



Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure¹

This standard is issued under the fixed designation E2707; 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 prescribes a method to assess the fire performance of a vertically oriented specimen exposed to direct flame impingement in a simulated external fire exposure potentially encountered in a ‘Wildland Urban Interface’ scenario. This test method provides data suitable for comparing the performance of materials, which are used as the exposed surfaces of exterior walls in construction applications.

NOTE 1—This test method closely follows the test procedure of California Office of State Marshal (SFM) Method 12-7A-1.²

1.2 This test method measures the ability of the wall system to resist fire penetration from the exterior into the wall cavity or unexposed side of the test assembly under the conditions of exposure.

1.3 This test method provides data suitable for comparing the performance of vertically oriented materials, products or assemblies in exterior construction applications. The test specimen shall be tested in thicknesses and configurations representative of actual end product or system uses.

1.4 Limitations of the test method are listed in Section 5.5.

1.5 The system of units to be used in referee decisions is the SI system of units; see **IEEE/ASTM SI-10** for further details. The units given in parentheses are for information only.

1.6 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.

1.7 *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 appro-*

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

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

1.9 *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:³

- D2898 Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
- D4442 Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials
- D4444 Test Method for Laboratory Standardization and Calibration of Hand-Held Moisture Meters
- D6662 Specification for Polyolefin-Based Plastic Lumber Decking Boards
- D7032 Specification for Establishing Performance Ratings for Wood-Plastic Composite and Plastic Lumber Deck Boards, Stair Treads, Guards, and Handrails
- E176 Terminology of Fire Standards
- 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
- 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

¹ This test method is under the jurisdiction of ASTM Committee E05 on Fire Standards and is the direct responsibility of Subcommittee E05.14 on External Fire Exposures.

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² 2019 California Building Code, Chapter 7A [SFM], Materials and Construction Methods for Exterior Wildfire Exposure, Exterior Wall Siding and Sheathing, SFM Standard 12-7A-1.

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.

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

E2102 Test Method for Measurement of Mass Loss and Ignitability for Screening Purposes Using a Conical Radiant Heater

E2257 Test Method for Room Fire Test of Wall and Ceiling Materials and Assemblies

E2886 Test Method for Evaluating the Ability of Exterior Vents to Resist the Entry of Embers and Direct Flame Impingement

IEEE/ASTM SI-10 American National Standard for Use of the International System of Units (SI): The Modern Metric System

2.2 *ISO Standards*:

ISO 13943 Fire Safety—Vocabulary⁴

3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, see Terminology **E176** 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 *orientation, n*—the vertical plane in which the exposed face of the test specimen is located during testing.

3.2.2 *siding (cladding), n*—any material that constitutes the exposed exterior covering of an exterior wall and such material is applied over sheathing or directly attached to the wall system.

3.2.3 *sheathing, n*—the material placed on an exterior wall beneath cladding or siding and directly attached to the wall system used over the wall framework and is attached directly to the wall framing members. Materials called sheathing that are not placed beneath cladding or siding shall be classified as cladding or siding.

3.2.4 *sustained flaming, n*—flame on or over the surface of a test specimen that lasts longer than a period of 4 s.

4. Summary of Test Method

4.1 This test method provides for the direct flame exposure of a wall specimen to a flame source centered at the base of a 1220 mm by 2440 mm (4 ft by 8 ft) test assembly.

4.2 This test method employs a gas burner to produce a diffusion flame in contact with the test wall assembly.

4.3 The gas burner produces a prescribed net rate of heat output of 150 kW (8535 BTU/min) for a period of 10 min, after which the flame exposure is terminated.

4.4 The test method measures the ability of the wall system to resist fire penetration from the exterior to the unexposed side of the test assembly under the conditions of exposure. Observations are made for the appearance of sustained flaming or glow on the unexposed side or sustained glowing on the unexposed side, or both, at the end of a 60 min observation period.

5. Significance and Use

5.1 The test method described herein measures the ability of the exterior wall covering material or system to resist fire penetration from the exterior to the unexposed side of the wall assembly under the specified conditions of exposure.

5.2 Representative joints and other characteristics of an assembly shall be included in a test specimen when these details are representative of the construction of the end-use product(s).

5.3 This test method is applicable to end-use product(s) not having an ideally planar external surface.

5.4 The overall performance of the test specimen is visually documented by full-color photographic records. Video recording of the complete fire test is an acceptable alternative to the photographic record. Infrared photography of the unexposed side of the test wall can be used to identify areas of increasing temperatures or persisting hot spots.

5.5 In this procedure, the specimens are subjected to a specific set of laboratory fire test exposure conditions. If different test conditions are substituted or the anticipated end-use conditions are changed, it is not known whether it is possible by use of this test to predict changes in the performance characteristics measured. Therefore, the results are strictly valid only for the fire test exposure conditions described in this procedure.

6. Safety Precautions

6.1 The test procedures involve high temperatures and combustion processes. Therefore, the potential exists for burns, ignition of extraneous objects or clothing, and for inhalation of combustion products.

7. Apparatus

7.1 Unless otherwise noted, dimensions in the following descriptions, shall be followed with a tolerance of ± 13 mm (0.5 in.).

7.2 *Wall Assembly Holding Fixture*—The test specimen support assembly shown in **Fig. 1** is designed to permit rapid installation and removal of wall assemblies, and to prevent edge penetration of fire at the margins of the wall assembly. It includes a sturdy frame assembly to hold the specimen and a simulated soffit that is non-combustible. The frame assembly permits a 1220 mm by 2440 mm (4 ft by 8 ft) prefabricated wall section to be inserted from the rear and to seal in such a way that protects the edges from fire. Side shields are situated near the vertical edges and to within 304 mm (12 in.) of the top of the test wall assembly as shown in **Fig. 1** to aid in minimizing extraneous drafts to the surface of the assembly.

7.3 *Burner Details*—The ignition source for the test shall be a gas diffusion burner with a nominal 100 mm wide by 1000 mm long (4 in. wide by 39 in. long) porous top surface of a refractory material, as shown in **Fig. 2**. With the exception of top surface dimensions, the essential configuration of the burner is comparable to the burner design described in Test Method **E2257**.

⁴ 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>.