Colorado Department
of Public Health
and Environment

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

AIR POLLUTION CONTROL DIVISION

COMPLIANCE TEST MANUAL

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1. Introduction

A. Purpose of Manual:

The purpose of this document is to provide a guide for industry, consultants, and private testing firms by specifying the proper procedures to be followed when conducting emission compliance tests in Colorado. These procedures shall also be followed when a source is certifying Continuous Emission Monitoring (CEM) equipment. However, each interested individual is encouraged to review and be familiar with the specific performance criteria contained in Regulation No. 1, Section IV. Continuous Emission Monitoring Requirements for existing sources, or Regulation No. 6 Standards of Performance for New Stationary Sources. Specific information regarding CEM is available from the Division upon request. The procedures contained in this document will minimize the possibility of inconsistency or duplication of effort, and are adopted pursuant to the provisions of 25-7-109(6) C.R.S. Extra copies of this Compliance Test Manual are available upon request for a small reproduction charge.

B. Authority:

Authority to require sources to perform emission compliance tests is found in several places. Wording in the Colorado Air Quality Control Act enables the Air Quality Control Commission to establish such test methods and procedures and encourages the use of the test methods that have been established by the U. S. EPA. The wording is found in 25-7-109 as follows:

(6) The commission shall establish test methods and procedures for determining compliance with emission control regulations promulgated under this section and, in so doing, shall, to the maximum degree consistent with the purposes of this article, consider the test methods and procedures established by the United States Environmental Protection Agency and shall adopt such test methods and procedures as shall minimize the possibility of inconsistency or duplication of effort.

Through this enabling legislation, the Air Quality Control Commission has passed several regulations that pertain to emission compliance testing. The main regulation is the Common Provisions Regulation under Part II General as follows:

"C. Performance Testing:

1. The owner or operator of any air pollution source shall, upon request of the Division, conduct performance test(s) and furnish the Division a written report of the results of such test(s) in order to determine compliance with applicable emission control regulations.

2. Performance test(s) shall be conducted and the data reduced in accordance with the applicable reference test methods unless the Division:

    a. specifies or approves, in specific cases, the use of a test method with

minor changes in methodology;

b. approves the use of an equivalent method;

c. approves the use of an alternative method the results of which the Division has determined to be adequate for indicating where a specific source is in compliance; or

d. waives the requirement for performance test(s) because the owner or operator of a source has demonstrated by other means to the Division's satisfaction that the affected facility is in compliance with the standard. Nothing in this paragraph shall be construed to abrogate the Commission's or Division's authority to require testing under Article 7 of Title 25, Colorado Revised Statutes 1973, and regulations of the Commission implemental thereof.

3. Compliance test(s) shall be conducted under such conditions as the Division shall specify to the plant operator based on representative performance of the affected facility. The owner or operator shall make available to the Division such records as may be necessary to determine the conditions of the performance test(s). Operations during period{s} of startup, shutdown, and malfunction shall not constitute representative conditions of performance test(s) unless otherwise specified in the applicable standard.

4. The owner or operator of an affected facility shall provide the Division 30 days prior notice of the performance test to afford the Division the opportunity to have an observer present. The Division may waive the 30 day notice requirement provided that arrangements satisfactory to the Division are made for earlier testing.

5. The owner or operator of an affected facility shall provide, or cause to be provided, performance testing facilities as follows:

a. Sampling ports adequate for test methods applicable to such facility

b. Safe sampling platform(s)

c. Safe access to sampling platform(s)

d. Utilities for sampling and testing equipment.

6. Each performance test shall consist of at least three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the applicable standard. For the purpose of determining compliance with an applicable standard the arithmetic mean of results of at least three (3) runs shall apply. In the event that a sample is accidentally lost or conditions

occur in which one (1) of the runs must be discontinued because of forced shutdown, failure of an irreplaceable portion of the sample train, extreme meteorological conditions, or other circumstances beyond the owner or operator's control, compliance may, upon the Division's approval, be determined using the arithmetic mean of the results of the two (2) other runs.

7. Criteria shall be established by the Division for the implementation of the requirements specified by Section II.D. of this regulation.

8. Nothing in this Section shall abrogate the Division's authority to conduct its own performance test(s) if so warranted."

The Colorado Air Quality Control Commission's Regulation No. 3 also has some wording affecting how and under what circumstances compliance tests are performed when required by permit conditions. This wording is contained in Regulation No. 3 Part B Section IV. H. 3. as follows:

"3. Before final approval of the permit is granted, the Division may require the applicant to conduct and pay for performance tests in accordance with methods approved by the Division. A test protocol shall be submitted to the Division for review and approval prior to testing. The Division may monitor such tests and may, at its expense, conduct its own performance tests."

The Air Quality Control Commission has defined emission compliance tests further in other specific regulations. For example, in Regulation No. 1, test methods are defined for particulates from fuel burning equipment and manufacturing processes, and for Sulfur Dioxide emissions. There are also test methods specified in Regulation No. 6, the New Source Performance Standards, and Regulation No. 7, the Volatile Organic Compound Regulations. The test methods that have been specified can be found in Title 40 of the Code of Federal Regulations. In most cases these test methods will be followed, however, all test methods should be approved in advance of every test. The Division can, under the provisions of the regulations cited above, change a specified test method or require a completely different test method, or specify a method if one has not been promulgated by the EPA.

C. Compliance Test Criteria

The following criteria should be followed when conducting a compliance source test:

1. The methods and procedures must be approved IN ADVANCE. If prior approval has not been given by the Division, the test results cannot be accepted and the test(s) must be repeated using approved procedures. The mechanism for approving the test procedures shall be the test protocol (see Chapter 2).

2. There is no required format for the protocol or the compliance test report. However, all of the information contained in the chapters on test protocol and test report should be addressed in order for it to be considered complete. The final test report must contain sufficient information for the reviewer to reconstruct the entire test from the reported results.

3. All source tests must be observed by a member of the Air Pollution Control Division or its delegated representative unless specifically waived. This requirement assures the Division that methods and procedures outlined in the protocol are followed and that a concurrent visible emission evaluation is conducted by a qualified observer if necessary.

4. The operating conditions of the process and air pollution control equipment tested must be recorded and verified by the responsible party and included as part of the compliance test report.

5. All testing and analytical apparatus must be calibrated against the appropriate primary standard, if available, or directly traceable to such, within 180 days prior to the source test. Records of such calibration must be included with the test report.

6. If the emission source has been modified and operated solely for the purpose of conducting a source test, thus constituting circumvention, the results of such source test will automatically be deemed invalid.

7. Quality Assurance will be an extremely important aspect of compliance testing procedures. The Division has adopted some minimal Quality Assurance Procedures which will be utilized during the tests (see Chapter on Quality Assurance). Sources and testers are encouraged to adopt and utilize other methods that are meaningful to them and will increase the precision and accuracy of their test results.

8. In general, compliance tests must be performed while the source is running at > 90% of full load. If the source operates below this level, the permit will be modified to limit the maximum operating level for the source. This requirement may be modified or waived in specific instances (e. g. see engine testing policy in appendix B). Monitor certifications must be performed while the source is operating at

9. Test stoppages: If a facility stops a test solely to avoid failing the test, this may be used as credible evidence to show that the source was out of compliance with its emission limitations. If the testing was stopped due to equipment failure beyond the source's control, extreme meteorological conditions and/or safety concerns which would prevent the test from being completed in a safe and accurate manner, the source should document the reasons for the stoppage. The Division will review this documentation, as well as any test data taken, to determine if a violation occurred. In any event, the source must still complete the testing prior to the deadline contained in its permit or the underlying regulation in order to avoid potential enforcement action.

10. Test postponements: A source which postpones a test may be considered out of compliance if it fails to complete the testing within the timeframe required by its permit or an underlying regulation. If evidence exists that the test was postponed to avoid documenting an emission violation, this may be used as credible evidence in a potential enforcement action.

2. Source Test Protocol

The Source Test Protocol, whether used for compliance purposes or monitor certification, shall be completed by the testing firm and/or the source and received by the Air Pollution Control Division thirty calendar days prior to the proposed test date. The protocol must contain, as a minimum, detailed information on the following:

A. A general description of the entire plant.

We need enough information about the entire plant to be able to understand how the process to be tested fits into the operation of the entire plant. This information will be used to gauge loads necessary for testing and to assure typical operations of the entire plant during the testing process.

B. A detailed description of the process to be tested

The information for this section should be similar to the information needed for the entire plant, however it needs to be submitted in much greater detail. The Division must be able to understand the operation of the process to be tested from the information that is submitted. This information will be used to assure that the process being tested is being operated in a normal manner during the test. The Division also needs to be able to understand which process controls or indicators can be used to check on the process. The information will also be used to check on possible interferences with the test methods that are proposed. Detailed information in the following areas should be submitted:

General Process

1. Flow diagrams
2. Drawings or blueprints of the unit, both plan and elevation views.
3. Raw materials, finished products, flow rates, design capacities, etc.
4. A description of how the process will be operated during the testing.
5. The purpose of the testing. What will the testing show or demonstrate?
6. The emission limits the source is subject to. What units will the results be presented in?
7. The process variables to be monitored during the test, what instrumentation is available to be monitored, and who will do the monitoring. What samples will be taken during the test and how will they be analyzed?
8. Does the operation change periodically? Start ups, shut-downs, cyclic operations, load shifts, soot blowing, etc. How will these problems be dealt with during the test?
9. A description of air pollution control devices including data to be monitored to ensure representative operation during testing and normal maintenance schedule of equipment. The air pollution control equipment shall be operated in such a manner to be representative of future normal operations.

C. Permits and Regulations

The protocol should include copies of emission permits and applicable regulations that can be referred to easily by the source, the test team, and the Division. This reduces confusion over conflicting regulations, permit conditions and any revisions or subsequent agreements. Any correspondence or memos that are related to the source test should also be included.

D. A description of the sampling locations.

This information is needed to plan for the tests.

1. Drawings or blueprints of the stack and/or ductwork including the port locations.
2. Drawings of the sample ports including their sizes and locations, as well as distances upstream and downstream to the nearest flow disturbance.
3. The dimensions of the stack or ducts and the location of the traverse points.

E. A description of the methods to be used in the testing.

This section should <u>not</u> consist of a one line statement that the standard EPA methods will be followed. Rather it should be a discussion of the methods to be used as they will be applied to the condition found on the site. This section of the protocol should provide the main bulk of the protocol as it is the most important. Naturally any deviations from the methods should be documented and explained in great detail. This section should also include a description of the sampling train, analytical procedures to be used, and where they will be done.

F. Quality Control/ Quality Assurance

This section should contain a complete description of the quality assurance and quality control measures that the test team proposes to use during the testing. It should include a statement of where, when, and how blanks will be taken and analyzed. It should also contain a description of the calibration procedures and schedules that the test team uses for its equipment. Any special QA/QC procedures should be explained in detail.

G. A listing of all equations to be used in the testing.

This section should list all of the equations that will be used to reduce the data from the test. The definition of all the variables in the equations should be done in this section.

H. Data Sheets

Copies of all the data sheets to be used in either the testing, analysis, or reporting of the data should be contained in the protocol.

I. Safety requirements

This section should contain a list of any necessary safety equipment and a list of any safety problems that may be encountered at the plant or the testing location.

J. Test Schedule

This section should contain the proposed test dates, as well as a matrix showing when specific tasks of the testing will be done.

After evaluating the completed protocol and, if necessary, after inspecting the test site, the Air Pollution Control Division may require that the test be postponed, or additional conditions, including, but not limited to, the following:

1. Correction of unsafe conditions.
2. Additional tests due to adverse conditions such as interferences, wide variation of feedstock, and non-steady or cyclic processes.
3. Modification of the stack or duct to obtain representative test conditions.
4. Modification of standard test methods in order to obtain representative samples.
5. Air Pollution Control Division observation of the laboratory analysis of the samples.
6. Analysis of blind samples.
7. Air Pollution Control Division obtaining portions of liquid samples.
8. Baseline process operating conditions established by the Air Pollution Control Division during the compliance test.
9. Process operating parameter(s) to be monitored during the compliance test and intervals of recording.
10. Calibration of process monitoring equipment.
11. Analysis of raw feed material or finished product of process being tested.
12. Fuel or pit analysis.

The Air Pollution Control Division must approve the protocol prior to the proposed test date. If the Air Pollution Control Division requires any modifications of the test and analytical methods and/or operational parameters, or requires any additional pre-test meetings, the source and testing firm will be contacted prior to the proposed test date. The source operator or tester shall notify the Division of any modification of the test procedures or analyses and/or operational parameters, as defined in the test protocol previously submitted.

A representative of the Division shall observe the field test procedures and shall be furnished copies of all field data upon request, where applicable. Division representative(s) will not sign a plant release or waiver form.

3. Compliance Test Report

A. Submittal of Report:

Within thirty days following the completion of the test(s), a compliance test report (one copy) must be submitted to the Air Pollution Control Division for review. Additional time may be granted upon written request. Upon receipt, a technical review will be conducted and written notification will be issued regarding the acceptability of the test results and the compliance status of the air pollutant source tested. Acceptance of the test(s) by the Division is contingent on proper operation of the process and related equipment during the test.

B. Certification:

The results of the test shall be certified by the test team leader, person(s) responsible for the writing and/or reviewing of the report, and a person with direct responsibility for plant or process operations. The certification need only include the portion of the report and data for which the representative is directly responsible.

C. Compliance Test Report Format:

Results of the performance test shall be submitted to the Air Pollution Control Division by the facility representative within thirty days following the completion of the field work. The following is a list of the important elements of the compliance test report:

1. A determination of the compliance status of the facility
2. A tabular summary of the results of each run.
3. A description of the process tested.
4. A summary of the test methods used, including an explanation of any deviations from standard methodologies.
5. A drawing of the sample location, including the location of traverse points.
6. A list of all calculations used to arrive at the final results.
7. Copies of all field and laboratory data sheets, including copies of any strip charts.
8. Calibration data for all equipment, including the certification of any calibration gas used in the testing.

The report can follow any format, however, the above information must be included for the report to be considered complete. The important thing to remember is that all of the raw data must be present in the report so that the calculations can be reconstructed to get a final compliance value.

Final results must be presented in units of the emission standard and contain at least one significant figure beyond that of the emission limit.

D. Maintenance of samples:

All sample fractions must be maintained in a safe place after analysis until the Air Pollution Control Division gives official written acceptance of the test report.

4. Calibration and Standardization of Equipment

A. All stack sampling and analytical equipment shall be calibrated against the appropriate primary standard, if available, or to a standard directly traceable to such. A copy of all calibration sheets must be included in the report.

B. All field sampling equipment shall be calibrated using the procedures and ranges as defined in the Federal Register, or with an approved alternate within 180 days prior to the field work. A one point check of any field equipment may be required by a Division representative in the field to detect gross equipment errors. If any equipment errors are detected in the field, the test equipment must either be repaired or replaced.

C. An appropriate standardization curve shall be prepared for all analytical equipment prior to each series of analyses. This requirement also applies to analytical balances which shall be calibrated semi-annually. A log must be maintained with the equipment to show this calibration and a copy shall be included in the final report.

D. All standard solutions utilized for the analysis of source samples shall be primary standards made from either certified standard samples obtained from the National Bureau of Standards, a commercially available primary standard directly traceable to such, or, where no certified NBS standard is available, an appropriate commercially available primary standard must be used. ASTM Standard Method E-200-91 provides appropriate methods and procedures for the preparation, standardization, and storage of standard solutions.

5. Quality Assurance

A compliance source test must provide data to the Division that is complete, precise, accurate, representative, comparable, and yet be done at a reasonable cost to the source. It is the job of the Source Test Coordinator to work with sources and testers to provide data from the compliance source test that meets the above criteria and is still reasonable and cost effective.

Quality Assurance is the method used to assure that the results meet the above criteria. Quality Assurance, then, is obviously an extremely important part of each compliance source test. It is the position of the Division to encourage the sources and the testers to adopt as many Quality Assurance procedures as possible for each test. The Division has some minimal Quality Assurance procedures that should be used for each test or method. Procedures to be used in certain methods are reproduced in Appendix A of this manual. For the other methods, the Test Coordinator should specify these methods if they are not in the test protocol that is submitted for review.

Generally, the Quality Assurance guidelines found in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, EPA- 600/4-77-0276, should be followed for most tests. This book will give the source and the tester an excellent start on Quality Assurance for the tests they are required to perform.

Appendix A

Quality Assurance for Specific Test Methods

The Colorado Air Pollution Control Division has adopted Quality Assurance procedures that reinforce those found in the EPA Regulations, and in some cases add additional requirements to or clarify the existing EPA Methods.

EPA Method 1

1. The stack shall be physically measured as accurately as possible prior to the test.

EPA Method 2

1. Any average delta P lower than .05 inches of water will require the use of an alternative flow measuring device such as an extended range manometer or a hook gauge micromanometer etc.

2. Any pitot tube configuration not meeting the minimum separation configuration found in Figures 2.6, 2.7, and 2.8 of Method 2 (with nozzle attached) will be required to be recalibrated after the test, in a wind tunnel with the nozzle attached.

3. Equipment calibrations must be done within 180 days prior to the test.

EPA Method 3

1. Any sample taken for molecular weight determination or excess air correction factor must be a continuous integrated sample taken at the same sample points and during the same time period as other methods such as Method 5 or Method 6.

2. The sample can be pulled from a separate sampling probe attached to the pitot tube or from a tap off the meter box orifice.

3. Analysis of the sample taken will be by Orsat only. Fyrite analysis is not acceptable. (Use of EPA Method 3A as an alternative to Method 3 is acceptable.)

EPA Method 4

1. Calibration data shall be the original hand written data sheets and shall be made available to the test observer in the field at the time of the test.

2. Equipment shall be calibrated within 180 days prior to the test date.

3. The dry gas meter coefficient must be $0.95<Y<1.05$. Any meter with a correction factor outside of this range must be repaired prior to its use in the field.

EPA Method 5

1. Calibration data requirements shall be the same as for EPA Method 4.

2. Copies of the initial or tare weights of the filters used in the test shall be made available to the observer in the field during the test.

3. The nozzle selected for use during the test will be measured in the field prior to the test using a micrometer. All nozzles will be round with sharp edges.

4. A filter blank and acetone blank will be reserved in the field to demonstrate balance continuity and acetone blank concentrations. Procedures found in QA Volume III for determining the acetone blank concentration will be used, including reporting the acetone density. If these procedures are not followed and if all necessary information is not present in the final report, no acetone blank correction will be allowed.

5. Pitot tubes will be leak checked after each run.

6. Any orsat sample required will be a continuous integrated sample pulled from each sample point during the test.

7. Copies of the laboratory raw data sheets will be submitted in the final report.

8. Isokinetic sampling rates shall be maintained throughout each test run. The isokinetic sampling rate is computed for each sampling point by the Division during the review of the test report. Anisokinetic sampling (less than 90% or greater than 110% of true isokinetic) at any point during the test run shall be grounds for rejecting the run or a test unless extenuating circumstances (such as highly variable flow rates or process changes) are evident. The documents found in Appendix D can be used to give some guidance as to whether or not a run or a test done anisokinetically is acceptable.

9. The Division may, at its discretion, require that condensible particulate or condensible gasses be analyzed. If such an analysis is required, the method of analysis will be according to EPA Method 202.

EPA Method 6

1. Absorbing chemicals shall be made up fresh on the day of the test.

2. Equipment calibrating standards are the same as for Method 5.

3. Isopropyl alcohol shall not be used in the first impinger. It should be replaced by peroxide. In Colorado SO_2 is defined as SO_2, SO_3, COS, CS_2, etc.

4. Titration standards for the barium perchlorate can only come from two sources.
   (a) Those made according to the QA Volume III, with appropriate documentation.
   (b) Those made from Dilutit or Acculute.

5. The Barium perchlorate shall be standardized on the day of the test, or the day the titrations are done.

6. A 25 ml burette shall be used for the titrations.

7. Titrations will be done in the State of Colorado so that they can be observed by the Division.

Instrumental Methods (Methods 3A, 6C, 7E, 10, 25A, etc.)

1. A pre- and post-test calibration drift check will be performed for every run.

2. For the pre- and post-test drift check, the calibration gas must be introduced at the probe tip. Sample flow and pressure during calibrations must be identical to the pressure and flow during the testing.

3. Emissions shall be calculated following the procedures in Section 8 of Method 6C. The gas concentration shall be corrected for the calibrations as follows:

$$C_{gas} = (\hat{C}-C_0)(C_{ma}/(C_m-C_0)$$

Where:
C_{gas} =Effluent gas concentration, ppm
$\hat{C}$ = Average gas concentration indicated by analyzer, ppm
C_0 = Average of the initial and final system calibration bias check responses for the zero gas, ppm
C_m = Average of the initial and final system calibration bias check responses for the upscale calibration gas, ppm
C_{ma} = Actual concentration of the upscale calibration gas, ppm

4. The use of Protocol 1 gasses is encouraged whenever possible. In some cases these are the only acceptable alternative.

5. If Method 25A is used to measure VOC emissions, emissions rates shall be calculated in terms of lbs/hr as propane. If individual compounds are speciated (e. g. with Method 18) the emissions of each individual VOC are calculated in units of lbs/hr, and the emissions of the individual VOCs are summed.

Method 19

In come cases, sources and testers propose the use of fuel based, or Method 19, calculations for determining the mass emission rate from a source rather than using Methods 1-4. (It is important to note that Method 19 does not contain any equations for calculating emissions in units of lbs/hr, or

any other time based units). The Division will accept the emission results calculated in this manner under certain circumstances.

1. This method is only acceptable for sources that are burning natural gas only. There must be no other source of air flow (e.g. an I.D. fan).

2. At least one run using EPA Methods 1-4 must be performed on the source. If the results calculated using both methods agree within 10%, then fuel based calculations are acceptable for future runs.

3. A calibrated fuel meter must be used to measure the fuel flow to the unit tested. This meter must measure only the amount of fuel that is burned in this emission source. The meter must have been calibrated within 180 days prior to the test. The calibration factor, as well as any other correction factors used to correct the reading that is shown on the meter itself, must be available on site, and a copy given to the Division representative upon request.

4. A sample of the fuel burned in the unit during the testing must be taken and submitted for analysis. The results of this fuel analysis must be used in calculating the final results in the test report.

5. The fuel meter must be capable of measuring the amount of fuel used during a run (typically 30 minutes or 1 hour) to at least two significant figures.

Appendix B

Standard Procedures for the Testing of Internal Combustion Engines

The Division has developed a standard procedure to be used when performing compliance tests on internal combustion engines. The Division may, at its discretion, require deviations from this procedure if circumstances warrant. However, under normal circumstances these procedures should be followed.

The engine must be tested at the maximum and minimum loads at which the source proposes to run the engine. Three half hour runs will be performed at each load. Load will be determined by horsepower. It is up to the source to choose the appropriate method of determining horsepower. The choice of horsepower calculation must be such that an inspector could make the same horsepower determination during an inspection. Based on the results of the stack test, the engine will then be limited by horsepower to operating between the highest and lowest loads at which compliance with the emission limits was demonstrated.

Method 19 type calculations can be used to calculate emissions if the criteria found in appendix A of this manual are met.

If there are multiple engines at a facility with the same make and model, the source can choose to perform the complete stack test program as stated above on one of the engines and a shortened version on the other identical engines. If the engines are not controlled by a catalytic converter, then one thirty minute test run must be performed for the other identical engines at the load at which the worst case emissions (closest to the emission limit) were observed. If the engine is equipped with a catalyst, then a thirty minute spot check must be performed at the maximum and minimum loads, as above. The second and subsequent engines should be set up to mimic, as much as possible, the conditions under which the first engine was tested. If the emissions from the shortened test on the second engine show that the emissions are in compliance with the emission limits, and not more than 10%, or 0.1 lbs/hr, whichever is greater, above the emissions of the engine that had a full test series performed on it, then the Division will consider the emissions from the second engine to be identical to the emissions from the first engine. If the emissions are more than 10% greater, a full set of three test runs must be completed at both loads. If the emissions from the second engine are higher than the first, and this results in an emission rate higher than the permit limit, a complete set of tests must be performed as above. Note that the Division considers the emissions from the second engine to be equal to the emissions of the first engine if a shortened test series is performed on the second engine. This means that the results of an abbreviated test cannot be used to modify a permit limit. If the source wishes to modify a permit based on the stack testing results, a full set of three test runs must be performed at both maximum and minimum loads.

Appendix C

Incinerator Testing Policy

All incinerators constructed, reconstructed, or modified after January 30, 1979 are subject to Regulation Number 6, Part B. VII, Standards of Performance for Incinerators. Part B. VII E. states that:

> "Sources subject to this section are subject to the testing requirements and procedures of Part A, Subpart A, and Part A, Subpart E, Section 60.54 of this Regulation No 6."

However, Regulation 6 goes on to say

> "The Division may waive the testing requirements, on a case by case basis, where sufficient information is available to warrant such a waiver."

This policy seeks to explain the conditions under which the Division will allow a waiver of the testing conditions under Regulation No 6, Part B. VII. E.

This policy attempts to reduce the overall testing burden placed on sources while continuing to ensure that the air quality of the state of Colorado is protected.

The Division will require that at least one of each model of incinerator be tested within the state of Colorado. Subsequent to an incinerator model passing the compliance testing required by Regulation Number 6, further testing of incinerators of the same model may be waived by the Division, providing the charging rate of the new incinerator is not significantly higher than the rate at which the model has been tested. If the new incinerator will burn waste at a rate more than 10% above the level that this incinerator model was tested, a new performance test should be required. The Division may allow a waiver of the testing requirement for a newer version of a previously tested model, provided that the newer version is identical to the tested model in terms of charging rate, burn time, burner size and configuration, chamber dimensions, and control equipment. Such a waiver must be approved by the Stack Testing Coordinator.

Six minutes of visible emissions readings will still be required for all incinerators in order to obtain final approval of construction permits.

The Division retains the right to require a performance test on any incinerator should there be any question regarding the operation, maintenance, or physical condition of the incinerator.

Appendix D

EPA Standard Reference Methods

SUMMARY OF EPA EMISSION TEST METHODS
Title 40
Office of Air Quality Planning and Standards

Method 1 - Traverse Points

Method 1A - Small Ducts

Method 2 - Velocity - S-type Pitot

Method 2 - Velocity - S-type Pitot

Method 2A - Volume Meters

Methos 2B - Exhaust Volume Flow Rate

Method 2C - Standard Pitot

Method 2D - Rate Meters

Method 2E - Landfill Gas Production Flow Rate

Methods 2F – 3D Probe

Method 2G – Yaw-angle Adjusted Velocity

Method 2H – Wall Effects

Method 3 - Molecular Weight

Method 3A - CO2, O2 - Instrumental

Method 3B - CO2, O2 - Orsat.

Method 3C - CO2, CH4, N2, O2 - TCD

Method 4 - Moisture Content

Method 5 - Particulate Matter(PM)

Method 5 - Particulate Matter(PM) (Adobe format)

Method 5A - PM Asphalt Roofing (Particulate Matter)

Method 5B - PM Nonsulfuric Acid (Particulate Matter)

Method 5D - PM Baghouses (Particulate Matter)

Method 5E - PM Fiberglass Plants (Particulate Matter)

Method 5F-PM Fluid Catalytic Cracking Unit

Method 5G - PM Wood Heaters from a Dilution Tunnel

Method 5H - PM Wood Heaters from a Stack

Method 5I - Determination of Low Level Particulate Matter Emissions

Method 6 - Sulfur Dioxide (SO2)

Method 6A - SO2, CO2.

Method 6B - SO2, CO2 - Long Term Integrated

Method 6C - SO2 - Instrumental.

Method 7 - Nitrogen Oxide (NOx)

Method 7A-NOx - Ion Chromatographic Method

Method 7B - NOx - Ultraviolet Spectrophotometry.

Method 7C - NOx - Colorimetric Method

Method 7D - NOx - Ion Chromatographic

Method 7E - NOx - Instrumental.

Method 8 - Sulfuric Acid Mist

Method 9 - Visual Opacity.

Method 10 - Carbon Monoxide-NDIR.

Method 10A - CO for Certifying CEMS

Method 10B - CO from Stationary Sources

Method 11 - H2S Content of Fuel

Method 12 - Inorganic Lead

Method 13A - Total Fluoride (SPADNS Zirconium Lake)

Method 13B - Total Fluoride (Specific Ion Electrode)

Method 14 - Fluoride for Primary Aluminum Plants

Method 14A - Total Fluoride Emissions from Selected Sources at Primary Aluminum Plants

Method 15 - Hydrogen Sulfide, Carbonyl Sulfide, and Carbon Disulfide

Method 15A - Total Reduced Sulfur (TRS Alt.)

Method 16 - Sulfur (Semicontinuous Determination)

Method 16A - Total Reduced Sulfur (Impinger)

Method 16B - Total Reduced Sulfur (GC Analysis)

Method 17 - In-Stack Particulate (PM)

Method 18 - VOC by Gc

Method 18 - VOC by GC

Method 19 - SO2 Removal & PM, SO2, NOx Rates from Electric Utility Steam Generators

Method 20 - NOx from Stationary Gas Turbines.

Method 21 - VOC Leaks

Method 22 - Fugitive Opacity

Method 23 - Dioxin and Furan

Method 24 - Surface Coatings

Method 24A - Publication Rotogravure Inks and Related Publication Rotogravure Coatings

Method 25 - Gaseous Nonmethane Organic Emissions

Method 25A - Gaseous Organic Concentration (Flame Ionization)

Method 25B - Gaseous Organic Concentration (Infrared Analyzer)

Method 25C - NMOC in Landfill Gases

Method 25D - VOC of Waste Samples

Method 25E- Vapor Phase Organic Concentration in Waste Samples

Method 26 - Hydrogen Chloride, Halides, Halogens

Method 26A - Hydrogen Halide & Halogen-Isokinetic

Method 27 - Vapor Tightness of Gasoline Tank-Pressure Vacuum

Method 28 - Certification and Auditing - Wood Heaters

Method 28A - Air to Fuel Ratio, Burn Rate - Wood-fired Appliances

Method 29 - Metals Emissions from Stationary Sources

Method 101 - Mercury from Chlor-Alkali Plants (Air)

Method 101A - Mercury from Sewage Sludge Incinerators

Method 102 - Mercury from Chlor-Alkali Plants (Hydrogen Streams)

Method 103 - Beryllium Screening Method

Method 104 - Beryllium Emissions Determination

Method 105 -Mercury in Wastewater Treatment Plant Sewage Sludge

Method 106-Determination of Vinyl Chloride

Method 107 - Vinyl Chloride content of Inprocess Wastewater Samples

Method 107A - Vinyl Choride content of Solvents

Method 108 - Particulate & Gaseous Arsenic emissions

Method 108A - Determination of Arsenic Content in Ore Samples from Nonferrous Smelters

Method 108B - Arsenic

Method 108C - Arsenic

Method 111 - Polonium-210 Emissions

Method 114 - Radionuclide Emissions.

Method 115 - Radon-222 Emissions.

Method 201 - PM10 (In-stack, CRS).

Method 201A - PM10 (In-stack, CRS)

Method 202 - Condensible Particulate Matter.

Method 204 - Permanent or Temporary Total Enclosure (TTE) for Determining Capture Efficiency.

Method 204A - VOCs in Liquid Input Stream.

Method 204B - VOCs in Captured Stream

Method 204C - VOCs in Captured Stream (Dilution Technique).

Method 204D - Fugitive VOCs from Temporary Total Enclosure.

Method 204E - Fugitive VOCs from Building Enclosure.

Method 204F - VOCs in Liquid Input Stream (Distillation).

Method 205 - Gas Dilution Calibration.

Method 301 - Validation Protocol.

Method 303 - By-product Coke Oven Batteries

Method 303A - Nonrecovery Coke Oven Batteries

Method 304A - Biodegradation Rates-Vent Option

Method 304B - Biodegradation Rates- Scrubber Option

Method 305 - Potential VOC in Waste

Method 306 - Chromium Emissions Electroplating/Anodizing

Method 306A - Chromium Emissions Electroplating/Anodizing(Mason Jar Method)

Method 306B - Surface Tension for Tanks Electroplating/Anodizing

Method 307 - Emissions from Solvent Vapor Cleaners

Method 308 - Methanol Emissions

Method 310A - Residual Hexane.

Method 310B - Residual Solvent.

Method 310C - Residual N-Hexane in EDPM Rubber.

Method 311 HAPS in Paints & Coatings.

Method 312A - Styrene in SBR Latex (GC).

Method 312B - Styrene in SBR Latex by Capillary Gc.

Method 312C - Styrene in SBR Latex Produced by Emulsion Polymerization.

Method 313A - Residual Hydrocarbon in Rubber Crumb.

Method 313B - Residual HC in Rubber Crumb by Capillary Gc.

Method 315 - PM and MCEM from Aluminum Production Facilities

Method 316 - Sample & Analysis for Formaldehyde emissions in the Mineral Wool & Wool Fiberglass Industries.

Method 318 - Extractive FTIR Method for Measurement of Emissions from the Mineral Wool and Wool Fiberglass Industries.

Method 320 - Vapor Phase Organic & Inorganic Emissions by Extractive FTIR.

Method 321 - Gaseous HCl Emissions at Portland Cement Kilns by FTIR.

CEMS Performance Specification 1 For Opacity

CEMS Performance Specification 2 for SO2 and NOx

CEMS Performance Specification 3 for O2 & CO2

CEMS Performance Specification 4 for CO

CEMS Performance Specification 4A for CO

CEMS Performance Specification 4B For CO and O2 Continuous Monitoring Systems.

CEMS Performance Specification 5 for TRS

CEMS Performance Specification 6 for Flow Rate

CEMS Performance Specification 7 for H2S

CEMS Performance Specification 8 for VOC CEMS

CEMS Performance Specification 8A for Total Hydrocarbon CEMS

CEMS Performance Specification 9 for GC CEMS

PS 11 for PM CEMS

PS 15 for Extractive FTIR CEMS in Stationary Sources

Appendix E

Guidelines for Isokinetic Sampling

August-1974

Environmental Monitoring Series

GUIDELINES FOR DEVELOPMENT OF A QUALITY ASSURANCE PROGRAM: VOLUME IV - DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

Office of Research and Development
U.S. Environmental Protection Agency
Washington, DC 20460

4.1.1.5 Nonisokinetic Sampling (I). Deviation from isokinetic sampling conditions may result in particulate measurement error. The magnitude of error depends on the degree of departure from isokinetic conditions, and on the particle size distribution in the sample gas. Departure from isokinetic sampling can occur due to failure to adjust the nozzle velocity as the stack gas velocity varies. This type of departure will be detected when the percent of isokinetic sampling is calculated. However, errors in the pitot tube coefficient and/or in the nozzle diameter can cause deviations from isokinetic conditions which are not detectable from any checks that can be performed while in the field.

The degree of deviation from isokinetic sampling is not a direct indication of the error in the final result. The error resulting from nonisokinetic sampling is a function of the particle size distribution in the stack. For gases and small particles (diameters $\leq$ 5 μm) isokinetic sampling is not necessary (ref. 27). Sample gases with particle size distributions extending in the 25 μm and above sizes are sensitive to anisokinetic sampling. Each particle size distribution has to be evaluated. For this analysis, using a particle size distribution of 80 to 100 μm particles (ref. 19) a variation of $\pm$ 5 percent from isokinetic sampling shows a relative variation of approximately $\pm$ 10 percent in the collected mass or a ratio of 2 to 1. For this analysis a 1 percent deviation from isokinetic conditions is taken to be a 2 percent error in the measured particulate concentration, i.e.,

$$\sigma_I\{m_n\} = 2 \times CV\{I\} \times m_t. \qquad (12)$$

Percent of isokinetic sampling is derived from the ratio of the gas velocity in the nozzle to the stack gas velocity in the stack by

$$I = V_n/V_s. \qquad (13)$$

The component of variability in m_n due to nonisokinetic sampling is taken as

A GUIDELINE FOR EVALUATING COMPLIANCE TEST RESULTS

(Isokinetic Sampling Rate Criterion)

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Introduction

The sampling rate used in extracting a particulate matter sample is important because anisokinetic conditions can cause sample concentrations to be positively or negatively biased due to the inertial effects of the particulate matter. Hence, the calculation of percent isokinetic (I) is a useful tool for validating particulate test results. Section 6.12 of the recently revised Method 5[1] states, "If 90 percent $\leq$ I $\leq$ 110 percent, the results are acceptable. If the results are low in comparison to the standard and I is beyond the acceptable range, or, if I is less than 90 percent, the Administrator may opt to accept the results."

This guideline provides a more detailed procedure on how to use percent isokinetic to accept or reject test results when the sampling rate is beyond the acceptable range. The basic approach of the procedure is to account for the inertial effects of particulate matter and to make a maximum adjustment on the measured particulate matter concentration.[2] Then, after comparison with the emission standard, the measured particulate matter concentration is categorized (1) as clearly meeting or exceeding the emission standard or (2) as being in a "gray area" zone. In the former category, the test report is accepted; in the latter, a retest should be done because of anisokinetic sampling conditions.

Procedure

1. Check or calculate the percent isokinetic (I) and the particulate

matter concentration (c_s) according to the procedure outlined in Method 5. Note that c_s must be calculated using the volume of effluent gas actually sampled (in units of dry standard cubic feet, corrected for leakage). Calculate the emission rate (E), i.e. convert c_s to the units of the standard. For the purposes of this guideline, it is assumed that all inputs for calculating E are correct and other specifications of Method 5 are met.

2. Compare E to the standard. Then accept or reject c_s using the criteria outlined below. (A summary is given in Table I):

a. Case 1 - I is between 90 and 110 percent. The concentration c_s must be considered acceptable. A variation of $\pm$ 10 percent from 100 percent isokinetic is permitted by Method 5.

b. Case 2 - I is less than 90 percent.

(1) If E meets the standard, c_s should be accepted, since c_s can either be correct (if all particulate matter are less than about 5 micrometers in diameter) or it can be biased high (if larger than 5 micrometer particulate matter is present) relative to the true concentration; one has the assurance that c_s is yielding an E which is definitely below the standard.

(2) If E is above the standard, multiply c_s by the factor (I/100) and recalculate E. If, on the one hand, this adjusted E is still higher than the standard, the adjusted c_s should be accepted; a maximum adjustment which accounts for the inertial effects of particulate matter has been made and E still exceeds the standard. On the other hand, if the

adjusted E is lower than the standard, a retest should be done.

c. Case 3 - I is greater than 110 percent.

(1) If E exceeds the standard, c_s should be accepted, since c_s can either be equal to the true concentration or biased low relative to it; one has the assurance that E is definintely over the standard.

(2) If E is below the standard, multiply c_s by the factor (I/100) and recalculate E. If, on the one hand, this adjusted E is still lower than the standard, the adjusted c_s should be accepted; a maximum adjustment which accounts for the inertial effects of particulate matter has been made and E still meets the standard. On the other hand, if the adjusted E exceeds the standard, a retest should be done.

Table I. Summary of Procedure

Case	I	Category	Decision
1	90 - 110		Accept
2	< 90	$E \leq$ Em. Std.	Accept
		$c_s(I/100) \rightarrow E_{adj}$ > Em. Std.	Accept
		$c_s(I/100) \rightarrow E_{adj} \leq$ Em. Std.	Retest
3	> 110	E > Em. Std.	Accept
		$c_s(I/100) \rightarrow E_{adj} \leq$ Em. Std.	Accept
		$c_s(I/100) \rightarrow E_{adj}$ > Em. Std.	Retest

Summary

A procedure for accepting or rejecting particulate matter test results based on percent isokinetic has been outlined. It provides a mechanism for accepting all data except where anisokinetic sampling might affect the validity of the test results. This procedure is one of several useful tools for evaluating testing results.

References

1. Method 5 - Determination of Particulate Emissions from Stationary Sources. Federal Register. 42(160):41776-41782, August 18, 1977.

2. Smith, W. S., R. T. Shigehara, and W. F. Todd. A Method for Interpreting Stack Sampling Data. Stack Sampling News. 1(2):8-17, August 1973.