



Standard Test Method for Fire Tests of Penetration Firestop Systems¹

This standard is issued under the fixed designation E814; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

INTRODUCTION

Characteristically fire spreads from one building compartment to another by the collapse of a barrier, or by openings through which flames or hot gases may pass, or by transfer of sufficient heat to ignite combustibles beyond the barrier. Test Methods E119 describe the method to be used to measure the fire-resistive performance of these barriers.

However, various techniques of providing for the distribution of services within a structure sometimes require that openings be made in fire-resistive walls and floors to allow the passage of such penetrating items as cables, conduits, pipes, trays, and ducts through to the adjacent compartment. Fire-stop material is installed into these openings to resist the spread of fire.

The performance of through-penetration firestops should be measured and specified according to a common standard that describes the method of fire exposure and rating criteria.

1. Scope

1.1 This test method is applicable to firestop systems of various materials and construction. Firestop systems are intended for use in openings in fire-resistive walls and floors that are evaluated in accordance with Test Methods E119.

1.2 Tests conducted in conformance with this test method record firestop system performance during the test exposure; but such tests shall not be construed to determine suitability of the firestop system for use after test exposure.

1.3 This test method also measures the resistance of firestop systems to an external force stimulated by a hose stream. However, this test method shall not be construed as determining the performance of the firestop system during actual fire conditions when subjected to forces such as failure of cable support systems and falling debris.

1.4 The intent of this test method is to develop data to assist others in determining the suitability of the firestops for use where fire resistance is required.

1.5 This test method does not apply to membrane penetrations of a floor-ceiling assembly or roof-ceiling assembly that are tested as part of the assembly in accordance with Test Methods E119.

1.6 This test method does not apply to membrane penetrations of load-bearing walls.

1.7 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.

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

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

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.*

¹ 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 July 1, 2023. Published July 2023. Originally approved in 1981. Last previous edition approved in 2023 as E814 – 23. DOI: 10.1520/E0814-23A.

2. Referenced Documents

2.1 ASTM Standards:²

E119 Test Methods for Fire Tests of Building Construction and Materials

E176 Terminology of Fire Standards

E2226 Practice for Application of Hose Stream

2.2 Other Documents:

ANSI/UL 1479 Standard for Fire Tests of Through-Penetration Firestops

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method refer to Terminology E176.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *firestop system, n*—a specific combination of penetrating item or items, the specific construction that is penetrated, and the materials or devices, or both, that seal the opening provided to accommodate one or more items that penetrate into or through a fire-resistance rated assembly.

3.2.1.1 *Discussion*—The materials and devices used to seal the opening around penetrating items are sometimes referred to as “firestops.” Note that it is not “firestops” that are tested by this standard, but rather “firestop systems.” Due to the complex interaction during a fire between the penetrant, the penetrated assembly, the materials and/or devices used to seal the penetration, and the specific size and shape of the opening, it is not possible to simply test the “firestop” to develop fire resistance data.

3.2.2 *membrane-penetration firestop system, n*—a firestop system that seals the opening provided to accommodate one or more items that penetrate the membrane on only one side of a fire-resistance rated assembly.

3.2.2.1 *Discussion*—Examples of penetrating items include cables, conduits, ducts, pipes, and electrical boxes.

3.2.3 *test assembly*—the wall or floor that is part of the firestop system being tested into which the test specimen(s) is (are) mounted or installed.

3.2.4 *test specimen*—the penetrating item or items and the materials or devices, or both, that seal the opening in the firestop system being tested.

3.2.5 *through-penetration firestop system, n*—a firestop system that seals the opening around penetrating items that pass through the entire fire-resistance rated assembly.

3.2.5.1 *Discussion*—Examples of penetrating items include cables, cable trays, conduits, ducts, and pipes.

4. Summary of Test Method

4.1 This method of testing through-penetration firestop systems exposes firestop systems to a standard temperature-time fire, and to a subsequent application of a hose stream.

4.2 Ratings are established on the basis of the period of resistance to the fire exposure, prior to the first development of through openings, flaming on the unexposed surface, limiting thermal transmission criterion, and acceptable performance under application of a hose stream.

5. Significance and Use

5.1 This test method is used to determine the performance of a firestop system with respect to exposure to a standard time-temperature fire test and a hose stream test. The performance of a firestop system is dependent upon the specific assembly of materials tested including the number, type, and size of penetrations and the floors or walls in which it is installed.

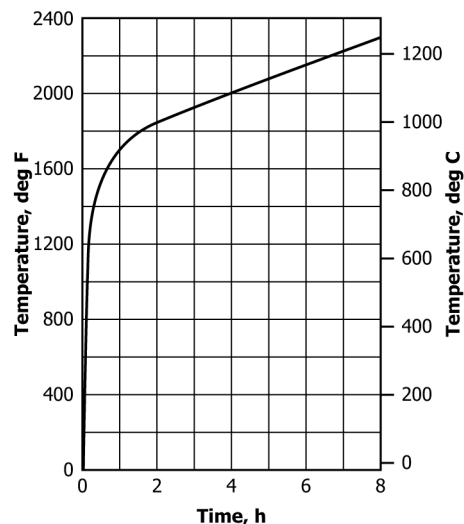
5.2 Two ratings shall be established for each firestop system. An *F* rating shall be based upon flame occurrence on the unexposed surface, while the *T* rating shall be based upon the temperature rise as well as flame occurrence on the unexposed side of the firestop system. These ratings, together with detailed performance data such as the location of through-openings and temperatures of penetrating items are intended to be one factor in assessing performance of firestop systems.

6. Control of Fire Tests

6.1 *Time-Temperature Curve*—The fire environment within the furnace shall be in accordance with the standard time-temperature curve shown in Fig. 1. The points on the curve that determine its character are:

Ambient at 0 min
1000 °F (538 °C) at 5 min
1300 °F (704 °C) at 10 min
1550 °F (843 °C) at 30 min
1700 °F (927 °C) at 60 min
1850 °F (1010 °C) at 120 min
2000 °F (1093 °C) at 240 min
2300 °F (1260 °C) at 480 min or over

6.2 Furnace Temperatures:



NOTE 1—For a closer definition of the temperature-time curve, see Annex A1.

FIG. 1 Temperature-Time Curve

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.