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An American National Standard

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 assesses the response of materials, products, and assemblies to controlled levels of radiant heat exposure with or without an external ignitor.

1.2 The fire-test-response characteristics determined by this test method include the ignitability, heat release rates, mass loss rates, visible smoke development, and gas release of materials, products, and assemblies under well ventilated conditions.

1.3 This test method is also suitable for determining many of the parameters or values needed as input for computer fire models. Examples of these values include effective heat of combustion, surface temperature, ignition temperature, and emissivity.

1.4 This test method is also intended 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 some studies have indicated that this test method is suitable for determining these fire parameters, insufficient testing and research have been done to justify inclusion of the corresponding testing and calculating procedures.

1.5 The heat release rate is determined by the principle of oxygen consumption calorimetry, via measurement of the oxygen consumption as determined by the oxygen concentration and flow rate in the exhaust product stream (exhaust duct). The procedure is specified in 11.1. Smoke development is quantified by measuring the obscuration of light by the combustion product stream (exhaust duct).

1.6 Specimens are exposed to a constant heating flux in the range of 0 to 50 kW/m^2 in a vertical orientation. Hot wires are used to ignite the combustible vapors from the specimen during the ignition and heat release tests. The assessment of the parameters associated with flame spread requires the use of line burners instead of hot wire ignitors.

1.6.1 Heat release measurements at low heat flux levels (< 10 kW/m^2) require special considerations as described in Section A1.1.6.

1.7 This test method has been developed for evaluations, design, or research and development of materials, products, or assemblies, for mathematical fire modeling, or for 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 5.5.

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 *Fire testing of products and materials is inherently hazardous, and adequate safeguards for personnel and property shall be employed in conducting these tests. This test method may involve hazardous materials, operations, and equipment. Specific information about hazard is given in Section 7.*

1.12 *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:* [3]

D 2016 Test Methods for Moisture Content of Wood

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

[3] 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.

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