Allegheny County Health Department
Air Quality Program

301 39th Street, Building 7
Pittsburgh, PA 15201

Source Testing Manual

ALLEGHENY COUNTY HEALTH DEPARTMENT
Air Quality Program

POLICY & PROCEDURE HPA #270 **Effective:** 11/21/2022

SOURCE TESTING MANUAL OF THE ALLEGHENY COUNTY HEALTH DEPARTMENT AIR QUALITY PROGRAM

Approved:

Page 1 of 47

AUTHORITY

Article XXI, § §2107.01, of the Allegheny County Health Department Rules and Regulations

PURPOSE

The purpose of this document is to provide detailed information on source test methods, procedures and guidance for the reporting of emissions to the Allegheny County Health Department Air Quality Program.

POLICY

The Allegheny County Health Department Air Quality Program will periodically update and publish a supplement to Article XXI, Part G ("Methods"), entitled the Source Testing Manual of the Allegheny County Health Department Air Quality Program.

DISCLAIMER

The policies and procedures herein are not an adjudication or a regulation or intended to supplement any existing regulations. There is no intent on the part of the Allegheny County Health Department ("Department") to give the procedures in this policy that weight or deference. This document establishes the framework, within which the Department will exercise its administrative discretion in the future. The Department reserves the discretion to deviate from this policy if circumstances warrant.

Contents

INTRODUCTION

This manual is provided by the Air Quality Program of the Allegheny County Health Department to assist the owners, managers, and operators of regulated sources, consultants, and members of this agency, to understand the testing procedures that are recommended and approved by the Air Quality Program for application to stationary air pollution sources located within Allegheny County.

PURPOSES

Source sampling or emission testing, as applied to air pollution is the procedure whereby a representative sample is removed from some larger, contaminant-bearing gas stream confined in a duct or stack. This sample is then subjected to further analysis, and the contaminant concentrations are related to the parent gas stream to determine total quantities. Because the sample extracted from the main gas stream usually represents a very small fraction of the total volume, extreme care should be exercised in obtaining a representative sample. Additionally, because of the many and variable factors encountered in sampling gas streams, complex methods must frequently be used to obtain representative samples. Source sampling is frequently employed to answer a variety of questions of which the main one is: What are the quantities and concentrations of emissions? Subsequent questions that can be answered from this basic determination include:

1. Is the process in compliance with the present or expected emission regulations?
2. What is the efficiency of existing pollution control equipment?
3. What effect do various process variables have on emissions?
4. Is a valuable product or by-product being emitted?
5. What are the potential (uncontrolled) emissions of various processes?
6. What further information is required, including legal enforcement actions, to attain compliance?
7. Is the operation of the process within approved surveillance limits?
8. Is continuous monitoring of emissions or parameter necessary?

PREFACE

This manual describes source testing methods that are recommended and approved by the Air Quality Program for each specific category of pollutant for determining compliance with the applicable regulations. Standard test methods that are authored by outside agencies (USEPA, ASTM, NBS etc.) may be revised periodically by these agencies. Later revisions in approved standard methods are applicable and preferred in most cases. It is the responsibility of the testing entity to obtain and follow the most recent version of each standard test method, even if the revision date of the test method is later than the revision date of this manual.

The Air Quality Program may accept other test methods, as equivalent, suitable or required, in accordance with the provisions of the applicable regulations. Additionally, some standard methods may require modifications as specified by the Program and/or as detailed in this manual. All elements of a standard method may not always be exactly applicable or justified in each situation; experience and intelligent judgment is required to develop a usable sampling plan. Since sampling results may have important legal consequences, deviations from the standard methods set forth herein should be approved in advance by the Program in accordance with the applicable regulations. All such deviations should be thoroughly documented in the test protocol and subsequent stack test reports.

CHAPTER 1: EMISSIONS TESTING

A. Before the Test

1. No later than 45 days prior to conducting any tests required by the Air Quality Program, the person responsible for the affected source should submit a written test protocol to the Air Quality Program for approval. Quarterly audit tests do not require a written protocol.

2. The protocol should explain the intended testing plan, including any deviations from standard testing procedures, a description of the source process, the proposed operating conditions of the source during the test, calibration data for specific test equipment and a demonstration that the tests will be conducted under the direct supervision of persons qualified by training and experience satisfactory to the Air Quality Program to conduct such tests.

3. The protocol should include the proposed test date; the street address of the source; the source's permit number; the source's emission limits for the pollutants that are going to tested, a drawing of the stack showing test locations, test points and port diameters, a schematic of the process, a set of sample calculations using data from a previous test if one was performed, sample data sheets, a sample of the chain of custody sheets if applicable, and the name and address of the laboratory for those proposed methods which require laboratory analysis of samples.

4. The test protocol should be signed by the testing entity and the person responsible for the affected source.

5. At least 30 days prior to conducting such tests, the person responsible should notify the Air Quality Program in writing of the time(s) and date(s) on which the tests will be conducted

6. The Air Quality Program will approve the test protocol in writing and send their approval to the affected source.

B. During the Test

1. The source should allow Air Quality Program personnel to observe tests, record data, provide pre-weighed filters and to take samples for independent analysis at the Air Quality Program's discretion.

2. Tests should be conducted while the source is operating at maximum routine operating conditions or under such other conditions as are specified by the Air Quality Program or the applicable permit. Maximum routine operating conditions is defined as operating above 85 percent of the maximum load condition or as set forth in the applicable permit. The Air Quality Program may approve lower operating conditions on a case-by-case basis.

3. Testing should be paused to allow any Air Quality Program auditors present to observe all leak checks. Air Quality Program personnel may stop and/or postpone a test if any OSHA safety

violations are observed in the testing locations. Platforms and walkways should be inspected by the source before the day of the test. A clear and accessible path shall be maintained to any analyzers and gas cylinders so they may be inspected during the test.

4. Air Quality Program personnel have the authority to invalidate the test run or the full test if they determine that the testing is not being run according to approved protocols and permit requirements.

C. After the Test

1. The test report should be submitted within 60 days following the test, or an alternate date as detailed in the applicable permit. Test results should be comprehensively and accurately reported in the units of measurement specified by the applicable emission limitations. The test report should be signed by the testers and the person responsible for the source and have a summary of results which compares the test results with permit limits and states whether the source passed or failed to demonstrate compliance with each limit. It is recommended that the summary be located within the first five pages of the report.

2. The test report should include sufficient information to verify the conditions existing at the time of the test and the way the test was conducted, including at a minimum:

    a. The dates of the test

    b. A thorough description of the source, any air pollution control equipment and the flue

    c. Source operating conditions during the test, such as the charging rate of raw materials, production rate, combustion rate, boiler pressure, oven temperature, or any other conditions which may affect emissions

    d. The location of the sampling ports

    e. Emission characteristics, including velocity, temperature, moisture content, density and gas composition (expressed as percent CO, CO_2, N_2, etc.) and static and barometric pressures at pertinent points in the system

    f. Sample collection techniques used, including procedures, equipment descriptions, data to verify that isokinetic sampling techniques were used where applicable, and data to verify that test conditions are acceptable

    g. Any deviation from procedures set forth in protocol

    h. Laboratory procedures and results

    i. Calculated results

    j. Chain of custody sheets if applicable

    k. Calibration sheets

CHAPTER 2: CONTINUOUS EMISSION MONITORING

Table 2: Regulations and Documents

ACHD Article XXI	ACHD
PADEP Continuous Source Monitoring Manual	PADEP
Appendix P of 40 CFR Part 51	USEPA
Appendix B of 40 CFR Part 60,	USEPA
40 CFR Part 60 Appendix B Performance Specifications	USEPA
40 CFR Part 75 Appendix A	USEPA
40CFR Part 75 Appendix B	USEPA

A. Approval of New Continuous Emission Monitoring Systems

A continuous emission monitoring system will be approved by the Air Quality Program in writing. At least 45 days prior to installing any such system, or at such other times as specified in an applicable order or permit condition, the person responsible for the affected source should make written application to the Air Quality Program for the approval of such system. The application should thoroughly describe the principle of operation along with schematics of the CEMS (Continuous Emission Monitoring System) and specifications of the analyzers and the data handling system. The specifications should also include the instrument's minimum detection limit and sampling frequency. All specifications provided in the application should be guaranteed by the manufacturer(s). The application should have drawings showing the location of the sample point(s) in the gas stream and should include a program for periodic calibration, zero and span drift checks and other quality assurance procedures and all other information needed by the Air Quality Program to evaluate the system. A Quality Assurance/Quality Control Manual should also be part of the application.

The Air Quality Program will make its evaluation in accordance with all relevant guidelines, including the performance specifications and other requirements of ACHD Article XXI, Appendix P of 40 CFR Part 51, Appendix B of 40 CFR Part 60, and the PADEP Continuous Source Monitoring Manual. After the Air Quality Program approves the application the source may install the CEMS.

B. Certification Testing

After installation, the CEMS should begin certification testing. The required testing for certification is the RATA test, linearity test, cycle time test and the 7-day calibration error test. The Air Quality Program should be notified of the successful completion of the 7-day calibration error test in writing within in 4 calendar days of the test completion date.

The certification test report should be submitted within 30 days of the conclusion of the 7-day calibration error test. The Air Quality Program will review the report and the source will be notified of the approval status of the CEMS system. The data collected after the RATA and linearity test will be considered acceptable quality data if the tests and report are found acceptable by the Air Quality Program.

The Air Quality Program should be notified 30 days before any required quarterly audits to allow the audit test to be observed by Air Quality Program personnel. During testing, calibration gas cylinders should be oriented with the labels facing outward such that they can be read by Air Quality Program personnel.

C. Summary of Audit Tests

1. **Opacity Audit**: The opacity audit should be performed by the procedures of the Field Audit Performance Tests United States Environmental Protection Agency, 40 CFR Part 60 Appendix B Performance Specification 1. The optical alignment indicator is checked for proper alignment. A calibration error check is done with a set of three calibration filters (low, mid and high). Also, a zero reading is taken without a filter. Five nonconsecutive readings are taken with each of the filters and the zero reading. An additional sixth set of readings should be made by inserting a set of certified filters which the Air Quality Program auditor will bring to the audit.

2. **Calibration Gas Audit**: The calibration gas audit (CGA) should be performed by the procedures of the Calibration Gas Audit Procedure, United States Environmental Protection Agency, 40 CFR Part 60 Appendix B Performance Specification 2. A CGA performance audit must be conducted in three of the four quarters but in no more than three quarters in succession. Each monitor is challenged by two levels calibration gas three times each, nonconsecutively. Test with both pollutant and diluent portions of the CEMS if applicable with audit gases of known concentrations. Test at two points for pollution monitors at a point between 20% and 30% of the span value and a point between 50% and 60% of span value. For CO_2 as diluents use a point between 5% and 8% by volume and a point between 10% and 14% by volume. For O_2 as diluent use a point between 4% and 6% by volume and a point between 8% and 12% by volume. Operate each monitor in its normal sampling mode, i.e., pass the audit gas through all filters, scrubbers, conditioners, and other monitor components used during normal sampling, and as much of the sampling probe as is practical. At a minimum, the audit gas should be introduced at the connection between the probe and the sample line.

3. **Relative Accuracy Audit**: The Relative Accuracy Audit (RAA) should be performed by the procedures of the Relative Accuracy Test Procedure United States Environmental Protection Agency, 40 CFR Part 60 Appendix B Performance Specification 2, except that only three sets of measurement data are required. The RAA is an abbreviated version of a RATA. The RAA is used to audit CEMS which are not designed to accept a CGA. The RAA may be conducted three of four calendar quarters, but in no more than three quarters in succession. The relative difference between the mean of the RM values and the mean of the CEMS responses will be used to assess the accuracy of the CEMS.

4. **Linearity Audit**: The CEMS Linearity Check should be performed by the method of the Linearity Test Procedure United States Environmental Protection Agency, 40 CFR Part 75 Appendix A. The linearity audit can only be performed while combusting fuel and exhausting gas though the stack. Each monitor is challenged with calibration gas, at the low (20%-30%), mid (50%-60%), and high (80%-100%) range concentrations. Introduce the calibration gas at the normal calibration gas injection point which should be near the CEMS sampling point. At a minimum, audit gas should be injected at the connection between the probe and the sampling line. Operate each monitor at its normal operating temperature and conditions. Challenge the monitor three times with each reference gas. Do not use the same calibration gas concentration twice in succession. The duration of the linearity test, from the hour of the first injection to the hour of the last injection, should not exceed 24-unit operating hours. Record the monitor response from the data acquisition and handling system. For each concentration use the average of the responses to determine the error in linearity.

5. **Relative Accuracy Test Audit**: The Relative Accuracy Test Audit (RATA) should be performed by the procedures of the Relative Accuracy Test Procedure United States Environmental Protection Agency, 40 CFR Part 60 Appendix B Performance Specification 2 and Part 75 Appendix A and B. The RATA compares the readings obtained by the source's CEMS with a reference method. Typically, this reference method is another CEMS. The source's CEMS and the reference method simultaneously measure the stack gas in the same location. A minimum of nine runs each at least twenty-one minutes in duration are performed. More than nine runs can be performed up to twelve runs but only nine of the runs should be used to calculate the relative accuracy. All runs must be reported. The reports should indicate which of the runs were used to calculate the relative accuracy.

   A source under Part 60 is required to perform a RATA at least every four calendar quarters, except in the case where the source does not operate in the fourth calendar quarter since the quarter of the previous RATA. In that case, the RATA should be performed in the quarter in which the unit resumes operation. The source should be operating at more than 50% of normal load.

   A source under Part 75 is required to perform a RATA every two operating quarters plus a grace period of 720 operating hours. Sources which have a RA less than or equal to 7.5% will have the RATA test frequency reduced to four operating quarters plus a grace period of 720 operating hours. At a minimum, a RATA shall be performed within eight calendar quarters plus a grace period of 720 hours. The sources should be operating at normal load during the test as defined in 40CFR Part 75 Appendix A and B. Testing may result in a bias adjustment factor being applied to all future CEMS measured stack data if the results of the test demonstrate that the CEMS measures lower than the reference method.

   A CEMS failing audits in two successive quarters indicates the quality control procedures are not effective and should be modified and improved.

6. **Calibration Drift Test Procedure**: The CEMS Calibration Drift Procedure should be performed by the procedures of the Calibration Drift Test Procedure United States Environmental Protection Agency, 40 CFR Part 60 Appendix B. The source should be operating at more than 50% of

normal during a calibration drift test. Conduct the CD test at both the zero-level concentration and high-level concentration while the facility is operating. Determine the magnitude of the calibration drift once each 24-hours for 7 consecutive calendar days.

7. **Seven Day Calibration Error Test**: The CEMS 7-Day Calibration Error Test should be performed by the method of the 7-day Calibration Error Test Procedure United States Environmental Protection Agency, 40 CFR Part 75Appendix A. The source should be operating at more than 50% of normal during a 7-Day Calibration Error test. Measure the calibration error of each monitor while the unit is combusting fuel once each day for 7 consecutive operating days. Do not make manual or automatic adjustments to the monitor settings until just after taking measurements at both zero and high concentration levels for that day during the 7-day test. The calibration error tests should be approximately 24 hours apart, (unless the 7-day test is performed over nonconsecutive days). Perform calibration error tests at both the zero-level (0-20% of span) concentration and high-level (80-100% of span) concentration. Alternatively, a mid-level (50-60%) concentration gas may be used in lieu of the high-level gas if the mid-level gas is more representative of the actual stack gas concentrations. If adjustments are made during the seven-day test, the magnitude of the adjustment must be recorded.

8. **Cycle Time Test**: The CEMS Cycle Time Test should be performed by the procedures of the Cycle Time Test Procedure United States Environmental Protection Agency, 40 CFR Part 75 Appendix A. The cycle time test determines the amount of time it takes the CEMS to measure calibration gas after it has been introduced into the system. The downscale cycle time is 95 percent of the amount of time the CEM takes to transition from a stable stack gas reading to a stable zero-level concentration calibration gas reading. The data acquisition and handling system is used to time the transition. The upscale cycle time is 95 percent of the amount of time the CEM takes to transition from a stable stack gas reading to a stable high-level concentration calibration gas reading. The data acquisition and handling system is used to time the transition.

CHAPTER 3: SUPPORTING METHODS

This table provides a list of various approved test methods as authored and updated by the USEPA. They are grouped as "Supporting Methods" because they are methods that are likely be required by or used in conjunction with other approved pollutant specific test methods discussed later in this manual.

Table 3: Approved Supporting Methods

Method	Title / Description	Author
1	Sample and Velocity Traverses	USEPA
2	Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)	USEPA
2 A	Direct Measurement of Gas Volume Through Pipes and Small Ducts	USEPA
2 B	Exhaust Gas Volume Flow Rate (Gasoline Vapor Incinerators)	USEPA
2 C	Gas Velocity and Volumetric Flow Rate in Small Stacks or Ducts (Standard Pitot Tube)	USEPA
2 D	Measurement of Gas Volume Flow Rates in Small Pipes and Ducts	USEPA
2 E	Determination of Landfill Gas Production Flow Rate	USEPA
2 F	Determination of Stack Gas Velocity and Volumetric Flow Rate with Three Dimensional Probes	USEPA
2 G	Determination of Stack Gas Velocity and Volumetric Flow Rate with Two Dimensional Probes	USEPA
2 H	Determination of Stack Gas Velocity Taking into Account Velocity Decay Near the Stack Wall	USEPA
3	Gas Analysis for the Determination of Dry Molecular Weight	USEPA
4	Determination of Moisture Content in Stack Gases	USEPA

CHAPTER 4: PARTICULATE MATTER

Table 4: Approved Particulate Matter Test Methods

Method	Title / Description	Author
5	Filterable Particulate Emissions	USEPA
5 A	PM Asphalt Roofing	USEPA
5 B	PM Non-Sulfuric Acid	USEPA
5 D	PM Baghouses	USEPA
5 E	PM Fiberglass Plants	USEPA
5 F	PM Fluid Catalytic Cracking Unit	USEPA
17	In Stack Particulate	USEPA
201	Determination of PM10 Emissions (exhaust gas recycle procedure)	USEPA
201A	Determination of PM10 and PM2.5 Emissions (Constant Sampling Rate Procedure)	USEPA
202	Condensable Particulate Emissions	USEPA

Filterable emissions from stationary sources should be determined by the Methods 5 through 5F inclusive and Method 17 United States Environmental Protection Agency, 40 CFR 60 Appendix A.

Condensable particulate emissions from stationary sources should be determined by Method 202 United States Environmental Protection Agency, 40 CFR 51 Appendix M.

PM_{10} emissions from stationary sources should be determined by Method 201 or Method 201A United States Environmental Protection Agency, 40 CFR 51 Appendix M

$PM_{2.5}$ emissions from stationary sources should be determined by Method 201A or Method 202 United States Environmental Protection Agency, 40 CFR 51 Appendix M

The methods above should be used in conjunction with Methods 1; 2 thorough 2H; 3; and 4 United States Environmental Protection Agency, 40 CFR 60 Appendix A.

A. Coke Ovens

Coke oven pushing sources should determine compliance of particulate emissions with one of the EPA stack test methods 5 through 5F with the following back-half analysis to be used:

1. Identify and desiccate for 24-hours sufficient filters to filter all liquid collectors and washing.
2. Weigh and record the weights of the filters in addition to the identification number.
3. Before filtering, measure to the nearest millimeter, the volume of liquid in each impinger and record the measurement.
4. Place the impinger solutions in a labeled container and wash any residuals in the impingers into the container using distilled water and a policeman.
5. Add the water washings from the back half of the filter holder and interconnecting glassware to the container in (4).
6. Wash the impingers and the connecting glassware with acetone and place in a labeled container.
7. Filter solutions from steps (4) and (5) using pre-weighed and identified Millipore

   0.22 micron Catalog # GSPW-047-00
   0.45 micron Catalog # HAWP-047-00
   0.80 micron Catalog # AAWP-047-00

8. Measure the filtrate from (7) to the nearest millimeter and record the volumes. Air dry, then desiccate for 24-hours all filters used in step 7. Weigh to the nearest .1 mg., and record the weight. As an alternative, the filters can be oven dried at 160-180° F, cooled in a desiccator, and weighed to a constant weight.
9. Identify and dry for two hours at 105° C as many 350 milliliter evaporating dishes as needed to evaporate the filtrates. Then desiccate until cool and weigh to the nearest 0.1 mg. Record each weight with its identification number.
10. Impinger solution after filtration – follow steps a through d below:
    a. Evaporate impinger (sample) solution to a minimum weight using evaporating dishes prepared in step 10 and an equal amount of distilled water used in the impingers at 160-180° F. Record the weight of the distilled water residue. This will be the distilled water blank.

    b. Re-dissolve the sample solution residue in water and neutralize using NaOH. Calculate weight of Na + ion. (The NaOH should react with any free H_2SO_4 to tie up the SO_4 = present in sample as well as other condensables).

    c. Evaporate neutralized solution to constant weight at 160-180° F. Record weight. (This weight should include NA +, added plus the SO_4 = present in sample, as well as other condensables).

   d. Re-dissolve in distilled water and use turbidimetric method for determination of sulfate ion (SO_4=). Calculate weight of SO_4=. An acceptable alternative for determining sulfate ion would be the Barium-Thorin titration method (EPA Method 6).

11. Transfer the acetone washing from step 6 into a pre-weighed evaporating dish after measuring and recording the volume of acetone.

12. Place a measured quantity of unused acetone into pre-weighed evaporating dish. This is the acetone blank.

13. Evaporate both blank (13) and unknowns (12) at less than 60° C in a vacuum.

14. Desiccate to a constant weight and reweigh. Then record the weight to the nearest 0.1milligram.

15. Calculation of back half particulate catch – determine the total back half particulate catch from the sum of the weights obtained from steps (9), (11c), and the unknown in step (15) minus the weights obtained from steps (11a), (11b), and (11d), and the blank from step (15).

16. Compliance with the particulate mass emission standard for coke oven pushing is calculated based upon the front half of the EPA train and insoluble weights in the impinger solution and on sample exposed surfaces after the final filtration media. Insoluble weights are determined by 0.22-micron filtration.

B. Pressurized Baghouses

Pressurized baghouse sources, which do not discharge from an outlet stack, may determine compliance with particulate matter standards by performing the following procedure:

1. The velocity and volumetric flow rate of gases going into the baghouse should be tested on the plenum connecting the fans to the baghouse. The number of traverse points will be selected per EPA Method 1. EPA Method 2 will be used to determine the volumetric flow rate. The volumetric flow rate will be determined for each run of particulate testing.

2. The concentration of particulate matter in the baghouse exhaust gases will be determined using high volume samplers of the type described in 40 CFR, Part 50, Appendix B.

3. Each compartment will be sampled for 3 consecutive hours with 4 samplers per compartment.

4. Each compartment will be divided in quadrants and one sampler located at the center of each quadrant. If desired, two or more compartments may be sampled simultaneously. All compartments should be sampled once during the compliance determination.
5. The samplers should be located above the bag support mechanism. If temperature conditions preclude placement of the samplers at the locations specified above, flexible duct work will be

used to duct the emissions to each sampler which will be in a “safe” area. The inlet to the flexible duct will be positioned at the sampling locations specified above.

6. The starting flow rate through each high-volume sampler should be approximately 50 cfm. If the flow volume through any sampler decreases by more than 20% from the starting flow rate, sampling with that sampler should then be terminated. Record when the sampling period of each sampler run commenced and terminated and record the physical location of each sampler. These data should be included in the test report. As soon as one such sampler run is terminated, the filter should be immediately replaced and another run should be started.

7. Any gratings of the baghouse compartments that may admit outside air into the baghouse will be sealed before the sampling period.

8. Temperature of the gases leaving the baghouse compartment will be measured by a temperature indicator located at each compartment being tested. This indicator will be near one of the high-volume samplers used to test the compartment.

9. Moisture content of the gases going to the baghouse will be measured at the plenum connecting the fans to the baghouse.

10. Test high volume sampler mass concentrations results will be determined and reported separately for each compartment.

11. In determining compliance with the emissions limitations these steps will be followed:

    a. A compartment average concentration will be computed by arithmetically averaging the concentrations from the four high-volume sampler locations. If more than one run per high-volume sampler is needed during any 3-hour test, then each of the individual concentrations per high-volume sampler should first be flow weight averaged to determine a concentration for that high-volume sampler location.

    b. The separate compartment average concentrations is arithmetically averaged to determine an overall concentration for the entire test.

    c. In computing compliance, the overall concentration determined in (b) above is utilized, in conjunction with the flow rate measured.

C. Procedure for Qualifying Test High-Volume Samplers

1. All test samplers used for testing pressurized baghouses should be qualified against a properly calibrated Air Quality Program sampler. The concentration variation of all test high-volume samplers should indicate a concentration variation less than 15% with the Air Quality Program sampler.

2. Qualification of test samplers will take place in a clean plant area with the samplers placed at least 10 feet apart from each other and any other obstacles. Adequate power service should be provided (115 v. @ approximately 100 amp.) to prevent low flow rates at the individual samplers.

Starting flow rates should be approximately 50 to 60 cfm. Final flow reduction for each individual sampler should be less than 20%. Any sampler showing a flow reduction greater than 20% should be recalibrated before the baghouse test is performed.

3. The samplers will run for four hours. Flow rate readings will be taken at the start and at one hour intervals during the test.

D. Modular Baghouses

Modular baghouses sources should determine compliance with particulate matter standards by performing the following procedure:

1. Stack sampling procedures for determining compliance for sources equipped with modular baghouses should be Method 5D United States Environmental Protection Agency and 40 CFR 60 Appendix A.
2. If the baghouse contains more than five stacks, the averaging provisions would not apply and one test run per stack should be performed. Compliance is determined by:
    a. Computing the mass emission rate, in lb. per hour, for each stack, then:
    b. Summing each of these mass emission rates. During all sampling periods, the production rate shall be maintained within ten percent of the mean rate for the entire sampling period.

E. Sources Located Within a Structure

Determination of compliance with PM_{10} standards for fugitive emissions from sources located within a structure should be performed by the following method:

1. Principle and Applicability and Limitations
    a. This method measures the mass concentration of respirable dust smaller than 10-micron particulate size.
    b. This method is applicable to respirable dust from the fugitive emission sources enclosed within a structure.
    c. Depending on predominant wind direction during the sampling, air flow will be inward at some openings and outward at others. Only the openings with outward air flow will be responsible for fugitive emission and therefore, the area and air velocity through these openings will be taken into consideration for calculating emission rate.
    d. Since the wind direction may change during sampling, the air flow which was outward may become inward at the same openings where the test is being carried out. Under this situation, the sampling must continue at the same opening.

   e. If the air flow remains inward for more than 50 percent of sampling time, then the sample must be discarded and another opening should be selected for sampling.

2. Sample Points

   a. By visual determination, select the openings with the most fugitive dust leakage out of enclosed structure.

   b. Each sampling area should be divided into 23 equal areas with the sample point at the centroid of each area.

3. Velocity and Temperature

   a. The velocity of the air flowing through the sample point can be measured with a vane anemometer (Kurtz Model 441 or equivalent) at the centroid of the sample point. The velocity should be measured at the beginning and end of the sampling period for each sample point. A total of 24 velocity measurements should be made per two-hour run.

   b. The temperature of the air can be measured with a mercury thermometer before and after each test run.

4. The moisture in the sampled air will be the relative humidity of the ambient air. This can be determined with a sling psychrometer and should be measured at least once at each opening.

5. The area of every opening should be measured in square feet.

6. Sampling Apparatus

   a. Sampling Train: The sample train consists of a 10 millimeter Dorr-Oliver cyclone connected to a filter holder (37mm) loaded with a tared quartz filter and personal sampling pump.

   b. Personal Sampling Pump: A personal sampling pump capable of sampling air at 1.7 L/min +5% with flexible Tygon connecting tubing.

   c. Filter: Whatman type ZM-A, 37 mm diameter quartz filter or equivalent supported with backup pad in a two-piece, 37mm cassette filter holder held together by tape or cellulose shrink band.

   d. Cyclone: 10 mm Dorr-Oliver nylon cyclone.

   e. Sampling Head Holder: This holder must keep the cassette, cyclone and coupler together rigidly so that air enters only at the cyclone inlet.

7. Equipment for Analysis

   a. Environmental Chamber for Balance: It should be maintained at 20 degrees C +/- 0.3 °C and 50% +/- 5% humidity.

   b. Vacuum desiccator

8. Filter Cassette Preparation and Pre-Weighing Before Sampling

   a. Dry filters and backup pads under vacuum in the vacuum desiccator for at least 15 minutes. Release the vacuum, remove the desiccator cover, and equilibrate the filters in the environmental chamber for at least 1 hour. Or,

   b. Desiccate the filters and backup pads in the desiccator for 24 hours.

   c. Number the backup pads with a ballpoint pen and place one pad, the numbered side down, in the filter cassette bottom section.

   d. Weigh the filters in the environmental chamber. Record the filter tare weight, W1(mg).

   e. Zero the balance before each weighing.

   f. Handle the filter with nylon forceps.

   g. Place a weighed filter on top of the backup pad in the filter cassette bottom section and allow to stand an additional 8 to 16 hours in the environmental chamber.

   h. Reweigh the filters. If this tare weight differs by more than 0.01 mg from the first tare weight obtained in step (d) above, discard the filter.

      NOTE: Insert a rod through the outlet hole of the filter cassette bottom section to raise the backup pad and filter so that the filter can be grasped with forceps.

   i. Reassemble the filters in the filter cassettes and close firmly so that leakage around the filter will not occur. Place a plug in each opening of the filter cassette. Place a cellulose shrink band around the filter cassette, allow to dry, and mark with the same number as the backup pad.

   j. Remove the cyclone's grit cap and vortex finder before use and inspect the cyclone interior. If the inside is visibly scored, discard this cyclone since the dust separation characteristics of the cyclone might be altered. Clean the interior of the cyclone to prevent re-entrainment of large particles.

   k. Assemble the sampler head. Check alignment of filter holder and cyclone in the sampling head to prevent leakage.

9. Procedure

   a. Calibration: Calibrate each personal sampling pump to 1.7 liters per minute with a representative quartz filter in line.

   b. Sampling Procedure: For door or window openings, sample at the centroid of each 12 equal areas used during the velocity traverse for 10 minutes per point for a total of 120 minutes per run. Three runs comprise a test, one each at three different window or door openings. The cyclone air intake should face the window or door opening and should be no more than 6 inches outside the plane of the door or the window.

NOTE: Do not allow the sample assembly to be inverted at any time.
Turning the cyclone to anything more than a Horizontal orientation
may deposit oversized material from the cyclone body onto the filter.

10. Sample Preparation

    a. Wipe dust from the external surface of the filter cassette with a moist paper towel to minimize contamination. Discard the paper towel.

    b. Remove the top and bottom plugs from the filter cassette. Place the filter cassettes in a vacuum desiccator for at least 15 minutes followed by equilibration for at least 1 hour in the environmental chamber, or desiccate the filter in desiccator for 24 hours.

    c. Remove the filter cassette band, pry open the filter cassette, and remove the filter by inserting a rod in the outlet hole of the filter cassette. Handle the filters very carefully by the edge to avoid loss of dust.

    d. Zero the microbalance before all weighing. Use the same microbalance for weighing filters before and after sample collection. Calibrate the balance with National Bureau of Standards Class M certified weights.

    e. Take two replicate blank filters for every batch of field samples for quality assurance on the sampling procedures. The set of replicate blank filters should be exposed to the same dust environment, either in a laboratory dust chamber or in the field. The quality control samples must be taken with the same equipment, procedures and personnel used in the routine field procedures. Calculate precision from these replicates. Take corrective action when the precision is out of control.

    f. Weigh each filter, including field blanks. Record this post-sampling weight, W2(mg), beside its corresponding tare weight, W2(mg). Record anything remarkable about a filter (e.g., visible particulates, overloaded, leaking, wet, torn, etc.)

11. Calculations

a. Calculate the concentration of respirable dust, C (mg/m^3), in the air volume sampled:

$$\boldsymbol{C = \frac{(W2-W1)}{V} + B \cdot 1000}$$

Where:
W1 = Tare weight of filter before sampling (mg).
W2 = Post-sampling weight of sample-containing Filter (mg).
B = Mean change in field blank filter weights between tare and post-sampling (mg) (+or-)
V = Air volume sampled (liters)

b. Calculate the air volume rate through a door or window.

$$\boldsymbol{VOs = Vs \cdot As}$$

Where:
V0s = Volumetric flow rate from a single window or door opening of ft^3/min.
Vs = Average of 24 velocity measurements by anemometer (ft/min) for a single window or door opening.
As = Cross-sectional area of a single window or ft^2 door opening.

c. Calculate the total air volume rate through the building.

$$\boldsymbol{V01 = V\varpi = A1}$$

Where:
V01 = Total volumetric outward flowrate from all building openings (ft^3/min).
Vϖ = Opening velocity averaged for 3 runs (ft/min).
A1 = Cross sectional area (ft^2) of all building openings where air flow was outwards.

d. Calculate the Emission Rate (1 lb./hour)

$$\boldsymbol{C = 1.3216 \cdot 10^4 Cavg \cdot \frac{VO1}{35.3}}$$

Where:
C = Total concentration lb/hour from all openings.
Cavg = Average concentration mg/m3 of 3 runs at 3 different openings.
Cavg = (C1 + C2 + C3) /3
C1 = Concentration from run 1 (mg/m^3)

C2 = Concentration from run 2 (mg/m^3)
V01 = Total volumetric flowrate from all building openings. (ft^3 / minute)
35.3 = Conversion factor for converting cubic feet to cubic meters.

CHAPTER 5: SULFUR AND SULFUR COMPOUNDS

Table 5: Approved Sulfur and Sulfur Compound Test Methods

Method	Title / Description	Author
6	Determination of Sulfur Dioxide Emissions	USEPA
6 A	Determination of Sulfur Dioxide, Moisture, and Carbon Dioxide (Fossil Fuel Combustion Sources)	USEPA
6 B	Determination of Sulfur Dioxide and Carbon Dioxide Daily Average Emissions (Fossil Fuel Combustion Sources)	USEPA
6 C	Determination of Sulfur Dioxide Emissions (Instrumental Analysis)	USEPA
8	Determination of Sulfuric Acid (Mist) and Sulfur Dioxide Emissions	USEPA
16	Semi-continuous Determination of Sulfur Emissions	USEPA
16 A	Determination of Total Reduced Sulfur Emissions (Impinger Technique)	USEPA

A. Sulfur Dioxide Emissions from Stationary Sources

1. Sulfur dioxide emissions from stationary sources should be determined by the Methods 6 through 6C inclusive United States Environmental Protection Agency, 40 CFR 60 Appendix A.

2. Calibration gas cylinders for the instrument method 6C should be Environmental Protection Agency Traceability Protocol for Assay and Certification of Gaseous Calibration Standards . Method 205 United States Environmental Protection Agency, 40 CFR 51 Appendix M can be used to dilute EPA protocol 1 gas to low level calibration gas.

B. Sulfuric Acid Mist Emissions

Sulfuric Acid Mist emissions from stationary sources should be determined by the Method 8 United States Environmental Protection Agency, 40 CFR 60 Appendix A.

C. Total Reduced Sulfur Emissions

Total reduced sulfur emissions from stationary sources should be determined by the Method 16A, United States Environmental Protection Agency, 40 CFR 60 Appendix A.

CHAPTER 6: CARBON MONOXIDE

Table 6: Approved Carbon Monoxide Test Methods

Method	Title / Description	Method
10	Determination of Carbon Monoxide Emissions (Instrumental Analyzer Procedure)	USEPA

A. Carbon Monoxide Emissions from Stationary Sources

Carbon monoxide emissions from stationary sources should be determined by Method 10 United States Environmental Protection Agency, 40 CFR 60 Appendix A.

CHAPTER 7: VOLATILE ORGANIC COMPOUNDS

Table 7: Approved VOC Test Methods

Method	Title / Description	Author
18	Measurement of Gaseous Organic Compound Emissions by Gas Chromatograph	USEPA
21	Determination of Volatile Organic Compound Leaks	USEPA
24	Determination of Volatile Matter Content, Water Content, Density, Volume solids of Surface Coatings	USEPA
24 A	Determination of Volatile Matter Content and Density of Publication Rotogravure Inks and Related Coatings	USEPA
25	Determination of Total Gaseous Non-Methane Organic Emission as Carbon	USEPA
25 A	Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer	USEPA
25B	Determination of Total Gaseous Organic Concentration Using a Nondispersive Infrared Analyzer	USEPA
316	Sample & Analysis for Formaldehyde Emissions in the Mineral Wool & Wool Fiberglass Industries	USEPA
318	Measurement of Emissions from the Mineral Wool and Wool Fiberglass Industries (Extractive FTIR Spectroscopy)	USEPA
320	Measurement of Vapor Phase Organic and Inorganic Emissions (Extractive FTIR Spectroscopy)	USEPA
323	Measurement of Formaldehyde Emissions from Natural Gas-Fired Stationary Sources (Acetyl Acetone Derivatization Method)	USEPA
23	Determination of Halogenated Organics (Dioxins and Furans)	USEPA
	Organic Carbon (Total), Combustion - Infrared Method, by Standard Methods for the Examination of Water and Wastewater, 14th edition	APHA
	Emission Test Procedures for Tank Truck Gasoline Loading Terminals (Appendix A), “Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals” EPA - 450/2-77-026	USEPA
	“Compliance Test Method and Leak Detection Equipment for Perchloroethylene Dry Cleaners", Appendix B, Measurement of Volatile Organic Compounds EPA - 450/2-78-041	USEPA
D322-97	Standard Test Method for Gasoline Diluent in used Gasoline Engine Oils by Distillation	ASTM

A. Definition

The USEPA defines a volatile organic compound as any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. 40 CFR 51.100(s) lists additional compounds of carbon that are not defined as VOC's due to negligible photochemical reactivity.

B. Subtraction of Exempt Carbon Compounds

For purposes of determining compliance with emissions limits, VOC should be measured by the approved test methods listed in this document as applicable. Where such a method also measures compounds with negligible photochemical reactivity, the Air Quality Program may approve the subtraction of these "exempt carbon compounds" from the total VOC results if the amounts of such compounds are accurately quantified.

If method 25A is used to determine total hydrocarbons, the Air Quality Program may permit the concurrent use of VOC speciating test methods (e.g. method 18 or method 320) to determine concentrations of individual compounds with negligible photochemical reactivity. However, Method 25A (FID) analyzer response factors for each compound must be established at the measured concentrations and stack gas conditions. The speciated concentration results must then be multiplied by the determined response factors before subtraction from the method 25A results.

Response factor sample calculation:

$$\mathbf{RF_i = \frac{C_{Mi}}{C_{Ai}}}$$

Where:

RF_i = Response factor of compound i when measured with Method 25A C_{Mi} =

Measured concentration of compound i in PPMv as carbon

C_{Ai} = True concentration of compound i in ppmv as carbon

$$C_{icorr} = RF_i \cdot C_{imeas}$$

Where:

C_{icorr} = Concentration of compound i corrected to the value that would have been measured by method 25A (ppm as carbon)

C_{imeas} = Concentration of compound i measured by method 18 or 320 (ppm as carbon)

$$C_{peg} = C_{icorr} \cdot 0.6098$$

Where:

C_{peg} = Concentration of compound i in mg of propane equivalent per DSCM

Note- By convention, concentrations of NMOC are reported in units of parts per million carbon (ppmC), which, for a specified compound, is the concentration of volume (ppmV) multiplied by the number of carbon atoms in the compound.

The following USEPA documents contain information on the establishment and use of Method 25A (FID) response factors:

- Manual for Coordination of VOC Emissions Testing using EPA Methods 18, 21,25 and 25A (EPA 340/1-91-008)
- 40 CFR 51.100
- 40 CFR 60 §60.4244 (g)
- OAQ-107, Section 3

C. Formaldehyde

Formaldehyde emissions from stationary sources should be determined by the Method 316, 318, 320 or 323 United States Environmental Protection Agency, 40 CFR 63 Appendix A

D. Dioxin and Furan

Dioxin and Furan emissions from stationary sources should be determined by the Method 23 United States Environmental Protection Agency, 40 CFR 60 Appendix A.

E. Surface Coatings

Surface Coatings volatile organic compound emissions, water content, and density of surface coatings should be determined by Methods 24 through 24A United States Environmental Protection Agency, 40 CFR 60 Appendix A.

F. Effluent Water Volatile Organic Compound

Effluent water volatile organic compound emissions should be determined by Standard Methods for the Examination of Water and Wastewater, 14th edition, "Organic Carbon (Total), Combustion - Infrared Method", American Public Health Association, Washington, D.C.

G. Control System Effectiveness of Vapor Recovery Systems

Control System Effectiveness of vapor recovery systems and similar control equipment for volatile organic compound emissions should be determined by method 25 through 25A inclusive and Method 21 United States Environmental Protection Agency, 40 CFR 60 Appendix A.

H. Gasoline Vapor Recovery Systems

Gasoline Vapor Recovery Systems volatile organic compound emissions during loading operations should be determined by Methods 21 and Methods 25 or 25A United States Environmental Protection Agency, 40 CFR 60 Appendix A.

I. Gasoline Tank Trucks Leak Tightness

Gasoline Tank Trucks leak tightness should be determined by Method 21 United States Environmental Protection Agency, 40 CFR 60 Appendix A.

J. Tank Trucks and Vapor Collection Systems

The following method should be used to determine the magnitude of leaks of volatile organic compounds from gasoline tank trucks and vapor collection systems and shall be used in the annual tests required of gasoline tank trucks:

Gasoline Vapor Leak Detection Procedure by Combustible Gas Detector (Appendix B), "Control of Volatile Organic Compound Leaks from Gasoline Tank Trucks and Vapor Collection Systems", EPA - 450/2-78-051, U.S. Environmental Protection Agency, December, 1978.

K. Perchloroethylene Dry Cleaning Facilities

The following method should be used to determine emissions from percloroethylene dry cleaning facilities:

"Compliance Test Method and Leak Detection Equipment for Perchloroethylene Dry Cleaners", Appendix B, Measurement of Volatile Organic Compounds, U.S. Environmental Protection Agency, EPA - 450/2-78-041, Washington, D.C.

L. Synthetic Organic Chemical and Polymer Manufacturing and Petroleum Refinery Equipment

The following method should be used to determine the magnitude of volatile organic compound leaks from synthetic organic chemical and polymer manufacturing and petroleum refinery equipment:

Method 21 - Determination of Volatile Organic Compounds Leaks, 40 C.F.R. Part 60, Appendix A

M. Petroleum Solvent Dry Cleaning Facilities

1. The following method should be used to calculate the weight of VOCs vented from a petroleum solvent dry cleaning dryer emission control device:

   Methods 1, 2, and 25A, 40 C.F.R. Part 60, Appendix A

2. Petroleum solvent dry cleaning facilities that operate a petroleum solvent filtration system but do not employ cartridge filters, should calculate, record, and report to the Air Quality Program the weight of VOCs contained in each of at least five 3-pound samples of filtration waste material taken at intervals of at least one week by employing the following method:

   ASTM Method D322-97 (Standard Test Method for Gasoline Diluent in used Gasoline Engine Oils by Distillation)

CHAPTER 8: NITROGEN OXIDES AND NITROGEN COMPOUNDS

Table 8: Approved Nitrogen Oxides and Nitrogen Compound Test Methods

Method	Title / Description	Author
7	Determination of Nitrogen Oxide Emissions	USEPA
7 A	Determination of Nitrogen Oxide Emissions (Ion Chromatographic Method)	USEPA
7 B	Determination of Nitrogen Oxide Emissions (Ultraviolet Spectrophotometric Method)	USEPA
7 C	Determination of Nitrogen Oxide Emissions (Alkaline Permanganate/Colorimetric Method)	USEPA
7 D	Determination of Nitrogen Oxide Emissions (Alkaline-Permanganate/Ion Chromatographic Method)	USEPA
7 E	Determination of Nitrogen Oxide Emissions (Instrumental analyzer Method)	USEPA
CTM 027	Procedure for Collection and Analysis of Ammonia	USEPA
26A	Determination of Hydrogen Halide Emissions (Isokinetic Method)	USEPA

A. Nitrogen from Stationary Sources

1. Nitrogen from stationary sources should be determined by the Methods 7 through 7E inclusive United States Environmental Protection Agency, 40 CFR 60 Appendix A.

Calibration gas cylinders for the instrument method 7E should be Environmental Protection Agency Traceability Protocol for Assay and Certification of Gaseous Calibration Standards. Method 205 United States Environmental Protection Agency, 40 CFR 51 Appendix M may be used to dilute EPA protocol 1 gas to low level calibration gas.

B. Ammonia from Stationary Sources

1. Ammonia from stationary sources should be determined by the Conditional Test Method 027 United States Environmental Protection Agency, 40 CFR 60 Appendix A.
2. In cases where the stack has a high degree of moisture, test method 26A United States Environmental Protection Agency, 40 CFR 60 Appendix A may be used upon approval by the Air Quality Program.

CHAPTER 9: HAZARDOUS AIR POLLUTANT METALS

Table 9: Approved Hazardous Air Pollutant and Metals Test Methods

Method	Title / Description	Author
29	Determination of Metals Emissions	USEPA
30 A	Determination of Total Vapor Phase Mercury Emissions (Instrumental Analyzer Procedure)	USEPA
30 B	Determination of Total Vapor Phase Mercury Emissions from Coal Fired Combustion Sources Using Carbon Sorbent Traps	USEPA
SW 0061	Determination of Hexavalent Chromium Emissions (SW-846 Compendium)	USEPA
26 A	Determination of Hydrogen Halide and Halogen Emissions (Isokinetic Method)	USEPA

A. HAP Metals / EPA Method 29

Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Phosphorus, Selenium, Silver, Thallium, and Zinc emissions from stationary sources may be determined by the Method 29, United States Environmental Protection Agency, 40 CFR 60 Appendix A.

B. Mercury

Mercury emissions from coal-fired stationary sources may be determined by the Methods 30A and 30 B, United States Environmental Protection Agency, 40 CFR 60 Appendix A.

C. Hexavalent Chromium

Hexavalent chromium from stationary sources should be determined by the Method SW 0061, "Determination of Hexavalent Chromium Emissions from Stationary Sources".
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846

D. Hydrogen Chloride and Hydrogen Fluoride

Hydrogen Chloride and Hydrogen Fluoride emissions from stationary sources should be determined by the Method 26A, United States Environmental Protection Agency, 40 CFR 60 Appendix A.

CHAPTER 10: INCINERATOR TEMPERATURES

A. Procedure for Determination of Incineration Temperature

1. Insert a shielded thermocouple into the sample gas stream at a downstream point at least 2' from the center dimension of any burner. The location should be selected to be completely free of flame impingement and contact with walls or baffles. A normal location is near the effluent point of an afterburner section.

2. Contact with surfaces is to be avoided. A volume of sample gas is drawn through the shield from the incinerator effluent and temperatures are recorded after attaining thermal equilibrium or a constant temperature range cycle.

3. The suitable thermocouple is normally enclosed in a 1/8" diameter sheath and inserted in a 3/8" ID stainless steel tube. The tube is designed to protect the sheathed thermocouple from exposure to open sight of walls or flame, and reduce radiation effects. The tube (shield) is opened to the sample gas near the junction end of the thermocouple, but closed at the instrument end, except for a gas suction connection. A volume of gas is aspirated past the thermocouple, through the shield, at a 500-fps velocity (about 6.5 SCFM at 1,400°F).

4. The temperature is read and recorded when stable or in a steady cycle.

CHAPTER 11: HYDROGEN SULFIDE

Table 11: Approved Hydrogen Sulfide Test Methods

Method	Title / Description	Author
15	Determination of Hydrogen Sulfide, Carbonyl Sulfide, and Carbon Disulfide Emissions	USEPA

Hydrogen Sulfide, Carbonyl Sulfide, and Carbon Disulfide emissions from stationary sources should be determined by **Method 15** United States Environmental Protection Agency, 40 CFR 60 Appendix A.

CHAPTER 12: SULFUR CONTENT OF COKE

Table 12: Approved Sulfur Content of Coke Test Methods

Method	Title / Description	Author
D 4239-14	Standard Test Method for Total Sulfur in the Analysis of Coal and Coke	ASTM

Sulfur content of coke should be determined by "Standard Test Method for Total Sulfur in the Analysis of Coal and Coke", American Society for Testing Materials, D 4239-14, 1

CHAPTER 13: VISIBLE EMISSIONS

Table 13: Approved Visible Emissions Measurement Methods

Method	Title / Description	Author
9	Visual Determination of the Opacity of Emissions (see section A of this chapter for ACHD modifications of this method)	USEPA
	Air Quality Program Certified Continuous Opacity Monitoring System (see **Chapter 2** of this manual for certification requirements)	

Measurements of visible emissions should be performed in either of the following two ways:

A. Allegheny County Method of Determining Visible Emissions

In determining compliance with the visible emission standards, EPA Method 9 should be used with the following modifications:

1. Provisions of paragraph 2.5 of Method 9 do not apply. Rather than applying the provisions of paragraph 2.5 of Method 9, each observation that is recorded to be equal to or greater than the opacity standard in §2104.01.a.1 or applicable source permit shall be counted in determining the hourly aggregated period.

2. In making visible emissions observations the observer should be positioned in accordance with the provisions of Section 2.1 of Method 9 except that if it is an overcast day the reader need not position themselves with their back to the sun.

B. Continuous Opacity Monitoring System

Using any continuous opacity monitoring system (COMS) required by regulation, permit, consent agreement, consent decree, or enforcement order. Chapter 2 of this manual provides requirements for certification and ongoing verification of continuous opacity monitoring systems.

CHAPTER 14: WASTE-DERIVED LIQUID FUEL

Sampling, analysis and equipment testing to determine compliance with the waste-derived liquid fuel burning regulations under Article XXI should be performed as:

A. Sampling

1. For a tank with a capacity of 1,000 gallons or less, a representative sample of waste-derived liquid fuel should consist of at least a single sample of sufficient volume and weight for all analyses required by Section 2105.31 of Article XXI. Single samples should be taken from the tank at a level of fifty percent (50%) of the liquid height from the bottom of the tank.

2. For a tank with a capacity of greater than 1,000 gallons, a representative sample of waste-derived liquid fuel should consist of a composite sample taken in a manner acceptable to the Air Quality Program. A single sample taken in accordance with Subparagraph 1. of this Paragraph constitutes a composite sample only where the owner or operator of the waste-derived liquid fuel-burning operation can demonstrate to the Air Quality Program's satisfaction that the contents of the tank were sufficiently agitated prior to and during the taking of the sample.

B. Equipment Testing by Direct Emission Reduction (Waste-Derived Liquid Fuel Regulation)

1. For all equipment <u>except</u> equipment subject to §2105.31.a.4 of Article XXI (unless allowed under §2105.31.b.6.C.ii), direct emission reduction should be determined by the following equation:

$$\text{Percent Direct Emission Reduction} = \frac{CO_2}{CO + CO_2} \times 100$$

Where:

CO_2 = the proportion by volume of carbon dioxide (CO_2) in the flue gas (on a dry basis);

CO = the proportion by volume of carbon monoxide (CO) in the flue gas (on a dry basis).

2. For equipment subject to §2105.31.a.4 of Article XXI (but not meeting the requirements of §2105.31.b.6.C.ii.(a).(2)), direct emission reduction shall be determined by one (1) of the following equations:

a. $$\text{Percent Direct Emission Reduction} = \frac{CCl_4(in) - CCl_4(out)}{CCl_4(in)} \times 100$$

Where:

CCl_4(in) = mass feed rate of carbon tetrachloride going into the equipment in the fuel

CCl_4(out) = mass emission rate of carbon tetrachloride coming from the equipment in the flue gas

This test procedure is spiked to contain at least 1,000 ppm of carbon tetrachloride ($CC1_4$) by weight.

b. $$\text{Percent Direct Emission Reduction} = \frac{POHC(in) - POHC(out)}{POHC(in)} \times 100$$

Where:

POHC(in) = the mass feed rate of principal organic halogenated compounds (POHC) going into the equipment in the fuel.

POHC(out) = the mass emission rate of principal organic halogenated compounds (POHC) coming from the equipment in the flue gas.

This test procedure is spiked to contain at least 1,000 ppm of principal organic halogenated compounds (POHC) by weight.

3. For determining direct emission reduction under Section 2105.31:

   a. The owner or operator of the affected equipment shall conduct the tests required under testing requirements contained in Subsection §2108.02.e of Article XXI unless otherwise specified by the Air Quality Program.

   b. The fuel being burned for a test required under Section 2105.31 shall:

      I. Contain the maximum routine percentage of waste-derived liquid fuel that is present when the equipment is operating at routine operating conditions.

II. Contain waste-derived liquid fuel, which is representative of the waste-derived liquid fuel burned when the equipment is operating at routine operating conditions.

C. Methods for Flue Gas Analysis Applicable to Waste Derived Liquid Fuel Regulation

1. Methods for Carbon Monoxide Analysis:

   a. EPA Method 10. Analysis using a luft-type NDIR analyzer or equivalent. This method allows either a continuous or integrated approach; the modification of the integrated approach using EPA Method 25 sample collection tanks instead of tedlar bags allows safe storage of the undegraded CO sample to the laboratory for analysis.

2. Methods for Carbon Dioxide Analysis:

   a. EPA Method 3 (orsat or fyrite methods)

   b. EPA Method 3A (instrument method). Concurrent measurements should be obtained using orsat or fyrite analyzers, instrument specifications are contained in EPA method 6C

   c. EPA Method 6A (method 6 midget impinger train followed by ascarite II CO_2 absorber). Acceptable for CO_2 values between 2.5% and 25%.

D. Methods for Principal Organic Halogenated Compound Analysis

EPA Method 23 (determination of halogenated organics). For analysis, gas chromatographic (GC) analysis using either a flame ionization detector (FID) or electron capture detector (ECD) is acceptable.

Table 14 Approved Test Methods / Waste Derived Liquid Fuel

Parameter	Author	Method #	Title	Notes
Metals	NBS	**1130 (1)**	Test Procedures for Three Recycled Fuel Oil impurities: Lead (section 6.1.1)	Modified D2788 use with nitric/perchloric acid digestion as proposed in Engineering Science Study
	USEPA	**200.7**	ICP-AES Method for Trace Element Analysis of Water and Wastes	Appendix C to Part 136, Waste Water Method
	ASTM	**1097-12**	Standard Guide for Direct Plasma Emission Spectrometry Analysis	Used by PTM inspectorate
	APHA	**305-85**	Metals by Emission Spectroscopy Using an Inductively Coupled Plasma Source	Waste Water Method
	APHA	**304-85**	Determination of Micro Quantities of (various) Elements by Electrothermal Atomic Absorption Spectrometry	Waste Water Method
	APA	**303B**	Determination of Low Concentrations of Elements (various) by Chelation with APDC and Extraction into MIBK	Waste Water Method
PCB’s	USEPA	**608**	Polychlorinated Biphenyl Determination in Complex Matrices	EPA 608 used as framework (waste water method) Digestion of sample according to Copeland and Gohmann procedure.
	NBS	**584**	Determination of polychlorinated biphenyls in waste and lubricating oils	Utilized L C clean-up procedure followed by glass capillary GC method with electron capture detector.
	ASTM	**D 4059-00**	Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography	Requires sample pre-clean up by NBS584 or Copeland and Gohmann procedure (used by PTM inspectorate)
Ash	ASTM	**D 482-13**	Ash from Petroleum Products	Method is limited to petroleum products which are free from added ash forming additives, including certain phosphorus compounds.
Flash Point	ASTM	**D 93-16**	Flash Point by Pensky-Martens Closed Tester	

Table 14 Approved Test Methods / Waste Derived Liquid Fuel, Continued

Parameter	Author	Method #	Title	Notes
Bottom Sediment / Water	ASTM	**E790-15**	Residual Moisture in Refuse Derived Fuel	
	ASTM	**1796-11**	Water and Sediment in Fuel Oils by the Centrifuge Method	Centrifuge method recommended by NBS 1130 for analysis of difficult types of oils.
	ASTM	**D 95-13**	Water in Petroleum Products and Bituminous Material by Distillation	Distillation method
	ASTM	**D 473-07**	Sediment in Crude Oils and Fuel Oils by the Extractive Method	Extraction method
Total Halogens	ASTM	**D 808-16**	Chlorine in New and Used Petroleum (High Pressure Decomposition Device Method)	
			X-Ray fluorescence or ion chromatography (various methods by approval)	
Heat of Combustion	ASTM	**D 240-14**	Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter	
	NBS	**1130**	Heating Value	
Flue Gas / Carbon Monoxide	USEPA	**10**	Determination of Carbon Monoxide Emissions	
Flue Gas / Carbon Dioxide	USEPA	**3**	Gas Analysis for the Determination of Dry Molecular Weight	
	USEPA	**3 A**	Determination of Oxygen and Carbon Dioxide Concentrations in Emissions (Instrumental Analyzer Procedure)	
	USEPA	**6 A**	Determination of Sulfur Dioxide, Moisture, and Carbon Dioxide from Fossil Fuel Combustion Sources	
Dioxins and Furans	USEPA	**23**	Determination of Halogenated Organics	gas chromatographic (GC) analysis using either a flame ionization detector (FID) or electron capture detector (EDC)

CHAPTER 15: MEASUREMENT OF ODOR EMISSIONS

Measurement of odor emissions beyond source boundary lines should be performed by the Allegheny County Health Department, Air Quality Program methodology as follows:

A. Purpose

This method is used to determine compliance with Section 2104.04 of Article XXI which prohibits the emission of malodorous matter that is perceptible beyond the property line of the emitting source.

B. Observers

During or immediately prior to making odor observations, the person observer should not smoke, use tobacco, eat, drink or do anything that would significantly affect his sense of smell. Observers should not wear aftershave, cologne or other products having a significant odor.

C. Observation Procedure

The following procedure should be used to observe and document odor observations. Information concerning the results of the observation shall be recorded in a form like that set forth in this chapter.

1. Observer should first patrol the area near the source. If odors are detected, the observer should immediately make an odor observation for approximately ten minutes and record the information obtained on the observation form.

2. The observer should then attempt to determine the source responsible for the odors. This can be done by tracing the odor upwind or, if a source is suspected, by going directly to that source. When the source is identified, the observer should make another odor observation of approximately ten minutes near the source boundary on the side on which the initial odor observation was made. Information obtained should be recorded on the observation form.

3. If possible, the observer should then go to the opposite side of the source, make an odor observation approximately 180° from the second observation point, and record the information obtained.

4. As time and circumstances permit, the observer should patrol the area around the source to determine the extent of the area affected by the odors. Additional observations can be made and recorded as described above.

5. The observer may interview persons present in the area affected by the odors to obtain background information. Relevant information includes whether the that person detects the odor, the frequency and duration of the odors, whether odor incidents occur at certain times or days or under certain circumstances, the period over which odor incidents have occurred, a description of the odors, their strength, characteristics and effects.

D. Observation Forms

Information for each observation should be recorded at the time of the observation.

1. **Strength of Odors**: The range of odor strengths observed at each observation point should be recorded using the definitions set forth below. If one odor strength prevails, that strength should be circled or otherwise marked to indicate that most of the odors during the observation were of that strength.

   a. No Odors:

   b. Slight Odors: The level at which the odor becomes detectable and can be described by its characteristics or can be distinguished from other odors.

   c. Moderate Odors: The level at which the odor becomes strong enough to block out other odors, but is not so strong as to make someone try to avoid the odor.

   d. Strong Odors: The level at which a person would take positive action to attempt to avoid the odor.

   e. Very Strong Odors: The level at which the odor produces physiological effects, such as nausea, difficulty of breathing, irritation of the eyes, nose, or throat, or the level at which a residual smell remains after the odor itself is gone.

2. **Odor Description**: The observer should describe as fully and objectively as possible the odors perceived, including as appropriate comparisons to other commonly-known odors. All physiological effects should be noted.

3. **Weather Information**: Weather information should be obtained from or through a qualified meteorologist or from the National Weather Service or similar public weather website. Any significant differences between actual weather conditions at the observation sites and the information obtained from such meteorologist should be noted on the observation form.

4. **Map**: The observation form should include a hand-drawn map showing all observation points, their approximate distance from the suspected source, wind direction as perceived at each observation point, other area odor sources, relevant topographical features and other pertinent information.

Figure 15: Odor Observation Form

ALLEGHENY COUNTY HEALTH DEPARTMENT

AIR QUALITY PROGRAM
ODOR OBSERVATION FORM

Date: ______________________________

Day: ______________________________

Source: ____

Observation Start: ___________ **AM/PM**

Observation Complete: ______________ **AM/PM**

Odor Strength

0 = NONE
1 = SLIGHT
2 = MODERATE
3 = STRONG
4 = VERY STRONG

Weather Conditions

Wind Speed/Dir.: ____

Temperature: ____

Observation Location	Time Interval	Odor Strength	Minutes of Odor Detected @ Each Strength	Odor Type

Total Minutes of Observation: ____________________

Total Minutes of Odor Detection: _________________

Observer:____

Signature:____

Observation Locations or Drawing:	Remarks:________________________________

Provide additional observation location details if necessary.

Odor verified by citizen witness: ____**yes** ____**no**

Signature of citizen witness/s: ____

CHAPTER 16: DETERMINING LEAD CONTENT OF PAINT

Table 16: Approved Methods for Determining Lead Content of Paint

Method	Title / Description	Author
D5702	Field Sampling of Coating Films for Analysis for Heavy Metals	ASTM
E1645-16	Preparation of Dried Paint Samples for Subsequent Analysis by Atomic Spectrometry	ASTM
D3335-85	Standard Test Method for Low Concentrations of Pb, Cd, Co in Paint by Atomic Absorption Spectroscopy	ASTM
6010 D	Inductively Coupled Plasma Atomic (or Optical) Emission Spectroscopy (SW-846 Compendium)	USEPA
E1613	Standard Method for the Analysis of Digested Samples for Lead by ICP-AES, FAAS or Graphite Furnace	ASTM

CHAPTER 17: MONITORING TEST METHODS FOR ABRASIVE BLASTING

Table 18: Approved Abrasive Blasting Monitoring Methods

Author	Method	Title	Notes
USEPA		Reference Method, Lead in Total Suspended Particulate (ambient method), CFR 40 Part 50 Appendix G	8 Hours sampling or longer
NIOSH	**7500**	Free Silica in Atmospheric Dust	8 Hours sampling or longer. Personal pump sampling for PM$_{10}$ using a 37 mm PVC filter and a nylon cyclone to fractionate the particles
			Optional sampling method: 8 Hours sampling or longer. High volume respirable dust sample (sampling rate of 9L/min).
USEPA		Reference Method, Suspended Particulate Matter in the Atmosphere, CFR40 Part 50 Appendix B	8 Hours sampling or longer
USEPA	**(1)**	Reference Method, Particulate Matter as PM10 in the Atmosphere, CFR40 Part 50 Appendix J	8 Hours sampling or longer. Quartz filters meet EPA specifications for SSI PM$_{10}$ Samplers
(1) PM$_{10}$ sampling is not required for abrasive blasting monitoring			

CHAPTER 18: "DETERMINATION OF ASBESTOS CONTENT OF BULK SAMPLES"

"Guidance for Controlling Asbestos-Containing Materials in Buildings,"
EPA 560/5-85-024 United States Environmental Protection Agency, June 1985.

CHAPTER 19: SULFUR IN FUEL OIL

The following apply to tests for the analysis of commercial fuel oil:

a. The fuel oil sample for chemical analysis should be collected in a manner that provides a representative sample. Upon the request of a Department official, the person responsible for the operation of the source should collect the sample employing the procedures and equipment specified in:

   1. ASTM D 4057, *Practice for Manual Sampling of Petroleum and Petroleum Products,* including updates and revisions; or

   2. ASTM D 4177, *Practice for Automatic Sampling of Petroleum and Petroleum Products*, including updates and revisions.

b. Test methods and procedures for the determination of viscosity and sulfur should be those specified in ASTM D 396, Standard Specification for Fuel Oils, including updates and revisions. The viscosity shall be determined at 100°F.

c. Results shall be reported in accordance with the units specified in §2104.10, Commercial Fuel Oil.