



Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies¹

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INTRODUCTION

Wall continuity is required by various model codes at *joint openings*, which are linear voids, gaps, openings, or other discontinuities between or bounded by a *rated wall assembly* and *nonrated horizontal assemblies*, to ensure that the protected *joint opening* has the same fire resistance rating as the *rated wall assembly*. The *joint opening* at the termination at the top of the *rated wall assembly* below the *nonrated horizontal assembly* must be protected by a *continuity head-of-wall joint system*, which has a fire resistance rating, in order to maintain continuity established by the *rated wall assembly*. This test method is not required when the *rated wall assembly* contacts *nonrated horizontal assemblies* when there is no *joint opening*. Normally such joint openings are denoted as “linear” because the length is normally greater than their width, which is defined by a typical ratio of at least 10:1 as in practice. *Joint openings* are present in buildings as a result of: (1) Design to accommodate various movements induced by thermal differentials, seismicity, and wind loads and exists as a clearance separation. (2) Acceptable dimensional tolerances between two or more building elements, for example, between non-loadbearing walls and roofs. (3) Inadequate design, inaccurate assembly, repairs or damage to the building. There are many unique applications for joint systems in buildings. To address this issue there are different types of *continuity head-of-wall joint systems*. It is not possible to test all fire-resistive joints systems using the same test apparatus or method of test, for example, Test Method E2307 employs the ISMA test apparatus. A *continuity head-of-wall joint system* is a particular type of fire-resistive joint system that provides fire resistance to prevent passage of fire from compartment to compartment within the building at the *joint opening* between a *rated wall assembly* and a *nonrated horizontal assembly*. A *continuity head-of-wall joint system* is a unique building construction detail not addressed by other fire test methods such as Test Method E1966 that tests joint systems installed between two assemblies that are fire resistance rated.

1. Scope

1.1 This fire-test-response test method measures the performance of a unique fire resistive joint system called a *continuity head-of-wall joint system*, which is designed to be used between a *rated wall assembly* and a *nonrated horizontal assembly* during a fire resistance test.

1.2 This fire-test-response standard does not measure the performance of the following:

1.2.1 The *rated wall assembly*, which is already established by other test methods, such as Test Method E119, or

1.2.2 The *nonrated horizontal assembly*, which would be established by other test methods such as Test Method E119.

NOTE 1—Typically, rated wall assemblies obtain a fire resistance rating after being tested to Test Method E119, NFPA 251, UL 263, CAN/ULC-S101, or other similar fire resistive test methods.

1.3 This fire-test-response standard is not intended to evaluate the connections between *rated wall assemblies* and *nonrated horizontal assemblies* unless part of the continuity head-of-wall joint system.

1.4 The fire resistive test end point is the period of time elapsing before the first performance criteria is reached when the *continuity head-of-wall joint system* is subjected to one of two time-temperature fire exposures.

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1.5 The fire exposure conditions used are either those specified by Test Method **E119** for testing assemblies to standard time-temperature exposures or Test Method **E1529** for testing assemblies to rapid-temperature rise fires.

1.6 This test method specifies the heating conditions, methods of test, and criteria to establish a fire resistance rating only for a *continuity head-of-wall joint system*.

1.7 Test results establish the performance of *continuity head-of-wall joint systems* to maintain continuity of fire resistance of the *rated wall assembly* where the *continuity head-of-wall joint system* interfaces with a *nonrated horizontal assembly* during the fire-exposure period.

1.8 Test results shall not be construed as having determined the *continuity head-of-wall joint system, nonrated horizontal assembly* and the *rated wall assembly's* suitability for use after that fire exposure.

1.9 This test method does not provide quantitative information about the *continuity head-of-wall joint system* relative to the rate of leakage of smoke or gases or both. However, it requires that such phenomena be documented and reported when describing the general behavior of *continuity head-of-wall joint systems* during the fire resistive test but is not part of the conditions of compliance.

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

1.10.1 The performance of the *continuity head-of-wall joint system* constructed with components other than those tested.

1.10.2 The cyclic movement capabilities of *continuity head-of-wall joint systems* other than the cycling conditions tested.

1.11 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.

1.12 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 as requirements of the standard.

1.13 *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.*

1.14 *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.*

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

2. Referenced Documents

2.1 ASTM Standards:²

E84 Test Method for Surface Burning Characteristics of Building Materials <https://standards.ansi.org/ASTM/E84-17>

E119 Test Methods for Fire Tests of Building Construction and Materials <https://standards.ansi.org/ASTM/E119-17>

E176 Terminology of Fire Standards <https://standards.ansi.org/ASTM/E176-17>

E631 Terminology of Building Constructions <https://standards.ansi.org/ASTM/E631-17>

E814 Test Method for Fire Tests of Penetration Firestop Systems <https://standards.ansi.org/ASTM/E814-17>

E1399 Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems <https://standards.ansi.org/ASTM/E1399-17>

E1529 Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies <https://standards.ansi.org/ASTM/E1529-17>

E1966 Test Method for Fire-Resistive Joint Systems <https://standards.ansi.org/ASTM/E1966-17>

E2226 Practice for Application of Hose Stream <https://standards.ansi.org/ASTM/E2226-17>

E2307 Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus <https://standards.ansi.org/ASTM/E2307-17>

2.2 NFPA Standard:³

NFPA 251 Standard Methods of Tests of Fire Endurance of Building Construction and Materials <https://www.nfpa.org/codes-standards/251>

2.3 ISO Standards:⁴

ISO 834 Fire resistance tests – Elements of building construction <https://www.iso.org/standard/42842.html>

ISO 10295-1 Fire tests for building elements and components – Fire testing of service installations – Part 1: Penetration seals <https://www.iso.org/standard/42843.html>

ISO 10295-2 Fire tests for building elements and components – Fire testing of service installations – Part 2: Linear joint (gap) seals <https://www.iso.org/standard/42844.html>

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.

³ National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

2.4 ~~Other Documents: Underwriters Laboratories Standards:~~⁵

~~NFPA-251~~UL 263 ~~Standard Methods of Fire Tests of Fire Endurance of Building Construction and Materials~~
 UL 2079 ~~Standard for Tests for fire Resistance of Building Joint Systems~~
 UL 2631479 ~~Standard for Fire Tests of Building Construction and Materials Through Penetration Firestops~~
 CAN/ULC-S101 ~~Standard Methods of Fire Endurance Tests of Building Construction and Materials~~
 CAN/ULC-S115 ~~Standard Method of Fire Tests of Firestop Systems~~

3. Terminology

3.1 For definitions of terms used in this test method and associated with fire issues, refer to the definitions contained in Terminology E176.

3.2 For definitions of term used in this test method and associated with building issues, refer to the definitions contained in Terminology E631.

3.3 When there is a conflict between Terminology E176 and Terminology E631 definitions, Terminology E176 definitions shall apply.

3.4 *Definitions of Terms Specific to This Standard:*

3.4.1 *continuity, n*—maintaining the fire resistance rating of the *rated wall assembly* and the protected *joint opening* to the underside of the *nonrated horizontal assembly* by use of a *continuity head-of-wall joint system*, which achieves the same or greater fire resistance rating as the *rated wall assembly*.

⁵ Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, <http://www.ul.com>.

3.4.1.1 *Discussion*—

This maintenance is achieved using materials or devices, or both, installed to extend and continue the fire resistance rating of the wall assembly to the underside of the *nonrated horizontal assembly* above.

3.4.2 *continuity head-of-wall joint system, n*—materials or devices, or both, installed to resist the spread of fire for a prescribed period of time through the *joint opening* between a fire-resistance *rated wall assembly* below and *nonrated horizontal assembly* above.

3.4.3 *joint opening, n*—the space between a *rated wall assembly* and the *nonrated horizontal assembly* above, which is either a void space or gap, or which is filled either partially or completely by a material, other than the wall material.

3.4.4 *maximum joint width, n*—the greatest width, size, or distance to which the *continuity head-of-wall joint system* is specified to open.

3.4.4.1 *Discussion*—

The *maximum joint width* equals the *nominal joint width* plus the extension of the *continuity head-of-wall joint system* from the *nominal joint width position*.

3.4.5 *minimum joint width, n*—the narrowest width, size, or distance to which the *continuity head-of-wall joint system* is specified to close.

3.4.5.1 *Discussion*—

The *minimum joint width* equals the *nominal joint width* minus the compression of the *continuity head-of-wall joint system* from the *nominal joint width position*.

3.4.6 *movement cycle, n*—the change between the *minimum joint width* and the *maximum joint width* of a *continuity head-of-wall joint system*.

3.4.7 *nominal joint width, n*—the specified opening width, size, or distance of a *joint opening* that is selected for test purposes.

3.4.7.1 *Discussion*—

The *nominal joint width* is typically the joint width that exists in the building at the time the *continuity head-of-wall joint system* is installed.

3.4.8 *nonrated horizontal assembly, n*—a ceiling, floor, or roof assembly that is not fire resistance rated such as determined in accordance with Test Methods E119 or E1529.

TABLE 1 Conditions of Test Specimen Cycling

Movement Type	Minimum Cycling Rates (cpm)	Minimum Number of Movement Cycles
Type I — Thermal	1	500
Type II — Wind Sway	10	500
Type III — Seismic	30	100
Type IV — Combined	30	100
Movement followed by:	10	400

3.4.9 *rated wall assembly, n*—an interior wall or partition having a period of fire resistance determined in accordance with Test Methods E119 or E1529.

3.4.10 *splice, n*—the connection or junction within the length of a *test specimen*.

3.4.11 *test assembly, n*—the complete assembly of the *test specimen* together with its *rated wall assembly* and *nonrated horizontal assembly*.

3.4.12 *test specimen, n*—a fire-resistive wall *continuity head-of-wall joint system* of a specific material(s), design, and width.

4. Summary of Test Method

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

4.1.1 The *test specimen*, the *rated wall assembly* and *nonrated horizontal assembly* shall be conditioned before *movement cycle* testing and fire resistive testing.

NOTE 2—The *movement cycle* testing is based on Test Method E1399. This test is not designed to address all types of movement. It does however provide some indication of the ability of the *test specimen* to accommodate some movement without incurring damage.

4.1.2 When the *test specimen* requires movement capability, which is defined as when the *maximum joint width* does not equal the minimum joint width, the *test specimen* shall be subjected to the *movement cycle* test before being fire resistive tested.

4.1.3 When desired, apply a superimposed load to the *test assembly*.

4.1.4 During the fire test, the integrity of the *test specimen* is determined by use of a cotton pad.

4.1.5 After the fire test, subject the *test assembly* to a hose stream test.

5. Significance and Use

5.1 This test method evaluates the following under the specified test conditions:

5.1.1 The ability of a *test specimen* to undergo movement without reducing its fire resistance rating, and

5.1.2 The duration for which a *test specimen* will contain a fire and retain its integrity during a predetermined fire resistive test exposure.

5.2 This test method provides for the following measurements and evaluations where applicable:

5.2.1 Ability of the *test specimen* to *movement cycle*.

5.2.2 Ability of the *test specimen* to prohibit the passage of flames and hot gases.

5.2.3 Transmission of heat through the *test specimen*.

5.2.4 Ability of the *test specimen* to resist the passage of water during a hose stream test.

5.3 This test method does not provide the following:

5.3.1 Any information about the *rated wall assembly* because its performance has already been determined.

5.3.2 Evaluation of the degree by which the *test specimen* contributes to the fire hazard by generation of smoke, toxic gases, or other products of combustion.

5.3.3 Measurement of the degree of control or limitation of the passage of smoke or products of combustion through the *test specimen*.

5.3.4 Measurement of flame spread over the surface of the *test specimen*.

NOTE 3—The information in 5.3.1-5.3.4 may be determined by other suitable fire resistive test methods. For example, 5.3.4 may be determined by Test Method E84.

5.4 In this procedure, the *test specimens* are subjected to one or more specific tests under laboratory conditions. When different test conditions are substituted or the end-use conditions are changed, it is not always possible by, or from, this test method to predict changes to the characteristics measured. Therefore, the results are valid only for the exposure conditions described in this test method.

6. Apparatus

6.1 *Cycling Apparatus*—Equipment (or device) capable of being used to induce movement of a *test specimen* and meeting the required cyclic rate and number of cycles selected from Table 1.

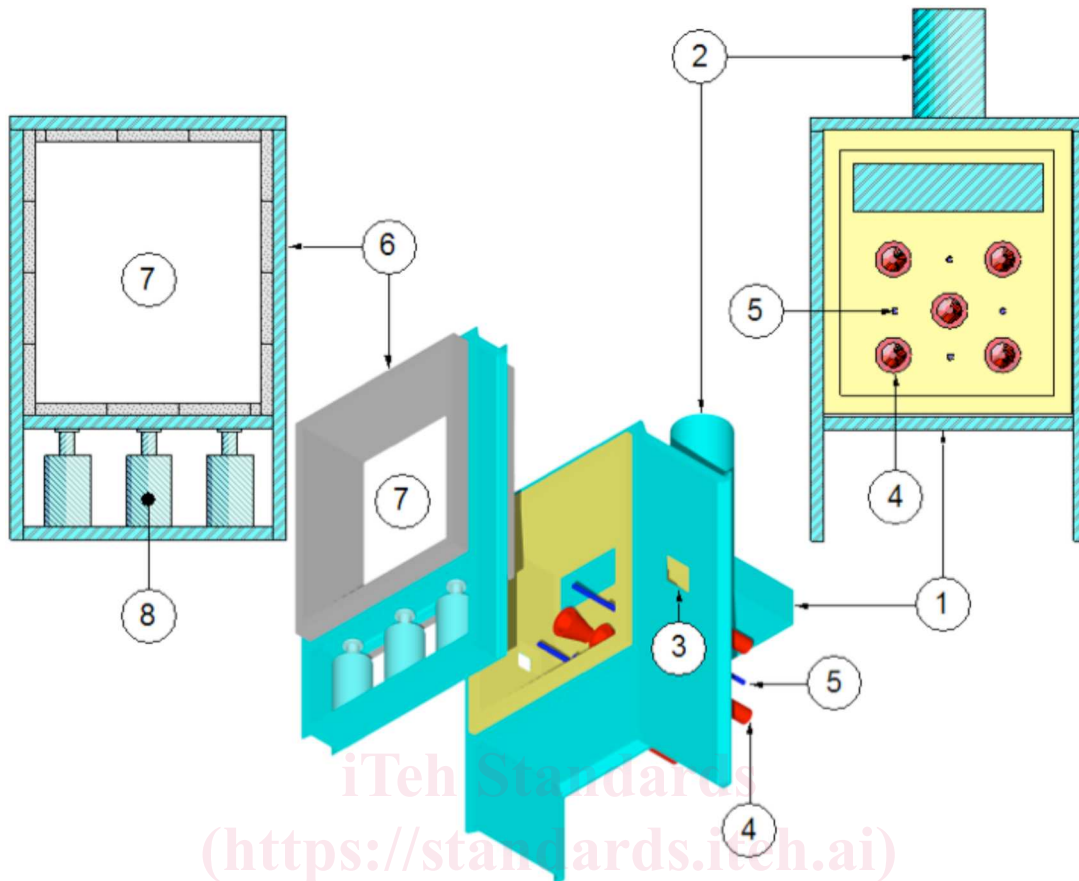


FIG. 1 Example of Vertical Furnace and Test Frame

- 1 = Vertical Furnace
- 2 = Exhaust Flue
- 3 = View Ports
- 4 = Gas Burners
- 5 = Thermocouple Tubes
- 6 = Test Frame
- 7 = Test Assembly Location
- 8 = Loading Jacks (when required)

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NOTE 4—Terms used for movement are indicative of the cyclic rate in expansion and contraction of the *test specimen* and not of the magnitude or direction of movement.

6.2 *Furnace*—An enclosed heating system or device capable of controlling a fire to the time-temperature curve in Test Methods E119 or E1529. An example of a vertical furnace with a test frame is shown in Fig. 1.

6.3 *Furnace Thermocouples:*

6.3.1 When testing to the time-temperature curve in Test Method E119, use thermocouples in accordance with Test Method E119.

6.4 When testing to the time-temperature curve in Test Method E1529, use furnace thermocouples in accordance with Test Method E1529.

6.5 *Pressure-sensing Probes*—Use tolerances are $\pm 0.5\%$ of dimensions shown in Fig. 2 or Fig. 3.

6.5.1 The pressure-sensing probes shall be either:

6.5.1.1 A T-shaped sensor as shown in Fig. 2, or

6.5.1.2 A tube sensor as shown in Fig. 3.

6.6 *Unexposed Surface Thermocouples:*

6.6.1 The wires for the unexposed thermocouple in the length covered by the thermocouple pad are not to be heavier than No. 18 AWG (0.82 mm²) and are to be electrically insulated with heat-resistant and moisture-resistant coatings.

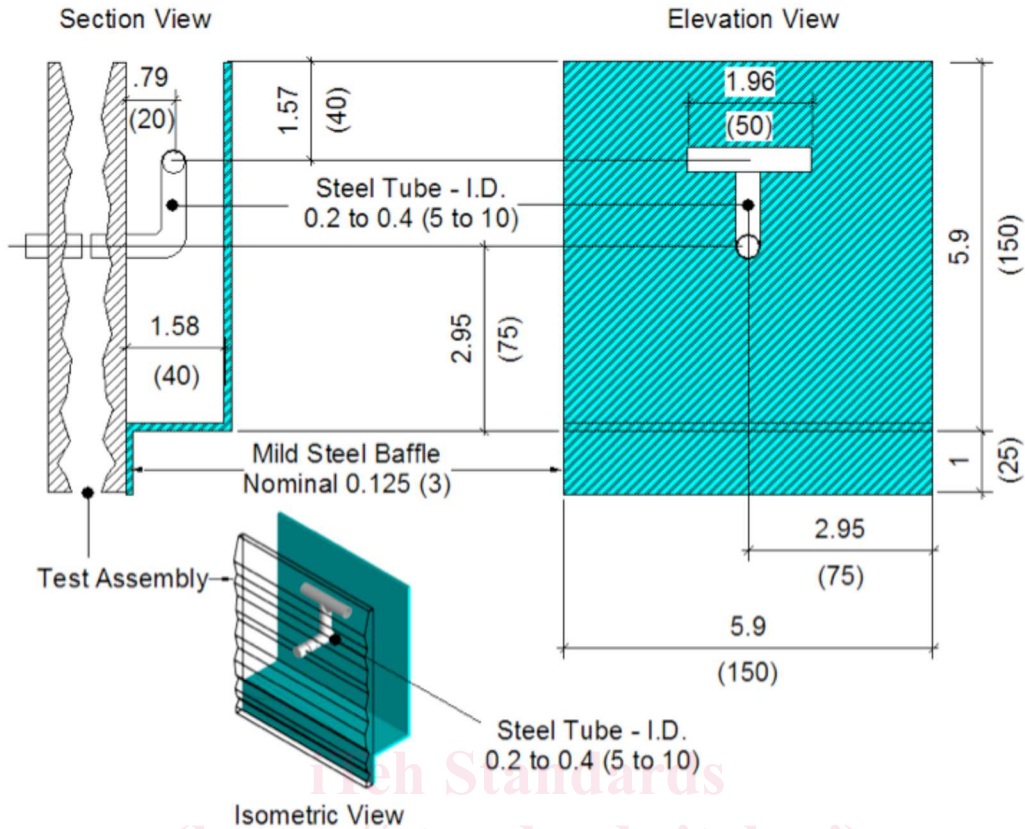


FIG. 2 "T" Shaped Pressure Sensing Probe

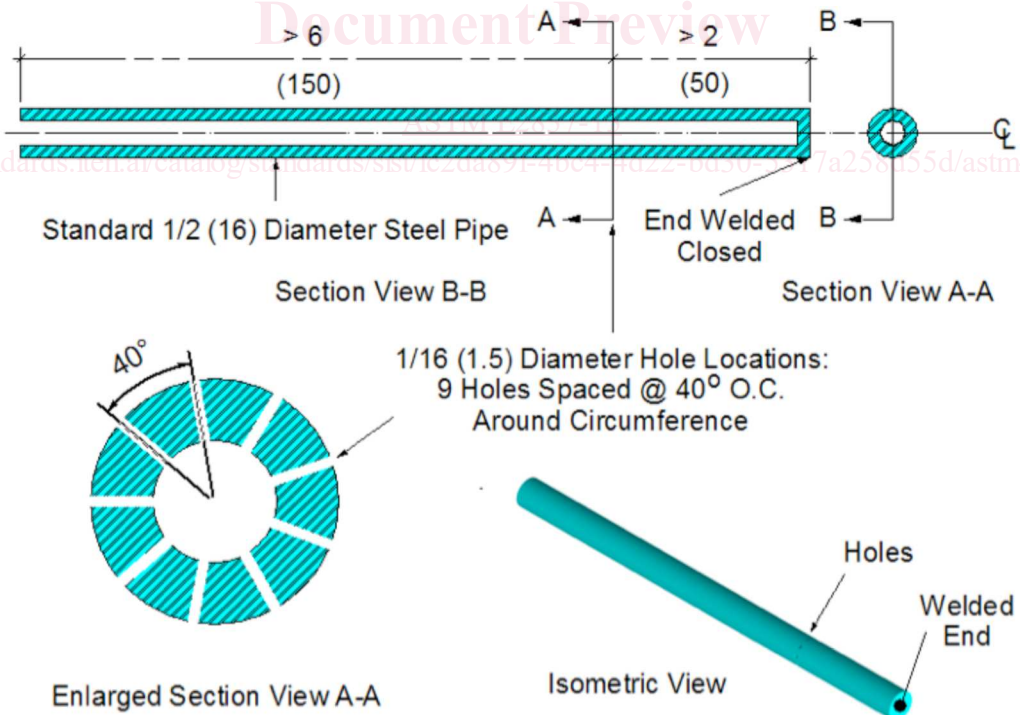


FIG. 3 Tube Type Pressure Sensing Probe

6.7 Thermocouple Pads:

6.7.1 The thermocouple pads used to cover each unexposed surface thermocouple on the unexposed side of the *test specimen* or *test assembly* shall be made of materials that meet the requirements specified in Test Method E119.