

ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF ENFORCEMENT

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*Summary of Reference Methods
for
Stationary Source Emission Evaluations
(40 CFR Part 60)*

FEDERAL ENFORCEMENT INVESTIGATIONS CENTER

DENVER, COLORADO

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Environmental Protection Agency
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SUMMARY OF REFERENCE METHODS FOR
EMISSION EVALUATIONS
(40 CFR Part 60)

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Denver, Colorado

*Information in this report has
been excerpted by NEIC from the
Code of Federal Regulations,
Title 40, Part 60, Appendix A.*

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METHOD 1
SAMPLE AND VELOCITY TRAVERSES
FOR STATIONARY SOURCES

- 1.1 Principle A sampling site and the number of traverse points are selected to aid in the extraction of a representative sample.
- 1.2 Applicability This method should be applied only when specified by the test procedures for determining compliance with the New Source Performance Standards. Unless otherwise specified, this method is not intended to apply to gas streams other than those emitted directly to the atmosphere without further processing.

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METHOD 2
DETERMINATION OF STACK GAS VELOCITY
AND VOLUMETRIC FLOW RATE
(Type S Pitot Tube)

- 1.1 Principle Stack gas velocity is determined from the gas density and from measurement of the velocity head using a Type S (Stauscheibe or reverse type) pitot tube.
- 1.2 Applicability This method should be applied only when specified by the test procedures for determining compliance with the New Source Performance Standards.

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METHOD 3
GAS ANALYSIS FOR CARBON DIOXIDE, EXCESS AIR,
AND DRY MOLECULAR WEIGHT

- 1.1 Principle An integrated or grab gas sample is extracted from a sampling point and analyzed for its components using an Orsat analyzer.
- 1.2 Applicability This method should be applied only when specified by the test procedures for determining compliance with the New Source Performance Standards. The test procedure will indicate whether a grab sample or an integrated sample is to be used.

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METHOD 4
DETERMINATION OF MOISTURE IN STACK GASES

1.1 Principle Moisture is removed from the gas stream, condensed, and determined volumetrically.

1.2 Applicability This method is applicable for the determination of moisture in stack gas only when specified by test procedures for determining compliance with New Source Performance Standards. This method does not apply when liquid droplets are present in the gas stream* and the moisture is subsequently used in the determination of stack gas molecular weight.

Other methods such as drying tubes, wet bulb-dry bulb techniques, and volumetric condensation techniques may be used.

* *If liquid droplets are present in the gas stream, assume the stream to be saturated, determine the average stack gas temperature by traversing according to Method 1, and use a psychrometric chart to obtain an approximation of the moisture percentage.*

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METHOD 5
DETERMINATION OF PARTICULATE EMISSIONS
FROM STATIONARY SOURCES

- 1.1 Principle Particulate matter is withdrawn isokinetically from the source and its weight is determined gravimetrically after removal of uncombined water.
- 1.2 Applicability This method is applicable for the determination of particulate emissions from stationary sources only when specified by the test procedures for determining compliance with New Source Performance Standards.

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METHOD 6
DETERMINATION OF SULFUR DIOXIDE EMISSIONS
FROM STATIONARY SOURCES

- 1.1 Principle A gas sample is extracted from the sampling point in the stack. The acid mist, including sulfur trioxide, is separated from the sulfur dioxide. The sulfur dioxide fraction is measured by the barium-thorin titration method.
- 1.2 Applicability This method is applicable for the determination of sulfur dioxide emissions from stationary sources only when specified by the test procedures for determining compliance with New Source Performance Standards.

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METHOD 7
DETERMINATION OF NITROGEN OXIDE EMISSIONS
FROM STATIONARY SOURCES

1.1 Principle A grab sample is collected in an evacuated flask containing a dilute sulfuric acid-hydrogen peroxide absorbing solution, and the nitrogen oxides, except nitrous oxide, are measured colorimetrically using the phenoldisulfonic acid (PDS) procedure.

1.2 Applicability This method is applicable for the measurement of nitrogen oxides from stationary sources only when specified by the test procedures for determining compliance with New Source Performance Standards.

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METHOD 8

DETERMINATION OF SULFURIC ACID MIST AND SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES

- 1.1 Principle A gas sample is extracted from a sampling point in the stack and the acid mist including sulfur trioxide is separated from sulfur dioxide. Both fractions are measured separately by the barium-thorin titration method.
- 1.2 Applicability This method is applicable to determination of sulfuric acid mist (including sulfur trioxide) and sulfur dioxide from stationary sources only when specified by the test procedures for determining compliance with the New Source Performance Standards.

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METHOD 9
VISUAL DETERMINATION OF THE OPACITY OF EMISSIONS
FROM STATIONARY SOURCES

- 1.1 Principle The relative opacity of an emission from a stationary source is determined visually by a qualified observer.
- 1.2 Applicability This method is applicable for the determination of the relative opacity of visible emissions from stationary sources only when specified by test procedures for determining compliance with the New Source Performance Standards.

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METHOD 10
DETERMINATION OF CARBON MONOXIDE EMISSIONS
FROM STATIONARY SOURCES

- 1.1 Principle An integrated or continuous gas sample is extracted from a sampling point and analyzed for carbon monoxide (CO) content using a Luft-type non-dispersive infrared analyzer (NDIR) or equivalent.
- 1.2 Applicability This method is applicable for the determination of carbon monoxide emissions from stationary sources only when specified by the test procedures for determining compliance with New Source Performance Standards. The test procedures will indicate whether a continuous or an integrated sample is to be used.

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METHOD 11
DETERMINATION OF HYDROGEN SULFIDE EMISSIONS
FROM STATIONARY SOURCES

- 1.1 Principle Hydrogen sulfide (H_2S) is collected from the source in a series of midjet impingers and reacted with alkaline cadmium hydroxide [$\text{Cd}(\text{OH})_2$] to form cadmium sulfide (CdS). The precipitated CdS is then dissolved in hydrochloric acid and absorbed in a known volume of iodine solution. The iodine consumed is a measure of the H_2S content of the gas. An impinger containing hydrogen peroxide is included to remove SO_2 as an interfering species.
- 1.2 Applicability This method is applicable for the determination of hydrogen sulfide emissions from stationary sources only when specified by the test procedures for determining compliance with the New Source Performance Standards.

39 FR 37016 October 16, 1974

METHOD 12
DETERMINATION OF SULFUR DIOXIDE EMISSIONS
FROM STATIONARY SOURCES BY CONTINUOUS MONITORS

- 1.1 Principle Gases are continuously sampled in the stack emissions and analyzed for sulfur dioxide by a continuously operating emission measurement system. Sampling may include either the extractive or non-extractive (*in situ*) approach.
- 1.2 Applicability This method is applicable to the instrument systems specified by subparts for continuously monitoring sulfur dioxide emissions. Specifications for continuous measurement of sulfur dioxide are given in terms of performance specifications. Test procedures are given to determine the capability of the measurement systems to conform to the performance specifications prior to approving the systems installed by an affected facility.

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METHOD 13A
DETERMINATION OF TOTAL FLUORIDE EMISSIONS
FROM STATIONARY SOURCES

SPADNS Zirconium Lake Method

- 1.1 Principle Gaseous and particulate fluorides are withdrawn isokinetically from the source using a sampling train. The fluorides are collected in the impinger water and on the filter of the sampling train. The weight of total fluorides in the train is determined by the SPADNS Zirconium Lake colorimetric method.
- 1.2 Applicability This method is applicable for the determination of fluoride emissions from stationary sources only when specified by the test procedures for determining compliance with New Source Performance Standards. Fluorocarbons, such as Freons, are not quantitatively collected or measured by this procedure.

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METHOD 13B
DETERMINATION OF TOTAL FLUORIDE EMISSIONS
FROM STATIONARY SOURCES

Specific Ion Electrode Method

- 1.1 Principle Gaseous and particulate fluorides are withdrawn isokinetically from the source using a sampling train. The fluorides are collected in the impinger water and on the filter of the sampling train. The weight of total fluorides in the train is determined by the specific ion electrode method.
- 1.2 Applicability This method is applicable for the determination of fluoride emissions from stationary sources only when specified by the test procedures for determining compliance with New Source Performance Standards. Fluorocarbons, such as Freons, are not quantitatively collected or measured by this procedure.

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METHOD 14
DETERMINATION OF FLUORIDE EMISSIONS FROM POT ROOM
ROOF MONITORS OF PRIMARY ALUMINUM PLANTS

- 1.1 Principle Gaseous and particulate fluoride roof monitor emissions are drawn into a permanent sampling manifold through several large nozzles. The sample is transported from the sampling manifold to ground level through a duct. The gas in the duct is sampled using Method 13A or 13B -- Determination of Total Fluoride Emissions from Stationary Sources. Effluent velocity and volumetric flow rate are determined with anemometers permanently located in the roof monitor.
- 1.2 Applicability This method is applicable for the determination of fluoride emissions from stationary sources only when specified by the test procedures for determining compliance with the New Source Performance Standards.