Designation: E1590 – 23

An American National Standard

Standard Test Method for Fire Testing of Mattresses[1]

This standard is issued under the fixed designation E1590; 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 is a fire-test-response standard.

1.2 This test method provides a means of determining the burning behavior of mattresses used in public occupancies by measuring specific fire test responses when the test specimen, a mattress or mattress with foundation, is subjected to a specified flaming ignition source under well ventilated conditions.

1.3 This is a test method for mattresses or mattresses with foundations.

1.4 Test data are obtained describing the burning behavior, following application of a specific ignition source, from ignition until all burning has ceased, a period of 1 h has elapsed, or flashover appears inevitable.

1.5 This test method does not provide information on the fire performance of mattresses under fire conditions other than those specified in this test method. In particular, this test method does not apply to smoldering ignition by cigarettes. See 5.12 for further information.

1.6 The rate of heat release of burning test specimen is measured by an oxygen consumption method. See 5.12.4 for further information.

1.7 Other measurements are the production of light-obscuring smoke and the concentrations of certain toxic gas species in the combustion gases. See 5.12.5 for further information.

1.8 The burning behavior is documented visually by photographic or video recordings.

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

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 is inherently hazardous. Adequate safeguards for personnel and property shall be employed in conducting these tests.*

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

1.13 *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]

D123 Terminology Relating to Textiles
E84 Test Method for Surface Burning Characteristics of Building Materials
E176 Terminology of Fire Standards
E603 Guide for Room Fire Experiments
E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
E800 Guide for Measurement of Gases Present or Generated During Fires
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

[1] This test method is under the jurisdiction of ASTM Committee E05 on Fire Standards and is the direct responsibility of Subcommittee E05.15 on Furnishings and Contents.

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[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.

***A Summary of Changes section appears at the end of this standard**

E2067 Practice for Full-Scale Oxygen Consumption Calorimetry Fire Tests
E2257 Test Method for Room Fire Test of Wall and Ceiling Materials and Assemblies
IEEE/ASTM SI-10 International System of Units (SI): The Modern Metric System
2.2 *ISO Standards:*[3]
ISO 4880 Burning Behaviour of Textiles and Textile Products—Vocabulary
ISO 9705 Fire Tests—Full Scale Room Test for Surface Products
ISO 13943 Fire Safety—Vocabulary
2.3 *UL Standards:*[4]
UL 1056 Fire Test of Upholstered Furniture (withdrawn)
UL 1895 Fire Test of Mattresses (withdrawn)
2.4 *CA Standards:*[5]
CA Technical Bulletin 121 Flammability Test Procedure for Mattresses for Use in Public Occupancies
CA Technical Bulletin 129 Flammability Test Procedure for Mattresses for Use in Public Buildings
CA Technical Bulletin 133 Flammability Test Procedure for Seating Furniture for Use in Public Occupancies (withdrawn)
2.5 *Other Documents:*
CFR Part 1632 Standard for the Flammability of Mattresses and Mattress Pads (formerly DOC FF4-72, 40 FR 59940)[6]
CFR Part 1633 Standard for the Flammability (Open Flame) of Mattress Sets[6]
Nordtest Method NT Fire 032 Upholstered Furniture: Burning Behavior—Full Scale Test[7]
2.6 *NFPA Standards:*[8]
NFPA 265 Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls
NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method and associated with fire issues, refer to the terminology contained in Terminology E176 and ISO 13943. In case of conflict, the definitions given in Terminology E176 shall prevail. For definitions of terms used in this test method and associated with textile issues, refer to the terminology contained in Terminology D123 and ISO 4880. In case of conflict, the definitions given in Terminology D123 shall prevail.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *product, n*—mattress, or mattress with foundation, for which fire-test-response characteristics are to be measured.

3.2.2 *specimen, n*—the manufactured item of the product, or representative prototype of the product.

4. Summary of Test Method

4.1 This fire-test-response test method determines a number of fire-test-response characteristics associated with a full-scale test specimen, mattress or mattress with foundation, ignited with a propane gas burner. Measurements to be made include the rate of heat and smoke release, total amount of heat released, rates and concentrations of carbon oxides released, and rates and amounts of mass of test specimen lost. Other optional measurements are also described.

4.2 In Test Configurations A and B, the test specimen is placed on a weighing platform located in a test room. An exhaust hood, connected to a duct, is located at the doorway of the room.

4.3 In Test Configuration C, the test specimen is placed on a weighing platform located directly under a hood.

4.4 Heat, smoke, and combustion gas release instrumentation is placed in the duct.

4.5 Additional (optional) instrumentation placed in the test room is also described.

5. Significance and Use

5.1 This test method provides a means of measuring a variety of fire-test-response characteristics resulting from burning a test specimen, mattress or mattress with foundation. After ignition using a propane gas burner, the test specimen is permitted to burn freely under well-ventilated conditions. The most important fire-test-response characteristic measured in this test method is the rate of heat release, which quantifies the intensity of the fire generated.

5.2 The rate of heat release is measured by the principle of oxygen consumption. Annex A3 discusses the assumptions and limitations.

5.3 This test method also provides measures of other fire-test-response characteristics, including smoke obscuration (as the rate of smoke release, total smoke released, or optical density of smoke), combustion gas release (as concentrations of combustion gases), and mass loss, which are important to making decisions on fire safety.

5.4 In the majority of fires, the most important gaseous components of smoke are the carbon oxides, present in all fires. They are indicators of the toxicity of the atmosphere and of the completeness of combustion. Measurement of concentrations of carbon oxides are useful for two purposes: (*1*) as part of fire hazard assessment calculations and (*2*) to improve the accuracy of heat release measurements. Other toxic combustion gases, which are specific to certain materials, are also indicators of the toxicity of the atmosphere, but are less crucial for determining combustion completeness and are optional measures; however, fire hazard assessment often requires their measurement.

[3] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.
[4] Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, http://www.ul.com.
[5] Available from California Bureau of Household Goods and Services (BHGS), State of California, Dept. of Consumer Affairs, 3485 Orange Grove Ave., North Highlands, CA 95660-5595, https://bhgs.dca.ca.gov/.
[6] Available from U.S. Consumer Product Safety Commission (CPSC), 4330 East West Hwy., Bethesda, MD 20814, http://www.cpsc.gov.
[7] Available from Nordtest, P.O. Box 22, SF-00341, Helsingfors, Finland.
[8] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, http://www.nfpa.org.