



Standard Test Method for Determination of Total Suspended Particulate Matter in the Atmosphere (High-Volume Sampler Method)¹

This standard is issued under the fixed designation D 4096; 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.

1. Scope

1.1 This test method provides for sampling a large volume of atmosphere, 1600 to 2400 m³ [55 000 to 85 000 ft³], by means of a high flow-rate vacuum pump at a rate of 1.13 to 1.70 m³/min [40 to 60 ft³/min] **(1, 2, 3 and 4)**.²

1.2 This flow rate allows suspended particles having diameters of less than 100 μm (stokes equivalent diameter) to be collected. However, the collection efficiencies for particles larger than 20 μm decreases with increasing particle size and it varies widely with the angle of the wind with respect to the roof ridge of the sampler shelter and with increasing speed **(5)**. When glass fiber filters are used, particles within the size range of 100 to 0.1 μm diameters or less are ordinarily collected.

1.3 The upper limit of mass loading will be determined by plugging of the filter medium with sample material, which causes a significant decrease in flow rate (see 6.4). For very dusty atmospheres, shorter sampling periods will be necessary. The minimum amount of particulate matter detectable by this method is 3 mg (95 % confidence level). When the sampler is operated at an average flow rate of 1.70 m³/min [60 ft³/min] for 24 h, this is equivalent to 1 to 2 μg/m³ **(3)**.

1.4 The sample that is collected may be subjected to further analyses by a variety of methods for specific constituents.

1.5 Values stated in SI units shall be regarded as the standard. Inch-pound units are shown for information only.

1.6 *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.*

2. Referenced Documents

2.1 ASTM Standards:

D 1356 Terminology Relating to Sampling and Analysis of Atmospheres³

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.

Current edition approved April 10, 2003. Published June 2003. Originally approved in 1982. Last previous edition approved in 1997 as D 4096 – 91 (1997)^{ε1}.

² The boldface numbers in parentheses refer to the list of references at the end of this practice.

³ *Annual Book of ASTM Standards*, Vol 11.03.

D 3631 Test Methods for Measuring Surface Atmospheric Pressure³

E 1 Specification for ASTM Thermometers⁴

2.2 Other Documents:

EPA-600/9-76-005 Quality Assurance Handbook for Air Pollution Measurement Systems, Vol I, Principles (December 1984 Rev.)⁵

EPA-600/4-77-027a Quality Assurance Handbook for Air Pollution Measurement Systems, Vol II, Ambient Air Specific Methods⁵

3. Terminology

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

3.2 Descriptions of Terms:

3.2.1 *absolute filter*—a filter or filter medium of ultra-high collection efficiency for very small particles (submicrometre size) so that essentially all particles of interest or of concern are collected. Commonly, the efficiency is in the region of 99.95 % or higher for a standard aerosol of 0.3-μm diameter (see Practice D 2986).

3.2.2 *Hi-Vol (The High-Volume Air Sampler)*—a device for sampling large volumes of an atmosphere, collection of the contained particulate matter by filtration, and consisting of a high-capacity air mover, a filter to collect suspended particles, and means for measuring, or controlling, or both, the flow rate.

3.2.3 *primary flow-rate standard*—a device or means of measuring flow rate based on direct primary observations, such as time and physical dimensions.

3.2.4 *secondary flow-rate standard*—A flow-rate-measuring device, such as an orifice meter, that has been calibrated against a primary standard.

3.2.5 *spirometer*—a displacement gasometer consisting of an inverted bell resting upon or sealed by liquid (or other means) and capable of showing the amount of gas added to or withdrawn from the bell by the displacement (rise or fall) of the bell.

⁴ *Annual Book of ASTM Standards*, Vol 14.03.

⁵ Available from U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Quality Assurance Division, Research Triangle Park, NC 27711. Attn: Distribution Record System.