

**CHAPTER 1200-3-12
METHODS OF SAMPLING AND ANALYSIS**

1200-3-12-.01 GENERAL

- (1) It is explicitly implied that in addition to and consistent with specific methods of sampling and analysis described herein, that samples will be taken in such number, duration and location as to be statistically significant and representative of the condition which the sample(s) purport to evaluate.
- (2) Where specific materials, equipment or procedures are specified, it shall be permissible to use other materials, equipment or procedures where it has been reliably demonstrated that their use produces results comparable to that which would have been obtained by use of the specified materials, equipment or procedures.

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1200-3-12-.02 PROCEDURES FOR AMBIENT SAMPLING AND ANALYSIS

- (1) Procedures for sulfur dioxide, suspended particulate, photochemical oxidants, carbon monoxide, and non-methane hydrocarbons may be found in Federal Register, Volume 36, Number 84, dated April 30, 1971. The reference method for the sampling and the analytical procedures for nitrogen dioxide may be found in the Federal Register, Volume 41, Number 232, dated December 1, 1976. The sampling and analytical procedures for lead may be found in the Federal Register, Volume 43, Number 194, dated October 5, 1978. The reference method for sampling and analytical procedures for ozone may be found in the Federal Register, Volume 44, Number 28, Part V, dated February 8, 1979. The procedure for sampling and analyzing atmospheric fluorides shall conform with the method adopted by the American Society for Testing Materials in 1958 and bearing ASTM designation D1606- 58T.
- (2) The Technical Secretary may approve the use of equivalent or alternative sampling procedures.

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1200-3-12-.03 SOURCE SAMPLING AND ANALYSIS

The methods set forth in this section shall be applicable for determining compliance with emission standards.

- (a) **SAMPLE AND VELOCITY TRAVERSES.** - Sample and velocity traverses shall be determined by Method 1 outlined in the Federal Register, Volume 42, Number 160, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978.
- (b) **STACK GAS VELOCITY DETERMINATION.** - Stack gas velocity shall be determined by Method 2 outlined in the Federal Register, Volume 42, Number 160, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978, except in such instances where a Type S pitot tube is not applicable.
- (c) **GAS ANALYSIS.** - Gas analysis for carbon dioxide, oxygen, excess air, and dry molecular weight shall be determined by Method 3 outlined in the Federal Register, Volume 42, Number 160, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978, or another type of test procedure that is direct indicating and/or recording approved by the Technical Secretary.
- (d) **DETERMINATION OF MOISTURE CONTENT I STACK GASES.** - Moisture content shall be determined by Method 4 outlined in the Federal Register, Volume 42, Number 60, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978, or other technique approved by the Technical Secretary.
- (e) **DETERMINATION OF PARTICULATE EMISSIONS.** - The basic design of the sampling train is left to the individual, if certain criteria are observed to assure high collection efficiency and standard analysis of the collected particulates.

1. DESCRIPTION OF SAMPLING APPARATUS.

- (i) This apparatus shall include interchangeable nozzles or probes, of various diameters, a filter effective for the removal of particulates exceeding 0.3 micron diameter of solid or liquid, a suitable number of impingers to reduce condensable vapors to liquid or solid particulate matter, and appropriate connecting tubing at temperature above the aqueous dewpoint of the gases. All materials of construction shall be resistant to corrosive elements in the flue gases, e.g., SO₃, NO_x, and elevated temperatures.
- (ii) This filter assembly shall be maintained above the aqueous dewpoint of the flue gases throughout the sampling operation. To accomplish this, the filter assembly may be disposed inside the gas flue to be completely bathed by the hot gas stream; or it may be disposed outside the gas stream, provided the following precautions are taken.

- (I) If the filter is disposed outside the hot gas flue, a temperature indicator, e.g., thermocouple, shall be provided at the sample filter gas exit to monitor the filter temperature above the aqueous dewpoint of the flue gases at all times. Auxiliary heating elements for tubing and filter holder shall be provided to maintain specified temperatures when required.
 - (II) Deposits in the tube connecting the probe to the exterior filter shall be quantitatively removed by washing with a suitable liquid and by brushing, the weight of the solids recovered there from being added to the weight found in the filter.
 - (iii) Provisions shall be included for cooling the gas stream to standard conditions (70°F) to reduce condensible vapors to liquids or solid particulate matter, and for cooling the condensed particles, including water that may be formed by condensation of water vapor in the sample. This shall be accomplished by passage through bubblers provided with an orifice submerged in water through which the gas stream passes at a velocity of approximately 100 meters per second. The bubblers shall be immersed in an ice bath to minimize evaporation. A trap of suitable shape and dimensions for the collection of overflow or overspray shall be provided downstream from the bubblers.
 - (iv) An indicating flowmeter shall be provided and preferably located in the train at a point preceding the source of suction, preceded by a trap to prevent condensed water from entering the flowmeter; and a vacuum gauge adjacent to the flowmeter to indicate the absolute pressure of the gas passing through the orifice meter.
 - (v) Operation charges comprising either graphs or tables shall be prepared and be available as a part of apparatus, to indicate proper sampling rates as a function of gas density in the stack and at the flowmeter.
2. ANALYTICAL RESULTS.- Analytical results shall be accomplished as outlined in the appendix of the Federal Register, Volume 42, Number 160, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978, for the filter catch and washings up to the filter. Inclusion or exclusion of material collected in the impinger train as "particulate matter" and method of analysis will be determined on an individual air contaminant source basis.
3. EQUIVALENT METHODS.- Those procedures demonstrated to yield equivalent results and approved by the Technical Secretary may be used for sampling and analysis of particulate matter. Stack sampling methods promulgated by the Environmental Protection Agency for specified air contaminant sources are

considered to be equivalent methods and therefore acceptable.

(f) MEASUREMENT OF SULFUR DIOXIDE IN STACK GASES.

1. The approved procedure for measuring Sulfur Dioxide in stack gases is the method contained in Chapter 3 of the Tennessee Department of Public Health's January, 1975 edition of the Source Sampling Manual as amended on August 11, 1975. [SUBMITTED JAN 22, 1982.]
2. EQUIVALENT METHODS. Many new and improved methods of continuous gaseous monitoring in stacks are now in use. Any method of stack sampling approved by the Technical Secretary may be used in accordance with good professional practice. Stack sampling methods promulgated by the Environmental Protection Agency for specified air contaminant sources are considered to be equivalent methods and therefore acceptable.

(g) DETERMINATION OF SULFURIC ACID (H₂SO₄) IN STACK GASES.- Sulfuric acid in stack gases shall be determined by Method 8 outlined in the Federal Register, Volume 42, Number 160, August 18, 1977, as amended in the Federal Register, volume 43, Number 57, March 23, 1978.

(h) DETERMINATION OF NITROGEN OXIDES IN STACK GASES. - Nitrogen oxides in stack gases shall be determined by Method 7 outlined in the Federal Register, Volume 42, Number 160, August 18, 1977, as amended in the Federal Register, Volume 43, Number 57, March 23, 1978.

(i) DETERMINATION OF THE EFFICIENCY OF FLUORIDE CONTROL DEVICES FOR POTROOMS OR PRIMARY ALUMINUM REDUCTION PLANTS, as follows:

1. The determination shall consist of three samples runs, each of which shall consist of a simultaneous inlet and outlet sample upon the control device or an equivalent test procedure approved by the Technical Secretary. Each sample shall be eight (8) hours duration and shall contain a minimum of two hundred and forty (240) dry standard cubic feet of air.
2. Other details as to be collection of the samples and their analysis shall be accomplished by either Method 13A or 13B or approved equivalent as outlined in the Federal Register, Volume 40, Number 152, August 6, 1975, and as amended in the Federal Register, Volume 41, Number 230, November 29, 1976.
3. The average efficiency of each fluoride control device shall be calculated as the average of the three control device collection efficiencies as determined by the three sample runs.

(j) DETERMINATION OF INORGANIC LEAD EMISSIONS IN STACK GASES. Lead

emissions in stack gases shall be determined by Method 12 outlined in the Federal Register, Volume 47, April 16, 1982, pp. 16574-16579.

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1200-3-12-.04 MONITORING REQUIRED FOR DETERMINING COMPLIANCE OF CERTAIN LARGE SOURCES

- (1) For a fossil fuel-fired steam generator using solid fuel subject to subparagraph 1200-3-14-.02-(1)-(d), the source owner or operator may choose the method of measuring sulfur dioxide in the stack gases depending upon the type of fuel burned. No later than 30 days after the effective date of this regulation, the source owner or operator must inform the Technical Secretary by certified mail of the method to be utilized. If no choice is made by that date the owner or operator must monitor using the methods as outlined in subparagraph (2)(b). of this rule.
- (2) The available sulfur dioxide measurement methods are as follows:
 - (a) If low sulfur coal is the only solid fuel burned, fuel analysis procedures and methods of calculations as prescribed by the Technical Secretary may be used. The purpose of this rule, low sulfur coal is defined as coal containing less than 1.00% sulfur by weight on a dry basis. Determination will be based on records of fuel burned during calendar year 1974. The procedures used to determine if the sulfur content of the fuel meet this 1.00% limitation during this time period will be subject to approval by the Technical Secretary. If the source owner or operator elects this method, the Technical Secretary will specify the data to be submitted to verify that the sulfur content is less than the 1.00% limitation. For facilities that elect to use fuel analysis procedures, fuels are not required to be sampled or analyzed for preparation of reports of compliance until the Technical Secretary specifies the procedures and requirements. If the 1.00% limit is ever exceeded than the method specified in subparagraph (b) of this paragraph must be used for monitoring.
 - (b) Measurement of sulfur dioxide in the stack gases may be accomplished by the installation and operation of a continuous in-stack sulfur dioxide monitoring instrument. The type of monitor and its location will be subject to approval by the Technical Secretary. The in-stack monitoring instrument will be subject to the provisions of subparagraph 1200-3-10-.02(1)(e) of these regulations.
- (3) For sulfuric acid plants and liquid sulfur dioxide plants located in a Class I county and existing on January 1, 1979, the measurement of sulfur dioxide in the stack gases must be accomplished by the installation and operation of a continuous in-stack sulfur dioxide monitor. The type of monitor and its location will be subject to approval by the Technical Secretary. The in-stack monitoring instrument will be subject to the provisions of paragraph 1200-3-10-.02-(1) of these regulations.
- (4) For recovery furnaces and lime kilns located at draft mills the measurement of total reduced sulfur compounds in stack gases must be accomplished by the installation and operation of a continuous in-stack total reduced sulfur (TRS) monitor. Such TRS monitor shall be accomplished by a continuous monitoring system for the measurement

of the percent oxygen. The type of monitor and its location will be subject to approval by the Technical Secretary. The instack monitoring instrument will be subject to the provisions of paragraph 1200-3-10-.02(1) of these regulations.

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