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Designation: E 1354 – 02a

An American National Standard

Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter[1]

This standard is issued under the fixed designation E 1354; 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 provides for measuring the response of materials 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, effective heat of combustion, and visible smoke development of materials and products.

1.3 The rate of heat release is determined by measurement of the oxygen consumption as determined by the oxygen concentration and the flow rate in the exhaust product stream. The effective heat of combustion is determined from a concomitant measurement of specimen mass loss rate, in combination with the heat release rate. Smoke development is measured by obscuration of light by the combustion product stream.

1.4 Specimens shall be exposed to heating fluxes in the range of 0 to 100 kW/m^2. External ignition, when used, shall be by electric spark. The value of the heating flux and the use of external ignition are to be as specified in the relevant material or performance standard (see X1.2). The normal specimen testing orientation is horizontal, independent of whether the end-use application involves a horizontal or a vertical orientation. The apparatus also contains provisions for vertical orientation testing; this is used for exploratory or diagnostic studies only.

1.5 Ignitability is determined as a measurement of time from initial exposure to time of sustained flaming.

1.6 This test method has been developed for use for material and product evaluations, mathematical modeling, design purposes, or development and research. Examples of material specimens include portions of an end-use product or the various components used in the end-use product.

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

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

1.9 *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 3286 Test Method for Gross Calorific Value of Coal and Coke by the Isoperibol Bomb Calorimeter[2]

E 176 Terminology of Fire Standards[3]

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods[4]

E 662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials[3]

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[4]

E 906 Test Method for Heat and Visible Smoke Release Rates for Materials and Products[3]

2.2 *ISO Standards:*

ISO 5657-1986(E) Fire Tests—reaction to fire—ignitability of building materials[5]

ISO 5725 Precision of test methods—determination of repeatability and reproducibility for a standard test method by inter-laboratory tests[5]

3. Terminology

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

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *effective heat of combustion, n*—the measured heat release divided by the mass loss for a specified time period.

3.2.2 *heating flux, n*—the incident flux imposed externally from the heater on the specimen at the initiation of the test.

3.2.2.1 *Discussion*—The specimen, once ignited, is also

[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.

Current edition approved August 10, 2002. Published September 2002. Originally published as E 1354 – 90. Last previous edition E 1354 – 02.

[2] *Annual Book of ASTM Standards*, Vol 05.06.

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

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

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