from the Regional Office)
- Directions to/from a major thoroughfare
- Safety concerns
- Additional equipment needed (e.g., ropes, ladders)
- Closest hospital (address)

- Closest facility for current shipping vender
- Closest hardware store
- Recommended hotel (address/phone)
- Important free-form notes
- Closest site
- Second closest site.

** Items marked with an asterisk (*) are available in the AQS. These data are publicly available through EPA's Web site; in the Web browser, enter <http://www.epa.gov/aqspubl1/site.htm> and go to Monitor Data Queries. The criteria pollutant code for Pb-TSP is 14129.*

The information previously listed will be kept in a site file (filed by AQS Site ID) and included in a site notebook for each FS. Internet software can help provide directions to sites. In addition, maps for each state and city where a monitor is located may be acquired. Site locations can be placed on these maps along with the site IDs.

Preparation for one or more PE trips will involve communication among various organizations, including the FS's organization (ESAT), the reporting organization (laboratory), and the site operator. A schedule will need to be set, operators notified, travel arrangements made, and all equipment and supplies gathered, packed, inventoried, and readied for shipping. The following sections discuss the necessary steps.

2.3.7.3 Final Preparation for PEP Sampling Events and Site Evaluation

The WACOR/TOCOR/DOCOR (or the FS, as delegated by the WACOR/TOCOR/DOCOR) will contact each site operator prior to the site visit to finalize preparations for the Pb-PEP sampling event. Contact must be made by telephone if within 30 days of the site visit, but e-mail is sufficient otherwise. Approximately 1 week prior to the actual evaluation, the FS will call the site operator to confirm that the PE visit remains on schedule and to confirm meeting arrangements. Points to be covered include the following:

- Confirming field implementation schedule and setting a location and time to meet.
- Providing assistance in setting up the portable instrument and in completing other tasks (if necessary).
- Briefing the operator on what will occur during the evaluation.
- Discussing the tasks that the site operator will be requested to do to assist with the evaluation.
- Gathering additional information needed for the Site Data Sheet.
- Answering any questions that the site operator may have.
- Emphasizing that the site's primary Pb sampler will not be adjusted in any way and that the operator should not vary his or her ordinary routine to prepare for the PE.
- Verifying that the site's primary Pb sampler will run on the scheduled day and that the results will be posted to AQS.
- Ensuring that all clearances have been obtained so that the site can be accessed as necessary. (A site representative must be present at the time of access. If a representative other than the site operator plans to be at the site, then the name and phone number of this representative must be identified and recorded.)
- Verifying that sufficient electric power is available for the portable FRM sampler and other equipment.
- Determining if special concerns exist about logistics (e.g., training, equipment).

If problems are identified during the preliminary discussions with the site operator, arrangements will be made to take corrective actions. The following are some suggested corrective actions for commonly encountered problems:

- Climbing or other special safety equipment is required:
 - Buy or rent appropriate equipment prior to the site visit
 - Borrow the necessary equipment from the site operator or the operator’s organization
 - Postpone the visit until the situation that requires special safety equipment is remedied, if feasible.
- Insufficient power at the site to operate the FRM and the routine sampler (and other site monitors and equipment) simultaneously:
 - Obtain permission to run an extension power cord from a nearby outlet
 - Cancel the site visit and request that adequate power be installed.
- The site will not accommodate the portable FRM sampler within siting requirements (see Table 2-2):
 - Perform the evaluation, flag the situation and resulting data, and contact the EPA Regional Office about the situation.
- Special restrictions on site access are in force, such as a requirement for a lengthy background check at certain high-security federal installations. (**NOTE:** An FS is required to observe laws, rules, regulations, and policies about access to restricted sites on public or private land. The Performance Evaluator shall not “borrow” the operator’s key or access card without the knowledge and permission of the site owner.) Options for dealing with this type of situation include the following:
 - Obtain necessary permissions, keycards, etc. in advance
 - Request that the reporting organization or the EPA Regional Office secure the necessary **written** permissions to access the site on behalf of the FS
 - Make arrangements for a “cleared” escort to accompany the FS at all times (if this is acceptable at the particular site).

NOTE: See Section 2.2 for procedures on communicating with reporting organization site operators prior to a site visit.

Table 2-2. General Siting Requirements for Pb-PEP Samplers

Siting Requirements
The PE sampler must have unobstructed air flow for a minimum of 2 meters for Hi-Vol Pb-TSP in all directions.
The sampler inlet will be placed at a height of 2 meters to 15 meters above ground level (2 meters to 7 meters if the routine sampler is designated as a micro-scale sampler).
Vertical distance between the PE sampler inlet and the audited site sampler inlet must be ≤ 1 meter. Note that 40 CFR Part 58, Appendix A is silent on this issue for TSP Pb but we are extending the requirement to TSP measurements through the Pb-PEP QAPP.
If the PE sampler is collocated with any other particulate matter sampler, the horizontal spacing between sampler inlets must be >1 meter for other $PM_{2.5}$ samplers and >2 meters for high volume total suspended particulate (TSP) and PM_{10} samplers. All samplers must be within 4 meters of each other.
In cases where several samplers are on site and all collocation criteria cannot be met, the FS should confer with the EPA Regional Pb-PEP contact to ensure that the PE sampler is appropriately spaced from the primary FRM sampler.
The sampler inlet must be level.

Reference: 40 CFR Part 58, Appendix A

2.3.7.4 Travel Arrangements for Pb-PEP Sampling Events

The FS and/or the contractor administrative staff is responsible for making travel arrangements early enough to provide a convenient location for the field sampler to access the site(s) to be visited. Step-by-step procedures for making travel arrangements are beyond the scope of this SOP; however, the following are some suggestions:

- Make travel arrangements well in advance to ensure the availability of hotel rooms and rental vehicles.
- A car or van is the preferable method for transporting sensitive equipment because of the large amount of equipment and the potential for rough handling by airlines or commercial carriers.
- Leave some flexibility in the schedule in case of bad weather and other unexpected delays.
- Plan adequate time at each site to perform the FRM PE and to retrieve the sampler equipment after the audit, remembering that PEP filters are to be exposed from midnight to midnight.
- Approximately 1 week prior to the actual PEP sampling event the FS will call the site operator to confirm that the PE audit remains on schedule and to confirm meeting arrangements.

2.3.7.5 Equipment Preparation for Pb-PEP Sampling Events

Prior to an evaluation excursion and based upon the number of sites to be visited, the following will occur:

- Sampling equipment will be inspected to ensure proper operation and adequate supplies.
- Inventory of consumables will be checked to ensure that adequate supplies are available.
- The FS should carry two or more portable FRMs for each type of PEP audit, set up one or two samplers on Day 1, move to another site to set up another sampler on Day 2, and then return to the first site to retrieve the sample on Day 3.

- For Hi-Vol Pb-TSP, at least one spare portable TSP sampler, 3-4 Hi-Vol filter cassettes, and a primary and a backup calibration system will be kept on hand. The EPA OAQPS has provided a primary and backup BGI Hi-Vol Cal unit for each regional office.
- Filters will be selected and stored appropriately (per SOPs) for transport to the sites.
- Filter COC Forms should be reviewed. Glass fiber filters should not exceed one year from opening the filter box or two years from the production date.
- Site Data Sheets should be available for each site. For initial visits, some of the information on the Site Data Sheets may be blank and must be completed during the first visit.
- The FS will review the site schedule to be sure that he or she understands which tasks will be implemented at the sites visited that week.

Upon completion of preparation activities, the Regional WACOR/TOCOR/DOCOR should be contacted or a meeting should be scheduled to review the preparation activities.

2.3.7.6 Other Advance Planning

The FS should determine the address and hours of operation for contractor shipping facilities in advance.

Critical Filter Holding Time Requirements

Ideally, samples will be sent the day of removal to the appropriate laboratory via express courier service. The FS should ship the exposed filters (per **Section 6.3, Filter Packing and Shipment**) within 96 hours of the end of the sampling period. Table 2-3 provides a summary of the key activities previously discussed.

Table 2-3. Implementation Summary

Activity	Holding Time	From	To
FS loads filter in the sampler	NA	FS Office	Mounting in sampler
Filter exposure	24 hours	Midnight (~12:00 a.m.) of prescribed sampling day	Midnight (~12:00 a.m.) following the sampling day
Filter collection ^a	≤ 24 hours	End of sampling period	Recovery
Shipped to laboratory ^b (best practice)	≤ 96 hours	End of sampling period	Shipment
Laboratory analysis ^c	≤ 30 days	Delivery of sample to lab	Analysis

^a Pb-PEP filters should be recovered within 24 hours after conclusion of exposure for best practice. It would be acceptable to exceed the 24 hours, but do not exceed 72 hours to avoid passive filter contamination. Document the reason on the FDS form.

^b The FS will always transport exposed filters and blanks with reinforced envelopes. The SOP calls for 96-hour packaging and shipping after the end of the sampling period.

^c Due to the number of filters expected in a given month, the laboratory will be able to batch and analyze all filters in one week within a 30 day period. Therefore filters received the day after sampling may be stored for as long as 30 days before analysis.

Section 2.3: Site Visit Preparation

Field Data Forms

FORM SD-01

Site Data Sheet	
AQS Monitor Site ID:	Monitor ID:
Site Name:	Monitoring Frequency: (1/6, 1/3, daily)
AQS Method Designation:	Monitor Make/Model:
Site Coordinates Latitude: Longitude:	Site Type (circle one): SLAMS, SLAMS/NCORE, Tribal, Special Purpose, Other _____
Reporting Organization Address:	Reporting Organization Contact: Name: Phone Number: E-mail:
Directions to Site from Field Office:	
Direction from Major Thoroughfare:	
Safety Concerns:	Additional Equipment Needed:
Closest Hospital Address and Directions from Site:	Closest Federal Express Facility:
Closest Hardware Store:	Recommended Hotel (Address/Phone Number):
Closest Monitoring Site:	Second Closest Monitoring Site:
Free-form Notes:	

Section 3

Filter Receipt, Storage, and Handling

3.1 Filter Receipt, Storage, and Handling

3.1.1 Scope and Applicability

This SOP applies to the receipt of glass fiber filters to the FS at the field office, the storage of these filters in the field office and in the field, and the proper handling of the filters throughout field activities. These filters will be used with Hi-Vol TSP samplers during the Pb-PEP.

3.1.2 Summary of Method

OAQPS will provide yearly allotments of 8" x 10" glass fiber filters to each EPA Region to be used for the Pb-PEP work. The FS will use the 8" x 10" glass fiber filters to generate routine, collocated, and blank samples for the Pb-PEP. There will be four types of blanks (Filter Lot, Passive Field, Field, and Trip) used in the Pb-PEP. A COC/FDS form will be prepared for all samples. The FS will randomly select filters from the box and record the Filter ID numbers to be used on the COC/FDS form found on the AIRQA Web site. Each selected filter will be placed in an antistatic bag along with the COC/FDS form until they are ready to be used in the field. The glass fiber filters are easily damaged (torn) when handling. Thus, the filters must be handled in a manner to prevent the filters from being damaged or contaminated and powder-free nylon gloves must be worn at all times when handling the filters.

3.1.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP. The four blanks to be used in the Pb-PEP are defined below.

A **Filter Lot Blank** is a randomly-selected glass fiber filter by the FS from a newly received box. This filter generally is selected from the middle of the box. The FS will process the Filter Lot Blank and COC/FDS form and submit to the Pb-PEP Laboratory (EPA Region 9) for analysis. The purpose of this blank is to determine if there is any lead contamination in the filters prior to using them.

A **Field Blank** is a randomly-selected filter used to determine contamination by the FS through filter handling during normal set up at the field site. The field blank filter is transported to the sampling site in the same manner as the filter(s) intended for sampling, installed in the sampler, removed from the sampler without sampling, stored in their protective containers inside the sampler's case at the sampling site until the corresponding exposed filter(s) is (are) retrieved, and submitted to the analytical laboratory for lead analysis.

A **Passive Field Blank** will be sampled from the field sites where lead concentrations are suspected to be high. A TSP glass fiber filter will be placed on the sample holder in a collocated sampler of the same make and design, to evaluate the level of contamination (lead) prior to a sampling event. The FS will place a glass fiber filter in the sample holder using the same procedure as a routine sample. The motor in the collocated sampler will not be engaged. The collocated TSP sampler will be closed and the filter will passively sample air for a selected period of time. The FS will send the filter to the analytical laboratory for lead analysis.

A **Trip Blank** is a randomly-selected filter that is taken to the sampling site and transported to the analytical laboratory for analysis without having been exposed to sampling procedures.

3.1.4 Personnel Qualifications

Personnel who conduct the FRM/FEM Pb-PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

3.1.5 Cautions

- Glass fiber filters are rather fragile and should be handled appropriately using powder-free nylon gloves.
- Always place the glass fiber filter in the Hi-Vol filter cassette with the Filter ID Number side aimed downward.
- Always place the protective cover on the Hi-Vol filter cassette to protect the filter before and after sampling.
- Bring backup filters to the site in 9" x 12" self-sealing shipping bag in case a damaged filter is noticed prior to the sampling event.

3.1.6 Equipment and Supplies

- Field notebook
- COC/FDS Form(s)
- Extra glass fiber filters in antistatic 9" x 12" self-sealed antistatic plastic bags in case of damage or contamination to the primary filter sampler before sampling event (NOTE: One filter per plastic bag)
- 9" x 12" self-sealed plastic bag for COC/FDS forms
- Glassine envelopes for containing exposed filter
- Manila envelope for storing exposed filter and glassine envelop (one sample per envelope)
- Storage box for sending exposed filter and COC/FDS forms to analytical laboratory
- Two Hi-Vol filter cassettes (3 to 4 Hi-Vol filter cassettes will be provided to each regional office).

3.1.7 Filter Receipt

This SOP describes the method for receiving filters sent by OAQPS to the Regional field office. OAQPS will notify the Regional WAM/TOPO/DOPO and FS of a filter box shipment on the day of shipping. The steps for receiving filters include the following:

1. Log receipt of box of 8" x 10" glass fiber filters with Filter Lot Number (if listed on box), and the Filter ID number sequence in the field notebook (e.g., "Box of glass fiber filter shipment from Regional EPA Office received on 1/1/09). The Filter Lot Number is AJ239 and the Filter Number sequence is from A122346 to A122446". The Filter Lot Number and Filter Number sequence should be easily identified on the outside of the box. Generally, most boxes hold 50 glass fiber filters.

2. Upon receipt, inspect the shipping container for damage and record any observed damage in the field notebook. Also, record on the outside of the box when it was received and by whom.
3. Submit the filter receipt information to OAQPS's data management contractor via the Pb-PEP data receiving website (see Section 2.2.5.2).
4. Wear powder-free nylon or vinyl gloves to open the box and confirm Filter Number sequence.
5. Select one filter from approximately the middle of the box as the representative Lot Blank. The FS will process the Filter Lot Blank and COC/FDS form, submit electronic data to AIRQA, and submit the filter to the Pb-PEP Laboratory (EPA Region 9) for analysis (see Section 2.2.5.2).
6. Store the filter box in a clean, dry environment within a secure location until ready for use.

3.1.8 Preparing Filters for Sampling Events

1. Determine the number of samples (routine, collocated, and blanks) to be collected during the scheduled sampling event. Set out the same number of Hi-Vol filter cassettes and COC/FDS forms.
2. On the top portion of the Hi-Vol filter cassettes, label them based on their usage at the field sites (RO = Routine; CO = Collocated; FB = Field blank; and PB = Passive blank). The Trip Blank will never be placed in the sampler; it can be processed in a 9" x 12" self-sealed plastic bag.
3. Remove the protective cover from the Hi-Vol filter cassette(s) and unscrew the two nuts holding the top part of the cassettes to the bottom. Remove the top portion of the Hi-Vol filter cassette. Inspect the gasket seals on the Hi-Vol filter cassettes. If worn, replace seal.
4. While wearing protective gloves remove a filter from the filter box and inspect the filter for damage, pin holes, creases, fold, etc.
5. On the AIRQA Web site, select "*3) EPA or Independent Audit Chain of Custody Form and Field Data Sheet*". Choose "*Add New*" to open a new COC/FDS form. At the top of the COC/FDS form, select the sampler to be used during the audit. For TSP filters, the field scientist should select the Tisch TE-5170 VFC+ samplers. Print the form.
6. In Part 1 of the COC/FDS form enter the Filter Lot Number (if listed on the box), the date received, and the Filter ID listed on the filter for the sample to be used during the sampling event. Be sure that the correct Hi-Vol filter cassette and Filter ID Number match the COC/FDS forms.
7. Place the filter with the Filter ID side down on the bottom part of the Hi-Vol filter cassette. Center the filter on the bottom portion of the cassette. Do not use if the filter shows signs of damage.
8. Place the top portion of the Hi-Vol filter cassette on the bottom portion and re-screw the holding nuts until the two portions of the cassette are secure.
9. Place the protective cover back on the Hi-Vol filter cassette. Set all filter assemblies aside and check when final inventory of supplies are packed for transport to the field site.
10. Repeat Steps 3 through 7 for each routine, collocated, and field blank filter to be used in the field audit (the trip blank is kept in the 9" x 12" antistatic bag).
11. Prepare 2-3 backup filters in 9" x 12" antistatic bags in case problems occur (e.g., filter tear, contamination) with the routine sample prior to the sampling event. These extra filters brought as backup filters do not need to assigned a COC/FDS at this time.

3.1.9 Filter Handling

The FS must wear powder-free gloves during all operations of handling the glass fiber filters. These operations include: placement and removal from the Hi-Vol filter cassettes, folding the exposed filter after the sampling event and placement in the glassine envelope, placement in the manila envelope, and finally packing in the shipping box to the analytical laboratory.

For more details of these operational instructions on filter handling during setup and sampling, please refer to **Section 6.1, *Conducting the Filter Exposure***.

3.1.10 Filter Storage

1. Place all the labeled COC/FDS forms in a 9" x 12" plastic bag and store them with the filter assemblies (filter and Hi-Vol filter cassette). Also place the backup filters and extra COC/FDS forms in the container to take to the field site. Place the container in a secure area to avoid tampering by unauthorized individuals.
2. The original box of unexposed filters should be stored in a clean, dry environment within a secure location at the Regional field office. The box of glass fiber filters should only be opened in a controlled environment such as a laboratory or office.
3. Upon returning from the sampling event, any backup filter not exposed to the field site can be used for the next sampling event. Do not remove these filters from the plastic shipment bags. Store these filters in the same location as the unexposed filters at the Regional field office.

Section 3.1: Filter Receipt, Storage, and Handling

Field Data Forms

COC/FDS Pb-PEP Chain-of-Custody/Field Data Sheet Form

Pb-PEP Chain-of-Custody and Field Data Sheet for EPA or Independent Audits

<input type="radio"/> Hi-Q HVP-4300AFC (Hi-Vol)	<input checked="" type="radio"/> Tisch TE-5170 VFC+ (Hi-Vol)	<input type="radio"/> BGI PQ200 (Lo-Vol)
---	--	--

PART I - FILTER PREPARATION AT PEP FIELD OFFICE

Prepared Date	<input type="text"/>	Prepared By	<input type="text"/>
Filter Lot Number	<input type="text"/>	Filter Number	<input type="text"/>

PART II - SAMPLING EVENT INFORMATION

AQS Site ID	<input type="text"/>	Setup and Sampler Verification Date	<input type="text"/>
Site Name	<input type="text"/>	PEP Field Scientist	<input type="text"/>
Primary SLT Sampler Make/Model	<input type="text"/>	PEP Sampler Make/Model	Tisch TE-5170 VFC+
Primary SLT Sampler Serial No.	<input type="text"/>	PEP Sampler Serial No.	<input type="text"/>
Site Operator	<input type="text"/>	GPS Latitude (ex. 38.889722)	<input type="text"/>
Other Operators Or Observers	<input type="text"/>	GPS Longitude (ex. -77.008889)	<input type="text"/>

PART IV - SAMPLING EVENT FILTER AND EXPOSURE DATA

Filter Number	<input type="text"/>
Sample Type	<input type="text"/> <small>If other, please describe</small> <input type="text"/>
Is Sample Void?	<input type="radio"/> Yes <input type="radio"/> No <small>If yes, please explain</small> <input type="text"/>
Pre-sampling Filter Check OK?	<input checked="" type="radio"/> Yes <input type="radio"/> No <small>If no, please describe</small> <input type="text"/>
Sample Date	<input type="text"/>
Retrieval Date	<input type="text"/>

PART V - FIELD FILTER SHIPPING INFORMATION

Filter Number	<input type="text"/>	Shipping Destination	<input type="text"/>
Shipment Date	<input type="text"/>	Shipping Company (if other, please explain)	<input type="text"/>
Affiliation Of Shipper	<input type="text"/>	Tracking No.	<input type="text"/>
Shipped By	<input type="text"/>		
Relinquished By (signature) _____			

PART VI - NATIONAL PB-PEP LABORATORY RECEIVING INFORMATION

Filter Number	<input type="text"/>		
Date Received	<input type="text"/>	Received By	<input type="text"/>
Integrity Flag	<input type="text"/>	Shipment Integrity OK?	<input checked="" type="radio"/> Yes <input type="radio"/> No

Section 4

Transportation of the Sampler and Installation at the Site

4.1 Sampler Transport and Placement

4.1.1 Scope and Applicability

This SOP describes the transport of the Hi-Vol TSP sampler to field sites for the Pb-PEP. The ESAT Pb-PEP field scientist will use Tisch TE-5170 VFC+ portable sampler to conduct the Pb-PEP audits.

4.1.2 Summary of Method

Prior to an audit, the field scientist must assign one sampler as the primary and a second sampler as the backup. Both portable samplers will be checked at the field office to ensure that all parts are available and are in good working condition. The sampler components will be packed into their carrying cases for transport to the field. Once at the field site, the equipment will be assembled and placed near the site's routine TSP sampler or collocated samplers to be audited based on siting criteria in 40 CFR Part 58, Appendix E.

4.1.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

4.1.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

4.1.5 Cautions

- The equipment must be packed and shipped to avoid damage to fragile components. If improperly packed, these components could loosen and cause damage to circuit boards and other delicate components.
- If sampler travel cases are used, they must be secured in the transportation vehicle to avoid movement or jostling of the sampler during transport. If space is available the sampler can be transported completely assembled, but must be properly secured in the vehicle.
- The manufacturer's instructions must be followed carefully to avoid damage to the sampler and ensure proper operation.
- The portable sampler may need to be hoisted onto a rooftop or an elevated platform at some sites. As part of the planning process, determine any site-specific equipment that is required to transport the portable sampler to the sampling platform. This information should be included in the Site Data Sheet (see Section 2.3).
- The weight of the transport cases is not trivial and should be handled with personal safety in mind.

- The Volumetric Flow Controller (VFC) of the Tisch TE-5170 VFC+ sampler should never be transported to the site while installed to the main unit. The throat of the VFC is not durable and will break under stress or constant vibration.
- Because of their relatively large height to footprint, these samplers can be blown over in a wind storm. Be aware of impending inclement weather and always prepare for the worst. Sandbags and tie-downs should be in the extra supplies inventory.

4.1.6 Equipment and Supplies

The Tisch sampler is stored in large rolling cases. The sampler should be transported to the site in its cases and assembled on site. The Tisch TE-5170 VFC+ sampler should **never** be assembled and transported to the site. Transport while assembled risks breaking the VFC component. The Tisch samplers consist of four major components (VFC, main unit, roof, and leg base). The equipment needed for setting up a high volume Pb-PEP audit include:

- Completely assembled TSP sampler
- Primary and backup BGI Hi Vol Cal units and adapter plate.
- Additional tools include the following:
 - Assorted hand tools (e.g., screwdrivers, pliers, wrenches)
 - Spirit level (an ordinary bubble level is sufficiently accurate) for leveling the sampler
 - Measuring tape (metric)
 - Hand truck or cart and hoisting equipment (e.g., ladders, rope) for transporting equipment to the sampling platform.

4.1.7 Procedures

4.1.7.1 Transportation of Equipment to the Site

The portable TSP samplers will be transported with the transfer standards, tools and equipment to each site selected for a Pb-PEP performance evaluation. The Pb-PEP encourages the use of ground transportation to sites due to the nature of the sampling equipment, the possibility of rough handling during air transportation, and the cost of shipping. It is important to observe the following guidelines when transporting equipment for the Pb-PEP:

- Prior to traveling, consider the number of sites to be visited and take an inventory of the field equipment to:
 - Determine how many portable samplers will be required for the trip. Take at least one additional portable sampler as a spare.
 - Ensure that there are sufficient glass fiber filters for each type of sample required for the evaluation (i.e., routine sample, field blank, trip blank, passive field blank, collocated sample). Pack extra filters individually in self-sealed plastic bags in case of damage or contamination.
 - Ensure that there are sufficient transport cassettes for the samples to be collected.
 - Ensure there are enough glassine envelopes, shipping container envelopes, shipping containers, and Chain-of-Custody/Field Data Sheet (COC/FDS) forms for each audit in the trip.
- Load and unload the sampler from your vehicle promptly and approach the sampling location from the downwind direction if possible.

4.1.7.2 Transportation of Equipment to the Sampling Platform, Siting and Placement

Upon arriving at the sampling site, the following steps should be taken:

1. Inspect the actual location, e.g., on the sampling platform, where the portable sampler will be set-up for safety. Be observant for potential hazards. If the site is not safe, contact the regional WACOR/TOCOR/DOCOR.
2. Place the Pb-PEP TSP sampler to meet the following siting criteria:
 - The Pb-PEP TSP sampler must have unobstructed air flow for a minimum of 2 meters in all directions.
 - The Pb-PEP TSP sampler must be >2 meters from the sampler being audited but within 4 meters.
 - The Pb-PEP TSP sampler inlet must be >2 meters away from all other samplers and analyzers.
 - The sampler inlet will be placed at a height of 2 meters to 15 meters above ground level (2 meters to 7 meters if the routine sampler is designated as a micro-scale sampler).
 - In cases where several samplers are on site and all collocation criteria cannot be met, ensure that the Pb-PEP TSP sampler is appropriately spaced from the primary Pb FRM/FEM sampler.
 - The sampler inlet must be level.
 - Vertical distance between the Pb-PEP TSP sampler inlet and the audited site TSP sampler inlet must be ≤ 1 meter.
3. If the location that is designated for the Pb-PEP TSP sampler does not appear to conform to the siting requirements, document this in the field notebook and follow-up with official communications to the site contact and the EPA Regional WAM/TOPO/DOPO (via phone). Notes should also be recorded on the COC/FDS form.
4. If the siting problem is rectified, document this in the field notebook and notify the WAM/TOPO/DOPO. If the siting problem is not rectified, do not proceed with the sampling event unless directed by the WAM/TOPO/DOPO.
5. After the location is set, determine the best method for transporting the traveling cases to the site.
6. The sampling equipment and verification device(s) must be transported in their traveling cases to the sampling platform or site position.
7. Under rainy conditions, the FS should determine the best place to assemble the Pb-PEP TSP sampler and transport it to the field site.
8. All verification equipment must be transported to the sampling platform to give this equipment an opportunity to equilibrate to ambient conditions prior to use (approximately 1 hour).

Section 5

Sampler Setup and Performance Verifications

5.1 Sampler Assembly

5.1.1 Scope and Applicability

This section describes the routine procedures for assembling the Tisch TE-5170 VFC+ TSP samplers. If other models of approved FRM TSP audit samplers are used for Pb-PEP activities, EPA will ensure that those sampler's instruction manuals are made available to the FS.

A verification check of calibration certificate against the VFC+ G factor and serial number must be performed by the FS when the Tisch TE-5170 VFC+ TSP sampler is initially received at the Field Office from the vendor. The G factor must also be manually entered into the sampling unit and it is highly recommended to label the VFC, sampler's main unit, and traveling cases to ensure VFC and G factor is dedicated to a single sampler. The labeling mechanism should include: a color-coded indicator that easily can be recognized, the VFC G factor, the VFC Serial Number, and the certification date. A good place to store this information is on the sampler's main unit on the inside door of the VFC+ controller box.

5.1.2 Summary of Method

Assembling the Tisch TE-5170 VFC+ sampler involves connecting the stand to the main unit and securing the roof. The Volumetric Flow Controller (VFC) will need to be connected to the base on the filter holder compartment at the site. The sampler should **never** be transported with the VFC installed. The throat of the VFC is not durable and will break under stress or constant vibration with the main unit. The sampler must be positioned at the SLT monitoring site following requirements in 40 CFR Part 58 Appendix E, then leveled and firmly anchored to the ground. The sampler is connected to a grounded GFCI electrical receptacle and powered on. The FS will verify the current date and time of the audit sampler and adjust as needed.

5.1.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

5.1.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

5.1.5 Health and Safety Warnings

- The main unit of each sampler weighs approximately 35 lbs. Take special care when carrying or lifting the main unit while assembling or moving the sampler.

- Safety is the priority. Always be careful when attaching the AC power connection. Do not attempt to connect the main power if any power connectors or wires appear cracked, frayed, or wet. Do not immerse power cords in water or other liquids.
- Avoid unnecessarily opening the control panel or touching internal electrical components while the AC power is in use. Be very careful when it is necessary to make adjustments while the power is on, such as when adjustments are made on the circuit boards during some calibration procedures.
- Make sure that the electrical outlet used with the Pb-PEP equipment is connected through a Ground Fault Circuit Interrupter (GFCI) device. If not, a portable GFCI device may be used.

Best Practice Note: Where permanent GFCI devices are not available, portable GFCI devices may be used. One type contains the GFCI circuitry in a plastic enclosure with plug blades in the back and receptacle slots in the front. It can be plugged into a receptacle, and then the electrical product is plugged into the GFCI device. Another type is an extension cord combined with a GFCI. It adds flexibility in using receptacles that are not protected by GFCI devices.

5.1.6 Cautions

- Lifting the main unit of the sampler and placing it on the stand could be cumbersome and difficult. If necessary, ask another person for assistance in attaching the main unit to the leg assembly.
- Periodically check the gaskets on the sampler's sample holder, adapter plates, and Hi-Vol filter cassettes. Replace gasket if it is brittle, cracking, or pieces are missing.
- Check and clean the area around the sample holder compartment and the top mounting screen of the motor assembly (located inside the opening to the top of the main unit).
- When the sampler is dismantled, be sure to remove any soil or debris that adheres to the stand legs before storing them for transport.
- The operating area for the FS may include more than one time zone. The FS needs to be aware of time zone changes and set up monitors based on the local standard time of the audited sampler.
- The FS should always download data prior to packing for transport and always check that data has been downloaded before resetting the sampler for the next run.
- The Tisch TE-5170 VFC+ sampler uses a SD card or USB drive for data download, it will be necessary to ensure your laptop computer can accept and read the SD card or USB drive from the sampler. The file generated by the sampler is a CSV file so to read it easily it should be imported into a spreadsheet program.

5.1.7 Equipment and Supplies

- Tisch TE-5170 VFC+ TSP sampler
- Printed copy of the COC/FDS from the AIRQA Web site
- Instruction manual
- 25-foot outdoor extension cord with ground (maybe longer for certain sites; this should be determined during initial site inspections)
- Bubble leveling device
- Shims for leveling instrument
- Assorted tools, including screwdrivers and pliers

- Flashlight for inspection of various sampler assemblies
- Pen or pencil for marking the sampler for reassembly
- Soft brush
- Lint-free wipes
- Static-free and powder-free Gloves

5.1.8 Placement and Installation Procedure for the Tisch TE-5170 VFC+ TSP Sampler

This procedure applies to the placement and installation of the TSP samplers at the field site; however, it is also applicable for indoor setup when testing the sampler before field use.

NOTE: Prior to assembling the sampler, the FS should set the verification equipment in a protected and shaded outdoor location to allow for equilibration.

5.1.8.1 Setting up the Leg/Base Assembly

NOTE: To avoid possible personal injury and sampler damage, care should be used when attaching the main unit of the sampler to the stand base. The best way to understand this procedure is by working with an experienced person to set up a sampler. The following steps should be used to assemble and level the sampler and securely anchor the sampler at the field site:

1. Place the travel cases as close to the actual sampling locations as possible. The bottom of the sampling unit should be kept off the ground to prevent debris from entering the sampler. The VFC/motor unit should also not be placed on the ground so that the vent located on the bottom of the motor can be kept free of dirt and debris.
2. The stand should be received pre-assembled from the vendor and it is advisable to check all screws to make sure they are tight before any weight is placed on top of the stand. The flat metal panel that connects two of the legs is deemed the back of the stand (Figure 5-1).

5.1.8.2 Assembling the Sampler Main Unit to the Leg/Base Assembly

1. Remove the main unit from its travel case using the handles, and set it down askew on the stand so it sits without any of the pins going through any of the holes on the bottom of the sampler unit (Figure 5-2). Open the front door for better visual alignment with easier placement of the unit on the pins of the stand.



Figure 5-1. Tisch TE-5170 VFC+ Sampler's Legs/Stand Base Assembly.



Figure 5-2. Tisch Sampler's Main Unit Askew on Base Assembly.

- Using the open door to visually see the pin and hole locations, line up the two back pins of the base unit with the two holes on the bottom of the sampling unit and set the sampler down flush (Figure 5-3). Once the back of the sampler has been lined up, carefully line up the front pins of the leg/base assembly with the front holes of the sampler and set the sampler down so all four pins are through all four holes as shown in Figure 5-4.

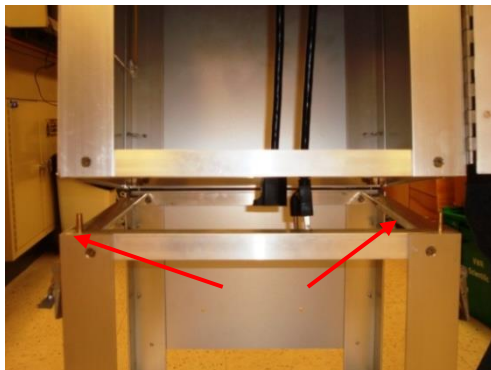


Figure 5-3. Back Pins Aligned with Leg/Base Assembly on the Tisch Sampler



Figure 5-4. Completely Aligned Sampler and Leg/Base Assembly for the Tisch Sampler

3. Use the clips on the leg/base assembly to clamp the main unit and leg/base assembly together (Figure 5-5). All four clips should be connected, however if any are broken there must be at least on clip on each side of the sampler connected for the sampler to be adequately connected to the leg/base assembly.
4. Verify the differential pressure ports are operational by tracing the Tygon tubing from the back of the VFC+ controller box to a “T” that branches to the differential port on the sample holder and the pressure port on the side of the sampler (see Section 5.1.9.10).

5.1.9.3 Attaching the Volumetric Flow Controller (VFC)/Motor Assembly

1. Verify the VFC/motor matches the sampler unit by comparing their unique labels (Figure 5-6) as described in Section 5.1.1. Remove the VFC/motor from the travel case.
2. Place the VFC/motor assembly on the bottom panel of the leg/base assembly by tilting the motor of the VFC and position it through the top opening of the leg/base assembly.
3. Place the provided gasket (lightly vacuum greased) on top of the VFC inlet.
4. Lift the VFC/motor up to the collar hanging down from the indoor ceiling of sampler unit. It is important to hold the VFC unit by the motor and apply as little pressure to the neck of the VFC as possible (Figure 5-7).
5. Holding the VFC/motor in place, screw the collar onto the threads of the VFC inlet. Once the collar is snug, carefully tighten the VFC/Motor, by rotating the motor unit and keeping the collar stationary to finish the attachment process.
6. Connect the electrical plug from the back of the control panel to the electrical plug of the VFC/motor (Figure 5-8).



Figure 5-5. Clips Used to Secure the Tisch Sampler to the Leg/Base Assembly



Figure 5-6. Unique Labels for the Tisch Sampler's VFC and VFC+ Controller Box/Main Unit



Figure 5-7. Hold the Tisch Sampler's VFC/Motor at Base of the Motor Assembly



Figure 5-8. Electrical Connection of the VFC to the Tisch Sampler Main Unit

5.1.9.4 Assembling the Roof to the Sampler Main Unit

1. Remove the roof assembly from the travel case.
2. Line up door hinges on roof assembly with the hinge holders on the back of the sampler unit. Allow the hinges to slide into place into the hinge holders. The hinges should sit securely, so no screw/pin attachments will be necessary (Figures 5-9 and 5-10).



Figure 5-9. Roof Assembly Hinges Resting on Tisch Sampler's Hinge Holders

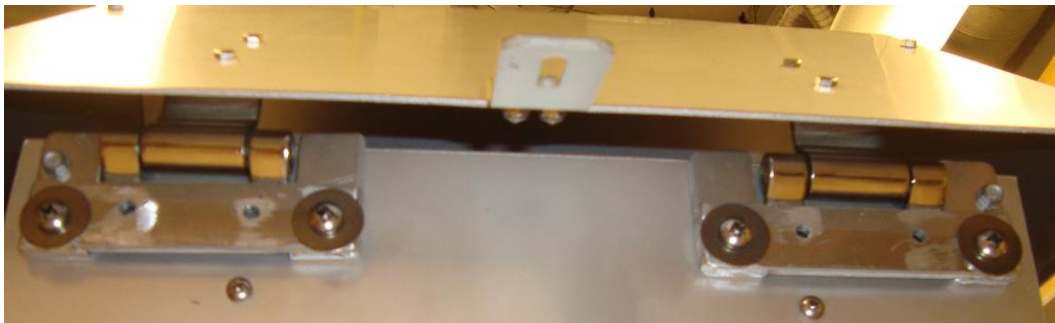


Figure 5-10. Roof Assembly Hinges Securely in Tisch Sampler's Hinge Holders

5.1.9.5 Leveling the Sampler

1. Place the assembled sampler in its designated location based on the siting criteria in 40 CFR Part 58 Appendix E. The leg supports for the Tisch TE-5170 VFC+ sampler may need to be anchored to the ground or platform. If there is any question about the sampler's stability at a particular location, then the FS must affix the sampler to the platform or flooring so that the following installation criteria are met:
 - The sampler must not tip over due to high winds, vibration, or any other event that might be expected to occur during the 24-hour exposure period.
 - The sampler must not be subject to excessive vibration, whether due to external sources (e.g., a nearby train track) or internal sources (e.g., pump motor vibrations).
 - The sampler must remain level throughout the filter exposure.
2. Open the roof of the sampler and place a bubble level on the inside of the main unit next to the sampler holder.
3. Adjust the TSP sampler so that bubble level indicates that the sampler is level (bubble inside the lines on the level). Conduct the final leveling of the unit only after the major installation tasks previously described have been completed. Repeat the leveling process if any subsequent activities cause the sampler to shift.
4. Adjust the sampler's horizontal angle by placing thin shims of wood or other solid material under the legs. Observe safety precautions; it may require two people to safely place the shims. Verify that the sampler remains secure after the shims are in place. The shims may need to be secured with a screw inserted through the hole in the foot of the leg.

One option might be to fasten the legs to a piece of plywood and level the unit by placing shims underneath. Sandbags or bricks could be placed on the plywood to secure the sampler.

5.1.9.6 Powering the Unit

Connect the power by using the following steps:

1. For AC operation, plug the AC power supply unit into a 110/120-volt grounded outlet. If an extension cord is needed, the extension cord must be for outdoor use and also be grounded. These samplers draw substantial current as they start-up. Any extension cord should be rated for 20 amps to be on the safe side.
2. If there is only one outlet available, the use of an expansion device (i.e., three-way splitter) is allowable. To protect the device from weather, place the splitter inside a plastic bag. If necessary, tape the bag shut to prevent moisture from entering the power strip and causing an electrical shortage to the sampler. However, the SLT operator must handle their own equipment. Be sure that the expansion device is capable of handling the same level of current as the circuit. A surge of power at startup can cause problems with the sampling device. If two samplers are

plugged into the same circuit their start times should be staggered by three to five minutes in order to accommodate the power surge.

3. As soon as the sampler is plugged in, the unit will turn on automatically. Open the front door of the main unit and verify the screen is on.

The screen will light up and display the Startup screen and within a few seconds to the Main Menu screen (Figure 5-11). (Note: The sampler's serial number is not given on the electronic display. It can be located on a label on the door of front panel of the sampler.)

4. Fill in *Part II – Sampling Event Information* of the COC/FDS. Note that the sampler type and sample type must be properly selected to reveal all required verification fields.



Figure 5-11. Tisch Sampler's Main Menu Screen

5.1.9.7 Setting Date and Time

NOTE: The operating area for the FS may include more than one time zone. The FS must be aware of time zone changes, set samplers up based on the local standard time, and ensure that PEP sampler's start and stop times match those of the audited sampler.

After the sampler has been successfully installed and powered-up, the date and time should be checked and, if necessary, adjusted to the local standard time. **All Pb-PEP samplers should be synchronized within 1 minute of a known time standard, such as an atomic watch.** The time and date will be displayed on the Main Menu screen, if either are incorrect, use the following procedure to set or adjust the Tisch TE-5170 VFC+ TSP sampler's date and time:

1. From the Main Menu screen, press "**F3**" to enter the Setup menu. A message will appear informing the user "TIMER WILL NOT EXECUTE WHILE IN SETUP!" - press the "**ENT**" key on the keypad.
2. Using the UP and DOWN arrow keys on the keypad, highlight CONFIGURE and press the "**ENT**" key to enter the configure menu. If the date and time are correct, press the "**ESC**" button to return to the Main Menu screen. If the date and time are not correct use the keypad to enter the correct date and time. Highlight the Date field, and press the "**ENT**" key to make edits. Using the keypad enter the date in MM/DD/YY format and press the "**ENT**" key again when completed. To change the time use the Up/Down arrow to highlight the Time field, and press "**ENT**" to make edits. Using the keypad, enter the time in HH:MM format, press the "**ENT**" key again when completed. The hours are in military time (24 hours from "0" to "24").
3. Press the "**ESC**" key twice to return to the Main Menu screen.
4. In *Part III – TSP Verification Checks* of the COC/FDS, record results of the time check.

5.1.9.8 *Setting Initial Sampler Configuration*

Note: This step must be completed upon sampler receipt. Settings should be verified before any sample run.

1. From the Main Menu screen, press “**F3**” to enter the Setup menu. A message will appear informing the user “TIMER WILL NOT EXECUTE WHILE IN SETUP!” - press the “**ENT**” key on the keypad.
2. Using the UP and DOWN arrow keys on the keypad, highlight CONFIGURE and press the “**ENT**” key to enter the configure menu. Scroll down to Q CONDITIONING, press the “**ENT**” key. Select “AMB” for ambient conditions and press “**ENT**” to save the settings.
3. From the CONFIGURE Menu, scroll down once from Q CONDITIONING to Q SET. Press the “**ENT**” key, and change the sampler flow volume to “44”. Press “**ENT**” to save the settings.
4. From the CONFIGURE Menu, scroll down to LOG INTERVAL and press the “**ENT**” key. This setting will change the time interval the data is recorded during sampling runs. Set the interval to “5” to represent five minutes and press the “**ENT**” key to save the settings.
5. Press “**ESC**” to return back to the Main Menu screen. See setting summary below:

CONFIGURE: Q CONDITIONING: AMB Q SET: 44.0 LOG INTERVAL: 5

5.1.9.9 *Verifying the Correct G Factor Setting in Sample Unit*

1. From the Main Menu screen, press “**F3**” to enter the Setup menu. A message will appear informing the user “TIMER WILL NOT EXECUTE WHILE IN SETUP!” - press the “**ENT**” key on the keypad.
2. Using the UP and DOWN arrow keys on the keypad, highlight CALIBRATE and press the “**ENT**” key to enter the calibration menu. Highlight QAMB and press the “**ENT**” key.
3. Confirm the G factor (labeled as A1 on the QAMB screen) matches the attached VFC G factor. If it matches return to the Main Menu screen. If it does not match, proceed to step 4.
4. Press the “**ENT**” key to bring up the A1 value. Type in correct G Factor number provided by vendor. Press “**ENT**” and select SAVE SETTINGS when prompted. **Do not select save factory calibration, or all parameter settings will need to be reset and verified.**
5. Return to **the** Main Menu screen by pressing the “**ESC**” key twice.
6. In *Part III – TSP Verification Checks* of the COC/FDS, record results of the G factor check.

5.1.9.10 *Verifying the Differential Pressure Ports are Properly Connected*

1. Trace the Tygon tubing from the bottom of the controller box to a “T”. At the T, one part runs to the port on the side of the sampler. The second part of the T runs to the port on the sample holder.

2. Locate the sample holder port by reach behind the controller box and then up on the right-hand side should be a metal nub (sample holder port).
3. If the Tygon tubing is not connected to the sample holder port, take the tubing and place over the port.
4. Place over the knob of the port and connect the tubing. It will fit rather snugly.
5. Next, verify the differential pressure is reading.
6. Use the thumb screws to secure the adapter plate to the sampler.
7. Press the “F3” key at the Main to enter the Setup Menu. Press the “ENT” key to bypass the warning message. Using the arrow keys highlight DIAGNOSTIC and press the “ENT” key. Highlight MOTOR using the up/down arrows and press the “ENT” key. The motor will turn on.
8. Look at the display screen and note the value for the pressure differential. Depending we are located in the US; this value should be around 6 inches of water with no filter in place and the motor running.
9. Take the Plexiglas used for leak checks and cover the opening on the adapter plate about half way.
10. Look at the display screen and the pressure differential value should have increased. This means the pressure differential is working properly.

5.2 Leak Check Procedures

5.2.1 Scope and Applicability

This section of the SOP applies to performing the mandatory leak check procedure for the Pb-PEP. Each portable TSP Pb-PEP sampler will be checked for leaks before the flow rate verification occurs. The leak check procedure verifies there are no leaks from the sampler holder assembly through the sampler's flow rate measurement sensor.

5.2.2 Summary of Method

The leak check procedure is used to verify that the sampling system is adequately free from leakage that could cause an incorrect measurement of flow rate. The FS will start the motor of the sampler and place a Plexiglas plate over the adapter plate fixed to the inlet. If a leak is present, the FS will hear a high pitched whine. The leak check must be successful before flow rate verification can be performed. To assess leakage within the filter assembly refer to troubleshooting procedure (see Section 5.2.7.2).

5.2.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

5.2.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be

achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

5.2.5 Cautions

1. Do not connect any other device to the adapter plate when conducting this procedure.
2. Be careful of any sharp edges on the Plexiglas.
3. Do not block the opening to the top of the adapter plate with the Plexiglas for more than 5 seconds; it will cause a strain to the motor blower.

5.2.6 Equipment and Supplies

- Tisch TE-5170 VFC+ TSP sampler
- Adapter plate (Either Hi-Q FHA-810CF adapter plate and two black secure bars, the BGI adapter plate, or Tisch adapter plate can be used.)
- ¼" thick Plexiglas measuring at least 5" x 5" to close flow opening at the top of the adapter plate.
- Chain-of-Custody/Field Data Sheet (COC/FDS) form
- 2 Hi-Vol filter cassettes
- FS field notebook

These procedures apply to performing a leak check on the TSP samplers at the field site; however, it is also applicable for indoor setup when testing the sampler before field use.

5.2.7 Procedure for Conducting a Leak Check on the Tisch TE-5170 VFC+ TSP Sampler

5.2.7.1 Conducting a Leak Check

1. Unpack, install, and power the sampler at the site as described in **Section 4, Sampler Transport and Placement**, and in Section 5.1.
2. Release the S-latch on the roof lock and open the roof. Insert the roof security S-latch pin to the rear latch of the roof assembly when in the open position. (**For safety, always insert the roof security quick release pin when the sampler's roof assembly is open.**)
3. Open the sample holder by loosening the large black thumb nuts and remove the transport filter. A transport filter should be in place when sampler is the process of being moved to reduce any contamination. Remove the transport filter and cassette for the sampler leak check.

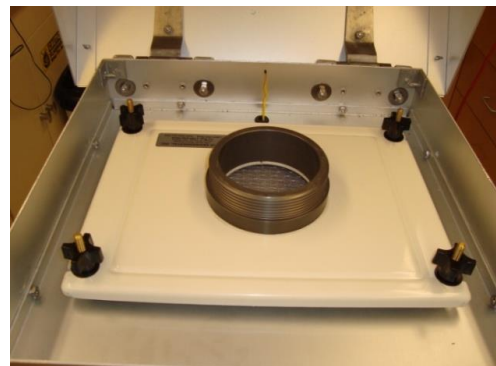


Figure 5-12. View of the Tisch Adapter Plate on Sampler Assembly for Leak Check of a Tisch Sampler

4. Place the adapter plate on the Hi-Vol filter cassette. Secure the adapter plate to the sampler by tightening the black thumb nuts (see Figure 5-12).
5. From the Main Menu screen, press “F3” to enter the Setup menu. A message will appear informing the user “TIMER WILL NOT EXECUTE WHILE IN SETUP!” - press the “ENT” key on the keypad. Using the Up/Down arrow keys highlight Diagnostics and press “ENT”. Use the Up/Down arrow keys to highlight “MOTOR” and press the “ENT” key to turn the motor on.
6. Slowly place the 5” x 5” piece of Plexiglas cover on the opening of the adapter plate. Listen for hissing or whistling sound for no more than 5 seconds. This will demonstrate the system has a leak. There are no quantitative measurements for leak checking a TSP sampler. If a leak is detected, follow the troubleshooting steps for leak check failure (see Section 5.2.7.2).

Caution: Do not leave the Plexiglas cover over the opening for more than 5 seconds or motor could over-heat and burn out.

7. Once the leak check has been performed, pressing the “ENT” key while MOTOR is highlighted will turn the motor off.
8. In *Part III – TSP Verification Checks* of the COC/FDS, record results of the time check. If the FS needed to perform troubleshooting steps, include comments under the Notes section on the COC/FDS form and in the FS field notebook.

NOTE: The leak test must be successful prior to performing the flow rate verification or using the sampler to acquire a PE sample.

5.2.7.2 Troubleshooting When the Leak Check Fails

The following troubleshooting procedures should be used when a sampler does not pass the leak check:

1. Ensure the motor is off before starting troubleshooting steps.
2. (Check 1) Check the thumbs nuts are completely tightened. If the nuts were loose, try the leak check again. Perform steps 5 through 7 in Section 5.2.7.1.
3. (Check 2) Visually examine the gasket of the sample holder for cracks, missing pieces, or debris that would affect a tight seal. Again, perform steps 5 through 7 in Section 5.2.7.1.
4. (Check 3) Try to further tighten the VFC/motor to the collar of the sampler unit. Tighten the collar as much as possible then rotate the VFC/motor assembly to thread it further. Perform steps 5 through 7 in Section 5.2.7.1.
5. (Check 4) If leak check is still failing after first three checks, unscrew VFC/motor assembly from the sampler unit. Ensure O-ring is not damaged and is slightly greased. And add a band of Teflon tape to the threads of the VFC. Perform steps 5 through 7 in Section 5.2.7.1.
6. (Check 5) If leak check is still failing, a second O-ring can be placed between the VFC/motor and sample housing. Perform steps 5 through 7 in Section 5.2.7.1.

7. If Checks 1 through 5 do not correct the leak problem, install the backup TSP sampler and inform the WACOR/TOCOR/DOCOR of the problem.

5.3 Barometric Pressure Verification

5.3.1 Scope and Applicability

This section of the SOP applies to verifying the barometric pressure measurement system of the TSP sampler. Operations covered in this SOP include routine functional check procedures for the pressure measurement system.

5.3.2 Summary of Method

The TSP sampler has a built-in atmospheric pressure sensor that measures barometric pressure in mmHg. Under actual ambient conditions for temperature and pressure, the target flow value for the Tisch TE-5170 VFC+ TSP sampler is 44 cubic feet per minute.

To perform a routine verification, the barometric pressure sensor reading is verified at ambient pressure through comparison with the reading from an external standard of known accuracy. If a pressure difference of >10 mm Hg is observed, a calibration of the pressure-sensing and display system is required before the TSP sampler may be used to perform a PE.

5.3.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

5.3.4 Personnel Qualifications

Personnel who conduct the FRM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

5.3.5 Cautions

- Protect all types of barometers from mechanical shock and sudden pressure changes. A barometer subjected to either of these events must be verified by comparing it to a laboratory mercury column barometer (or other NIST-traceable standard). If required, the barometer would either be adjusted, or an offset correction would be established.
- Minimize the vertical and horizontal temperature gradients across the barometer and avoid direct sunlight, drafts, and vibrations.
- Barometers should be allowed some time to adjust to temperature and pressure differences. Prior to assembly of the instrument, transport the barometer to the sampling platform so that it may equilibrate for approximately 30 minutes before use.

- At high altitudes, verification of barometric pressure may be difficult due to significantly lower pressure. The FS should use all available information, including SLT FRM barometric pressure readings and/or readings from other samplers. The FS may also check with a local airport or weather stations for comparable readings. The FS should document all of this extra information on the COC/FDS form.

5.3.6 Equipment and Supplies

The following equipment and supplies are required for barometric pressure verification checks:

- Tisch TE-5170 VFC+ TSP sampler
- COC/FDS form
- FS field notebook
- Portable, NIST-traceable barometer for field barometric pressure verifications (BGI hivolCal, see Figure 5-13).



Figure 5-13. BGI hivolCal Model HVC8 Hi-Vol Field Audit Calibrator

5.3.7 Procedure for Conducting a Barometric Pressure Verification on the Tisch TE-5170 VFC+ TSP Sampler

5.3.7.1 Field Verification of Barometric Pressure System using the BGI hivolCal

The BGI hivolCal, similar to other verification devices, needs to equilibrate to ambient conditions before use. Be sure to allow enough time for the verification equipment to equilibrate to these conditions. The Pb-PEP sampler's barometric pressure sensing system is verified by comparing the sampler reading to that of the portable barometer at ambient conditions, as described in the following steps:

- Unpack, install, and power the sampler at the site as described in **Section 4, Sampler Transport and Placement**, and in Section 5.1.
- Unpack the BGI hivolCal from its carrying case. The HVC8 is a single orifice unit with a flow rate range of 0.2 to 1.53 m³/min. The HVC8 measures actual m³/min calibrated at sea level and 25°C as standard conditions. The Tisch TE-5170 VFC+ TSP sampler is targeted to operate at 44 cubic feet/min. The BGI hivolCal set up is shown in Figure 5-14.
- Switch on the power and the hivolCal will perform a self-calibration. (Note: The calibrator opening should be covered to minimize the effects of drafts during the self-calibration, although this might not be as critical for measuring high flows.) Record the serial number and last calibration date of the BGI hivolCal unit on the COC/FDS form in Part III.

Note the battery percentage. The hivolCal uses four AA batteries. Be sure to have backup batteries and the % Battery is above 90% when using the hivolCal. The barometric pressure is in mm of Hg and the temperature is in °C. The hivolCal also reports the flow rate cubic meters per minute for both actual (Q_a) and standard (Q_s) conditions. The Pb-PEP will use Q_a for determining flow rates.

- From the Main Menu screen, press “**F3**” to enter the Setup menu. A message will appear informing the user “TIMER WILL NOT EXECUTE WHILE IN SETUP!” - press the “**ENT**” key on the keypad. Using the Up/Down arrow keys highlight Diagnostics and press “**ENT**”.

5. Record the pressure readings from the sampler (“Pamb”) and the hivolCal (Reference Standard Pressure) on the COC/FDS form in Part III.
6. If the two readings are ≤ 10 mm Hg of each other, the verification of the Pb-PEP TSP monitor’s pressure sensor is satisfactory.
7. If the deviation is > 10 mm Hg, re-check the barometric pressure using a backup verification device. If the results are similar to the primary verification device, then the sampler’s pressure measurement system may be damaged and should be serviced. A calibration procedure should be performed at a later time (see **Section 10, Calibrations**). A spare Pb-PEP sampler must be installed at the site. Note any troubleshooting steps in the Notes section of the COC/FDS form and the FS field notebook.

5.4 Temperature Verification

5.4.1 Scope and Applicability

This section of the SOP applies to verifying the temperature measurement system for the TSP Pb-PEP sampler. Operations covered in this SOP include verification check for the ambient temperature sensor in the Tisch TE-5170 VFC+ TSP unit using the BGI hivolCal verification device. Specific information herein may not be applicable to other makes and models of equipment (refer to Appendix E for directions on using alternate verification devices).

5.4.2 Summary of Method

The ambient temperature sensor is verified at a single point using the ambient temperature sensor of the BGI hivolCal standard. If an excessive difference is observed, a calibration of the temperature sensor may be required (see **Section 10, Calibrations**). The ambient temperature sensor (thermocouple) in the Tisch TE-5170 VFC+ samplers measures in degrees Celsius ($^{\circ}\text{C}$).

To perform a routine verification, the ambient temperature sensor reading is verified at ambient temperature through comparison with the reading from an external standard of known accuracy. If a temperature difference of $\pm 2^{\circ}\text{C}$ is observed, a calibration of the temperature sensing and display system is required before the TSP sampler may be used to perform a PE.

5.4.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

5.4.4 Personnel Qualifications

Personnel who conduct the FRM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

5.4.5 Cautions

- Be sure that the temperature reference standard used to verify the instrument's sensors has been calibrated against a NIST-certified standard within the prescribed time period (annually).
- Temperature verification device sensor should not be placed in direct sunlight during equilibration and verification.

5.4.6 Equipment and Supplies

- Tisch TE-5170 VFC+TSP sampler
- COC/FDS form
- Portable, NIST-traceable thermometer for field temperature verifications (BGI hivolCal).
- FS field notebook

5.4.7 Procedure for Conducting a Temperature Sensor Verification on the Tisch TE-5170 VFC+ TSP Sampler

The response of ambient temperature sensor (thermocouple) must be verified each time the Tisch TE-5170 VFC+ TSP sampler is set up at a new location.

5.4.8.1 Single-Point Field Verification in Ambient Air Using the BGI hivolCal

The hivolCal, similar to other verification devices, must be equilibrated to ambient conditions before use. Be sure to allow enough time for the verification equipment to equilibrate to these conditions. The hivolCal should have been powered on and placed near the TSP sampler during the barometric pressure verification. Avoid direct sun exposure of the box to guard against heat buildup affecting the electronics. The shielded probe should equilibrate in the same conditions as the temperature probe of the sampler-shade if shaded, sun if the sampler's probe is in the sun. A single point ambient temperature verification is described in the following steps:

1. It is best if the sampler has been on the site for at least 30 minutes to allow adequate time for the ambient temperature sensor to reach temperature equilibrium with their surroundings; however, equilibration may occur in <30 minutes. The FS should use his or her best judgment to ensure that all temperature sensors (sampler and audit standard) are equilibrated to ambient conditions.
2. From the Main Menu screen, press "**F3**" to enter the Setup menu. A message will appear informing the user "TIMER WILL NOT EXECUTE WHILE IN SETUP!" - press the "**ENT**" key on the keypad. Using the Up/Down arrow keys highlight Diagnostics and press "**ENT**".
3. Hold the BGI hivolCal standard within a few inches of the sampler temperature probe (Figure 5-14). Wait for the readings to stabilize.

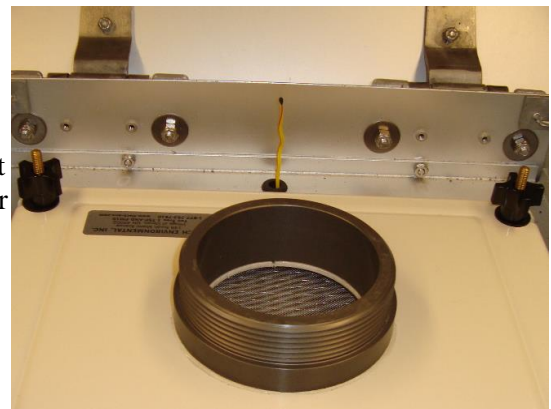


Figure 5-14. Temperature Thermocouple for Tisch Sampler

4. Record the temperature readings from the sampler (T_{amb}) and the hivolCal (Reference Standard Temperature) on the COC/FDS form in Part III. If the temperatures agree within $\pm 2^{\circ}\text{C}$, then the ambient temperature sensor response is acceptable. If not, proceed to Step 5.
5. If the two readings are outside acceptance criteria, wait longer (10 to 15 minutes) for temperature equilibration to occur and repeat the procedure. If the readings still do not agree, verify that the problem is not with the hivolCal by using another verification device. If the problem is not with the hivolCal and the FS does not feel the problem can be rectified, replace the Pb-PEP sampler using a backup sampler.
6. Note any troubleshooting steps in the Notes Section of the COC/FDS form and the FS field notebook.

5.5 Flow Rate Verification

5.5.1 Scope and Applicability

The following information is applicable to the Tisch TE-5170 VFC+ TSP sampler and the BGI hivolCal verification device. Specific information herein may not be applicable to other makes and models of equipment (refer to Appendix E for directions on using alternate verification devices.)

In the Tisch TE-5170 VFC+ sampler, the flow rate is controlled by a Volumetric Flow Controller (VFC) in conjunction with the VFC+ electronic control unit. The VFC has a specific geometry to achieve near constant volumetric flow and is calibrated by the manufacturer. The VFC+ electronic control unit consistently monitors the ambient temperature and barometric pressure as well as the differential pressure through the orifice and the flow rate is calculated using a constant G factor that is developed by the manufacturer. Each VFC will have a corresponding G factor that must be entered in to the VFC+ controller by the FS. The designed flow rate for the Tisch TE-5170 VFC+ sampler is 44 cubic feet per minute and is programmed in the VFC+ controller. The maximum allowable error is $\pm 4\%$ of the target flow rate of 44 cubic feet per minute. The flow rate of the portable TSP sampler must be verified at each site before the PE samples are taken.

5.5.2 Summary of Method

A single-point verification of the sampler flow rate is performed prior to each use of the TSP sampler in a PE. If the verification check is outside the tolerance of $\pm 4\%$ of the indicated reading on the working standard or $\pm 4\%$ of the target flow rate and no reason can be found for the discrepancy, the sampler may need to be recalibrated (see **Section 10, Calibrations**), sent to the FS laboratory or manufacturer for repair. The VFC in the Tisch TE-5170 VFC+ sampler cannot be calibrated by the FS; it must be returned to the manufacturer.

5.5.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

5.5.4 Personnel Qualifications

Personnel who conduct the FRM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual

recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

5.5.5 Cautions

- Do not conduct the flow check with a TSP filter installed.
- The Tisch TE-5170 VFC+ sampler could have issues maintaining a flow rate of at least 39.5 ft³/min at high altitudes.
- Verify that the G factor and VFC serial number on the VFC match the values on the VFC+ controller on the Tisch TE-5170 VFC+ sampler.
- Verify the flow rate condition (Q Conditioning) is set to “AMB” on the VFC+ controller.
- Verify that the BGI hivolCal standard is properly seated on the adapter plate.

5.5.6 Equipment and Supplies

- Tisch TE-5170 VFC+ sampler TSP sampler
- One clean filter 8” x 10” QMP 2000 glass fiber filter in a labeled Hi-Vol filter cassette for “**Calibration and Verification Checks Only.**” This filter is not to be used for sampling and may be used repeatedly for leak checks, and flow rate calibrations for the TSP sampler. When this filter becomes loaded or damaged, it should be discarded; however, the filter cassette must be retained.
- Adapter plate (Either the FHA-810CF adapter plate and two black secure bars, BGI, or Tisch)
- Chain-of-Custody/Field Data Sheet (COC/FDS) form
- Hi-Vol filter cassettes
- FS field notebook

5.5.7 Procedure for Conducting the Flow Rate Verification on the Tisch TE-5170 VFC+ TSP Sampler

The operating flow rate of 44.0 cubic feet per minute is verified before each PE. In the field, only one-point verifications should be performed. If the verification result is outside the required $\pm 4\%$ tolerance of the indicated flow on the working standard or $\pm 4\%$ of the target flow rate, calibration (at an indoor location) may be required. The one-point verification must be repeated after any calibration procedure to ensure the sampler operates properly at the target flow rate of 44.0 cubic feet per minute.

5.5.7.1 Flow Rate Verification Using the hivolCal

Perform the sampler leak, temperature, and barometric pressure verification procedures, and take any corrective actions necessary to meet the acceptance criteria before performing this procedure. If a leak check was just performed, the sample holder and adapter plate should be in position to install the BGI hivolCal unit for verification of the flow rate. If these devices were removed, complete Steps 1 through 5 below and continue with the flow rate verification. Flow rate verification of the sampler is described in the following steps:

1. If the roof is closed, release the S-latch on the roof lock and open the roof. Insert the roof security S-latch pin in the rear holder to secure the roof assembly in the open position. (For safety, always insert the roof security pin when the sampler’s roof assembly is open.)

2. Open the sample holder by loosening the large black thumb nuts and remove the transport filter carrier. A transport filter carrier should be in place when sampler is the process of being moved to reduce contamination into the mass flow controlled and motor assembly.
3. Turn the hivolCal unit on to perform its self-calibration.
4. Place the BGI hivolCal unit on the adapter plate and ensure it is properly seated.
5. From the Main Menu screen, press “F3” to enter the Setup menu. A message will appear informing the user “TIMER WILL NOT EXECUTE WHILE IN SETUP!” - press the “ENT” key on the keypad. Using the Up/Down arrow keys highlight Diagnostics and press “ENT”. Use the Up/Down arrow keys to highlight “MOTOR” and press the “ENT” key to turn the motor on.
6. Record the flow rate readings from the sampler (Qamb) and the hivolCal (Reference Standard Flow Rate) on the COC/FDS form in Part III. Both readings should be reported in cubic feet per minute under actual conditions. The Target Flow Rate is 44.0 cubic feet per minute. The percent difference (PD) between the reference standard (BGI hivolCal) and the sampler’s flow rate and the percent difference between the target flow rate and sampler’s flow rate are listed below in **Error! Reference source not found.** and **Error! Reference source not found.**

$$PD(\%)_{flowrate} = \frac{Flow_{sampler} - Flow_{standard}}{Flow_{standard}} \times 100$$

Equation 1. Percent difference between standard and sampler flow rate.

$$PD(\%)_{corrected\ target\ flowrate} = \frac{Flow_{standard} - 44}{44} \times 100$$

Equation 2. Percent difference between target and sampler flow rate.

If the calculated flow rate is outside the $\pm 4\%$ tolerance with the Tisch TSP sampler’s flow rate or if the sampler’s flow rate is outside $\pm 4\%$ agreement with the target flow rate, the FS should ensure that the sampler and the flow rate measurement equipment are operating properly using the following steps:

- Verify that the body of the hivolCal is properly seated on the adapter plate to prevent leakage past the gasket that seals it to the sample holder.
- Check that flow has stabilized and ensure that the hivolCal has been given enough time to equilibrate to ambient conditions. Read the given flow rate provided by the hivolCal and record the value.
- Visually inspect the sampler and the flow rate measurement equipment. Consider any other factors that might affect the flow rate measurement or the sampler operation.
- After adjustments have been made, repeat the flow rate verification procedure. If the calculated flow rate and/or sample flow rate still do not meet QC criteria, check the

temperature and barometric pressure readings because they affect the instrument's flow rate calibration.

- If the calculated flow rate and/or sample flow rate still do not meet QC criteria, there is most likely a mechanical problem with the sampler. It should be taken to the FS laboratory or sent to the manufacturer for repair. A backup sampler unit is necessary. If the acceptance criteria cannot be met and no backup sampler is available, then the audit must be postponed.
7. After all troubleshooting has been completed, indicate the final result of the check and comments in the Notes Section on the COC/FDS form. Indicate whether the verification was acceptable by checking the "Yes" or "No" box under "Verification OK?"
 8. Press the "ENT" key while the MOTOR menu item is highlighted to turn the motor off.
 9. Following the verification, remove the flow rate standard from the sampler and remove the calibration adapter. If it is time to install the filter and program the sampler for the PEP audit, proceed to **Section 6.1, *Conducting the Filter Exposure***.

Section 6

Filter Exposure and Concluding the Sampling Event

6.1 Conducting the Filter Exposure

6.1.1 Scope and Applicability

This SOP describes how to set up the TSP sampler to start and end sampling for a 24-hour period, from midnight to midnight. The following information is applicable to the Tisch TE-5170 VFC+ TSP sampler. Specific information herein may not be applicable to other makes and models of samplers. If other models of approved FRM TSP audit samplers are used for Pb-PEP activities, EPA will ensure that those sampler's instruction manuals are made available to the FS (Manufacturer's manuals will be provided on training CDs and could be posted to the AIRQA Web site).

Before collecting the Pb PE sample, the sampling unit must have successfully passed the date and time checks and leak, barometric pressure, temperature, and flow rate verifications (see **Section 5, *Sampler Setup and Performance Verifications***). Activities about the receipt, examination, installation, use, retrieval, packaging, and shipment of sampling filter cassettes must be documented in accordance with instructions given in **Section 7, *Chain-of-Custody and Field Data Sheet Form***.

6.1.2 Summary of Method

Sample exposure involves placing an 8" x 10" EPM 2000 glass fiber filter in the sampler and setting the sampler's timer to start the exposure for a 24-hour period that corresponds to the site sampler's operating period (which should be from midnight to midnight). After exposure, the filter is removed from the sampler, and then it is packaged and shipped to the EPA Region 9 Laboratory.

After the routine verifications have been performed, the FS needs to program the sampler for the sampling event and install the glass fiber filter sample(s) (field blank, passive field blank, collocated PEP, or routine) using proper sample filter handling procedures.

6.1.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

6.1.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

6.1.5 Cautions

- Before sampling, the sampler flow rate, temperatures, barometric pressure, and clock must be successfully verified (see **Section 5, *Sampler Setup and Performance Verifications***).
- Use care when handling unexposed and exposed filters.

- Strictly follow all procedures about labeling, documenting, and transporting filters (in 9" x 12" self-sealed plastic bags prior to sampling event and glassine envelopes after sampling event).
- Ensure that the portable computer or other data storage device used for downloading data is in good condition and that the battery is sufficiently charged.

- It may be necessary to begin the sampling run 5 minutes after the SLT sampler start time. **If the two samplers are operating on the same circuit, the power draw of both samplers powering up at the same time could trip the breaker cutting power.** If possible, operate the Pb-PEP sampler on a separate circuit from the SLT sampler.

6.1.6 Equipment and Supplies

- Tisch TE-5170 VFC+ TSP sampler
- 8" x 10" EPM 2000 glass fiber filter in a Hi-Vol filter carrier with a protective cover
- COC/FDS Form from AIRQA Web site
- Hi-Vol filter cassettes
- Nylon or vinyl gloves
- 9" x 12" self-sealed plastic bag for containing COC/FDS form and electronic storage media (flash drive)
- Extra glass fiber filters in antistatic plastic bags in case of damage or contamination to the primary filter sampler before sampling event (NOTE: One filter per plastic bag)
- Glassine envelopes for storing exposed filter
- Manila envelope for shipping glassine envelope(s)
- Shipping box for shipment of filter and COC/FDS form to EPA Region 9 Laboratory
- Laptop computer
- Electronic storage media (SD card)
- FS Field Notebook
- Marker (indelible ink).

6.1.7 Filter Inspection

Handle the glass fiber filter as indicated in **Section 3, *Cassette Receipt, Storage, and Handling***. Look for the following types of defects:

- Pinhole (a small hole)
 - Loose material (e.g., any extra loose material or dirt particles on the filter)
 - Discoloration (i.e., any obvious discoloration that might be evidence of contamination).
1. Return any filters with visible damage or imperfections to the regional field office. In Part IV of the COC/FDS form, check "VOID" and give reason. Do not use the filter.

 2. If the filter is acceptable, find the corresponding COC/FDS form and match the Sample Type with the label on the top portion of the Hi-Vol filter cassette (RO, CO, FB, or PB) as completed in Section 3.1.8. The trip blank will never be placed in the sampler and will be transported in a 9" x 12" self-sealed plastic bag. The Sample Type is located in Part IV of the COC/FDS form. Section 6.1.8 describes the procedure for processing blanks at the field site. Section 6.1.9 describes the routine sample process.

6.1.8 Types of Blanks Used at the Field Site

Prior to setting up for the routine sample, the FS should prepare and secure all blanks to associate with the field site and routine sample. The frequency of these blanks throughout the year will be determined by the EPA OAQPS Office and the requirement in the Pb Quality Assurance Project Plan. The field process for handling each blank type is described below in Sections 6.1.8.1 through 6.1.8.3.

6.1.8.1 Field Blank

Field blanks are randomly-selected filters used to determine contamination by the FS through filter handling during normal set up at the field site. Field blanks will be conducted for every sampling event during initial Pb-PEP implementation. After that, EPA will re-evaluate the need and frequency for field blanks. The following steps outline the proper procedure for implementing field blanks:

1. Locate the Hi-Vol filter cassette (FB) to be used for the field blank and find the corresponding COC/FDS form for that Sample Type.
2. Complete the information in Part II of the COC/FDS form regarding the sampling event.
3. In Part IV of the COC/FDS form, enter the Sample Date.
4. Open the roof assembly to the TSP sampler.
5. Remove the protective cover and place the Hi-Vol filter cassette on the filter holder support and tighten the thumb nuts. Remove the Hi-Vol cassette cover and close the roof assembly.
6. After one minute, open the roof assembly and place the protective cover on the Hi-Vol filter cassette. Then loosen the thumb nuts and remove the Hi-Vol filter cassette. It will later be processed in the same manner as the routine sample for shipping to the EPA Region 9 Laboratory.
7. The field blank will be returned to the field office with the routine sample. While wearing nylon or vinyl gloves carefully remove the field blank filter and fold the filter in half (length wise). The Filter ID Number should be visible on the outside. Place the folded filter in a glassine envelope and place it in a manila envelope. On the outside of the manila envelope, record the Filter ID Number of the filter used.
8. In Part IV of the COC/FDS form, enter the Retrieval Date. Place the COC/FDS form in a separate 9" x 12" self-sealed plastic shipping bag.

6.1.8.2 Trip Blank

Trip blanks are randomly-selected filters taken to the sampling site to measure possible contamination to filters during transportation to and from sampling locations. They provide a frame of reference in case field blanks exhibit a contamination that is higher than the tolerance levels. Trip blanks should remain inside their protective bags and never be exposed to sampling procedures. Trip blanks will be conducted for every sampling event during initial Pb-PEP implementation. After that, EPA will re-evaluate the need and frequency for trip blanks. The following steps outline the proper procedure for implementing trip blanks:

1. Locate the glass fiber filter by Filter ID Number to be used for the trip blank. Find the corresponding COC/FDS form for that Filter Number.
2. Using a permanent marker, write "TRIP BLANK" and the filter ID on a 9" x 12" anti-static plastic bag. While wearing nylon or vinyl gloves carefully fold the filter in half lengthwise and place in the bag. The Filter ID Number should be visible on the outside.
3. Complete the information in Part II of the COC/FDS form regarding the sampling event.
4. Enter the Sample and Retrieval Dates in Part IV of the COC/FDS form. Place the COC/FDS form in a separate 9" x 12" self-sealed plastic bag.
5. Place the 9" x 12" bag containing the folded filter in a manila envelope.
6. Do not leave the trip blank inside the sampler during the sampling event. It will later be processed in the same manner as the routine sample for shipping to the EPA Region 9 Laboratory.

6.1.8.3 Passive Field Blank

A Passive Field Blank will be sampled from the field sites where lead concentrations are suspected to be high and/or where high winds may impact sample results. The FS will place a glass fiber filter in the sample holder using the same procedure as a routine sample. The motor will not be engaged. The TSP sampler will be closed and the filter will passively sample air for the same period of time as the routine filter. The passive field blank has no frequency requirement and is a tool that may be used for assessing passive loading. The following steps outline the proper procedure for implementing passive field blanks prior to a sampling event:

1. Locate the Hi-Vol filter cassette (PB) to be used for the Passive Blank and find the corresponding COC/FDS form for that Sample Type.
2. Complete the information in Part II of the COC/FDS form regarding the sampling event.
3. In Part IV of the COC/FDS form, enter the Sample Date.
4. Open the roof assembly to the TSP sampler. Verify the sampler holder area is clean.
5. Place the Hi-Vol filter cassette on the filter holder support and tighten the thumb nuts. Remove the Hi-Vol cassette cover and close the roof assembly.
6. Record the time of day that the passive filter is placed into service, i.e., the roof is closed.
7. Unless otherwise directed by the EPA OAQPS Office the designed time for passive blanks should be approximately the same period as the routine filter is placed in the active sampler. This is accomplished by loading and unloading the filters in the same sequence. For example load passive then active sampler and unload passive then active sampler. For those events that passive blanks are generated it is important to recover the filters as soon as possible after the sampling event has concluded.

8. To unload, open the roof assembly and place the protective cover on the Hi-Vol filter cassette. Then loosen the thumb nuts and remove the Hi-Vol filter cassette. It will later be processed in the same manner as the routine sample for shipping to the EPA Region 9 Laboratory. Record the time that the passive filter is collected.
9. The Passive Blank will be returned back to the field office with the routine sample. While wearing nylon or vinyl gloves carefully remove the Passive Blank Filter and fold the filter in half (length wise). The Filter ID Number should be visible. Place the folded filter in a glassine envelope and place it in manila envelope. On the outside of the manila envelope, record the Filter ID Number of the filter used.
10. In Part IV of the COC/FDS form, enter the Retrieval Date. Place the COC/FDS form in a separate 9" x 12" self-sealed plastic shipping bag.

6.1.9 Collecting a 24-Hour PE Sample Using the Tisch TE-5170 VFC+ TSP Sampler

To comply with EPA regulation, the 24-hour sampling period begins at midnight (00:00) and concludes at midnight (00:00) of the next day. The total sampling period is programmed for 24 hours (1,440 minutes). However, if sampling during another time period is required by the local site and has been approved by the WAM/TOPO/DOPO, then consult Step 3 of Section 6.1.9.2 for instructions on resetting the sampling time. Section 6.1.10 describes the procedure to use if it is necessary to briefly stop, and then restart the sampler during a sampling period.

6.1.9.1 Verifying Routine Filter Sample and Initializing Sampler

1. Locate the Hi-Vol filter cassette (RO) to be used for the routine sample and find the corresponding COC/FDS form for that Sample Type.
2. Review the information in Part II of the COC/FDS form regarding the sampling event.
3. Review that all verifications were satisfactory in Part III of the COC/FDS form.
4. In Part IV of the COC/FDS form, enter the Sample Date.
5. Open the roof assembly to the TSP sampler. Verify the sampler holder support area is clean.
6. Place the Hi-Vol filter cassette on the filter holder support and tighten the thumb nuts. Remove the Hi-Vol cassette cover and close the roof assembly.
7. Open the door to the VFC+ Controller box and verify the power is on (there is no power switch for the Tisch sampler, if the unit is plugged in and receiving power it should be on).
8. Continue to Section 6.1.9.2 for programming the sampler.

6.1.9.2 Programming the Tisch TE-5170 VFC+ TSP Sampler for the 24-Hour PE Exposure

1. Once the sampler has been plugged in, allow the system to initialize for 5 seconds. An opening screen will have a count-down timer (Figure 6-1) and will automatically change to the Main Menu screen after the timer ends (Figure 6-2).
2. If the date and time are correct, proceed to Step 3. If the date and time are incorrect, press "F3" on the Main Menu screen to enter the Setup Menu. A message will appear informing the user

“TIMER WILL NOT EXECUTE WHILE IN SETUP!” - press the “**ENT**” key on the keypad. Using the UP and DOWN arrow keys on the keypad highlight CONFIGURE and press the “**ENT**” key to enter the Configure Menu. If the date and time are correct, press the “**ESC**” key to return to the Main Menu screen. If the date and time are not correct use the keypad to enter the correct date and time. Highlight the Date field, and press the “**ENT**” key to make edits. Using the keypad, enter the date in MM/DD/YY format and press the “**ENT**” key again when completed. To change the time use the Up/Down arrow to highlight the Time Field, and press the “**ENT**” key to make edits. Using the keypad, enter the time in HH:MM format, press the “**ENT**” key again when completed. The hours are in military time (24 hours from “0” to “24”). Once the date and time have been entered press the “**ESC**” key to return to the Main Menu screen.



Figure 6-1. Tisch Initializing Screen

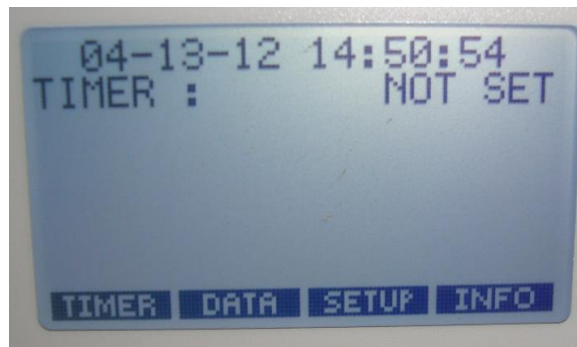


Figure 6-2. Tisch Main Menu Screen

- From the Main Menu screen (Figure 6-2), press “**F1**” to enter the Timer screen. The information entered in the Timer screen is used to turn the sampler ON and OFF on a programmed date and at a programmed time. The duration time for the run is also entered on this screen. Once in the Timer Setup screen (Figure 6-3), highlighting and selecting “Date” will bring the user to the date screen (Figure 6-4). The format for the date is MMDDYY. Once the date has been entered, press the “**ESC**” key will bring the user back to the Timer Menu screen.

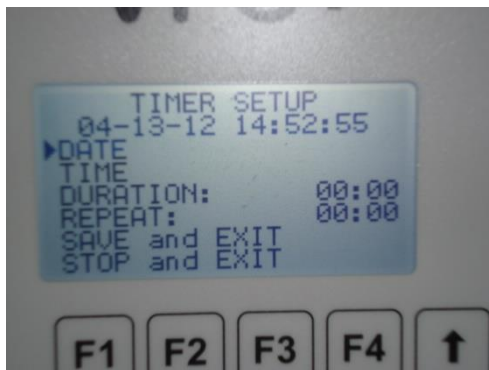


Figure 6-3. Timer Setup Screen

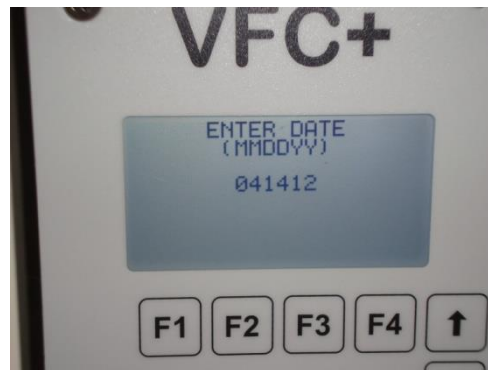


Figure 6-4. Date Screen

- Selecting “Time” from the Timer Setup screen will allow the user to enter the time of the run start. Typically this will be at midnight (00:00), unless the SLT sampler is set to start at a different time and it has been determined to be an acceptable alternate time by the

WAM/TOPO/DOPO. To set the time highlight the time field and press the “ENT” key. The next screen will be where the user enters the start time in military hours. Once the time has been entered press the “ENT” key to return to the Timer Setup screen.

The duration of the run will need to be set next. On the Timer Setup screen, highlight “Duration” and press the “ENT” key to set the amount of time for the sampler to run (Figure 6-5). The user will need to enter the hours and minutes for the run, which for a standard sampling event will be “2400” (HH:MM). Once the run time has been entered press the “ESC” key to return to the Timer Setup screen.

5. The last field in the Timer Setup screen is “Repeat”. This setting allows for repeat intervals. The default setting is “none” which should be left as is for Pb-PEP program runs.

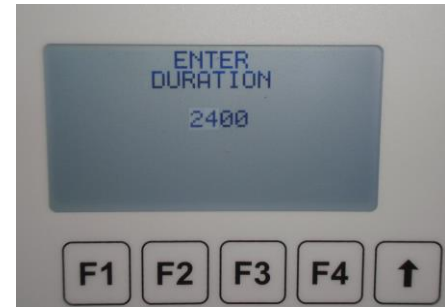


Figure 6-5. Duration Screen (Set to 24 hours)

6. Once all the fields in the Timer Setup screen have been entered, the user must “Save and Exit”, or the choices will not be saved and the run will not start. To save the settings, simply highlight the “Save and Exit” field and press the “ENT” key. This will bring the user back to the Main Menu screen. If a run was set correctly three things should happen. First the green power light should start to blink, second a timer countdown should start indicating when the sampling run will commence, and third the status on the Main Menu screen should change to “Waiting” (Figure 6-6). If either of these actions does not occur go back to Step 2 and repeat the process.

7. The Tisch TE-5170 VFC+ TSP sampler is now ready to begin sampling for 24 hours starting at 00:00 and running to the following midnight. The sample event will begin on the Start Day (week day) selected by the FS.

8. Close the door to the Main Unit and the VFC+ Controller box. Verify the roof assembly is closed and latched shut.
9. Pack up loose supplies, pick up trash, and secure the site for the 24-hour exposure period. It is not necessary for the site operator to be present when the sampler starts or ends the sampling event.



Figure 6-6. Main Menu Screen with Sampling Scheduled

10. If convenient, visit the site during the exposure to verify that there are no problems with either sampler. Such a visit allows a defective run to be terminated so that a replacement exposure can be scheduled as soon as possible.

6.1.9.3 Monitoring Status While the Tisch TE-5170 VFC+ Is Running

During the exposure run, the FS can monitor the event using the Monitor Menu. From the Main Menu screen, select “F2” to get to the Data Menu screen. Select “VIEW CURRENT” by pressing the “ENT” key, which will bring you to the current run information. Using the UP/DOWN keys will allow the FS to see all the current information being recorded by the sampler during the run. An example screen is shown in Figure 6-7.

6.1.10 Temporary Halt Then Continue Sampling

During a PE sampling period, it is not desirable to halt sampling operations during a run of either the TSP sampler or the fixed site sampler. However, in an emergency, it may be necessary to suspend sampling for a brief period. It may also be necessary for the Tisch TE-5170 VFC+ to be paused if the VFC unit has come loose and a whistling can be heard indicating a leak. Be sure to note any interruption of sampling on the COC/FDS form, specifying the time and duration of the interruption, as well as the reason for the interruption. Interruptions in sampling activities for either the TSP sampler should be noted.



Figure 6-7. Display Information during Sample Run

A 24-hour sample may be suspended for up to 1 hour and still remain a legitimate sample according to EPA rules; therefore, a means to temporarily halt and then resume sampling has been incorporated into the Tisch TSP sampler. To halt the sampler, press the “F1” key to enter the Timer screen. Selecting “Pause” will ask the user if they would like the run paused or aborted. Choose pause by highlighting “Pause” and pressing the “ENT” key. The sampler will stop sampling during this time and will go to the Main Menu screen.

To continue with the current sample run, press the “F1” key to enter the Timer screen. Selecting “Resume” will ask the user if they would like the run resumed or aborted (Figure 6-8). Choose resume by highlighting “Resume” and pressing the “ENT” key. The sampler will then resume the run. During the run stoppage the timer will continue to countdown even though the sampler will not be sampling (i.e. If the run is paused at 09:00 with 15 hrs of sampling left, and started again at 09:05 the timer will have 14 hrs 55 min left until run completion).



Figure 6-8. Timer Menu Used to Resume a Run

6.2 Sample Recovery and Data Download

6.2.1 Scope and Applicability

This SOP describes the steps to perform a sample recovery and download data from the TSP sampler. The Tisch TE-5170 VFC+ sampler uses an SD card and there is no software required to download to the FS laptop. The data is dumped into an Excel file for both samplers. The following information is

applicable to only the Tisch TE-5170 VFC+ TSP sampler. Specific information herein may not be applicable to other makes and models of samplers.

Before collecting the PE sample, the sampler must have successfully passed the leak, temperature, barometric pressure, flow rate, and time verification checks.

6.2.2 Summary of Method

After completion of 24-hour sample run, the FS returns to the site generally within 24 hours for “best practice,” documents sample run information, recovers the sample, and downloads the detailed sample run information to an electronic recording device. Collection within 48 hours is permissible due to holidays and weekends when a site is inaccessible. Following the sample recovery, the FS will contact the SLT operator to determine if the SLT sampler operated correctly and collected a sample. If an SLT sample was not collected, a make-up Pb-PEP audit will be scheduled and completed.

If either the SLT or Pb-PEP fails to collect a valid sample, there will be no data pair for comparison. If there is no data pair the Regional completeness numbers will show a Pb-PEP implementation of less than 100% for the audited PQAO.

6.2.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

6.2.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

6.2.5 Cautions

- Use care when handling unexposed and exposed glass fiber filters
- Strictly follow all procedures about labeling, documenting, and transporting filters (in their cassettes) to reduce the chance for measurement errors
- Ensure that the portable computer or other data storage device used for downloading data is in good condition and that the battery is sufficiently charged.
- Confirm your laptop computer has the current software for the sampler installed and working properly. Verify the complete downloading process is operational.

6.2.6 Equipment and Supplies

- Tisch TE-5170 VFC+ TSP sampler
- COC/FDS Form
- Laptop computer
- Portable data storage media (SD card)
- SD card reader
- FS Field Notebook.

6.2.7 Procedure for the Tisch TE-5170 VFC+ TSP Sampler

6.2.7.1 Downloading Data Using an SD Card

1. Data is downloaded from the Tisch TE-5170 using a SD card. A card should be provided by the vendor, but any SD card will work.
2. From the Main Menu screen (Figure 6-9), press the “F2” key to enter the Data Menu Screen (Figure 6-10). Press the DOWN key and highlight “SAVE”, pressing the “ENT” key here will initiate all records to save to the SD card. A progress screen will show what records are being saved and how far along the process is (Figure 6-11). All electronic records will be copied since the last time the FS erased the data.
3. Once the data has finished downloading, the SD card can be removed. The FS can erase the run data on the sampler’s memory at this point, though it is recommended that the data on the SD card is checked before anything is erased. It is good practice to wait until the trip is over and the sampler is back at the field office before any data is erased.
4. Two files should be saved to the SD card following download. The first will be called REPORT.csv, this file contains the start time, run duration, conditions, set flow, avg flow, cv, total volume, avg temp, avg pressure, and any sampler flags for each run. The second file, DATA.csv, will contain data taken at 5 minute intervals for as long as the sampler had power supplied to it. Both .csv files will have the dates listed for each piece of information, making locating run information easier.
5. After the electronic raw data file is saved to the SD card, it should be saved to the FS’s computer as an Excel file. The file should be renamed to include the Sample Start Date and Filter ID number using the following convention “YYYY_MM_DD_FilterID_T.xls” (e.g., “2009_11_25_1234567_T.xls”). The “T” is to represent the Tisch sampler. Any extra data that is not pertinent to the sample run conducted for the audit, does not need to be included in the excel file.

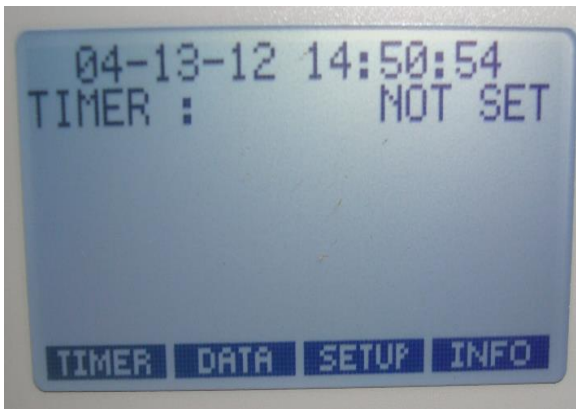


Figure 6-9. Main Menu Screen



Figure 6-10. Data Menu Screen

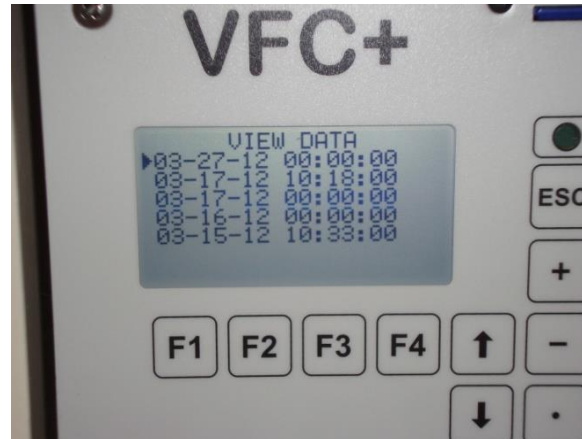


Figure 6-11. Data Saving to SD Card

The SD card used to copy the data from the sampler should remain with the sampler. The raw data files will be uploaded to the AIRQA Web site. A copy of the files should also be archived at the field office.

6.2.7.2 Ending a Run

The FS will retrieve the glass fiber filter after the exposure has terminated, typically the next day. Collection within 48 hours is permissible (except when passive blanks are generated) due to holidays and weekends when a site is inaccessible. The following steps describe shutdown procedures for the sampler:

1. A properly programmed Tisch TE-5170 VFC+ TSP sampler will automatically stop sampling at the end of 24 hours. Ensure that the sampler pump has stopped running. Once the run is completed the Main Menu screen will be displayed, but no indications of the success of the run will be shown.
2. From the Main Menu screen, select “F2” for the Data Menu. Use the DOWN arrow to select “Past Records”, and press the “ENT” key. A list of all previous runs will be displayed (Figure 6-12), use the DOWN arrow to select the date/time of the audit run and press the “ENT” key.
3. Record all fields in the FDS/COC form Section IV for: Flow (Q_{amb}), CV, Volume, Elapsed Time, Start Date/Time, Stop Date/Time, Temperature, and Barometric Pressure – including all necessary units. Details for each field will be located on different screens which can be reached by pressing the UP/DOWN arrows after the sampling date has been selected.

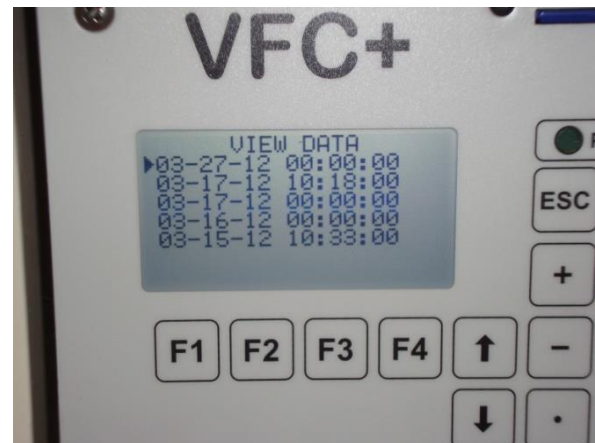


Figure 6-12. Display of Sampling Events by Date

Pb samples should be collected and data recorded under ambient conditions. Thus, the FS should enter data for flow rate and volume for ambient conditions (Q_{amb}) not standard conditions. The FS does not need to enter the values for T_{cjc} and P_{diff} (maximum, minimum, and average). Both of these measurements are used by the program in the VFC+ Controller to calculate the flow rate.

4. Enter information in the Filter Quality field in Section IV as well as any Field Flags in the space provided, or in the Comments section. This starts the process of determining if the sample is valid, questionable, or invalid. Record any observations and reasons for questioning a run on the COC/FDS form.
5. Place the original (white copy) COC/FDS form in 9" x 12" self-sealed plastic shipping bag. The second copy (yellow) will be maintained by the FS at their field office.
6. If the exposure was not valid for any reason, the FS will contact the WAM/TOPO/DOPO to begin scheduling a second PE audit to replace the invalid evaluation. In either case, the WAM/TOPO/DOPO should be notified of schedule changes. This may require scheduling considerations that are beyond the scope of this SOP.
7. Release the latch on the roof assembly and slowly open the roof. Be careful that no loose debris lands on the filter when opening the roof assembly. Place the roof security quick release pin in the rear latch to hold the roof open.
8. Place the protective cover on the Hi-Vol filter cassette and remove it from the filter holder assembly by loosening the large black thumb nuts.
9. The routine sample must be returned back to the field office or an indoor enclosure for disassembly. While wearing nylon or vinyl gloves carefully remove the exposed filter from the Hi-Vol filter cassette and fold the filter in half (length wise). The Filter Number should be visible on the outside after folding. Place the folded filter in a glassine envelope and place in a manila envelope. On the outside of the manila envelope, record the Filter Number of the filter used.
10. Gather and place the manila envelopes containing the routine sample, collocated sample (if conducted), and any blanks conducted at the field site with the original (white copy) COC/FDS forms in a safe place such as the commercial shipping envelope to be used to send to the EPA Region 9 Laboratory.
11. Check the sample holder area including the mesh screen of the sample holder support for any loose debris. Clean if necessary.
12. Place the transport filter on mesh screen and cover with the sample holder. Tighten the four thumb nuts.
13. See Section 6.3 for packing and shipping instructions and Section 6.4 for instructions on how to disassemble the sampler.

6.3 Filter Packing and Shipment

6.3.1 Scope and Applicability

This SOP describes how to package the sampled filters into shipping containers and transport them to the EPA Region 9 Laboratory.

6.3.2 Summary of Method

Ideally, the glass fiber filters should be removed from the sampler within 24 hours of the end of the collection period and shipped to the laboratory within 96 hours of the sample event. Shorter recovery periods are desirable when passive blanks are generated in the event. The sampled filters will be packed in shipping envelopes and the COC/FDS forms will be packed in plastic bags and placed in a shipping container and sent to the EPA Region 9 Laboratory using the EPA contract carrier.

6.3.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

6.3.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

6.3.5 Cautions

- Use care when handling unexposed and exposed glass fiber filters
- Always wear nylon or vinyl gloves when handling the filters
- Strictly follow all procedures about labeling, documentation, and transporting filters (in their cassettes) to reduce the chance for measurement errors.

6.3.6 Equipment and Supplies

- Glassine envelopes for sampled glass fiber filters
- COC/FDS form
- Hi-Vol filter cassettes
- 10 3/8" x 4 1/2" glassine envelopes #11 for containing exposed filter
- 5" x 11.5" manila envelope (#14 Kraft) for storing exposed filter and glassine envelope (one sample per envelope)
- 9.5" x 12.5" manila envelope (#90 Kraft) for grouping filters for a particular site
- Shipping box for shipment of filter and COC/FDS form to the EPA Region 9 Laboratory
- Knife or scissors
- 9" x 12" plastic self-sealing shipping bags for trip blanks, COC/FDS forms and electronic storage media
- Portable data storage media (e.g., CD or USB flash drive)
- Shipping tape

- Shipping label using the EPA contract carrier

6.3.7 Procedure

This section of the SOP describes the method of packing and shipping the sampled filters, COC/FDS forms, and electronic media. The routine, collocated, and blank samples will return to the field office in their labeled Hi-Vol filter cassettes. The trip blank will remain in its 9" x 12" self-sealed plastic shipping bag throughout the trip. Exposed (sampled) filters will be folded lengthwise and placed in individual glassine envelopes and then placed in individually labeled manila envelopes. Manila envelopes with the individual filters will be grouped by site and placed within a larger manila envelope. All COC/FDS forms for the lab will be placed in a plastic bag separate from the filters. The large manila envelopes and plastic bag (COC/FDS forms and electronic media) will be grouped together and placed in a shipping box or envelope and shipped to the EPA Region 9 Laboratory. The sampled filters do not need to be shipped cold. The FS will maintain a copy of the COC/FDS forms and electronic data downloaded from the sampler. The electronic data will be submitted to EPA's database contractor via the AIRQA Web site. The data should only be stored temporarily on portable storage devices; it should later be transferred to a secure permanent archive at the field office.

The steps below should be conducted from the field office where possible, or other clean, lead-free indoor environment otherwise:

1. Ensure the folding surface is clean prior to packing each filter to avoid cross-contamination.
2. Fold each filter lengthwise exposing the Filter Number, place the folded filter in a glassine envelope and fold the glassine envelope to fit inside a manila envelope. Place the glassine envelope inside a manila envelope labeled with the Filter Number.
3. Group all of the manila envelopes (labeled with Filter Numbers) by site. Ensure that there is a one-to-one match of COC/FDS forms to the sampled filters. Place all filters for a single site within a larger manila envelope (labeled with the Site Name). Do not place the trip blank inside a large manila (site) envelope. Place all the large manila envelopes and trip blank envelope within a shipping box.
4. Select a pre-printed express courier label. Record the courier's tracking number, shipment date, affiliation, shipping destination, and shipping company name in the proper location in Part V of the COC/FDS form.
5. Check the COC/FDS forms for completeness.
6. Submit the original COC/FDS forms to the analytical laboratory, but maintain a copy for the field office records. Place the laboratory copies of the COC/FDS forms for all the samples in a 9" x 12" plastic shipping bag. Place this plastic shipping bag with the sampled filters in the shipping box.
7. Seal the shipping box with packing tape. If instructed by the Regional WAM/TOPO/DOPO, apply a custody seal to indicate if the package has been tampered with.
8. Affix a pre-printed express courier shipping label to the shipping box and transport the box to the nearest express courier shipping office. The FS should ship the exposed filters within 96 hours of the sampling event.

Note: Hand-written labels are strongly discouraged and often rejected by the courier service. Please use pre-printed shipping labels.

9. E-mail the EPA Region 9 Laboratory to report a sample shipment on the day of the shipment. The communication should include your name, the date, the courier's tracking number, and the number of filters in the shipment.

6.4 Sampler Disassembly

6.4.1 Scope and Applicability

This SOP describes the procedure for sampler disassembly, which occurs after sample exposure and data collection have been completed. This SOP contains materials specific for the Tisch TE-5170 VFC+ TSP samplers and may not be applicable to other sampler makes and models.

6.4.2 Summary of Method

The method for disassembly is essentially the reverse of assembly. As with assembly, it is important to follow proper procedures to avoid damage to and minimize wear and tear on the sampler.

6.4.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

6.4.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

6.4.5 Cautions

- Check and clean area around the sample holder and top mounting screen of the motor assembly inside the opening to the top of the main unit. When folding the glass fiber filter and placing in the glassine envelope be aware of pieces of filter that may fall in the sample holder area.
- When the sampler is dismantled, be sure to remove any debris that adheres to the stand legs before storing them for transport. To minimize contamination, always pack the legs of the sampler apart from the sampler's main unit.

6.4.6 Procedure

If the TSP sampler is being disassembled for transport to a new site, follow these steps after the sample has been removed:

1. Power the unit down and disconnect the electricity.

2. If necessary, release the latch on the roof assembly and verify a transport filter is covering the sample holder support (mesh screen). Secure the sample holder using the four thumb nuts and close the roof assembly.
3. Remove the roof assembly from the main unit and place it in its proper travel case.
4. Remove the VFC from the sampler's main unit and place it in the proper travel case. Be careful not to lose the black rubber washer and maintain the washer with the VFC.
5. Disconnect the main unit from the leg base plate and carefully place it in its proper travel case. **Do not sit the main unit on the ground.**
6. Place the leg base in the proper travel case.
7. Check the sampling site to ensure no equipment and supplies are left at the site.
8. Follow up the audit with a phone call to the site operator to ensure the SLT collected a valid sample. If the SLT sampler failed to run, contact the Regional Pb-PEP lead to reschedule.

6.5 Sampler Maintenance and Cleaning

6.5.1 Scope and Applicability

This SOP describes the routine procedures for maintaining and cleaning the TSP samplers. This SOP contains material that is specific for the Tisch TE-5170 VFC+ TSP samplers and may not be applicable to other sampler makes and models.

6.5.2 Summary of Method

The Pb-PEP TSP samplers will be regularly checked and cleaned to ensure reliable operation and avoid contamination, which could affect the quality of resultant data. Some activities should ideally be performed in the field in concert with disassembly (e.g., cleaning debris from the area around the sample holder and off the legs of the sampling device).

6.5.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

6.5.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

6.5.5 Cautions

- The FS must properly install and maintain the sampler to prevent damage and contamination. Be particularly attentive to maintenance of the pump, ensuring the soundness of electrical and pneumatic connections that will be repeatedly assembled and disassembled.

- Periodically check the gaskets on the sample holder and the adapter plates. Clean their surfaces as required because this will make assembly easier and will maintain leak-free seals. Replace gaskets that are split, brittle, or cracked. Use only gaskets that are specified for this equipment.

6.5.6 Equipment and Supplies

- Low-lint wipes
- Isopropyl alcohol
- Marking pencil
- Soft brush (interior cleaning)
- Plastic bristle baby bottle cleaning brush
- Distilled water (general use found at pharmacies and grocery stores)
- Silicone vacuum grease.

6.5.7 Procedure

Several of the sampler components will need to be maintained and cleaned periodically. Table 6-1 indicates the maintenance schedule of the important sampler components. The FS may also use the checklist at the end of this section entitled Quarterly Maintenance and Repair.

Table 6-1. Preventative Maintenance of Field Equipment

Frequency	Maintenance item
Every visit (prior to sampling)	1. Inspect and clean the filter compartment area of dust and debris. 2. Inspect the gaskets around the filter compartment area and Hi-Vol filter cassettes
Quarterly (every 3 months)	1. Check the seals around the motor housing and main unit for splits or tears, replace if necessary.

Section 6.5: Sampler Maintenance and Cleaning

Field Data Forms

Section 6.5: Sampler Maintenance and Cleaning

Field Data Forms

Quarterly Maintenance and Repair

Check	Monitor Number: _____ Date: _____ FS: _____
Comments/Notes:	

Section 7

Chain-of-Custody Form and Field Data Sheet

7.1 Chain-of-Custody and Field Data Sheet (COC/FDS) Form

7.1.1 Scope and Applicability

This SOP applies to the COC/FDS form procedures used in the field for the Pb-PEP TSP audit. This form has been developed for use with the Tisch TE-5170 VFC+ samplers for Hi-Vol collection. If an alternate approved sampler type is used for Pb-PEP audits, the FS should clearly indicate the sampler type at the top of each form.

7.1.2 Summary of Method

The COC/FDS procedure for the Pb-PEP is used to record information about sampler verifications and exposure data and to track the path of individual filters from the field to the Pb-PEP Laboratory (EPA Region 9). The COC/FDS form begins when the FS assigns the type of sampler used and a glass fiber (Hi-Vol) filter to an activity (routine, collocated, or blank samples) at a field site. This form stays with the filter when it is sent to the field for sampling and a signed copy is submitted with the filter to the Pb-PEP Laboratory. As soon as convenient, the FS should enter the COC/FDS data into the web-enabled version of the form on OAQPS's data management website for Pb-PEP. The FS should also upload the associated raw sampler data files to the website.

7.1.3 Definitions

Appendix A contains a glossary of the terms used in the Pb-PEP.

7.1.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

7.1.5 Caution

1. Document mistakes by marking a single horizontal line through the error, writing correct information in the available space, and initialing and dating the correction.

7.1.6 Equipment and Supplies

- Pb-PEP COC/FDS form
- Ball-point ink pen

7.1.7 Procedure

7.1.7.1 Chain-of-Custody and Field Data Sheet Form

The Pb-PEP COC/FDS form is printed from the AIRQA Web site. The form itself is divided into six parts, which are completed at different locations, as described below. Parts I through V are completed by the FS and Part VI is completed by the Region 9 Laboratory located in Richmond, CA. The steps discussed below instruct the FS in completing the COC/FDS form when using a Hi-Vol filter in the Tisch TE-5170 VFC+ samplers.

Prior to the FS completing the COC/FDS form, the FS must determine the sampler make to be used for the audit and select that sampler make at the top of the COC/FDS form.

PART I—Filter Preparation at PEP Field Office

Part I of the COC/FDS Form is completed by the FS at the PEP Field Office prior to leaving for the field site. This portion of the form consists of four entries (Prepared Date, Prepared by, Filter Lot Number, and Filter Number). The Prepared Date is the date the FS assigns a particular filter to a Pb-PEP audit and the Prepared by is the name of the FS. The Filter Lot Number may be found on the outside of the filter box provided by the EPA. The Filter Numbers are pre-printed by the vendor on each of the 8" x 10" glass fiber filters. The FS should record the Filter Number of the filter on the COC/FDS form. The FS should use recommended filter handling procedure discussed in ***Section 3. Filter Receipt, Storage, and Handling*** when handling filters.

PART II—Sampling Event Information

Part II is completed by the FS at the field site prior to conducting the Pb-PEP audit. The Sample Event Information consists of the following:

- **AQS Site ID**—This is the nine-digit identification code for the air monitoring site as used by EPA's Air Quality System. Any leading zeros in the ID must be included. If the Parameter Occurrence Code (POC) for the audited sampler is available, record it in the Notes section.
- **Site Name**—This is the name of the sampling location and any relevant description for identification purposes.
- **Primary SLT Sampler Make/Model/Serial Number**—This refers to the manufacturer (make), model, and serial number of the fixed SLT sampler operated at the site.
- **Site Operator**—This is the name of the SLT's site operator.
- **Other Operators or Observers**—This lists the name and affiliations of any assisting operators or other official observers, such as representatives of EPA or the local air monitoring authority.
- **Setup and Sampler Verification Date**—This is the date when the PEP audit sampler is placed at the site and flow rate, temperature, and barometric pressure are verified. This is not necessarily the date when the sample was taken.
- **PEP Field Scientist**—This is the name of the Pb-PEP FS who is conducting the PE audit.
- **PEP Sampler Make/Model/Serial Number**—This refers to the manufacturer (make), model, and serial number of the Pb-PEP auditor's TSP sampler.

- **Site GPS Latitude and Longitude**—This refers to the site’s GPS location (latitude and longitude) and is recorded to five decimal places.

PART III—TSP Verification Checks

Part III is completed at the sampling location to verify the TSP sampler is operational and within acceptance criteria for time, temperature, barometric pressure, flow leak check and flow rate. This section also provides a place for the FS to document any siting criteria issues or problems. The temperature, barometric pressure, and flow rate parameters must be verified using a NIST-traceable standard(s) designed for TSP samplers (see **Section 5, *Sampler Setup and Performance Verifications***). The measuring units for temperature and barometric pressure for each sampler are measured in °C and mm Hg. For the flow rate, the unit for the Tisch TE-5170 VFC+ sampler is ft³/min. The COC/FDS form provides the FS the option to record the sampler’s flow rate in either m³/min or ft³/min. The current BGI hivolCal units measure temperature, barometric pressure, and flow rate in °C, mm Hg, and m³/min. If the standard used by the FS does not measure in m³/min, the FS must apply conversion factors and record the parameter values in the correct measuring units for the reference standard. The acceptance criteria for each of these parameters are identified on the COC/FDS form. Check the appropriate box for verification checks (all boxes should be checked “yes”). The leak check box should be checked “No” which means there was no leak. If the sampler’s parameters are outside the acceptance criteria, troubleshooting of the sampler must be performed and documented. If troubleshooting is unsuccessful, the sampler must be recalibrated or repaired before conducting a sampling event. The FS must use the backup TSP sampler to conduct the audit.

The web-enabled COC/FDS form also includes a section for post-sampling verification checks. During initial implementation of the program, these additional checks are recommended to ensure that the audit sampler continues to perform as expected at the end of the sampling event. These additional checks may be recorded in the “Notes” section of the COC/FDS form.

PART IV—Sampling Event Filter and Exposure Data

Part IV is completed by the FS at the field site prior to conducting the Pb-PEP TSP audit. The Sample Event Filter and Exposure Data Information consist of the following:

- **Sampling Type**—This identifies how the filter is used at the site. The seven options are as the following:
 - **RO—Routine**—The TSP filter PE sample that is collected by the FS at the same time and at the same site as the primary SLT TSP sampler.
 - **CO—Collocated PEP**—The TSP PE filter sample that is collected by the FS at the same time and the same location as one or more samplers that are part of regional “parking lot” collocation study, or specially-arranged event at a SLT monitoring site directed by the WAM/TOPO/DOPO.
 - **Other**—A TSP filter that is in some other category (e.g., a special type of QA or QC sample). The FS should always provide additional information about type of sample in the “Notes” section.
 - **FLB—Filter Lot Blank**—A TSP filter from a newly received box sent by EPA OAQPS to the EPA Regional field office (see **Section 3. *Filter Receipt, Storage, and Handling***). This filter will be processed in the field office and will not be taken to the field site.

- **FB–Field Blank**—A TSP filter is transported to the sampling site in the same manner as the RO filter(s), installed in the sampler prior to a sampling event, removed from the sampler without sampling, stored in their protective containers inside the sampler’s case at the sampling site until the corresponding exposed filter(s) is (are) retrieved (see **Section 3. Filter Receipt, Storage, and Handling**).
- **TB–Trip Blank**—A TSP filter that is transported to and from the field by the FS (see **Section 3. Filter Receipt, Storage, and Handling**). The 9" x 12" antistatic bag remains unopened throughout the trip.
- **PB–Passive Field Blank**—A TSP filter that is placed on the sample holder to evaluate the level of contamination (lead) that might be introduced to a filter sample prior to a sampling event. The FS will place a glass fiber filter in the sample holder using the same procedure as a routine sample. The motor will not be engaged. The TSP sampler will be closed and the filter will passively sample air for a specified period of time (see **Section 3. Filter Receipt, Storage, and Handling**).

If the FS considers the filter to be invalid for any reason, the “**Void**” box should be checked. Describe the reason for voiding a filter in the space provided, or in the “**Notes**” section if additional space is required. Some possible reasons for voiding a filter include visible contamination on the filter, sampler malfunction, or a discrepancy in the COC/FDS documentation.

- **Pre-sampling Filter Check:** Visual inspection of the filter prior to the leak check is described in **Section 6. Filter Exposure and Concluding the Sampling Event**. If the filter passes visual inspection, then the FS should place a checkmark in the “OK” box. If any defects were noted, the FS should place a checkmark in the “Reject” box and describe the imperfection in the space provided. If additional space is required, use the “Notes” section at the bottom of the form.
- **Sample Date**—The date when the sampling event began or was scheduled to begin.

At the conclusion of the sampling event, the Exposure Data Information consists of the following:

- **Retrieval Date and Time**—This is the date and time when the exposed TSP filter was retrieved from the sampler.
- **Elapsed Time**—Report the elapsed time of the sampling event in hours (24 hours ± 1 hour) from the sampler’s display screen.
- **Post Sampling Filter Check** —Use the same criteria and directions as stated for the “Pre-sampling Filter Check”.
- **Total Volume**—Record the total volume sampled in cubic feet (Tisch TE-5170 VFC+) from the sampler’s display screen.
- **Start Date/Time**—Record the start date and time from the sampler’s display screen.
- **Stop Date/Time**—Record the stop date and time from the sampler’s display screen.
- **Flow Rate**—Record the maximum, minimum, and average flow rates during the sampling event from the sampler’s display screen. Record the flow rate in ft³/min for the Tisch TE-5170 VFC+.
- **%CV**—Record the %CV from the display screen for the Tisch TE-5170 VFC+.
- **Temperature**—Record the maximum, minimum, and average temperature readings during the sampling event from the sampler’s display screen.

- **Barometric Pressure**—Record the maximum, minimum, and average barometric pressure readings during the sampling event from the sampler’s display screen.
- **Field Flags**—Record any field flags that may have occurred during the sampling event. Refer to Appendix B for a list and description of other field qualifiers that should be recorded in the “**Field Flags**” section as relevant. Add “EST” flag in “**Notes**” if the runtime is outside of the 1,380–1,500 minute range.

The “**Notes**” section is available for the FS to record all relevant notes. Use extra pages if necessary. The FS should keep a copy of any additional pages attached to the FDS.

PART V—Field Filter Shipping Information

Part V should be completely filled out. The FS should normally package and ship the exposed TSP filter and any accompanying field or trip blank filter within 96 hours of the end of the sampling period. This section is used to record shipping information.

- **Shipment Date**—This is the scheduled shipment date for the package.
- **Affiliation of Shipper**—This refers to the affiliation of the FS.
- **Shipped by (Signature)**—This is the signature of the FS unless shipping is delegated to another person.
- **Shipping Destination**—For the Pb-PEP, this is the Pb-PEP Laboratory in Region 9.
- **Shipped via**—Indicate the shipment method using the current OAQPS contract carrier for shipments.
- **Tracking No.**—Fill in the tracking number for the scheduled shipment.

After Part V has been completed, the FS will make a copy of the COC/FDS Form for the field office records. The original form is submitted to the laboratory with the filter(s) and any additional written notes as the official COC. Upon returning to their field offices (or whenever internet access is available), the FS will electronically enter the data from the COC/FDS forms to the AIRQA Web site for the Pb-PEP. The sampler download data files will also be submitted by the FS to EPA’s data processing website for the Pb-PEP. (See **SOP 6** for instructions on obtaining the sampler download data.)

PART VI—National Pb-PEP Laboratory Receiving Information

The final part of the COC/FDS Form primarily documents the condition of the container upon receipt at the Pb-PEP Laboratory (EPA Region 9), but also includes the “Notes” section. The “Notes” section is available for the FS and LA to record any relevant notes. If additional space is necessary, extra pages should be attached.

When the COC/FDS forms are received at the Pb-PEP Laboratory, each form should be date stamped and signed; any relevant information regarding the sampling event should be recorded in the laboratory’s information management system (LIMS). The Pb-PEP Laboratory will scan the COC/FDS forms into PDF format and submit them to the AIRQA Web site for QC purposes and data archiving.

Section 7.1: Field Data Sheet and Chain-of-Custody Form

Field Data Forms

COC/FDS Pb-PEP Field Data Sheet and Chain-of-Custody Form

Pb-PEP Chain-of-Custody and Field Data Sheet for EPA or Independent Audits

Hi-Q HVP-4300AFC (Hi-Vol)
 Tisch TE-5170 VFC+ (Hi-Vol)
 BGI PQ200 (Lo-Vol)

PART I - FILTER PREPARATION AT PEP FIELD OFFICE

Prepared Date Prepared By

Filter Lot Number Filter Number

PART II - SAMPLING EVENT INFORMATION

AQS Site ID Setup and Sampler Verification Date

Site Name PEP Field Scientist

Primary SLT Sampler Make/Model PEP Sampler Make/Model BGI PQ200

Primary SLT Sampler Serial No. PEP Sampler Serial No.

Site Operator GPS Latitude (ex. 38.889722)

Other Operators Or Observers GPS Longitude (ex. -77.008889)

PART III - TSP VERIFICATION CHECKS

Standard Make/Model 1 Serial No. 1 Last Certification Date 1

Standard Make/Model 2 Serial No. 2 Last Certification Date 2

Standard Make/Model 3 Serial No. 3 Last Certification Date 3

PRE-SAMPLING VERIFICATION CHECKS

Time Checks OK? Yes No If no, please describe

Monitoring Site Criteria OK? Yes No If no, please describe

Parameter	Criteria	Reference Standard	Sampler	Verification OK?
Ambient Temperature	± 2° C	<input type="text"/> ° C	<input type="text"/> ° C	<input type="radio"/> Yes <input type="radio"/> No
Barometric Pressure	± 10 mm Hg	<input type="text"/> mm Hg	<input type="text"/> mm Hg	<input type="radio"/> Yes <input type="radio"/> No
Leak Check	5 cm H ₂ O in 2 min	<input type="radio"/> No <input type="radio"/> Yes	If yes, please describe <input type="text"/>	
Flow Rate	16.0 ≤ Q ≤ 17.4 L/min	<input type="text"/> L/min	<input type="text"/> L/min	<input type="radio"/> Yes <input type="radio"/> No
Target Flow Rate	16.0 ≤ Q ≤ 17.4 L/min	<input type="text"/> L/min	16.7 L/min	<input type="radio"/> Yes <input type="radio"/> No

POST-SAMPLING VERIFICATION CHECKS

Parameter	Criteria	Reference Standard	Sampler	Verification OK?
Ambient Temperature	± 2° C	<input type="text"/> ° C	<input type="text"/> ° C	<input type="radio"/> Yes <input type="radio"/> No
Barometric Pressure	± 10 mm Hg	<input type="text"/> mm Hg	<input type="text"/> mm Hg	<input type="radio"/> Yes <input type="radio"/> No
Flow Rate	16.0 ≤ Q ≤ 17.4 L/min	<input type="text"/> L/min	<input type="text"/> L/min	<input type="radio"/> Yes <input type="radio"/> No
Target Flow Rate	16.0 ≤ Q ≤ 17.4 L/min	<input type="text"/> L/min	16.7 L/min	<input type="radio"/> Yes <input type="radio"/> No

PART IV - SAMPLING EVENT FILTER AND EXPOSURE DATA

Filter Number

Sample Type RO - Routine If other, please describe

Is Sample Void? Yes No If yes, please explain

Pre-sampling Filter Check OK? Yes No If no, please describe

Sample Date Retrieval Date

Elapsed Time (ET) (hr) Total Volume (m³)

Start Date/Time Stop Date/Time

%CV

Flow Rate (L/min) Max: Min: Avg:

Temperature (° C) Max: Min: Avg:

COC/FDS Pb-PEP Field Data Sheet and Chain-of-Custody Form (*continued*)

Barometric Pressure (mm Hg) Max: Min: Avg:

Field Flags

Post-sampling Filter Check (OK?) Yes No If no, please describe

Data Download OK? Yes No If no, please describe

PART V - FIELD FILTER SHIPPING INFORMATION

Filter Number

Shipment Date Shipping Destination

Affiliation Of Shipper Shipping Company (if other, please explain)

Shipped By Tracking No.

Relinquished By (signature) _____

PART VI - NATIONAL PB-PEP LABORATORY RECEIVING INFORMATION

Filter Number

Date Received Received By

Integrity Flag Shipment Integrity OK? Yes No

VALIDATION

Choose Fields to Display Select Export Format:

Drag a column header here to group by that column

Parameter	Criteria	Value	Pass/Fail	QC Level
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

No data to display

VALIDATION NOTES

Section 8 Quality Assurance/Quality Control

8.1 Quality Assurance/Quality Control

8.1.1 Scope and Applicability

This SOP describes the QA and QC procedures that will be implemented at prescribed frequencies during routine Pb-PEP activities.

8.1.2 Summary of Method

This SOP summarizes the important QA and QC procedures that must be accomplished as part of the Pb-PEP and provides procedures for those activities that have not been reviewed in other sections. QA and QC procedures documented in the other Pb-PEP Field SOP sections are not discussed in this section. Table 8-1 summarizes the Pb-PEP field QC checks.

Table 8-1. Field Quality Control Checks

Requirement	Frequency	Acceptance Criteria	SOP Reference
<i>Filter Holding Time</i>			
Filter exposure	All filters	24 hours	Section 2
Filter collection	All filters	≤24 hours from end of sampling period ^a	Section 2
Filter shipment to laboratory	All filters	≤96 hours from end of sampling period	Section 2
Laboratory analysis	All filters	≤30 days from delivery of sample to lab	Section 2
<i>Data Completeness</i>			
Data completeness	5 audits for PQAOs with ≤5 sites (1 EPA or independent, 4 SLT site-collocated ^b); 8 audits for PQAOs with >5 sites (2 EPA or independent, 6 SLT site-collocated ^b)	100%	Section 8
<i>Filter</i>			
Visual defect check	All filters	See reference	Section 6
<i>Field QC Checks</i>			
Field filter blank	1 per audit (for the first year of the program); the frequency will be re-evaluated by EPA after year 1	<MDL	Sections 6 and 8
Trip filter blank	1 per audit trip (for the first year of the program); the frequency will be re-evaluated by EPA after year 1	<MDL	Sections 6 and 8

Table 8-1. Field Quality Control Checks (Continued)

Requirement	Frequency	Acceptance Criteria	SOP Reference
Passive field blank	As requested for assessments	As requested for assessments	Sections 6 and 8
<i>Calibration/Verification of Sampler (Using Normal PE Verification Devices) ^c</i>			
Clock/timer verification	Every sampling event	1 min/month	Section 5
External leak check	Every sampling event	No audible (hissing) sound	Section 5
Single-point barometric pressure verification	Every sampling event and following every calibration	± 10 mm Hg	Section 5
Barometric pressure calibration	Upon failure of the single-point verification	± 5 mm Hg	Section 10
Single-point temperature verification	Every sampling event and following every calibration	± 2°C of working standard	Section 5
Temperature calibration	Upon failure of the single-point verification	Adjust to within ± 0.1°C of calibration standard	Section 10
Single-point flow rate verification	Every sampling event	± 4% of working standard and ± 4% of target flow (44 ft ³ /min)	Section 5
Flow rate calibration	Upon failure of the single-point verification	± 2% of calibration standard at target flow (44 ft ³ /min)	Section 10
Post-calibration single-point flow rate verification	Following every calibration	± 2% of target flow (44 ft ³ /min)	Section 10
<i>Accuracy (Using Independent Verification Devices)</i>			
External leak check	4/yr	No audible (hissing sound)	Section 8
Barometric pressure audit	4/yr	± 10 mmHg of calibration standard	Section 8
Temperature audit	4/yr	± 2°C of calibration standard	Section 8
Flow rate audit	4/yr (manual)	± 4% of calibration standard at target flow (44 ft ³ /min)	Section 8
<i>Precision (Using Collocated Samples)</i>			
All samplers (mandatory)	2/yr (semi-annual)	CV ≤10%	Section 8
<i>Standards Recertifications</i>			

Table 8-1. Field Quality Control Checks (Continued)

Requirement	Frequency	Acceptance Criteria	SOP Reference
Field barometer	1/yr	±1 mmHg resolution ±5 mmHg accuracy	Section 8
Field thermometer	1/yr	± 0.1 °C resolution ± 0.5 °C accuracy	Section 8
Flow rate transfer standard	1/yr	± 2% of NIST-traceable standard	Section 8

^a Pb-PEP filters should be recovered within 24 hours after conclusion of exposure for best practice. It would be acceptable to exceed the 24 hours, but do not exceed 72 hours. Document the reason on the FDS/COC form.

^b Filters from SLT collocated sampler are shipped to Pb-PEP Analytical support lab.

8.1.3 Definitions

Appendix A contains a glossary of the terms used in the Pb-PEP.

8.1.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

8.1.5 Cautions

The activities described in the following procedure refer to the SOPs where the activity is described. The referenced SOPs provide the appropriate cautions.

8.1.6 Equipment and Supplies

The activities described in the following procedure refer to the SOPs where the activity is described. The referenced SOPs provide the appropriate equipment and supply lists.

8.1.7 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained. Each Region has information about the expected number of sites that need a PE, and the PEP is expected to obtain valid data for 100% of these sites each year. In determining the total number of audits needed to meet the requirements of the Pb-PEP, the implementing Region or SLT will separate the total by high volume and low volume method. Then total all Pb monitors in each set regardless of method in the PQAQO to determine the number of audits needed for the PQAQO. High volume samplers operating at Ncore sites will be included in the PQAQO network total, but low volume samplers will not be included. Because of the small number of low volume Ncore samplers that exist in the network, each low volume sampler will be audited once per year.

The National Ambient Air Quality Standards for Lead, revised November 12, 2008 (Federal Register, Vol. 73, No. 219), requires the following for Pb-PEP completeness:

- For Primary Quality Assurance Organizations (PQAOs) with less than or equal to five monitoring sites, five valid PE audits must be collected and reported each year (1 Federal PEP audit and 4 SLT collocated audits).
- For PQAOs with greater than five monitoring sites, eight valid PE audits must be collected and reported each year (2 Federal PEP audits and 6 SLT collocated audits).
- Have all FRM or FEM samplers subject to a Pb-PEP audit at least once every 6 years, which equates to approximately 15% of the monitoring sites audited each year.

8.1.8 Field Blanks

Field blanks are randomly-selected filters used to determine contamination by the FS through filter handling during normal set up at the field site. A field blank will be collected for every sampling event. Field blank procedures are described further in **Section 6, *Filter Exposure and Concluding the Sampling Event***.

8.1.9 Trip Blanks

Trip blanks are randomly-selected filters taken to the sampling site to measure possible contamination to filters during transportation to and from sampling locations. They provide a frame of reference in case field blanks exhibit a contamination that is higher than the tolerance levels. Trip blanks should remain inside their protective bags and never be exposed to sampling procedures. However, for the Pb-PEP, trip blanks will be removed from the protective bags during the folding procedure of shipping preparation. This will provide information on possible contamination during transport or in the filter folding area. A trip blank will be collected for every sampling event. Trip blank procedures are described further in **Section 6, *Filter Exposure and Concluding the Sampling Event***.

8.1.10 Passive Field Blanks

A Passive Field Blank may be sampled from the field sites where lead concentrations are suspected to high and/or strong winds may be an influencing factor. The FS will place a glass fiber filter in the sample holder using the same procedure as a routine sample. The motor will not be engaged. The TSP sampler will be closed and the filter will passively collect Pb deposition for a specified amount of time.

The passive field blank collection methodology is a “side-by-side” passive field blank. The FS will set up a passive field blank in a separate sampler housing, identical to that of the Pb-PEP sampler collecting the PEP filter sample; the passive field blank would remain in the field from the time the actual Pb-PEP filter was installed until the filter is retrieved. This will allow the PEP to evaluate the amount of contamination that may have been collected passively during the periods of time before and after the 24-hour sampling event.

Passive field blank procedures are described further in **Section 6, *Filter Exposure and Concluding the Sampling Event***.

8.1.11 Accuracy

Once every 3 months, the FS will perform the following tasks on all Pb-PEP samplers that are in use in his/her jurisdiction:

1. External leak check
2. Temperature audit
3. Pressure audit

4. Flow rate audit.

These audits will be performed using the same procedures as those used for the verification checks (described in **Section 5, *Sampler Setup***). The audits must be accomplished with either 1) an independent standard used for calibration (but not used in field operations) or 2) an independent verification device from another Region or one that is not used in normal operations.

8.1.12 Annual Program Collocation Studies

Collocation studies are implemented to provide an estimate of the precision or repeatability of the portable Pb-PEP samplers and the analytical procedures. The results of the collocation studies are also used to assess the bias or errant behavior of individual samplers. Twice a year, the FS will complete a collocation study. One collocation study is defined as setting up and operating an extra Pb-PEP sampler at a routine monitoring site; repeating the process in a 6 month period until all Pb-PEP samplers have been compared. The Pb samplers will be placed and operated as they would during any Pb-PEP event and the Pb-PEP sample will be sent to the Region 9 lab, and the SLT sample will go to the state or local laboratory. On average, most regions will only have two Pb-PEP audit samplers which means this study will only have to be done once every six months. However, Regions with more than two samplers will run more frequently to meet the collocation requirement.

The data from the two Pb-PEP samplers and the SLT sampler will be compared. If the Pb-PEP samplers differ by more than 10% using **Error! Reference source not found.** below, the FS will troubleshoot the sampler that has the highest percent difference from the SLT sampler. The SLT will be used as a “referee” if there is a difference between the Pb-PEP samplers. This process will be completed twice per year. This study will assess bias among the Pb-PEP sampler fleet. Equation 10 is also described in the Pb-PEP QAPP in Section 14.1.3.1

$$d_i = \frac{Y_i - X_i}{(Y_i + X_i)/2} \times 100$$

Equation 3. Percent difference between Pb-PEP sampler and SLT sampler.

8.1.13 Collocation Coding

Assigning the proper code to collocated samples is important to ensure that the data are correctly imported into the Pb-PEP database. When conducting a regional parking lot collocation, use the convention displayed in Table 8-2 to determine the AQS Site ID. Note that these types of collocations do not have actual AQS Site IDs, and a 9-character code is used. Specify “Collocated” as the filter type on the COC/FDS form for all of the samples collected. Enter “NA” (not applicable) in the SLT sampler make and model and serial number areas in all of the COC/FDS forms. Be sure to record all of the Filter IDs from a single collocation event on one COC/FDS form and attach a diagram of the sampler layout (described in Section 8.1.12).

8.1.14 Standards Recertification

All primary and transfer standards purchased for the Pb-PEP will be certified as NIST-traceable and will have one year expirations. Annually, EPA will request that these standards be returned to EPA for re-certification. EPA will use a contractor to provide the re-certification service and will inform the FS of where and when to send standards for this re-certification.

Table 8-2. Developing the AQS Site ID for a Semi-Annual Collocation

Region	State Where Regional Office Is Located	State Code	Surrogate AQS Site ID
1	Massachusetts (MA)	25	25region1
2	New Jersey (NJ)	34	34region2
3	Maryland (MD)	24	24region3
4	Georgia (GA)	13	13region4
5	Illinois (IL)	17	17region5
6	Texas (TX)	48	48region6
7	Kansas (KS)	20	20region7
8	Colorado (CO)	08	08region8
9	California (CA)	06	06region9
10	Washington (WA)	53	53region0

8.2 Field Data Verification and Validation

8.2.1 Scope and Applicability

This SOP describes the QA procedures that will be implemented to verify and validate field data. Verification refers to the process of examining the result of a given activity to determine the result's conformance with stated requirements. Validation refers to examining a result to determine its conformance to user needs.

8.2.2 Summary of Method

The FS will transcribe their hand-written data from the COC/FDS forms into the Web-based forms available via the AIRQA Web site. This will eliminate the need to verify the interpretation and transcription of handwritten data by another person. The Web-based form will incorporate QA checks for valid data types, lookup tables for applicable data fields, and reasonableness checks for data that should be within certain ranges. The data downloaded from the sampler will be used to verify some of the data entered off of the COC/FDS forms. The FS will be able to edit their own data should corrections be needed.

The Region 9 Pb-PEP Laboratory will be responsible for reviewing and validating only the analytical data. Lab data qualifiers will be submitted to EPA along with the analytical results. EPA's data management contractor will associate the field and analytical data in the Pb-PEP database and produce an automated validation report for the EPA Regional Pb-PEP leads and National Pb-PEP Lead to review and approve before the data is posted to AQS.

Additionally, all Pb-PEP program managers will have the ability to review data under their purview (via the AIRQA Web site) as it is made available within the system.

8.2.3 Definitions

Appendix A contains a glossary of the terms that will be used in the Pb-PEP.

8.2.4 Personnel Qualifications

Personnel who conduct the FRM/FEM PEs must have attended an initial training course, which includes lectures, demonstrations, hands-on practice, a written exam for which a passing score of 90% must be achieved, and a hands-on practical training examination. Annual recertification requirements include a written and hands-on practical training examination. The hands-on practical examination for annual recertification may be replaced, pending the satisfactory completion of the field evaluation of the FS during a TSA.

8.2.5 Procedure

The FS will need his or her copies of the COC/FDS form, as well as an electronic version of the portable sampler data.

1. The FS will log into the Pb-PEP section of the AIRQA Web site.
2. The FS will upload new electronic sampler download data into the AIRQA Web site. The filename for the data file will identify the Filter ID and sample date.
3. The FS will enter the COC/FDS data using the Web-based data entry form.
4. The Pb-PEP database will document the date/time and User ID for all data entered or modified.
5. The FS will conduct a review of the data input for errors.
6. An automated data validation summary will be generated from the Pb-PEP database and made available for the Pb-PEP Regional Lead for review.
7. If the Regional Pb-PEP Lead questions any of the field data, the FS may be asked to review their original records and respond to the inquiry. Scanned copies of the completed COC/FDS forms will be submitted by the Pb-PEP Laboratory to EPA's data management contractor for official record and can be used in the review.
8. The Regional Pb-PEP Lead will determine the status of the audit using the automated validation summary. If all critical criteria pass the checks, the audit will be checked "Approved". Consequently, if a critical criteria fails, the Pb-PEP lead will investigate the failure, and after confirming the failure, leave the "Approved" box UNCHECKED. Operational criteria that have failed the check do not necessarily invalidate the audit. The Pb-PEP Lead should use the weight of evidence approach to approve audits with failed operational criteria.
9. If any changes were made to the record during the approval process, the Pb-PEP Lead will document the changes in the "Validation Notes" section of the Web form.

Section 9 Information Retention

9.1 Information Retention

9.1.1 Scope and Applicability

The Federal Records Act (44 U.S.C. 31) and other statutes require all federal agencies to **create** records that document their activities, **file** records for safe storage and efficient retrieval, and **dispose** of records according to Agency schedules. This SOP defines which records are critical to the project, what information needs to be included in reports, and which data reporting format and document control procedures should be used.

The following information describes the document and records procedures for the Pb-PEP field activities. In EPA’s QAPP regulation and guidance, EPA uses the term “reporting package.” This term is defined herein as all the information required to support the concentration data reported to EPA, which includes all of the required data, as well as any data deemed important by the Pb-PEP. Table 9-1 identifies these documents and records by the Agency File Code (AFC) function and schedule numbers. It would be acceptable to have an overarching file called “Pb-PEP” for the purposes of locally delineating these files from other programs.

Table 9-1. Pb-PEP Reporting Package Information

Agency File Code		Category	Record/Document Types
Function	Number		
301-093	006	Program Management Files	
	006.1	Management and organization	<ul style="list-style-type: none"> • Organizational structure for EPA and how the Regions and ESAT contractors fit into running the Pb-PEP • Organizational structure for the support contractors • Pb-PEP Project Plans, and subsequent revisions • QMP
	006.2	Monitoring site information	<ul style="list-style-type: none"> • Site characterization file (Site Data Sheets) • Site maps • Site pictures • SLT site contact information
	006.3	Field operations and data acquisition (by EPA Regional staff or contractors on behalf of EPA)	<ul style="list-style-type: none"> • QAPPs • SOPs • Field logbooks and communications • Sample handling/COC forms
	006.4	Communications (contractor technical project activity)	<ul style="list-style-type: none"> • Telephone records and e-mails between ESAT contractor and SLT agencies • Telephone records and e-mails between ESAT contractor and the WAM/TOPO/DOPO

Table 9-1. Pb-PEP Reporting Package Information (Continued)

Agency File Code		Category	Record/Document Types
Function	Number		
301-093	006.5	Communications (EPA project activity)	<ul style="list-style-type: none"> • Telephone records and e-mails between EPA Regional or Headquarters staff and SLT agencies and vice versa • Telephone records and e-mails between EPA Regional and other EPA personnel (Headquarters to Regions and vice versa)
	006.6	Equipment and instruments used by contractors in the Pb-PEP (records about charged time to the support of the program would reference AFC 405-202)	<ul style="list-style-type: none"> • Procurement logs • Inventories of capital equipment, operating supplies and consumables • Repair and maintenance (e.g., vendor service records, calibration records) • Retirement or scrapping
405	202	Contract Management Records	
	202.1	Contract administration	<ul style="list-style-type: none"> • Work Assignments, task orders, delivery orders, and Work Plans • Contractor monthly reports • Technical directives from the COR to the contractor • Invoices for consumables • Requisite qualifications of FSs and LAs for Pb-PEP-related, contractor-implemented activities • Training records and certificates of ESAT contractors conducted and issued by the EPA Regional ESAT COR
404-142-01	179	Special Purpose Programs	
	179.1	Data administration and integration	<ul style="list-style-type: none"> • Data management plans and flowcharts • Raw data: any original data (routine and QC data), including data entry forms • Data algorithms • Documentation of Pb-PEP database (national/Regional level) • Pb-PEP data • COC/FDS forms
404-142-01	173	Data Files Consisting of Summarized Information	
	173.1	Data summaries, special reports, and progress reports	<ul style="list-style-type: none"> • Data, summary, and monthly field activity reports • Journal articles, papers, and presentations • Data validation summaries

Table 9-1. Pb-PEP Reporting Package Information (Continued)

Agency File Code		Category	Record/Document Types
Function	Number		
108-025-01-01	237	State and Local Agency Air Monitoring File	
	237.1	QA/QC Reports	<ul style="list-style-type: none"> • 3-year Pb-PEP QA reports • Pb-PEP Data Quality Assessments • QA reports • Response and corrective action reports • Site audits
405	036	Routine Procurement	
	036.1	Acquisition of capital equipment and supplies by EPA (either Headquarters or Regional office)	<ul style="list-style-type: none"> • Needs assessments and reports • Program copies of purchase requests • Requests for bids or proposals • Proposals, bids, or quotations • Bills of lading • Warranties and certificates of performance • Evaluations of proposals, bids, quotations, or trial installations
403-256	122	Supervisors' Personnel Files and Duplicate Official Personnel Folder Documentation	
	122.1	Personnel qualifications, training, and certifications	<ul style="list-style-type: none"> • WAM/TOPO/DOPO training certifications • Certification as a Pb-PEP FS and/or LA • Certification as a Pb-PEP FS trainer and/or LA trainer

9.1.2 Information Included in the Reporting Package

9.1.2.1 Data Reporting Package Format and Document Control

The Pb-PEP has structured its records management system according to EPA's File Plan Guide (see <http://www.epa.gov/records/tools/toolkits/filecode>). A **File Plan** lists the records in your office and describes how they are organized and maintained. A good File Plan is one of the essential components of a recordkeeping system and is key to a successful records management program. It can help you:

- Effectively document activities
- Consistently identify records
- Quickly retrieve records
- Conduct disposition of records no longer needed
- Meet statutory and regulatory requirements.

The Pb-PEP Records Management System uses the AFCs to facilitate the easy retrieval of information during EPA TSAs and reviews. The Pb-PEP Records Management System also follows EPA records schedules, which constitute EPA's official policy on how long to keep Agency records (retention) and what to do with them afterwards (disposition). For more information on EPA records schedules, see

<http://www.epa.gov/records/policy/schedule> (the Web site is searchable by AFC function and schedule numbers).

Table 9-1 lists the documents and records that will be filed according to the statute of limitations referenced in Section 9.1.1. To archive the information as a cohesive unit, all the Pb-PEP information will be filed under the major code “Pb-PEP,” followed by the AFC function and schedule numbers listed in Table 9-1. For example, Pb-PEP Project Plans would be filed under the heading “Pb-PEP/301-093-006.1” and COC forms would be filed under “Pb-PEP/301-093-006.3.”

9.1.2.2 Field Notebooks

The Pb-PEP will issue field notebooks to each FS. Each field notebook will be uniquely numbered and associated with the individual FS and the Pb-PEP. Although data entry forms are associated with all routine environmental data operations, the field notebooks should be used to record additional information about these operations.

9.1.2.3 Sample Receipt

Boxes of filters will be issued to each EPA Region or self-implementing SLT organization on an as needed basis. Upon receipt, the FS will log information about the filter shipment using the Pb-PEP data receiving Website. It is recommended that the FS maintain a copy of the sample receipt information in a field notebook as well.

9.1.2.4 Field Binders

Three-ring field binders will be issued to each FS and will contain the inspection and maintenance forms, the appropriate data forms for routine operations, and the SOPs.

9.1.2.5 Communications

In addition to the Phone Communication Forms (COM-1) and the Monthly Progress Reports (COM-2), significant Pb-PEP e-mail communications should be printed and filed according to the records schedule outlined in Table 9-1.

9.1.2.6 Electronic Data Collection

In addition to paper-based documents (e.g., notebooks, forms, binders), the Pb-PEP also gathers much of its data electronically (e.g., sampler data as shown in Table 9-2). Various printouts are made from these electronic systems, such as the Pb-PEP database and spreadsheets used by the FS and others. Printouts that are determined to be permanent record (e.g., data which leads to significant findings or conclusions) should be filed as a data reporting package to ensure that all Pb-PEP data are properly archived.

9.1.2.7 Hand-Entered Data

Much of the data will be entered by hand onto the forms found at the end of each field SOP section. All information will be entered into hard-copy forms using indelible ink, and any corrections should be made by marking a single line through the incorrect entry, initialing, and dating this correction. The correct information should be entered alongside the incorrect entry if this can be accomplished legibly. If this is not feasible, then the correct information may be provided on a new line. Completed data forms will be filed in the field binders (see Section 9.1.2.4).

Table 9-2. Field Measurements

Information to be Provided	Appendix L Section Reference	Availability				Format	
		Anytime	End of Period	Visual Display	Data Output	Digital Reading	Units
Flow rate, 30-second maximum interval	7.4.5.1	✓	—	✓	*	XX.X	m ³ /min
Flow rate, average for the sample period	7.4.5.2	*	✓	*	✓	XX.X	m ³ /min
Flow rate, CV, for the sample period	7.4.5.2	*	✓	*	✓•	XX.X	%
Flow rate, 5-min average out of specification	7.4.5.2	✓	✓	✓	✓•	On/Off	
Sample volume, total	7.4.5.2	*	✓	✓	✓•	XX.X	m ³
Temperature, ambient, 10-minute interval	7.4.8	✓	—	✓	—	XX.X	°C
Temperature, ambient, minimum, maximum, average for the sample period	7.4.8	*	✓	✓	✓•	XX.X	°C
Barometric pressure, ambient, 10-minute interval	7.4.9	✓	—	✓	—	XXX	mmHg
Barometric pressure, ambient, minimum, maximum, average for the sample period	7.4.9	*	✓	✓	✓•	XXX	mmHg
Date and time	7.4.12	✓	—	✓	—	YY/MM/DD HH:mm	Yr/Mo/ Day Hr min
Sample start and stop time settings	7.4.12	✓	✓	✓	✓	YY/MM/DD HH:mm	Yr/Mo/ Day Hr min
Sample period start time	7.4.12	—	✓	✓	✓•	YYYY/MM M/DD HH:mm	Yr/Mo/ Day Hr min
Elapsed sample time	7.4.13	*	✓	✓	✓•	HH	Hr
Elapsed sample time out of specification	7.4.13	—	✓	✓	✓•	On/Off	
Power interruptions >1 min, start time of first 10 power interruptions	7.4.15.5	*	✓	*	✓	1 HH:mm, 2 HH:mm, etc.	Hr min
User-entered information, such as sampler and site identification	7.4.16	✓	✓	✓	✓•	As entered	

Reference: 40 CFR Part 50 Appendix L, Table L-1.

✓ Provision of this information is required.

— Not applicable.

* Provision of this information is optional. If information related to the entire sample period is provided before the end of the sample period, the value provided should be the value that is calculated for the portion of the sampler period completed up to the time when the information is submitted.

• Indicates that this information is also required to be provided to the AQS database.

9.1.3 Data Retention/Archive

The information listed in Table 9-1 will be retained by the ESAT contractor for 4 calendar years (e.g., all data from calendar year 2012 will be archived through 12/31/2016). Upon reaching the 4-year archival date, the ESAT contractor will inform OAQPS that the material has met the archive limit and will ask for a decision on whether to continue archiving or to dispose of the material.

Section 10 Calibrations

10.1 Barometric Pressure Calibration

10.1.1 Scope and Applicability

This SOP applies to barometric pressure verification/calibration for the Tisch TE-5170 VFC+ TSP sampler. This procedure is not intended to be performed by the FS as part of field operations, but it has been included so experienced operators can use it to correct problems that might have been found when the barometric pressure verification was performed (see **Section 5.3, *Barometric Pressure Verification***) or to satisfy annual calibration requirements. For additional approved FRM audit samplers, refer to the sampler's instruction manual for direction. Where possible, these manuals will be made available to the FS.

10.1.2 Summary of Method

A barometric pressure calibration of the sampler is performed annually or upon failure of a single-point barometric pressure verification. If calibration does not resolve the problem, then troubleshooting will be necessary. The sampler must be calibrated to within 5 mm Hg of a NIST-traceable barometric pressure standard. After the calibration, the barometric pressure is verified with a separate NIST-traceable device to confirm that the ± 10 mm Hg verification tolerance has been achieved. In this method, the internal circuitry of the sampler is adjusted to make the sampler's readout match the reference barometer. The barometric pressure calibration is a single-point calibration. The operator is essentially adjusting the offset of a linear curve programmed into the sampler; therefore, a multipoint calibration is not necessary.

10.1.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

10.1.4 Personnel Qualifications

This procedure is intended for experienced operators and/or metrology laboratory personnel.

10.1.5 Cautions

- This procedure must be completed before conducting a flow calibration. **DO NOT** perform a flow calibration if the barometric pressure and/or temperature are outside of acceptable verification limits. Flow rate is calculated using barometric pressure.
- Protect all types of barometers from mechanical shock and sudden changes in pressure. A barometer subjected to either of these events must be recalibrated by comparing it to a laboratory mercury column barometer or other NIST-traceable pressure standard. The barometer is then adjusted to specifications or an offset correction is established. Minimize the vertical and horizontal temperature gradients across any barometer and avoid direct sunlight, drafts, and vibrations.
- Ensure that lines to barometric pressure board are not crimped or clogged with debris prior to verification or calibration.
- Ensure that the sampler, verification device, and calibration device are equilibrated to ambient conditions before beginning the procedure.

- The calibration device must be different from the routine verification device.

10.1.6 Equipment and Supplies

The following equipment and supplies are required for the barometric pressure verification and calibration procedure:

- 2 NIST-traceable BGI hivolCals or other applicable flow devices having a ± 1 mm Hg resolution and at least a ± 5 mm Hg accuracy
- Pb-PEP Calibration Worksheet for the Tisch TSP samplers.

10.1.7 Procedure

10.1.7.1 Overview

This procedure must be performed annually or after an unacceptable one-point verification check.

CAUTION: This procedure makes permanent calibration changes that can affect the FRM sampler's flow and volume measurements, which, in turn, affect the mass concentration results. Before proceeding, carefully check that the calibration equipment is operating properly and that the transfer standard has been calibrated within the past year.

10.1.7.2 Barometric Pressure Calibration for the Tisch TE-5170 VFC+ TSP Sampler

1. If the calibration is being performed because of an unacceptable verification (see **Section 5.3, Barometric Pressure Verification**), be sure that the two originally observed pressure readings (sampler and verification device) and the difference have been recorded on the Pb-PEP Calibration Worksheet in the "Initial Verification" section before proceeding. The measurements from a verification check should agree to within ± 10 mm Hg. If performing an annual calibration, no beginning verification is required. All readings for barometric pressure are in mmHg.
2. Examine the sampler for any obvious physical damage that could be responsible for the discrepancy, evidence of shipping damage (e.g., bent or loose components), or electrical problems.
3. Power on the Tisch sampler and the NIST-traceable calibration barometer (BGI hivolCal calibrator) and equilibrate to ambient conditions before proceeding. The NIST-traceable calibration barometer is an independent standard that is not used in the field.
4. Complete the initial information regarding the sampler (type and serial number), field scientist (name, date, and location), and standards used for calibration and verification (manufacturer, make, model, serial number, and last certification date) on the Pb-PEP Calibration Worksheet.
5. From the Main Menu screen, select "**F3**" and then the "**ENT**" key to enter the Setup Menu screen. Use the DOWN arrow to highlight "**CALIBRATE**" and press the "**ENT**" key. This will bring you to the Calibrate menu. Record the sampler and NIST-traceable barometer measurements on the Pb-PEP Calibration Worksheet in the "Initial Calibration Comparison" section and compute a difference. The barometric pressure standard's proximity to the sampler's sensor is not relevant in measuring barometric pressure.

6. From the Calibrate Menu, use the DOWN arrow to highlight Pamb and press the “ENT” key. Figure 10-1 will appear on the display screen.
7. To change the barometric pressure set point press “F1” for ADD. A screen will prompt the user to enter the reference value. Type the pressure reading from the NIST-traceable standard using the keypad and press the “ENT” key when completed. The sampler will start taking readings to determine A1 and A0, which it will calculate pressure based on the reading entered. Once completed press “F4” on the pressure calibration screen to exit. A prompt will initiate asking the user if they would like to save the changes. Select “Yes”. Record the sampler and NIST-traceable standard on the Pb-PEP Calibration Worksheet in the “Adjusted Calibration Comparison” in the “Barometric Pressure” and compute a difference.



Figure 10-1. Screen Used to Change Ambient Pressure

8. Verify that the calibration of the sampler’s barometric pressure sensor was satisfactorily performed by exiting the Calibrate menu, by pressing the “ESC” key and entering the “DIAGNOSTICS” screen. View the barometric pressure on the display screen and compare it to the NIST-traceable barometer.
9. Repeat the verification process as described in **Section 5.3, Barometric Pressure Verification** and record measurements and difference on the Pb- PEP Calibration Worksheet in the “Post Verification” section.

10.2 Temperature Calibration

10.2.1 Scope and Applicability

This SOP applies to temperature verification and calibration for the Tisch TE-5170 VFC+ TSP samplers. This procedure is not intended to be performed by the FS as part of field operations, but it has been included so experienced operators can use it to correct problems that might have been found when the temperature verification was performed (see **Section 5.4, Temperature Verification**) or to satisfy annual calibration requirements. For additional approved FRM audit samplers, refer to the sampler’s instruction manual for direction. Where possible, these manuals will be made available to the FS.

10.2.2 Summary of Method

A temperature calibration of the sampler is performed annually or upon failure of a one-point temperature verification check of the sampler’s probe. If calibration does not resolve the problem, then troubleshooting will be necessary. The sampler must be calibrated to within 2 °C of a NIST-traceable thermometer. After the calibration, the temperature is verified with a separate NIST traceable thermometer to confirm that the 2 °C verification tolerance has been achieved. In this method, the internal circuitry of the sampler is adjusted to make the sampler’s readout match the reference thermometer. The temperature calibration is a two-point calibration using an ice/water mixture and ambient temperature.

10.2.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

10.2.4 Personnel Qualifications

This procedure is intended for experienced operators and/or metrology laboratory personnel.

10.2.5 Cautions

- This procedure must be completed before conducting a flow calibration. DO NOT perform a flow calibration if the barometric pressure and/or temperature are outside of acceptable verification limits. Flow rate is calculated using ambient temperature.
- Exercise care if using mercury-in-glass thermometers, which can break easily. Verify that there are no gaps in the mercury column. If a thermometer is broken, avoid contact with mercury and avoid breathing the mercury vapors. Clean up the mercury and dispose of it properly. A NIST-traceable digital thermometer with probe is an alternative measurement method that avoids mercury and is recommended for use.
- Be sure that the temperature reference standard used to verify the instrument's sensors has been calibrated within the past year against a NIST-certified standard.
- Temperature calibration should always be conducted indoors. Direct sunlight will affect temperature measurements.
- Ensure sampler, verification device, and calibration device are equilibrated to ambient conditions before beginning procedure.
- The calibration device must be different from the routine verification device.

10.2.6 Equipment and Supplies

- 2 NIST-traceable BGI deltaCals or other applicable flow devices with attached temperature probe
- Pb-PEP Calibration Worksheet for the Tisch TSP samplers.

10.2.7 Procedure

10.2.7.1 Overview

The temperature calibration procedure is to be used annually or whenever the single-point verification of either the ambient or filter temperature sensor is outside of the 2 °C tolerance, when compared to an NIST-traceable temperature standard.

CAUTION: This procedure makes permanent calibration changes that can affect the FRM sampler's flow and volume measurements, which, in turn, affect the mass concentration results. Before proceeding, carefully check that the calibration equipment is operating properly and that the transfer standard has been calibrated within the past year.

10.2.7.2 Temperature Calibration for the Tisch TE-5170 VFC+ TSP Sampler

The procedure for performing the two-point temperature calibration is as follows:

1. If the calibration is being performed because of an unacceptable verification of the ambient temperature (see **Section 5.4, Temperature Verification**), then record the originally observed readings (sampler and verification device) and difference on the Pb-PEP Calibration Worksheet in the "Initial Verification" of the "Temperature" section before proceeding. The verification

measurements should agree within 2 °C. If performing an annual calibration, no beginning verification is required. All readings for temperature are in °C.

2. Power on the Tisch sampler and the NIST-traceable calibration thermometer (BGI deltaCal calibrator) and equilibrate to ambient conditions before proceeding. The NIST-traceable calibration thermometer is an independent standard that is not used in the field.
3. Complete the initial information regarding the sampler (type and serial number), field scientist (name, date, and location), and standards used for calibration and verification (manufacturer, make, model, serial number, and last certification date) on the Pb-PEP Calibration Worksheet. Be sure to use the proper Calibration Worksheet based on sampler manufacturer.

4. The thermocouple is located between the sampling screen tray and back of the sample unit (Figure 10-2). The wire can be gently tugged in order for the probe to be moved around. Be sure there is enough slack in the thermocouple to allow the tip to be submerged in an ice bath. Place the temperature probe from the NIST-traceable standard and the thermocouple tip within 1 inch of each other.



Figure 10-2. Ambient Temperature Thermocouple

5. From the Main Menu screen, select “F3” (followed by the “ENT” key) to enter the Setup menu screen. Scroll down to, and select “Calibrate”. Record the sampler (Tamb) and NIST-traceable ambient temperature measurements on the Pb-PEP Calibration Worksheet in the “Initial Calibration Comparison” section and compute a difference.

6. Place the temperature probe from the NIST-traceable standard and the tip of the thermocouple in the ice/water mixture and allow to equilibrate.

7. From the Calibrate Menu, use the DOWN arrow to highlight Tamb and press the “ENT” key. Figure 10-3 will appear on the display screen.

8. To change the temperature set point press the “F1” (ADD) key. A screen will prompt the user to enter the reference value. Type the temperature reading in °C from the NIST-traceable standard using the keypad and press the “ENT” key when completed. The sampler will start taking readings to determine A1 and A0, which it will use to calculate temperature based on the reading(s) entered. Do not exit/save the calibration until Steps 8-10 are completed. Record the sampler and NIST-traceable ice/water temperature measurement readings on the



Figure 10-3. Screen Used to Change Ambient Temperature

Pb-PEP Calibration Worksheet in the “Initial Calibration Comparison” section and compute a difference.

9. Remove the thermocouple and NIST-traceable thermometer from the ice/water mixture, wipe dry, and let equilibrate at ambient conditions. The Teflon coating around the BGI deltaCal temperature probe will take some time to equilibrate to ambient temperature. Be sure to follow recommended procedure when temperature change is significant.
10. Place the NIST-traceable thermometer probe within ± 1 inch of the thermocouple tip. Using the keypad, press the “**F1**” (ADD) key. A screen will prompt the user to enter the reference value. Type the temperature reading in °C from the NIST-traceable standard using the keypad and press the “**ENT**” key when completed. The sampler will again start taking readings to determine A1 and A0, which it will use to calculate temperature based on the reading(s) entered. Record the sampler and NIST-traceable ambient temperature measurement readings on the Pb-PEP Calibration Worksheet in the “Initial Calibration Comparison” section and compute a difference.
11. Once completed press the “**F4**” key on the temperature calibration screen to exit. A prompt will initiate asking the user if they would like to save the changes. Select “Yes”. Record the sample and NIST-traceable standard on the Pb-PEP Calibration Worksheet in the “Adjusted Calibration Comparison” in the “Temperature” and compute a difference.
12. Verify that the calibration of the sampler’s temperature sensor was satisfactorily performed by exiting the Calibrate menu, by pressing the “**ESC**” key and entering the “DIAGNOSTICS” screen. View the ambient temperature on the display screen and compare it to the NIST-traceable temperature probe.
13. Repeat the verification process as described in **Section 5.4, Temperature Verification** and record measurements and difference on the Pb- PEP Calibration Worksheet in the “Post Verification” section.

<p>Note: The REDO (F3) command is used prior to the calibration being saved into the system, if a point needs changing for either Pamb or Tamb.</p>
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10.3 Flow Rate Calibration

10.3.1 Scope and Applicability

This SOP is applicable to the Tisch TE-5170 VFC+ TSP samplers. This procedure is not intended to be performed by the FS as part of field operations, but it has been included so experienced operators can use it to correct problems that might have been found when the flow rate verification was performed (see **Section 5.5, Flow Rate Verification**) or to satisfy annual calibration requirements. Flow rate calibration is best performed at an indoor location. For more FRM audit samplers that are approved, refer to sampler’s instruction manual for direction. Where possible, these manuals will be made available to the FS.

10.3.2 Summary of Method

A multi-point verification of the Tisch sampler is performed annually or upon failure of a single-point flow rate verification. The Tisch sampler uses a VFC to control the flow rate and it cannot be calibrated by the FS. Thus, the FS will perform a multi-point verification by restricting the flow rate using five restrictor plates. This multi-point verification must be within 4% of a NIST-traceable flow standard. After the calibration or multi-point verification, the flow rate is verified with a separate NIST-traceable device to confirm that the $\pm 4\%$ verification tolerance has been achieved.

10.3.3 Definitions

Appendix A contains a glossary of terms used in the Pb-PEP.

10.3.4 Personnel Qualifications

This procedure is intended for experienced operators and/or metrology laboratory personnel.

10.3.5 Cautions

- Flow rate is calculated using ambient temperature and pressure. These parameters must be verified as acceptable prior to conducting a flow calibration. DO NOT perform a flow calibration if the barometric pressure and/or temperature are outside of acceptable verification limits.
- Do not perform the multi-point verification of the Tisch sampler with a filter installed.
- Calibration of the sampler's flow rate measurement system must be in the units of the actual ambient volumetric flow rate.
- The portable FRM sampler must pass the verification check for external leaks before the flow rate verification or calibration is performed. See Section 5.2 for details.
- Do not calibrate the flow rate measurement system if there is any doubt that the temperature and pressure measurement systems also are not in calibration. If there is doubt, verify and calibrate the temperature and pressure sensors first.
- Verify the connection between the sample holder and FHA-810CF adapter plate or BGI adapter plate is securely affixed to the sampler.
- When the flow rate standards are not in use, store them in a protective case or container.
- Ensure that the sampler, verification device, and calibration device are equilibrated to ambient conditions before beginning procedure.
- Verify the G factor and VFC serial number on the VFC match the values on the VFC+ controller on the Tisch TE-5170 VFC+ sampler.
- Verify the flow rate condition (Q Conditioning) is set to "AMB" on the VFC+ controller.
- Verify that the BGI hivolCal standard is properly seated on the adapter plate.
- The calibration device must be different from the routine verification device.

NOTE: The calibration device is intended only for calibration. The verification device in this procedure is used to verify the calibration. The purpose of using different devices to calibrate and verify is to ensure there are no erroneous measurements by either device.

10.3.6 Equipment and Supplies

- Pb-PEP Calibration Worksheet
- Adapter plate (Either the FHA-810CF, BGI, or Tisch)

- 2 NIST-traceable BGI hivolCals HVC8 or other applicable flow devices.

10.3.7 Procedure for Conducting Flow Rate Multi-Point Verification on the Tisch TE-5170 VFC+ TSP Sampler

10.3.7.1 Overview

The operating flow rate of 44 ft³/minute is verified before each PE. If the verification result is outside the required $\pm 4\%$ tolerance for agreement with the target flow rate of 44 ft³/minute, then a multi-point verification may be required. The one-point verification must be repeated after any calibration to ensure the sampler operates properly at the target flow rate of 44 ft³/minute.

When performing the multi-point verification, reduction to air flow through the sample compartment is performed by the use of restrictor plates. The sampler's flow rates are compared to measured flow rates of a reference standard (BGI hivolCal unit).

10.3.7.2 Flow Rate Calibration

The flow rate calibration for the Tisch TE-5170 VFC+ TSP sampler will be calibrated using a set of restrictor plates and a BGI hivolCal standard. The Tisch sampler does not use a mass flow controller, so the calibration procedure will be used as a check to ensure proper operation of the components from the top of the VFC to the bottom of the motor. **A satisfactory external leak check must be performed before conducting a flow rate calibration.** All readings for flow rate are in ft³/minute. BGI hivolCal standards read in m³/minute, so the units will need to be converted before any calculations are performed (the calibration worksheet should do these conversions automatically, if the information is entered into the correct fields).

1. If a verification does not pass within $\pm 4\%$, then a calibration is required to help locate the issue. Record the results of this calibration in the "Initial Verification" section of the Pb-PEP Calibration Worksheet and compute a percent difference. If performing an annual calibration, no beginning verification is required.
2. Power on the Tisch sampler and the NIST-traceable calibration flow rate calibrator (BGI hivolCal HVC8 calibrator) and equilibrate to ambient conditions before proceeding. The NIST-traceable calibration flow meter is an independent standard that is not used in the field.
3. Complete the initial information regarding the sampler (type and serial number), field scientist (name, date, and location), and standards used for calibration and verification (manufacturer, make, model, serial number, and last certification date) on the Pb-PEP Calibration Worksheet. Be sure to use the proper Calibration Worksheet based on sampler manufacturer.
4. Release the latch on the roof lock and open the roof. Insert the roof security quick release pin to secure the roof assembly when in the open position. **(For safety, always insert the roof security quick release pin when the sampler's roof assembly is open.)**
5. Open the sample holder by loosening the large black thumb nuts and remove the transport filter. A transport filter should be in place when sampler is the process of being moved to reduce contamination into the mass flow controlled and motor assembly.
6. Place an adapter plate on the Hi-Vol screen and secure by tightening the black thumb nuts.

7. From the Main Menu screen, select “F3” (followed by the “ENT” key) to enter the Setup menu screen. Scroll down to, and select “Diagnostics”.
8. Attach the BGI hivolCal unit to the adapter plate.
9. Scroll down on the Diagnostics screen to motor, and press the “ENT” key to turn the motor on. Record the reading from the sampler and hivolCal into the “Initial Calibration Comparison” Flow Rate fields in the Calibration Worksheet.
10. Press the “ENT” key to turn the motor off again. Unscrew the hivolCal from the adapter plate. Place the first restrictor plate (designated plate 1) on top of the adapter hole. Re-attach the hivolCal so it sits snugly over the restrictor plate.
11. While “Motor” is highlighted on the Diagnostics menu, press the “ENT” key to start the motor again. Allow flow to stabilize before taking any readings. Record the Sampler Flow Rate (ft³/min) and the Standard Flow Rate (m³/min) in the Restrictor Plate 1 line of the “Adjusted Multi-Point Verification Comparison” section of the calibration worksheet. The sampler flow rate should automatically convert to m³/min if the designated electronic worksheet is being used. If the worksheet is being filled out by hand, use the conversion ft³/min = 0.0283168 m³/min. If the % Difference between the sampler and standard is <4% proceed to the next step. If the % Difference between the sampler and standard is >4% go to **Section 10.4 Troubleshooting the TISCH TE-5170 VFC+ TSP Sampler**.
12. Press the “ENT” key to turn the motor off. Unscrew the hivolCal from the adapter plate. Remove the first restrictor plate and place the second restrictor plate (designated plate 2) on top of the adapter hole. Re-attach the hivolCal so it sits snugly over the restrictor plate.
13. While “Motor” is highlighted on the Diagnostics menu, press the “ENT” key to start the motor. Allow flow to stabilize before taking any readings. Record the Sampler Flow Rate (ft³/min) and the Standard Flow Rate (m³/min) in the Restrictor Plate 2 line of the “Adjusted Multi-Point Verification Comparison” section of the calibration worksheet. The sampler flow rate should automatically convert to m³/min if the designated electronic worksheet is being used. If the worksheet is being filled out by hand, use the conversion ft³/min = 0.0283168 m³/min. If the % Difference between the sampler and standard is <4% proceed to the next step. If the % Difference between the sampler and standard is >4% go to **Section 10.4 Troubleshooting the TISCH TE-5170 VFC+ TSP Sampler**.
14. Press the “ENT” key to turn the motor off. Unscrew the hivolCal from the adapter plate. Remove the second restrictor plate and place the third restrictor plate (designated plate 3) on top of the adapter hole. Re-attach the hivolCal so it sits snugly over the restrictor plate.
15. While “Motor” is highlighted on the Diagnostics menu, press the “ENT” key to start the motor again. Allow flow to stabilize before taking any readings. Record the Sampler Flow Rate (ft³/min) and the Standard Flow Rate (m³/min) in the Restrictor Plate 3 line of the “Adjusted Multi-Point Verification Comparison” section of the calibration worksheet. The sampler flow rate should automatically convert to m³/min if the designated electronic worksheet is being used. If the worksheet is being filled out by hand, use the conversion ft³/min = 0.0283168 m³/min. If the % Difference between the sampler and standard is <4% proceed to the next step. If the %

Difference between the sampler and standard is >4% go to **Section 10.4 Troubleshooting the TISCH TE-5170 VFC+ TSP Sampler**.

16. Press the “**ENT**” key to turn the motor off. Unscrew the hivolCal from the adapter plate. Remove the third restrictor plate and place the fourth restrictor plate (designated plate 4) on top of the adapter hole. Re-attach the hivolCal so it sits snugly over the restrictor plate.
17. While “Motor” is highlighted on the Diagnostics menu, press the “**ENT**” key to start the motor again. Allow flow to stabilize before taking any readings. Record the Sampler Flow Rate (ft³/min) and the Standard Flow Rate (m³/min) in the Restrictor Plate 4 line of the “Adjusted Multi-Point Verification Comparison” section of the calibration worksheet. The sampler flow rate should automatically convert to m³/min if the designated electronic worksheet is being used. If the worksheet is being filled out by hand, use the conversion ft³/min = 0.0283168 m³/min. If the % Difference between the sampler and standard is <4% proceed to the next step. If the % Difference between the sampler and standard is >4% go to **Section 10.4 Troubleshooting the TISCH TE-5170 VFC+ TSP Sampler**.
18. Press the “**ENT**” key to turn the motor off. Unscrew the hivolCal from the adapter plate. Remove the fourth restrictor plate and place the fifth restrictor plate (designated plate 5) on top of the adapter hole. Re-attach the hivolCal so it sits snugly over the restrictor plate.
19. While “Motor” is highlighted on the Diagnostics menu, press the “**ENT**” key to start the motor again. Allow flow to stabilize before taking any readings. Record the Sampler Flow Rate (ft³/min) and the Standard Flow Rate (m³/min) in the Restrictor Plate 5 line of the “Adjusted Multi-Point Verification Comparison” section of the calibration worksheet. The sampler flow rate should automatically convert to m³/min if the designated electronic worksheet is being used. If the worksheet is being filled out by hand, use the conversion ft³/min = 0.0283168 m³/min. If the % Difference between the sampler and standard is <4% proceed to the next step. If the % Difference between the sampler and standard is >4% go to **Section 10.4 Troubleshooting the TISCH TE-5170 VFC+ TSP Sampler**.
20. Repeat verification process described in **Section 5.5, Flow Rate Verification** and record measurements and difference on the Pb-PEP Calibration Worksheet in the “Post Verification” section.

10.4 Troubleshooting the Tisch TE-5170 VFC+ TSP Sampler

1. If any of the flow rate points varies by >4% from the standard measurement, troubleshooting will need to be initiated to correct the problem. The following checks should be performed and after determining the problem, that multi-point verification point should be measured. Any re-tests should be documented in the “Calculations and Notes” section of the Calibration Worksheet.
2. **Check 1:** Ensure the V factor on the VFC unit matches the V factor in the electronics of the sampler. To do this, turn the sampler on (by plugging it in) and press the “**F3**” key followed by the “**ENT**” key. Go to the Calibrate screen, highlight Qamb and press the “**ENT**” key. The A1 value displayed is the V factor. If the V factor does not match the VFC V factor and press “**F3**” to edit and use the keypad to enter the correct V factor.
3. **Check 2:** Ensure the pressure and temperature calibration points were entered in correctly and the post verification for each passed within acceptable criteria.

4. **Check 3:** Ensure that the adapter plate is tight to the housing assembly using the thumb-nut screws.
5. **Check 4:** Check the bottom of the motor assembly and ensure there is nothing restricting the flow out of the motor.
6. **Check 5:** Unscrew the collar which connects the VFC to the Sampler housing and verify the seal between the VFC and housing is not damaged or warped. If it is, replace it with a new, greased, seal.
7. **Check 6:** Check the threads of top of the VFC are not damaged. If there is some non-uniformity in the threads, Teflon tape can be used to help create a better airtight seal with the sampler housing unit.
8. **Check 7:** Verify the filter holder frame gasket is in good condition and is keeping an airtight seal between the VFC and motor.
9. **Check 8:** Remove the VFC from the motor and inspect for debris buildup or damage.
10. **Check 9:** Check the brushes in the motor for excessive wear. The motor brushes will wear out over time, and will need to be replaced every ~500 hours of sampling. Each Region will be responsible for changing the brushes once they have worn out. Consult the Operators Manual for directions on how to do this.
11. If the verification still fails, the WAM/TOPO/DOPO will need to be contacted and part or all of the unit will need to be sent to Tisch for repairs.

Section 10: Pb-PEP Calibration Worksheet

Field Data Form

**Lead (Pb) Performance Evaluation Program
 Calibration Worksheet**

Sampler Type: Tisch TE-5070 VFC+ Sampler ID: 3456
 Field Scientist: Jeff Michal Date: 4/16/2012
 Location: RTI International

Verification Device:		Standard		Standard Make and Model		Standard Serial Number		Last Calibration Date of Standard	
BCI		BCI		deltaCal		105		12/11/2011	
BCI		BCI		hvacCal HVAC8		100034		12/16/2011	
BCI		BCI		deltaCal		004		12/11/2011	
BCI		BCI		hvacCal HVAC8		100458		10/20/12	

Parameter	Initial Verification		Initial Calibration Comparison		Adjusted Calibration Comparison		Post Verification	
	Sampler	Standard	Sampler	Difference	Sampler	Difference	Sampler	Difference
Barometric Pressure:	748	745	747	3			750	2
Calibration Acceptance Criteria ± 0.5 mm Hg Verification Acceptance Criteria ± 0.10 mm Hg								
Temperature Ambient:	23.8	23.7	23.5	0.3			23.8	0.2
Calibration Acceptance Criteria $\pm 0.2^\circ\text{C}$ Verification Acceptance Criteria $\pm 0.2^\circ\text{C}$								
use only if adjustment is needed								

Flow Rate:	Initial Verification		Initial Multi-Point Verification		Adjusted Multi-Point Verification Comparison		Post Verification	
	Sampler	Standard	Sampler	Difference	Restrictor Plate	Sampler Flow Rate (m ³ /min)	Standard Flow Rate	% Difference
Ambient	44.7	44.1	44.5	0.6	1.50	36	1.076	1.70
		1.250		1.347	2.17	40	1.133	1.45
					3.150	60	1.188	1.91
					4.130	80	1.244	2.34
					5.110	100	1.303	2.92
The conversion factor from m ³ /min to ft ³ /min is ft ³ /min = 0.0283168 m ³ /min Multi-Point Verification Acceptance Criteria $\pm 2\%$ of 44 ft ³ /min Verification Acceptance Criteria $\pm 4\%$ of 44 ft ³ /min								
Calculations and Notes: <div style="text-align: right; font-size: 2em; font-family: cursive;">Jeff Michal</div>								

4-16-2012

Date: _____

Section 11 References

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Appendix A

Glossary

Acceptance criteria—Specified limits that are placed on the characteristics of an item, process, or service defined in requirements documents (American Society of Quality Control definition).

Accuracy—This term refers to a measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; the U.S. Environmental Protection Agency (EPA) recommends using the terms “*precision*” and “*bias*,” rather than “*accuracy*,” to convey the information usually associated with accuracy.

Activity—This all-inclusive term describes a specific set of operations of related tasks to be performed, either serially or in parallel (e.g., research and development, field sampling, analytical operations, equipment fabrication) that, in total, result in a product or service.

Aerometric Information Retrieval System (AIRS)—See the Air Quality System (AQS).

American National Standards Institute (ANSI)—ANSI is the administrator and coordinator of the U.S. private-sector voluntary standardization system.

American Society for Testing and Materials (ASTM)—The ASTM is a professional organization that develops and distributes protocols for testing and provides reference standards.

Analyst—An analyst is a staff member who weighs the new and used filters and computes the concentration of PM_{2.5} in $\mu\text{g}/\text{m}^3$.

ANSI/ASTM Class 1 and 2 standards—These are the standards for weighing operations with a microbalance that is certified by their manufacturer as being in conformance with ASTM’s standard specification for laboratory weights and precision mass standards (E 617-9), particularly the Class 1 and 2 specifications. These standards are traceable to the National Institute of Standards and Technology (NIST).

Air Quality System (AQS)—The AQS, which is EPA’s repository of ambient air quality data, stores data from more than 10,000 monitors, 5,000 of which are currently active. State, local, and Tribal agencies collect monitoring data and submit it to the AQS periodically. The AQS was formerly the Air Quality Subsystem of the AIRS, which also contained an Air Facility System (AFS) that stored information on pollution sources. After the AFS was separated from AIRS, the terms AIRS and AQS became frequently used as synonyms to refer to the ambient air quality database.

AQS Monitor ID—This is a 10-digit combination of the AIRS Site ID and POC (see each in this glossary) that together uniquely defines a specific air sampling monitor for a given pollutant. Some forms and dialog boxes may refer to this as an AIRS ID or 10-digit AIRS ID.

AQS Site ID—This is a unique identifier for an AQS sampling site. The AQS Site ID is frequently combined with the Parameter Occurrence Code (POC) (see POC in this glossary) to provide a unique 10-digit monitor ID. The first nine digits uniquely identify each air monitoring site (two-digit state code, three-digit county code, and four-digit site code). The tenth digit (POC) identifies the monitor at that site. The state and county codes are Federal Information Processing Standard (FIPS) codes. The four-digit site codes are assigned by the local agency, which may allocate them in any way it chooses, as long as there is no duplication in the county. AQS Site IDs are associated with a specific physical location and address. Any significant change in location will typically require a new site ID.

Assessment—This term refers to the evaluation process that was used to measure the performance or effectiveness of a system and its elements. As used here, “*assessment*” is an all-inclusive term that is used to denote any of the following: an audit, a Performance Evaluation (PE), a management systems review (MSR), peer review, inspection, or surveillance.

Audit of Data Quality (ADQ)—A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality.

Audit (quality)—A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.

Authenticate—The act of establishing an item as genuine, valid, or authoritative.

Bias—The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample’s true value).

Blank—A sample that is intended to contain none of the analytes of interest and is subjected to the usual analytical or measurement process to establish a zero baseline or background value. A blank is sometimes used to adjust or correct routine analytical results. A blank is used to detect contamination during sample handling preparation and/or analysis.

Calibration—A comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments.

Calibration drift—The deviation in instrument response from a reference value over a period of time before recalibration.

Cassette—A device that is supplied with PM_{2.5} samplers to allow a weighed Teflon[®] filter to be held in place in the sampler and manipulated before and after sampling without touching the filter and to minimize damage to the filter and/or sample during such activities.

Certification—The process of testing and evaluation against specifications designed to document, verify, and recognize the competence of a person, organization, or other entity to perform a function or service, usually for a specified time.

Chain of custody—An unbroken trail of accountability that ensures the physical security of samples, data, and records.

Characteristic—Any property or attribute of a datum, item, process, or service that is distinct, describable, and/or measurable.

Check standard—A standard that is prepared independently of the calibration standards and analyzed exactly like the samples. Check standard results are used to estimate analytical precision and to indicate the presence of bias due to the calibration of the analytical system.

Collocated samples—Two or more portions collected at the same point in time and space, so as to be considered identical. These samples are also known as “*field replicates*” and should be identified as such.

Comparability—A measure of the confidence with which one data set or method can be compared to another.

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.

Computer program—A sequence of instructions suitable for processing by a computer. Processing may include the use of an assembler, a compiler, an interpreter, or a translator to prepare the program for execution. A computer program may be stored on magnetic media and referred to as “software,” or it may be stored permanently on computer chips, referred to as “firmware.” Computer programs covered in a Quality Assurance Project Plan (QAPP) are those used for design analysis, data acquisition, data reduction, data storage (databases), operation or control, and database or document control registers when used as the controlled source of quality information.

Conditioning environment—A specific range of temperature and relative humidity values in which unexposed and exposed filters are to be conditioned for at least 24 hours immediately preceding their gravimetric analysis.

Confidence interval—The numerical interval constructed around a point estimate of a population parameter, combined with a probability statement (the confidence coefficient) linking it to the population’s true parameter value. If the same confidence interval construction technique and assumptions are used to calculate future intervals, then they will include the unknown population parameter with the same specified probability.

Confidentiality procedure—A procedure that is used to protect confidential business information (including proprietary data and personnel records) from unauthorized access.

Configuration—The functional, physical, and procedural characteristics of an item, experiment, or document.

Conformance—An affirmative indication or judgment that a product or service has met the requirements of the relevant specification, contract, or regulation; also, the state of meeting the requirements.

Consensus standard—A standard established by a group representing a cross section of a particular industry or trade, or a part thereof.

Contract Officer’s Representative (COR)—The EPA Contract Officer designates this person as the responsible party for managing the work. Depending on the contract, the COR could be the Delivery Order Project Officer (DOPO), the Task Order Project Officer (TOPO), or the Work Assignment Manager (WAM).

Contractor—Any organization or individual contracting to furnish services or items or to perform work.

Control chart—A graphical presentation of quality control (QC) information over a period of time. If a procedure is “in control,” the results usually fall within established control limits. The chart is useful in detecting defective performance and abnormal trends or cycles, which can then be corrected promptly.

Corrective action—Any measures taken to rectify conditions adverse to quality and, where possible, to preclude their recurrence.

Correlation coefficient—A number between -1 and 1 that indicates the degree of linearity between two variables or sets of numbers. The closer to -1 or $+1$, the stronger the linear relationship between the two (i.e., the better the correlation). Values close to zero suggest no correlation between the two variables. The most common correlation coefficient is the product-moment, which is a measure of the degree of linear relationship between two variables.

Data of known quality—Data that have the qualitative and quantitative components associated with their derivation documented appropriately for their intended use; documentation is verifiable and defensible.

Data Quality Assessment (DQA)—The scientific and statistical evaluation of data to determine if data obtained from environmental operations are of the right type, quality, and quantity to support their intended use. The five steps of the DQA process include: 1) reviewing the Data Quality Objectives (DQOs) and sampling design, 2) conducting a preliminary data review, 3) selecting the statistical test, 4) verifying the assumptions of the statistical test, and 5) drawing conclusions from the data.

Data Quality Indicators (DQIs)—The quantitative statistics and qualitative descriptors that are used to interpret the degree of acceptability or utility of data to the user. The principal data quality indicators are bias, precision, and accuracy (bias is preferred); comparability; completeness; and representativeness.

Data Quality Objectives (DQOs)—The qualitative and quantitative statements derived from the DQO process that clarify a study's technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.

Data Quality Objectives (DQO) Process—A systematic planning tool to facilitate the planning of environmental data collection activities. DQOs are the qualitative and quantitative outputs from the DQO process.

Data reduction—The process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors and collating them into a more useful form. Data reduction is irreversible and generally results in a reduced data set and an associated loss of detail.

Data usability—The process of ensuring or determining whether the quality of the data produced meets the intended use of the data.

Deficiency—An unauthorized deviation from acceptable procedures or practices or a defect in an item.

Demonstrated capability—The capability to meet a procurement's technical and quality specifications through evidence presented by the supplier to substantiate its claims and in a manner defined by the customer.

Design—The design refers to specifications, drawings, design criteria, and performance requirements, as well as the result of deliberate planning, analysis, mathematical manipulations, and design processes.

Design change—Any revision or alteration of the technical requirements defined by approved and issued design output documents and by approved and issued changes thereto.

Design review—A documented evaluation by a team, including personnel such as the responsible designers, the client for whom the work or product is being designed, and a quality assurance (QA) representative, but excluding the original designers, to determine if a proposed design will meet the established design criteria and perform as expected when implemented.

Detection limit (DL)—A measure of the capability of an analytical method to distinguish samples that do not contain a specific analyte from samples that contain low concentrations of the analyte; the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability. DLs are analyte and matrix specific and may be laboratory dependent.

Distribution—This term refers to 1) the appointment of an environmental contaminant at a point over time, over an area, or within a volume; and 2) a probability function (density function, mass function, or distribution function) used to describe a set of observations (statistical sample) or a population from which the observations are generated.

Document—Any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results.

Document control—The policies and procedures used by an organization to ensure that its documents and their revisions are proposed, reviewed, approved for release, inventoried, distributed, archived, stored, and retrieved in accordance with the organization's requirements.

Dry-bulb temperature—The actual temperature of the air, which is used for comparison with the wet-bulb temperature.

Duplicate samples—Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method, including sampling and analysis (see also *collocated samples*).

Electrostatic charge buildup—A buildup of static electrical charge on an item, such as the PM_{2.5} filter, which makes it difficult to handle, attracts or repels particles, and can influence its proper weighing.

Environmental conditions—The description of a physical medium (e.g., air, water, soil, sediment) or a biological system expressed in terms of its physical, chemical, radiological, or biological characteristics.

Environmental data—Any parameters or pieces of information collected or produced from measurements, analyses, or models of environmental processes, conditions, and effects of pollutants on human health and the environment, including results from laboratory analyses or from experimental systems representing such processes and conditions.

Environmental data operations—Any work performed to obtain, use, or report information pertaining to environmental processes and conditions.

Environmental monitoring—The process of measuring or collecting environmental data.

Environmental processes—Any manufactured or natural processes that produce discharges to, or that impact, the ambient environment.

Environmental programs—An all-inclusive term that pertains to any work or activities involving the environment, including but not limited to, the characterization of environmental processes and conditions; environmental monitoring; environmental research and development; the design, construction, and operation of environmental technologies; and laboratory operations on environmental samples.

Environmental technology—An all-inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be used to remove pollutants or contaminants from, or to prevent them from entering, the environment. Examples include wet scrubbers (air), soil washing (soil), granulated activated carbon unit (water), and filtration (air, water). Usually, this term applies to hardware-based systems; however, it can also apply to methods or techniques used for pollution prevention, pollutant reduction, or containment of contamination to prevent further movement of the contaminants, such as capping, solidification or vitrification, and biological treatment.

Equilibration chamber—A clean chamber that is usually constructed of plastic or glass, held at near constant temperature and relative humidity, and is used to store and condition PM_{2.5} filters until they and their collected particulate sample (if the filters have been exposed) have reached a steady state of moisture equilibration.

Estimate—A characteristic from the sample from which inferences on parameters can be made.

Evidentiary records—Any records identified as part of litigation and subject to restricted access, custody, use, and disposal.

Expedited change—An abbreviated method of revising a document at the work location where the document is used when the normal change process would cause unnecessary or intolerable delay in the work.

Field blank—A blank that provides information about contaminants that may be introduced during sample collection, storage, and transport. A clean sample is carried to the sampling site, exposed to sampling conditions, returned to the laboratory, and treated as an environmental sample.

Field blank filter—New, randomly selected filters that are weighed at the same time that presampling weights are determined for a set of PM_{2.5} filters and used for QA purposes. These field blank filters are transported to the sampling site in the same manner as the filter(s) intended for sampling, installed in the sampler, removed from the sampler without sampling, stored in their protective containers inside the sampler's case at the sampling site until the corresponding exposed filter(s) is (are) retrieved, and returned for postsampling weighing in the laboratory, where they are handled in the same way as an actual sample filter and reweighed as a QC check to detect weight changes due to filter handling.

Field (matrix) spike—A sample prepared at the sampling point (i.e., in the field) by adding a known mass of the target analyte to a specified amount of the sample. Field matrix spikes are used, for example, to determine the effect of the sample preservation, shipment, storage, and preparation on analyte recovery efficiency (the analytical bias).

Field split samples—Two or more representative portions taken from the same sample and submitted for analysis to different laboratories to estimate inter-laboratory precision.

File plan—A file plan lists the records in your office, and describes how they are organized and maintained. For more information about EPA’s File Plan Guide, see <http://www.epa.gov/records/tools/toolkits/filecode> (see also *records schedule*).

Financial assistance—The process by which funds are provided by one organization (usually governmental) to another organization for the purpose of performing work or furnishing services or items. Financial assistance mechanisms include grants, cooperative agreements, and governmental interagency agreements.

Finding—An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive or negative, and is normally accompanied by specific examples of the observed condition.

Global Positioning System (GPS)—A space-based global navigation satellite system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. It is maintained by the United States government and is freely accessible by anyone with a GPS receiver.

Goodness-of-fit test—The application of the chi square distribution in comparing the frequency distribution of a statistic observed in a sample with the expected frequency distribution based on some theoretical model.

Grade—The category or rank given to entities having the same functional use but different requirements for quality.

Graded approach—The process of basing the level of application of managerial controls applied to an item or work according to the intended use of the results and the degree of confidence needed in the quality of the results (see also *Data Quality Objectives (DQO) Process*).

Guidance—A suggested practice that is not mandatory; it is intended to be an aid or example in complying with a standard or requirement.

Guideline—A suggested practice that is not mandatory in programs intended to comply with a standard.

Hazardous waste—Any waste material that satisfies the definition of hazardous waste given in 40 CFR 261, *Identification and Listing of Hazardous Waste*.

High-efficiency particulate air (HEPA) filter—A HEPA filter is an extended-media, dry-type filter with a minimum collection efficiency of 99.97% when tested with an aerosol of essentially monodisperse 0.3- μm particles.

Holding time—The period of time a sample may be stored prior to its required analysis. Although exceeding the holding time does not necessarily negate the veracity of analytical results, it causes the qualifying or “flagging” of any data not meeting all of the specified acceptance criteria.

Hygrothermograph—An instrument that results from the combination of a thermograph and a hygrograph and furnishing, on the same chart, simultaneous time recording of ambient temperature and relative humidity.

Identification error—The misidentification of an analyte. In this error type, the contaminant of concern is unidentified and the measured concentration is incorrectly assigned to another contaminant.

Independent assessment—An assessment that is performed by a qualified individual, group, or organization that is not a part of the organization directly performing and accountable for the work being assessed.

Inspection—The examination or measurement of an item or activity to verify conformance to specific requirements.

Internal standard—A standard added to a test portion of a sample in a known amount and carried through the entire determination procedure as a reference for calibrating and controlling the precision and bias of the applied analytical method.

Item—An all-inclusive term that is used in place of the following: appurtenance, facility, sample, assembly, component, equipment, material, module, part, product, structure, subassembly, subsystem, system, unit, documented concepts, or data.

Laboratory analyst—The generic term used to describe the Environmental Sampling and Assistance Team (ESAT) contractor(s) responsible for the activities described in the SOPs.

Laboratory blank filters—New filters that are weighed at the time of determination of the presampling (tare) weight of each set of PM_{2.5} filters intended for field use. These laboratory blank filters remain in the laboratory in protective containers during the field sampling and are reweighed in each weighing session as a QC check.

Laboratory split samples—Two or more representative portions taken from the same sample and analyzed by different laboratories to estimate the inter-laboratory precision or variability and the data comparability.

Limit of quantitation—The minimum concentration of an analyte or category of analytes in a specific matrix that can be identified and quantified above the method detection limit and within specified limits of precision and bias during routine analytical operating conditions.

Local Standard Time—The time used in the geographic location of the sample site that is set to standard time. Standard time is used in the Federal Reference Method (FRM) program to match continuous instruments to filter-based instruments. During the winter months, all areas of the country use standard time; however, in the summer months, some areas may go to Daylight Saving Time (1 hour ahead of standard time).

Management—Those individuals who are directly responsible and accountable for planning, implementing, and assessing work.

Management system—A structured, nontechnical system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for conducting work and producing items and services.

Management Systems Review (MSR)—The qualitative assessment of a data collection operation and/or organization(s) to establish whether the prevailing quality management structure, policies, practices, and procedures are adequate for ensuring that the type and quality of data needed are obtained.

Mass reference standard—The NIST-traceable weighing standards, generally in the range of weights expected for the filters.

Matrix spike—A sample that is prepared by adding a known mass of a target analyte to a specified amount of matrix sample for which an independent estimate of the target analyte concentration is available. Spiked samples are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

May—When used in a sentence, this term denotes permission but not a necessity.

Mean squared error—A statistical term for variance added to the square of the bias.

Mean (arithmetic)—The sum of all the values of a set of measurements divided by the number of values in the set; a measure of central tendency.

Measurement and Testing Equipment (M&TE)—Tools, gauges, instruments, sampling devices, or systems used to calibrate, measure, test, or inspect to control or acquire data to verify conformance to specified requirements.

Memory effects error—The effect that a relatively high concentration sample has on the measurement of a lower concentration sample of the same analyte when the higher concentration sample precedes the lower concentration sample in the same analytical instrument.

Method—A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.

Method blank—A blank that is prepared to represent the sample matrix as closely as possible and analyzed exactly like the calibration standards, samples, and QC samples. Results of method blanks provide an estimate of the within-batch variability of the blank response and an indication of bias introduced by the analytical procedure.

Microbalance—A type of analytical balance that can weigh to the nearest 0.001 μg (i.e., one microgram, or one-millionth of a gram).

Mid-range check—A standard used to establish whether the middle of a measurement method's calibrated range is still within specifications.

Mixed waste—A hazardous waste material as defined by 40 CFR 261 and the Resource Conservation and Recovery Act (RCRA) and mixed with radioactive waste subject to the requirements of the Atomic Energy Act.

Must—When used in a sentence, this term denotes a requirement that has to be met.

Nonconformance—A deficiency in a characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate; nonfulfillment of a specified requirement.

Objective evidence—Any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measurements, or tests that can be verified.

Observation—An assessment conclusion that identifies a condition (either positive or negative) that does not represent a significant impact on an item or activity. An observation may identify a condition that has not yet caused a degradation of quality.

Organization—A company, corporation, firm, enterprise, or institution, or part thereof, whether incorporated or not, public or private, that has its own functions and administration.

Organization structure—The responsibilities, authorities, and relationships, arranged in a pattern, through which an organization performs its functions.

Outlier—An extreme observation that is shown to have a low probability of belonging to a specified data population.

Parameter—A quantity, usually unknown, such as a mean or a standard deviation characterizing a population. Commonly misused for “*variable*,” “*characteristic*,” or “*property*.”

Pb-PM₁₀—Low-volume PM₁₀ sampling using a 46.2-mm Teflon filter for determining lead (Pb) concentration.

Pb-TSP—High-volume sampling of total suspended particles (TSP) using a 8x10-inch glass fiber filter for determining lead (Pb) concentration.

Peer review—A documented, critical review of work generally beyond the state of the art or characterized by the existence of potential uncertainty. Conducted by qualified individuals (or an organization) who are independent of those who performed the work but collectively equivalent in technical expertise (i.e., peers) to those who performed the original work. Peer reviews are conducted to ensure that activities are technically adequate, competently performed, properly documented, and satisfy established technical and quality requirements. An in-depth assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodology, acceptance criteria, and conclusions pertaining to specific work and of the documentation that supports them. Peer reviews provide an evaluation of a subject where quantitative methods of analysis or measures of success are unavailable or undefined, such as in research and development.

Performance Evaluation (PE)—A type of audit in which the quantitative data generated in a measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of an analyst or laboratory.

PM_{2.5}—Particulate matter (suspended in the atmosphere) having an aerodynamic diameter less than or equal to a nominal 2.5 μm , as measured by a reference method based on 40 CFR Part 50, Appendix L, and designated in accordance with 40 CFR Part 53.

PM_{2.5} sampler—A sampler that is used for monitoring PM_{2.5} in the atmosphere that collects a sample of particulate matter from the air based on principles of inertial separation and filtration. The sampler also maintains a constant sample flow rate and may record the actual flow rate and the total volume sampled.

PM_{2.5} mass concentration is calculated as the weight of the filter catch divided by the sampled volume. A sampler cannot calculate PM_{2.5} concentration directly.

POC (Parameter Occurrence Code)—A one-digit identifier used in AIRS/AQS (see both defined in this glossary) to distinguish between multiple monitors at the same site that are measuring the same parameter (e.g., pollutant). For example, if two different samplers both measure PM_{2.5}, then one may be assigned a POC of 1 and the other a POC of 2. Note that replacement samplers are typically given the POC of the sampler that they replaced, even if the replacement is of a different model or type.

Pollution prevention—An organized, comprehensive effort to systematically reduce or eliminate pollutants or contaminants prior to their generation or their release or discharge into the environment.

Polonium-210 (²¹⁰Po) antistatic strip—A device that contains a small amount of ²¹⁰Po that emits α particles (He²⁺) that neutralize the static charge on filters, making them easier to handle and their weights more accurate.

Polytetrafluoroethylene (PTFE)—Also known as Teflon, this is a polymer that is used to manufacture the 46.2-mm diameter filters for PM_{2.5} FRM and Federal Equivalent Method (FEM) samplers.

Population—The totality of items or units of material under consideration or study.

Precision—A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions expressed generally in terms of the standard deviation.

Procedure—A specified way to perform an activity.

Process—A set of interrelated resources and activities that transforms inputs into outputs. Examples of processes include analysis, design, data collection, operation, fabrication, and calculation.

Project—An organized set of activities within a program.

Qualified services—An indication that suppliers providing services have been evaluated and determined to meet the technical and quality requirements of the client as provided by approved procurement documents and demonstrated by the supplier to the client's satisfaction.

Qualified data—Any data that have been modified or adjusted as part of statistical or mathematical evaluation, data validation, or data verification operations.

Quality—The totality of features and characteristics of a product or service that bears on its ability to meet the stated or implied needs and expectations of the user.

Quality assurance (QA)—An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.

Quality Assurance Program Description/Plan—See *Quality Management Plan*.

Quality Assurance Project Plan (QAPP)—A formal document that describes in comprehensive detail the necessary QA, QC, and other technical activities that must be implemented to ensure that the results

of the work performed will satisfy the stated performance criteria. The QAPP components are divided into the following four classes: 1) Project Management, 2) Measurement/Data Acquisition, 3) Assessment/Oversight, and 4) Data Validation and Usability. Guidance and requirements on preparation of QAPPs can be found in *EPA, Requirements for Quality Assurance Project Plans, EPA QA/R-5* and *Guidance for Quality Assurance Project Plans, EPA QA/G-5*.

Quality Assurance (QA) Supervisor or Coordinator—A staff member who assists in preparation of the reporting organization’s quality plan, makes recommendations to management on quality issues (including training), oversees the quality system’s control and audit components, and reports the results.

Quality control (QC)—The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality. The system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against “out of control” conditions and ensuring the results are of acceptable quality.

Quality control (QC) sample—An uncontaminated sample matrix that is spiked with known amounts of analytes from a source independent of the calibration standards. This type of sample is generally used to establish intra-laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system.

Quality improvement—A management program for improving the quality of operations. Such management programs generally entail a formal mechanism for encouraging worker recommendations with timely management evaluation and feedback or implementation.

Quality management—That aspect of the overall management system of the organization that determines and implements the quality policy. Quality management includes strategic planning, allocation of resources, and other systematic activities (e.g., planning, implementation, and assessment) pertaining to the quality system.

Quality Management Plan (QMP)—A formal document that describes the quality system in terms of the organization’s structure, the functional responsibilities of management and staff, the lines of authority, and the required interfaces for those planning, implementing, and assessing all activities conducted.

Quality system—A structured and documented management system that describes the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC.

Radioactive waste—This refers to waste material that contains or is contaminated by radionuclides and is subject to the requirements of the Atomic Energy Act.

Readability—The smallest difference between two measured values that can be read on the microbalance display. The term “*resolution*” is a commonly used synonym.

Readiness review—A systematic, documented review of the readiness for the startup or continued use of a facility, process, or activity. Readiness reviews are typically conducted before proceeding beyond project milestones and prior to initiation of a major phase of work.

Record (quality)—A document that furnishes objective evidence of the quality of items or activities and that has been verified and authenticated as technically complete and correct. Records may include photographs, drawings, magnetic tape, and other data recording media.

Records schedule—This schedule constitutes EPA’s official policy on how long to keep Agency records (retention) and what to do with them afterwards (disposition). For more information, refer to <http://www.epa.gov/records/policy/schedule> on EPA’s Web site or see *file plan*.

Recovery—The act of determining whether the methodology measures all of the analyte contained in a sample.

Remediation—The process of reducing the concentration of a contaminant (or contaminants) in air, water, or soil media to a level that poses an acceptable risk to human health.

Repeatability—This refers to a measure of the ability of a microbalance to display the same result in repetitive weighings of the same mass under the same measurement conditions. The term “*precision*” is sometimes used as a synonym. Repeatability also refers to the degree of agreement between independent test results produced by the same analyst, using the same test method and equipment on random aliquots of the same sample within a short time period.

Reporting limit—The lowest concentration or amount of the target analyte required to be reported from a data collection project. Reporting limits are generally greater than detection limits and are usually not associated with a probability level.

Representativeness—A measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition.

Reproducibility—The precision, usually expressed as variance, that measures the variability among the results of measurements of the same sample at different laboratories.

Requirement—A formal statement of a need and the expected manner in which it is to be met.

Research (basic)—A process, the objective of which is to gain fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind.

Research (applied)—A process, the objective of which is to gain the knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.

Research development/demonstration—The systematic use of the knowledge and understanding gained from research and directed toward the production of useful materials, devices, systems, or methods, including prototypes and processes.

Round-robin study—A method validation study involving a predetermined number of laboratories or analysts, all analyzing the same sample(s) by the same method. In a round-robin study, all results are compared and used to develop summary statistics such as inter-laboratory precision and method bias or recovery efficiency.

Ruggedness study—The carefully ordered testing of an analytical method while making slight variations in test conditions (as might be expected in routine use) to determine how such variations affect test results. If a variation affects the results significantly, the method restrictions are tightened to minimize this variability.

Scientific method—The principles and processes regarded as necessary for scientific investigation, including rules for concept or hypothesis formulation, conduct of experiments, and validation of hypotheses by analysis of observations.

Self-assessment—The assessments of work conducted by individuals, groups, or organizations directly responsible for overseeing and/or performing the work.

Sensitivity—The capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest.

Service—The result generated by activities at the interface between the supplier and the customer, and the supplier internal activities to meet customer needs. Such activities in environmental programs include design, inspection, laboratory and/or field analysis, repair, and installation.

Shall—A term that denotes a requirement is mandatory whenever the criterion for conformance with the specification permits no deviation. This term does not prohibit the use of alternative approaches or methods for implementing the specification so long as the requirement is fulfilled.

Should—A term that denotes a guideline or recommendation whenever noncompliance with the specification is permissible.

Significant condition—Any state, status, incident, or situation of an environmental process or condition, or environmental technology in which the work being performed will be adversely affected sufficiently to require corrective action to satisfy quality objectives or specifications and safety requirements.

Software life cycle—The period of time that starts when a software product is conceived and ends when the software product is no longer available for routine use. The software life cycle typically includes a requirement phase, a design phase, an implementation phase, a test phase, an installation and check-out phase, an operation and maintenance phase, and sometimes a retirement phase.

Source reduction—Any practice that reduces the quantity of hazardous substances, contaminants, or pollutants.

Span check—A standard used to establish that a measurement method is not deviating from its calibrated range.

Specification—A document that states requirements and refers to or includes drawings or other relevant documents. Specifications should indicate the means and criteria for determining conformance.

Spike—A substance that is added to an environmental sample to increase the concentration of target analytes by known amounts. Spikes are used to assess measurement accuracy (spike recovery), whereas spike duplicates are used to assess measurement precision.

Split samples—Two or more representative portions taken from one sample in the field or in the laboratory and analyzed by different analysts or laboratories. Split samples are QC samples that are used to assess analytical variability and comparability.

Standard Operating Procedure (SOP)—A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps and that is officially approved as the method for performing certain routine or repetitive tasks.

Standard deviation—A measure of the dispersion or imprecision of a sample or population distribution expressed as the positive square root of the variance and having the same unit of measurement as the mean.

Supplier—Any individual or organization furnishing items or services or performing work according to a procurement document or a financial assistance agreement. An all-inclusive term used in place of any of the following: vendor, seller, contractor, subcontractor, fabricator, or consultant.

Surrogate spike or analyte—A pure substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them to establish that the analytical method has been performed properly.

Surveillance (quality)—Continual or frequent monitoring and verification of the status of an entity and the analysis of records to ensure that specified requirements are being fulfilled.

Technical Systems Audit (TSA)—A thorough, systematic, on-site qualitative audit of facilities, equipment, personnel, training, procedures, recordkeeping, data validation, data management, and reporting aspects of a system.

Technical review—A documented critical review of work that has been performed within the state of the art. The review is accomplished by one or more qualified reviewers who are independent of those who performed the work, but are collectively equivalent in technical expertise to those who performed the original work. The review is an in-depth analysis and evaluation of documents, activities, material, data, or items that require technical verification or validation for applicability, correctness, adequacy, completeness, and assurance that established requirements have been satisfied.

Traceability—This term refers to the ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project. This term also refers to the property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, all having stated uncertainties. Many QA programs demand traceability of standards to a national standard. In most cases this can be achieved through a standard traceable to NIST.

Trip blank—A clean sample of a matrix that is taken to the sampling site and transported to the laboratory for analysis without having been exposed to sampling procedures.

Validation—Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use have been fulfilled. In design and development, validation refers to the process of examining a product or result to determine conformance to user needs.

Variance (statistical)—A measure or dispersion of a sample or population distribution. Population variance is the sum of squares of deviation from the mean divided by the population size (number of elements). Sample variance is the sum of squares of deviations from the mean divided by the degrees of freedom (number of observations minus one).

Verification—Confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. In design and development, verification refers to the process of examining a result of a given activity to determine conformance to the stated requirements for that activity.

Wet-bulb thermometer—A thermometer with a muslin-covered bulb, which is moistened and used to measure the wet-bulb temperature.

Wet-bulb temperature—The temperature of the wet-bulb thermometer at equilibrium with a constant flow of ambient air at a rate of from 2.5 meters to 10.0 meters per second.

Wide Area Augmentation System (WAAS)—An air navigation aid developed by the Federal Aviation Administration to augment the Global Positioning System (GPS), with the goal of improving its accuracy, integrity, and availability.

Appendix B
Data Qualifiers/Flags

A sample qualifier or a result qualifier consists of three alphanumeric characters that act as an indicator of the reason that the subject data collection activity (a) did not produce a numeric result, (b) produced a numeric result that is qualified in some respect relating to the type or validity of the result, or (c) produced a numeric result but for administrative reasons is not to be reported outside the laboratory.

Field Qualifiers

Code	Definition	Description
CON	Contamination	Contamination, including observations of insects or other debris
DAM	Filter damage	Filter appeared damaged
EST ^{1/}	Elapsed sample time	Elapsed sample time out of specification
EVT	Event	Exceptional event expected to have affected sample (dust, fire, spraying)
FAC	Field accident	Field accident either destroyed the sample or rendered it not suitable for analysis
FAT	Failed temperature check – ambient	Ambient temperature check out of specification
FIT	Failed temperature check – Internal	Internal temperature check out of specification
FLR ^{1/}	Flow rate	Flow rate 5-minute average out of specification
FLT ^{1/}	Filter temperature	Filter temperature differential, 30-second interval out of specification
FMC	Failed multipoint calibration verification	Failed the initial multipoint calibration verification
FPC	Failed pressure check	Barometric pressure check out of specification
FSC	Failed single point calibration verification	Failed the initial single-point calibration verification
FVL	Flow volume	Flow volume suspect
LEK	Leak suspected	Internal/external leak suspected
SIT	Siting criteria	Siting criteria for the PEP sampler not met
SDM	Sampler damaged	Sampler appears to be damaged, which may have affected the filter
SVW	Severe weather	Severe weather that could have affected the quality of the sample

^{1/}- Flag generated by sampling equipment.

Laboratory Qualifiers

Code	Definition	Explanation
ALT	Alternate measurement	The subject parameter was determined using an alternate measurement method. Value is believed to be accurate but could be suspect.
AVG	Average value	The average value that is used to report a range of values.
BDL	Below detectable limits	There was not a sufficient concentration of the parameter in the sample to exceed the lower detection limit in force at the time the analysis was performed. Numeric results field, if present, is at best an approximate value.
BLQ	Below limit of quantitation	The sample was considered above the detection limit, but there was not a sufficient concentration of the parameter in the sample to exceed the lower quantitation limit in force at the time the analysis was performed.
CAN	Canceled	The analysis of this parameter was canceled and not performed.
CBC	Cannot be calculated	The calculated analysis result cannot be calculated because an operand value is qualified.
EER	Entry error	The recorded value is known to be incorrect, but the correct value cannot be determined to enter a correction.

Code	Definition	Explanation
FBK	Found in blank	The subject parameter had a measurable value above the established QC limit when a blank was analyzed using the same equipment and analytical method. Therefore, the reported value may be erroneous.
FCS	Failed collocated sample	The collocated sample exceeded the acceptance criteria limits.
FFB	Failed field blank	Field blank samples exceeded acceptance criteria limits.
FIS	Failed internal standard	Internal standards exceeded acceptance criteria limits.
FLB	Failed laboratory blank	Laboratory blank samples exceeded acceptance criteria limits.
FLD	Failed laboratory duplicate	Laboratory duplicate samples exceeded acceptance criteria limits.
FLH	Failed laboratory humidity	Laboratory relative humidity exceeded acceptance criteria limits
FLT	Failed laboratory temperature	Laboratory temperature exceeded acceptance criteria limits.
FQC	Failed quality control	The analysis result is not reliable because quality control criteria were exceeded when the analysis was conducted. Numeric field, if present, is estimated value.
FRW	Failed replicate weight	The sample was reweighed and was not repeatable with acceptance criteria.
HTE	Holding time exceeded	Filter holding time exceeded acceptance criteria limits
ISP	Improper sample preservation	Due to improper preservation of the sample, it was rendered not suitable for analysis.
LAC	Laboratory accident	There was an accident in the laboratory that either destroyed the sample or rendered it not suitable for analysis.
LLS	Less than lower standard	The analysis value is less than the lower quality control standard.
LTC	Less than criteria of detection	Value reported is less than the criteria of detection (which may differ from instrument detection limits).
NAR	No analysis result	There is no analysis result required for this subject parameter.
PSD	Possible shipping damage	Upon receipt of filter from the field, the filter appears to have been damaged during shipping.
REJ	Rejected	The analysis results have been rejected for an unspecified reason by the laboratory. For any results where a mean is being determined, this data was not utilized in the calculation of the mean.
REQ	Re-queue for re-analysis	The analysis is not approved and must be re-analyzed using a different method.
RET	Return(ed) for re-analysis	The analysis result is not approved by laboratory management and reanalysis is required by the bench analyst with no change in the method.
RIN	Reanalyzed	The indicated analysis results were generated from a re-analysis
SIS	Sample integrity suspect	Based upon other flags or free-form notes the data quality from this sample is suspect.
STD	Internal standard	The subject parameter is being used as an internal standard for other subject parameters in the sample. There is no analysis result report, although the theoretical and/or limit value(s) may be present.
UND	Analyzed but undetected	Indicates material was analyzed for but not detected.
VOD	Void sample	The sample had flags indicating that the sample integrity was suspect and, after examination, further processing was halted.

