



# Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus<sup>1</sup>

This standard is issued under the fixed designation E2307; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## INTRODUCTION

A perimeter fire barrier is the perimeter joint protection that provides fire resistance to prevent passage of fire from floor to floor within the building at the opening between the exterior wall assembly and the floor assembly. A perimeter fire barrier is a unique building construction detail not addressed by other fire test methods.

Among its other functions, a perimeter fire barrier impedes the vertical spread of fire from the floor of origin to the floor(s) above, at the building's exterior perimeter and accommodates various movements such as those induced by thermal differentials, seismicity, and wind loads.

This test method describes criteria and test methods used to determine the fire resistance of perimeter fire barriers when subjected to standard fire exposure conditions using the intermediate-scale, multistory test apparatus (ISMA). The use of the multi-story test apparatus and this test method are intended to simulate a possible fire exposure on a perimeter fire barrier.

## 1. Scope

1.1 This test method measures the performance of the perimeter fire barrier and its ability to maintain a seal to prevent fire spread during the deflection and deformation of the exterior wall assembly and floor assembly during the fire test, while resisting fire exposure from an interior compartment fire as well as from the flame plume emitted from the window burner below. The end point of the fire-resistance test is the period of time elapsing before the first condition of compliance is reached as the perimeter fire barrier is subjected to a time-temperature fire exposure.

1.2 The fire exposure conditions used are those specified by this test method for the first 30 min of exposure and then conform to the Test Methods E119 time-temperature curve for the remainder of the test in the test room.

1.3 This test method specifies the heating conditions, methods of test, and criteria for evaluation of the ability of a perimeter fire barrier to maintain the fire resistance where a floor and exterior wall assembly are juxtaposed to a perimeter joint.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee E05 on Fire Standards and is the direct responsibility of Subcommittee E05.11 on Fire Resistance.

Current edition approved April 1, 2020. Published May 2020. Originally approved in 2004. Last previous edition approved in 2019 as E2307 – 19. DOI: 10.1520/E2307-20.

1.4 Test results establish the performance of perimeter fire barriers during the fire-exposure period and shall not be construed as having determined the suitability of perimeter fire barriers for use after that exposure.

1.5 This test method does not provide quantitative information about the perimeter fire barrier relative to the rate of leakage of smoke or gases or both. While it requires that such phenomena be noted and reported when describing the general behavior of perimeter fire barrier during the fire-resistance test, such phenomena are not part of the conditions of compliance.

1.6 Potentially important factors and fire characteristics not addressed by this test method include, but are not limited to:

1.6.1 The performance of the perimeter fire barrier constructed with components other than those tested, and

1.6.2 The cyclic movement capabilities of perimeter fire barriers other than the cycling conditions tested.

1.7 This test method 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 the fire-hazard or fire-risk assessment of the materials, products, or assemblies under actual fire conditions.

1.8 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.9 The text of this test method references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.10 *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.*

1.11 *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:<sup>2</sup>

**E84** Test Method for Surface Burning Characteristics of Building Materials

**E108** Test Methods for Fire Tests of Roof Coverings

**E119** Test Methods for Fire Tests of Building Construction and Materials

**E176** Terminology of Fire Standards

**E511** Test Method for Measuring Heat Flux Using a Copper-Constantan Circular Foil, Heat-Flux Transducer

**E631** Terminology of Building Constructions

**E1529** Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies

**E1966** Test Method for Fire-Resistive Joint Systems

### 2.2 Other Documents:

**Uniform Building Code Standard No. 26-9** Method of Test for the Evaluation of Flammability Characteristics of Exterior, Non-Loadbearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale Multistory Test Apparatus<sup>3</sup>

**NFPA 285** Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Loadbearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus<sup>4</sup>

**GA-600-2015** Fire Resistance Design Manual, 21st Edition<sup>5</sup>

## 3. Terminology

3.1 Terms defined in Terminology **E176** and **E631** shall prevail for fire standard and building terms not defined in this document.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> International Conference of Building Officials Inc., 5360 Workman Mill Rd., Whittier, CA 90601.

<sup>4</sup> National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101.

<sup>5</sup> Gypsum Association, 6525 Belcrest Road, Suite 480, Hyattsville, Maryland 20782.

### 3.2 Definitions:

3.2.1 *blockout, n*—a recess formed in the floor assembly to accommodate the installation of the perimeter joint protection, flush with the wearing surface of the floor assembly.

3.2.2 *curtain wall assembly, n*—either a rated or non-rated, nonbearing exterior wall assembly secured to and supported by the structural members of the building.

3.2.3 *exterior wall assembly, n*—a curtain wall or a load-bearing exterior wall that is either fire resistance rated or one that is not.

3.2.4 *floor assembly, n*—a fire resistance rated loadbearing horizontal separating element adjacent to and separate from the floor of the observation room.

3.2.4.1 *Discussion*—Floor assemblies tested in accordance with Test Methods **E119** are required to be loadbearing.

3.2.5 *integrity, n*—the ability of a perimeter fire barrier, when exposed to fire from two sides, to prevent the passage of flame and hot gases through it and the occurrence of flames on its unexposed sides as determined by using a cotton pad.

3.2.6 *maximum joint width, n*—the widest opening of the perimeter joint as defined by the test sponsor.

3.2.7 *minimum joint width, n*—the narrowest opening of the perimeter joint as defined by the test sponsor.

3.2.8 *movement cycle, n*—the change between the minimum and the maximum joint widths.

3.2.9 *nominal joint width, n*—the specified opening of the perimeter joint as defined by the test sponsor that is selected for test purposes.

3.2.10 *observation room, n*—the second-story room of the ISMA.

3.2.11 *perimeter fire barrier, n*—the perimeter joint protection that provides fire resistance to prevent the passage of fire from floor to floor within the building at the opening between the exterior wall assembly and the floor assembly. The boundaries are the edge of the floor assembly and the interior face of the exterior wall assembly in contact with the perimeter joint protection.

3.2.11.1 *Discussion*—For the purpose of this standard, a knee wall is not to be considered as part of the exterior wall.

3.2.12 *perimeter joint, n*—the linear void located between a juxtaposed exterior wall assembly and floor assembly to accommodate various movements induced by thermal differentials, seismicity, wind loads, and misalignments of the floor and wall during construction.

3.2.13 *perimeter joint protection, n*—a fire-resistive joint system located between the exterior wall assembly and the floor assembly that fills the perimeter joint.

3.2.13.1 *Discussion*—Fire-resistive joint system is defined in Test Method **E1966**.

3.2.14 *separating element, n*—a floor assembly or exterior wall assembly.

3.2.15 *splice, n*—the connection or junction within the length of a perimeter joint protection.

3.2.15.1 *Discussion*—A splice is a result of the device or

1. Gas Supply Line (Ref. 6.3.3.3)
2. Concrete Slab (First Floor of Test Room) (Ref. 6.2.2)
3. Wall (Ref. 6.2.3)
4. Test Room Burner (Ref. 6.3.2)
5. Area of Burner with Holes (6.3.2.3)
6. Column (Typical) (Ref. 6.2.2)

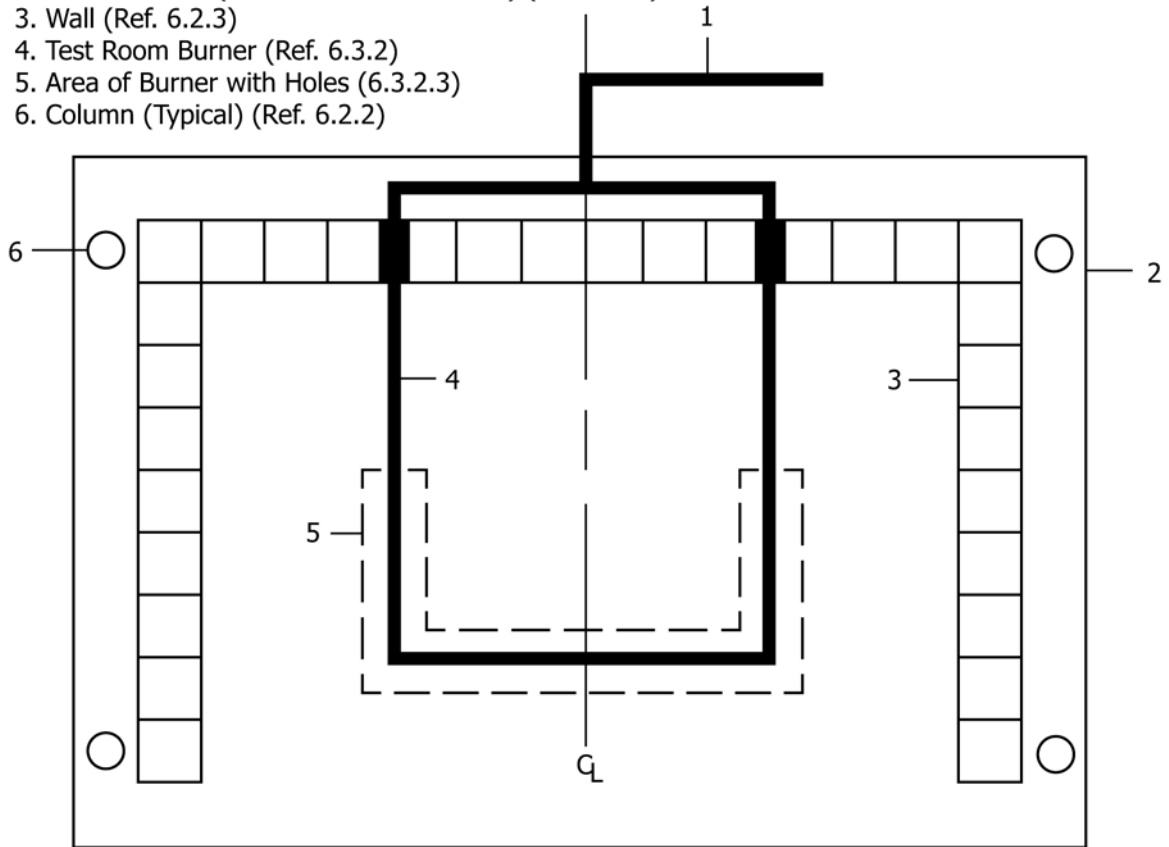


FIG. 1 Plan View of Test Room Burner Positioned in Test Room (See 6.3.2 for Dimensions)

method used to connect or join multiple lengths of the perimeter joint protection.

3.2.16 *supporting construction, n*—the arrangement of separating elements forming the intersection into which the perimeter joint protection is installed.

3.2.17 *test assembly, n*—the complete assembly of the test specimen together with the test apparatus.

3.2.18 *test room, n*—the first-story room of the ISMA.

3.2.19 *test specimen, n*—the specific test details of the perimeter fire barrier.

#### 4. Summary of Test Method

4.1 This test method describes the following test sequence and procedure:

4.1.1 When the maximum joint width does not equal the minimum joint width, the perimeter fire barrier is movement cycled before being fire tested.

4.1.2 A perimeter joint protection and its supporting construction are conditioned and fire tested.

4.1.3 During the fire test, the integrity of the perimeter joint protection and its supporting construction is determined by use of a cotton pad.

#### 5. Significance and Use

5.1 This test method provides for the following measurements and evaluations:

5.1.1 Movement capacity of the perimeter fire barrier.

5.1.2 Loadbearing capacity of the perimeter joint protection is optional.

5.1.3 Ability of the perimeter fire barrier to resist the passage of flames and hot gases.

5.1.4 Transmission of heat through the perimeter fire barrier.

5.2 This test method does not provide the following:

5.2.1 Evaluation of the degree to which the perimeter fire barrier contributes to the fire hazard by generation of smoke, toxic gases, or other products of combustion,

5.2.2 Measurement of the degree of control or limitation of the passage of smoke or products of combustion through the perimeter fire barrier,

NOTE 1—This test method does not measure the quantity of smoke or hot gases through the floor assembly, the wall assembly, or the perimeter joint protection.

5.2.3 Measurement of flame spread over the surface of the perimeter fire barrier,

NOTE 2—The information in 5.2.1 through 5.2.3 are determined by other suitable fire test methods. For example, Test Method E84 is used to determine 5.2.3.

5.2.4 Durability of the test specimen under actual service conditions, including the effects of cycled temperature,

5.2.5 Effects of a load on the movement cycling of the perimeter fire barrier established by this test method,