



Designation: D 5955 – 96

Standard Test Methods for Estimating Contribution of Environmental Tobacco Smoke to Respirable Suspended Particles Based on UVPM and FPM¹

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1. Scope

1.1 These test methods pertain to the sampling/analysis of respirable suspended particles (RSP) and the estimation of the RSP fraction attributable to environmental tobacco smoke. These test methods are based on collection of total RSP on a membrane filter, extracting the collected material in methanol, and measuring total ultraviolet absorbance or fluorescence, or both, of this extract. The corresponding methods of estimation are termed ultraviolet particulate matter (UVPM) and fluorescent particulate matter (FPM), respectively.

1.2 The sampling components consist of a preweighed, 1.0- μm pore size polytetrafluoroethylene (PTFE) membrane filter in a filter cassette connected on the inlet end to a particle size separating device and, on the outlet end, to a sampling pump. These test methods are applicable to personal and area sampling.

1.3 These test methods are limited in sample duration only by the capacity of the membrane filter (about 2000 μg). These test methods have been evaluated up to a 24-h sample duration with a minimum sample duration of at least 1 h.

1.4 Limits of detection (LOD) and limit of quantitation (LOQ) for the UVPM test method at a sampling rate of 2 L/min are, respectively, 2.5 $\mu\text{g}/\text{m}^3$ and 8.3 $\mu\text{g}/\text{m}^3$ for a 1-h sample duration and 0.3 $\mu\text{g}/\text{m}^3$ and 1.0 $\mu\text{g}/\text{m}^3$ for an 8-h sample duration. The LOD and LOQ for the FPM test method at a sampling rate of 2 L/min are, respectively, 1.4 $\mu\text{g}/\text{m}^3$ and 4.7 $\mu\text{g}/\text{m}^3$ for a 1-h sample duration and 0.2 $\mu\text{g}/\text{m}^3$ and 0.6 $\mu\text{g}/\text{m}^3$ for an 8-h sample duration.

1.5 The values stated in SI units are to be regarded as standard.

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.* Specific precautionary information is given in 13.6.

2. Referenced Documents

2.1 ASTM Standards:

- D 1356 Terminology Relating to Sampling and Analysis of Atmospheres²
- D 1357 Practice for Planning the Sampling of the Ambient Atmosphere²
- D 3631 Test Methods for Measuring Surface Atmospheric Pressure²
- D 5337 Practice for Flow Rate for Calibration of Personal Sampling Pumps²

3. Terminology

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

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *environmental tobacco smoke* (ETS)—an aged, dilute composite of exhaled tobacco smoke and smoke from tobacco products.

3.2.2 *environmental tobacco smoke particulate matter* (ETS-PM)—the particulate phase of ETS.

3.2.3 *fluorescent particulate matter* (FPM)—an estimation of the contribution of ETS particulate matter to RSP obtained by comparing the fluorescence intensity of the RSP sample to that of a surrogate standard.

3.2.4 *respirable suspended particles* (RSP)—particles which can be deposited in the gas-exchange region of the lung and are defined as particles that pass through a sampler having a 4.0- μm median cutpoint **(1)**.³

3.2.5 *surrogate standard*—a chemical whose concentration has been related quantitatively to a known concentration of ETS-PM.

3.2.6 2,2',4,4'-tetrahydroxybenzophenone (THBP)—a UVPM surrogate standard.

3.2.7 *ultraviolet particulate matter* (UVPM)—an estimation of the contribution of ETS particulate matter to RSP obtained by comparing the ultraviolet absorbance of the RSP sample to that of a surrogate standard.

¹ These test methods are under the jurisdiction of ASTM Committee D-22 on Sampling and Analysis of Atmospheres and are the direct responsibility of Subcommittee D22.05 on Indoor Air.

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² *Annual Book of ASTM Standards*, Vol 11.03.

³ The boldface numbers in parentheses refer to the list of references at the end of this standard.