



Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials¹

This standard is issued under the fixed designation E 662; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This fire-test-response standard covers determination of the specific optical density of smoke generated by solid materials and assemblies mounted in the vertical position in thicknesses up to and including 1 in. (25.4 mm).

1.2 Measurement is made of the attenuation of a light beam by smoke (suspended solid or liquid particles) accumulating within a closed chamber due to nonflaming pyrolytic decomposition and flaming combustion.

1.3 Results are expressed in terms of specific optical density which is derived from a geometrical factor and the measured optical density, a measurement characteristic of the concentration of smoke.

1.4 This test method is intended for use in research and development and not as a basis for ratings for regulatory purposes.

1.5 *This standard should be used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions and should not be used to describe or appraise the fire-hazard or fire-risk of materials, products, of assemblies under actual fire conditions. However, results of the test may be used as elements of a firehazard assessment or a fire-risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard or fire risk of a particular end use.*

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.*

1.7 The values stated in inch-pound units are to be regarded as standard. Values stated in parentheses are for information only.

2. Referenced Documents

2.1 ASTM Standards:

D 2843 Test Method for Density of Smoke from the Burning or Decomposition of Plastics²
E 176 Terminology of Fire Standards³

3. Terminology

3.1 *Definitions*—For definitions of terms found in this test method refer to Terminology E 176.

4. Summary of Test Method

4.1 This test method employs an electrically heated radiant-energy source mounted within an insulated ceramic tube and positioned so as to produce an irradiance level of 2.2 Btu/s·ft² (2.5 W/cm²) averaged over the central 1.5-in. (38.1-mm) diameter area of a vertically mounted specimen facing the radiant heater. The nominal 3 by 3-in. (76.2 by 76.2-mm) specimen is mounted within a holder which exposes an area measuring 2⁹/₁₆ by 2⁹/₁₆ in. (65.1 by 65.1 mm). The holder can accommodate specimens up to 1 in. (25.4 mm) thick. This exposure provides the nonflaming condition of the test.

4.2 For the flaming condition, a six-tube burner is used to apply a row of equidistant flamelets across the lower edge of the exposed specimen area and into the specimen holder trough. This application of flame in addition to the specified irradiance level from the heating element constitutes the flaming combustion exposure.

4.3 The test specimens are exposed to the flaming and nonflaming conditions within a closed chamber. A photometric system with a vertical light path is used to measure the varying light transmission as smoke accumulates. The light transmittance measurements are used to calculate specific optical density of the smoke generated during the time period to reach the maximum value.⁴

5. Significance and Use

5.1 This test method provides a means for determining the specific optical density of the smoke generated by specimens of

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² *Annual Book of ASTM Standards*, Vol 08.02.

³ *Annual Book of ASTM Standards*, Vol 04.07.

⁴ Additional parameters, such as the maximum rate of smoke accumulation, time to a fixed optical density level, or a smoke obscuration index may provide useful information. See Appendix X1.