



Standard Test Method for Measurement of Mass Loss and Ignitability for Screening Purposes Using a Conical Radiant Heater¹

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INTRODUCTION

The screening fire-test-response method described in this standard uses a radiant energy source similar to that used in the cone calorimeter, Test Method E1354. However, the test method apparatus is much simpler, because it excludes measurements of oxygen consumption or of smoke obscuration, which are incorporated into the cone calorimeter to measure heat and smoke release. A fire-test-response standard describes a test method from which one or more fire-test-response characteristics can be measured, as a result of exposure to a prescribed source of heat or flame, under controlled conditions. There are many occasions, typically for initial research and development, when there is a need for screening samples of materials, products, or assemblies, using a simple test. This allows the user to verify whether certain fire-test-response characteristics of the sample fall within the expected margins. Screening tests, as related to fire, are described in fire terminology as fire-response tests performed to determine whether a material, product, or assembly (*a*) exhibits any unusual fire-related characteristics, (*b*) has certain expected fire-related characteristics, or (*c*) is capable of being preliminarily categorized according to the fire characteristic in question. Screening tests addressing fire properties should be chosen so that the energy input (as heat or flame) is representative of that in the fire test method for which screening is desired.

1. Scope*

1.1 This fire-test-response standard provides a means of measuring mass loss and ignitability, for screening purposes, from essentially planar materials, products, or assemblies (including surface finishes), exposed to controlled levels of radiant heating, with or without an external ignitor. This test method is intended for screening purposes only.

1.2 The principal fire-test-response characteristics obtained from this test method are those associated with mass loss from the specimens tested, as a function of time. Time to sustained flaming is also determined. Heat release is, optionally, determined using thermopile measurements detailed in Annex A2.

1.2.1 The fire-test-response characteristics obtained from this test are best used for comparisons between materials with some similarities in composition or structure.

1.3 The relationship between mass loss and heat release depends on the material, product, or assembly tested, and no

universal formula exists for calculation of heat release using mass loss measurements (see also additional limitations in 5.7).

1.4 The fire-test-response characteristics obtained from this test method are also obtainable with the apparatus used in Test Method E1354 (the cone calorimeter) or in an applications standards of that equipment (see also 5.4). The referenced test methods permit measurements of added fire-test-response characteristics.

1.5 The fire-test-response characteristics obtained by this test method are specific to the specimen tested, in the form and thickness tested, and are not an inherent property of the material, product, or assembly.

1.6 This fire-test-response method does not provide information on the fire performance of the test specimens under fire conditions other than those conditions specified in this test method. For additional limitations of this test method, see 5.7.

1.7 Use the SI system of units in referee decisions; see IEEE/ASTM SI-10. The units given in parentheses are for information only.

1.8 This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate

¹ This test method is under the jurisdiction of ASTM Committee E05 on Fire Standards and is the direct responsibility of Subcommittee E05.21 on Smoke and Combustion Products.

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all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.

1.9 *Fire testing is inherently hazardous. Adequate safeguards for personnel and property shall be employed in conducting these tests. See also Section 7.*

1.10 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.11 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- D5537** Test Method for Heat Release, Flame Spread, Smoke Obscuration, and Mass Loss Testing of Insulating Materials Contained in Electrical or Optical Fiber Cables When Burning in a Vertical Cable Tray Configuration
- D6113** Test Method for Using Cone Calorimeter to Determine Fire-Test-Response Characteristics of Insulating Materials Contained in Electrical or Optical Fiber Cables
- E176** Terminology of Fire Standards
- E535** Practice for Preparation of Fire-Test-Response Standards
- E603** Guide for Room Fire Experiments
- E638** Test Method for Calibration of Heat Transfer Rate Calorimeters Using a Narrow-Angle Blackbody Radiation Facility (Withdrawn 2001)³
- E906** Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using a Thermopile Method
- E1354** Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
- E1474** Test Method for Determining the Heat Release Rate of Upholstered Furniture and Mattress Components or Composites Using a Bench Scale Oxygen Consumption Calorimeter
- E1537** Test Method for Fire Testing of Upholstered Furniture
- E1590** Test Method for Fire Testing of Mattresses
- E1623** Test Method for Determination of Fire and Thermal Parameters of Materials, Products, and Systems Using an Intermediate Scale Calorimeter (ICAL)
- E1740** Test Method for Determining the Heat Release Rate and Other Fire-Test-Response Characteristics of Wall

Covering or Ceiling Covering Composites Using a Cone Calorimeter

E1822 Test Method for Fire Testing of Stacked Chairs
IEEE/ASTM SI-10 International System of Units (SI) The Modernized Metric System

2.2 ISO Standards:⁴

- ISO 3261** Fire Tests—Vocabulary
- ISO 5657** Fire Tests—Reaction to Fire—Ignitability of Building Products
- ISO 5660-1** Fire Tests—Reaction to Fire—Rate of Heat Release from Building Products (Cone calorimeter method)
- ISO 9705** Fire Tests—Full Scale Room Test for Surface Products
- ISO 13943** Fire Safety Vocabulary

2.3 British Standards:⁵

- BS 476, Part 15, Fire Tests—** Reaction to Fire—Rate of Heat Release from Building Products (Cone calorimeter method)
- BS 6809** Method of Calibration of Radiometers for Use in Fire Testing

3. Terminology

3.1 *Definitions:* For definitions of terms used in this test method refer to the terminology contained in Terminology **E176**, ISO 3261 and ISO 13943. In case of conflict, the definitions given in Terminology **E176** shall prevail.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *assembly, n*—a unit or structure composed of a combination of materials or products, or both.

3.2.2 *continuous* (as related to data acquisition), *adj*—conducted at data collection intervals of 5 s or less.

3.2.3 *critical heat flux for ignition, n*—the midpoint within the range of heat fluxes between the maximum (highest) heat flux that produces no ignition and the minimum (lowest) heat flux that produces ignition, for a specified exposure time.

3.2.4 *essentially flat surface, n*—surface where the irregularity from a plane does not exceed ± 1 mm.

3.2.5 *exposed surface, n*—that surface of the specimen subjected to the incident heat.

3.2.6 *flashing, n*—existence of flame on or over the surface of the specimen for periods of less than 1 s.

3.2.7 *irradiance* (at a point of a surface), *n*—ratio of the radiant flux incident on a small but measurable element of surface containing the point, by the area of that element.

3.2.7.1 *Discussion*—Convective heating is negligible in the horizontal specimen orientation. In the vertical orientation, it is small, but not negligible. Despite this contribution from convective heating, the term “irradiance” is used instead of “heat flux” throughout this test method as it best indicates the essentially radiative mode of heat transfer.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from International Standardization Organization, P.O. Box 56, CH-1211; Geneva 20, Switzerland or American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁵ Available from British Standards Institution, PO Box 4033, Linford Wood, Milton Keynes, MK 14 6LE, United Kingdom