



Standard Test Method for Determination of Fire and Thermal Parameters of Materials, Products, and Systems Using an Intermediate Scale Calorimeter (ICAL)¹

This standard is issued under the fixed designation E 1623; 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 fire-test-response standard covers measuring the response of materials, products, and assemblies exposed to controlled levels of radiant heating with or without an external ignitor.

1.2 This test method is used to determine the ignitability, heat release rates, mass loss rates, and visible smoke development of materials, products, and assemblies under well ventilated conditions.

1.3 This test method is also used to determine many of the parameters or values needed in computer fire models. Examples of these values include effective heat of combustion, surface temperature, ignition temperature, gas concentrations, and emissivity.

1.4 This test method was also designed to provide information about other fire parameters such as thermal conductivity, specific heat, radiative and convective heat transfer coefficients, flame radiation factor, air entrainment rates, flame temperatures, minimum surface temperatures for upward and downward flame spread, heat of gasification, nondimensional heat of gasification (**1**)² and the Φ flame spread parameter (see Test Method E 1321). While early studies indicate that it is appropriate to use this test method to determine these parameters, insufficient testing and research has been done to justify inclusion of testing and calculational procedures at this time.

1.5 The heat release rate is determined by measurement of the oxygen consumption as determined by the oxygen concentration and flow in the exhaust product stream as specified in 11.1. Smoke development is quantified by measuring the obscuration of light by the combustion product stream.

1.6 Specimens are exposed to heating fluxes ranging from 0 to 50 kW/m² (heat release measurements at the low flux levels are limited by the exhaust hood size) in a vertical orientation. Hot wires are used as the ignition source when the parameters other than those connected to flame spread are being determined.

1.7 This test method has been developed for material, product, or assembly evaluations, mathematical modeling, design purposes, or research and development. The specimen shall be tested in thicknesses and configurations representative of actual end product or system uses.

1.8 Limitations of the test method are listed in Section 12.

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

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

1.11 *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 hazard statements, see Section 7.*

2. Referenced Documents

2.1 ASTM Standards:

D 2016 Test Methods for Moisture Content of Wood³

D 3286 Test Method for Gross Calorific Value of Coal and Coke by the Isoperibol Bomb Calorimeter⁴

E 84 Test Method for Surface Burning Characteristics of Building Materials⁵

E 176 Terminology of Fire Standards⁵

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods⁶

E 662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials⁵

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁶

E 800 Guide for Measurement of Gases Present or Generated During Fires⁵

¹ This test method is under the jurisdiction of ASTM Committee E-5 on Fire Standards and is the direct responsibility of Subcommittee E05.21 on Smoke and Combustion Products.

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

³ Discontinued; see 1988 *Annual Book of ASTM Standards*, Vol 04.09. Replaced by D 4442 and D 4444.

⁴ *Annual Book of ASTM Standards*, Vol 05.05.

⁵ *Annual Book of ASTM Standards*, Vol 04.07.

⁶ *Annual Book of ASTM Standards*, Vol 14.02.