



Designation: D 3267 – 91 (Reapproved 2000)^{ε1}

Standard Test Method for Separation and Collection of Particulate and Water-Soluble Gaseous Fluorides in the Atmosphere (Filter and Impinger Method)¹

This standard is issued under the fixed designation D 3267; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

^{ε1} NOTE—Editorial corrections were made throughout in March 2000.

1. Scope

1.1 This test method provides a procedure for separation and collection on a chemically treated filter and in an impinger of particulate and water-soluble gaseous fluoride in the atmosphere. The sampling rate may vary from 30 L/min (1.0 ft³/min) to 15 L/min (0.5 ft³/min) for longer sampling periods depending on the atmospheric fluoride concentration. This test method is not intended to be applied to gaseous fluorine compounds that are not water-soluble.

1.2 There are several limitations of the test method:

1.2.1 Although the acid-treated, medium retentive, prefilter has been shown to allow passage of HF, it will restrict passage of particulate matter only as small as about 1 μm. Thus, smaller particulate matter may pass through the filter and be collected in or pass through the impingers.

1.2.2 The maximum sample volume to be taken using this test method prior to changing the acid-treated prefilter is recommended as 12 m³. This recommendation is made to minimize any effects due to particulate matter build-up.

1.3 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific precautionary statements, see 7.2 and 7.4.6.

2. Referenced Documents

2.1 ASTM Standards:

D 1071 Test Methods for Volumetric Measurement of Gaseous Fuel Samples²

¹ This test method is under the jurisdiction of ASTM Committee D22 on Sampling and Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.03 on Ambient Atmospheres and Source Emissions.

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² Annual Book of ASTM Standards, Vol 05.06.

D 1193 Specification for Reagent Water³

D 1356 Terminology Relating to Sampling and Analysis of Atmospheres⁴

D 1357 Practice for Planning the Sampling of the Ambient Atmosphere⁴

D 2009 Practice for Collection by Filtration and Determination of Mass, Number, and Optical Sizing of Atmospheric Particulates⁵

D 3266 Test Method for Automated Separation and Collection of Particulate and Acidic Gaseous Fluoride in the Atmosphere (Double Paper Tape Sampler Method)⁴

D 3268 Test Method for Separation and Collection of Particulate and Gaseous Fluorides in the Atmosphere (Sodium Bicarbonate-Coated Glass Tube and Particulate Filter Method)⁴

D 3269 Test Methods for Analysis for Fluoride Content of the Atmosphere and Plant Tissues (Manual Procedures)⁴

D 3270 Test Method for Analysis for Fluoride Content of the Atmosphere and Plant Tissues (Semiautomated Method)⁴

E 1 Specification for ASTM Thermometers⁶

E 337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)⁴

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology D 1356.

4. Summary of Test Method

4.1 Air is drawn through an air inlet tube (see Practice D 1357) and is first passed through an acid-treated prefilter to remove particulate matter that may contain fluoride and then through an impinger to remove water-soluble fluorides.

³ Annual Book of ASTM Standards, Vol 11.01.

⁴ Annual Book of ASTM Standards, Vol 11.03.

⁵ Discontinued; see 1994 Annual Book of ASTM Standards, Vol 11.03.

⁶ Annual Book of ASTM Standards, Vol 14.03.

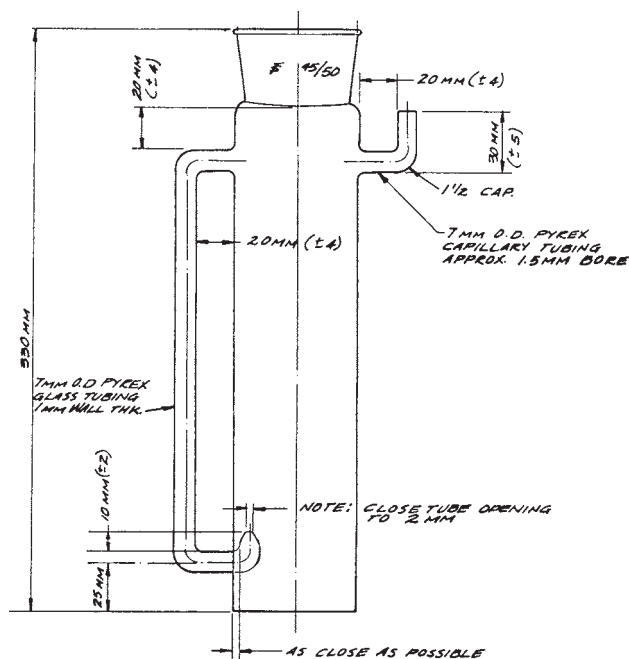


FIG. 1 Modified Standard Impinger

4.2 The prefilter and impinger solution are removed from the sampling system at the end of the selected sampling period and taken to an analytical work area and analyzed by either a potentiometric or photometric method (1, 2, 3, 4).⁷ See Test Methods D 3269 and D 3270.

5. Significance and Use

5.1 This test method provides a means of separation and collection of particulate and water soluble gaseous fluoride and provides samples that are convenient to analyze.

6. Interferences

6.1 Particulate metallic salts, such as those of aluminum, iron, calcium, magnesium or rare-earth elements, may react with and remove some or all of the water-soluble gaseous fluoride on the prefilter. If interfering quantities of such particulate metallic salts are present, the use of Test Method D 3268 is recommended because the acidic fluoride gases are collected prior to the filter.

6.2 Aluminum or certain other metals or phosphates can interfere with subsequent analyses by photometric or electro-metric methods. These potential interferences are discussed in Test Methods D 3269 and D 3270.

7. Apparatus

7.1 *Standard Impinger*, (Fig. 2C) for sampling covering periods up to 3 h. When sampling is initiated, the collecting impinger shall contain 75 to 150 mL of reagent water (see 8.2).

7.2 *Impinger, Modified, Standard*, Smith-Greenburg (Fig. 1). For sampling periods from 3 to 72 h, see Fig. 1 and Fig. 3C.

(Warning—If a different size impinger is used, the recovery of the sample should be determined.)

7.3 *Water Level Control Device*, for use with long-term sampling train (Fig. 3).

7.3.1 *Liquid Level Controller*. (See Fig. 3G and H.)

7.3.2 *Control Valve*, solenoid-activated. (See Fig. 3D.)

7.3.3 *Water Reservoir*, equipped with a guard tube containing an alkaline reagent to prevent fluoride contamination. (See Fig. 3E and F.)

7.4 *Sampling Equipment* (see Fig. 1, Fig. 2, and Fig. 3 for dimensions and details).

7.4.1 *Sampling Tube* (see Fig. 2A), constructed of a 1225-mm (4-ft) length of a material that is inert to the atmosphere being sampled. (See Note 1.)

NOTE 1—Stainless steel coated with plastic material is preferred because of its rigidity and permanence. Plastic materials which have been shown to have a low absorbance for gaseous fluorides are polytetrafluoroethylene, polyethylene, polypropylene and polychlorotrifluoroethylene.

However, high air velocities through some types of plastic tubing may create a static charge and cause deposition of particulate matter. Consequently, if plastic is selected for use, it should be tested to demonstrate that this effect does not occur to a significant degree.

7.4.2 *Filter Holder*, stainless steel or polypropylene, (Fig. 2B), to hold the acid-treated prefilter. (See Note 2.)

NOTE 2—Note that filter changes are recommended after 12 m³ are sampled.

7.4.3 *Mercury Manometer* (Fig. 2E), for the determination of pressure in the metered sampling line. A calibrated vacuum gauge is also satisfactory.

7.4.4 *Dry Test Meter* (Fig. 2F), for measuring the total volume sampled.

7.4.5 *Thermometer*, to sense the temperature of the sampled gas (Fig. 2G). ASTM thermometer 33C has been found useful for this application.

7.4.6 *Control Valve* (Fig. 2H), to adjust the sample rate through a dry test meter. (See 7.4.4.) (Warning—Exercise care to see that all sampling apparatus is clean and free of contamination. Clean with a detergent low in fluoride and phosphate, followed by thorough rinsing with water (see 8.2).

7.4.7 *Vacuum Pump* (see Fig. 2J), capable of a 30 L/min (1 ft³/min) sampling rate and capable of continuous operation over the maximum sample period selected under the environmental conditions imposed by the sampling location.

8. Reagents

8.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. All reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁸

8.2 *Purity of Water*—Water shall be Type II reagent water conforming to Specification D 1193. Additionally, test the

⁷ The boldface numbers in parentheses refer to the references at the end of this standard.

⁸ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Anal. Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.