NFPA®

275

Standard Method of Fire Tests for the Evaluation of Thermal Barriers

2017

NFPA®

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NFPA® 275

Standard

Method of Fire Tests for the Evaluation of Thermal Barriers

2017 Edition

This edition of NFPA 275, *Standard Method of Fire Tests for the Evaluation of Thermal Barriers*, was prepared by the Technical Committee on Fire Tests. It was issued by the Standards Council on November 11, 2016, with an effective date of December 1, 2016, and supersedes all previous editions.

This edition of NFPA 275 was approved as an American National Standard on December 1, 2016.

Origin and Development of NFPA 275

The 2009 edition was the first edition of NFPA 275, *Standard Method of Fire Tests for the Evaluation of Thermal Barriers Used Over Foam Plastic Insulation*. Several NFPA codes and standards, as well as other model codes, include provisions that require portions of buildings to be separated by 15-minute thermal barriers. Building and fire regulations historically have addressed thermal barriers in vague and imprecise terms. Provisions of other codes and standards indicate that thermal barriers are intended to limit thermal transmission based on fire resistance testing and must remain in place based on a full-scale test. The NFPA 275 fire test methods identified specific sample construction, fire exposures, and acceptance criteria to qualify a material or product for use as a thermal barrier. It was anticipated that this test method would be referenced by other model building and fire codes and standards.

The 2013 edition was revised to address both foam plastic insulation and metal composite materials (MCM). References were updated to reflect the most recent editions.

The 2017 edition is a reconfirmation of the 2013 edition with minor editorial changes and reference updates.

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Standard

Method of Fire Tests for the Evaluation of Thermal Barriers

2017 Edition

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex B. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex B.

Chapter 1 Administration

1.1 Scope.

1.1.1* This method of fire tests for qualifying a thermal barrier for protecting foam plastic insulation or metal composite materials (MCM), herein referred to as a *thermal barrier*, is applicable to building construction materials, products, or assemblies intended to be used to protect foam plastic insulation or MCM from direct fire exposure.

1.1.2 The performance of the thermal barrier is evaluated by its ability to limit the temperature rise on its unexposed surface and by the ability of the thermal barrier to remain intact in order to provide protection from ignition of the foam plastic insulation or MCM during a standard fire exposure.

1.1.3 This method of fire tests does not evaluate thermal barriers used in or on upholstered furniture or mattresses.

1.1.4 This standard does not purport to address all safety problems or considerations associated with its use.

1.2 Purpose.

1.2.1 The purpose of this method of fire tests is to evaluate the ability of the thermal barrier to prevent ignition of foam plastic insulation or MCM from a standard fire exposure for a period of 15 minutes.

1.2.2 The purpose of this method of fire tests is also to evaluate the ability of the thermal barrier to remain in place and prevent ignition of foam plastic insulation or MCM for a period of 15 minutes during a standard room/corner fire exposure.

1.3 Application. Two fire tests are conducted to determine the fire performance of the thermal barrier: Part I, temperature transmission fire test, and Part II, integrity fire test.

1.3.1 Part I measures the temperature rise on the unexposed face of the thermal barrier, without foam plastic in place, when it is subjected to a standard fire exposure specified in ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*. This Part I test shall be conducted on the thermal barrier only, without the foam plastic in place, to determine the heat-blocking ability of the thermal barrier.

1.3.2 Part II evaluates the ability of the thermal barrier to remain intact in order to provide protection from ignition of the foam plastic insulation or MCM by conducting a test of the thermal barrier and foam plastic insulation or MCM assembly in accordance with a standard room/corner fire test method.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth,* 2015 edition.

2.3 Other Publications.

2.3.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2015.

2.3.2 FM Publications. FM Global, 270 Central Avenue, P.O. Box 7500, Johnston, RI 02919-4923.

FM Approval 4880, *Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall Systems*, 2010.

2.3.3 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, 2011, revised 2014.

ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*, 1996, revised 2012.

ANSI/UL 1715, *Standard for Fire Test of Interior Finish Material*, 1997, revised 2013.

2.3.4 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 5000® , *Building Construction and Safety Code®,* 2015 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1 Shall. Indicates a mandatory requirement.

3.2.2 Should. Indicates a recommendation or that which is advised but not required.

3.2.3 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase "standards development process" or "standards development activities," the term "standards" includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Foam Plastic Insulation. A cellular plastic, used for thermal insulating or acoustical applications, having a density of 20 lb/ft^3 (320 kg/m^3) or less, containing open or closed cells, and formed by a foaming agent. [**5000,** 2015]

3.3.2 Metal Composite Material (MCM). A factory-manufactured panel consisting of metal skins bonded to both faces of a core made of any plastic other than foam plastic as defined in 3.3.1. [**5000,** 2015]

3.3.3 Thermal Barrier. A material, product, or assembly that prevents or delays ignition of an unexposed surface by limiting the temperature rise and by acting as a flame exposure barrier for a 15-minute time period.

Chapter 4 Temperature Transmission Fire Test (Part I)

4.1 Thermal Barrier Supporting Structure. The thermal barrier supporting structure shall be constructed as a wood stud frame and calcium-silicate board sandwich having minimum dimensions of 36 in. × 36 in. (915 mm × 915 mm).

4.1.1 The supporting structure shall be framed by nominal 2 in. × 4 in. (38 mm × 89 mm) wood studs.

4.1.1.1 The wood studs shall be oriented with the nominal 4 in. (89 mm) side vertical.

4.1.1.2 One additional wood stud shall be positioned in the center of the wood stud framing, parallel to two opposite sides.

4.1.1.3 Each wood stud connection point shall be secured using two evenly spaced 10d nails driven into the ends of the studs.

4.1.2 A single layer of nominal ½ in. (13 mm) thick nominal 46 lb/ft^3 (736 kg/m^3) density calcium-silicate board shall be installed on both faces of the supporting structure.

4.1.3 Each calcium-silicate board shall be secured to each wood stud of the supporting structure using nominal 1¼ in. (32 mm) long drywall screws, spaced a maximum of 9 in. (229 mm) on center around the perimeter and in the field of the board.

4.1.4 The wood stud and calcium-silicate board test specimen supporting structure shall be constructed as shown in Figure 4.1.4.

4.2 Thermal Barrier Test Specimen. The thermal barrier test specimen shall consist of the thermal barrier supporting structure with the thermal barrier installed on one side.

4.2.1 The side of the test specimen with the installed thermal barrier shall be designated as the exposed face.

4.2.2 The thermal barrier and the method of securing the thermal barrier shall be representative of the construction for which the thermal barrier is being evaluated.

4.2.3 If joints are a component of the thermal barrier installation in actual use, a minimum of one representative joint shall be incorporated into the thermal barrier.

4.2.4 The joint described in 4.2.3 shall be located in the centerline of the test specimen.

4.3 Test Specimen Instrumentation.

4.3.1 The temperature at the interface of the thermal barrier and the calcium-silicate board shall be measured by a minimum of nine thermocouples.

4.3.2 The thermocouples shall be symmetrically distributed across the surface of the exposed face of the calcium-silicate board as shown in Figure 4.1.4.

4.3.3 The wire leads of each thermocouple shall be in the plane of the interface of the thermal barrier and the exposed face of the calcium-silicate board for a length of not less than 1.5 in. (38 mm).

4.3.4 The thermocouples shall be Type K, with wire leads not greater than 20 AWG [0.032 in. (0.81 mm)] in diameter.

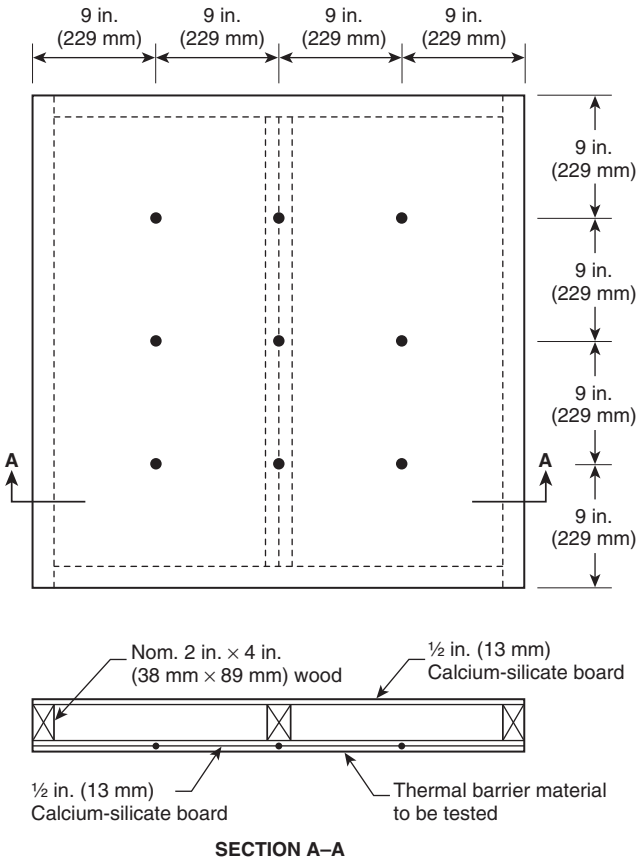

FIGURE 4.1.4 Thermal Barrier Supporting Structure.

4.3.5 The temperatures measured by the thermocouples shall be measured and recorded at intervals not exceeding 15 seconds.

4.4 Test Specimen Conditioning.

4.4.1 Before the fire test is conducted, the test specimen shall be conditioned to a constant weight at a temperature of 70°F ± 5°F (21°C ± 3°C) and at a relative humidity of 50 percent ± 5 percent.

4.4.2 Constant weight as specified in 4.4.1 shall be considered to have been reached when two successive weighing operations, carried out at an interval of 24 hours, differ by not more than 1 percent.

4.4.3 The test shall be started within 30 minutes of removal of the test specimen from the conditioning area.

4.5 Test Furnace.

4.5.1 The test furnace shall be constructed so as to expose the test specimen in a horizontal configuration mounted on top of the furnace.

4.5.2 The side of the test specimen with the thermal barrier installed shall be exposed to the fire.

4.5.3 The test furnace shall be gas fired and shall be capable of generating and containing a fire exposure controlled to the time-temperature curve as specified in ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, for a period of 15 minutes.

4.5.4 The furnace shall be designed to expose a minimum of a 31.5 in. × 31.5 in. (800 mm × 800 mm) portion of the test specimen.

4.6 Control of Fire Test.

4.6.1 Time-Temperature Curve.

4.6.1.1 The conduct of the fire test shall be controlled by the standard time-temperature curve in accordance with Table 4.6.1.1 for a period of 15 minutes.

4.6.1.2 The temperature inside the furnace shall be within the range of 50°F to 90°F (10°C to 32°C) at the start of the fire test.

4.6.2 Furnace Temperatures. The temperatures in the furnace as determined by the time-temperature curve shall be the average temperature measured by not fewer than three furnace thermocouples.

4.6.2.1 The furnace thermocouples shall be uniformly distributed in a horizontal plane located 12 in. ± ½ in. (305 mm ± 13 mm) below the test specimen's exposed face.

4.6.2.2 The furnace thermocouples shall be as described in ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*.

4.6.2.3 The minimum length of the thermocouple wire lead exposed within the furnace shall be not less than 12 in. (305 mm).

4.6.3 Accuracy of Furnace Control. The area under the time-temperature curve, obtained by averaging the results from the thermocouple readings, shall be within 10 percent of the corresponding area under the standard time-temperature curve specified in 4.6.1.1.

4.6.4 Furnace Pressure. The pressure differential between the exposed face of the test specimen and the laboratory test area shall be measured and controlled in accordance with 4.6.4.1 through 4.6.4.9.

4.6.4.1 The pressure-sensing probes shall be as shown in Figure 4.6.4.1.

4.6.4.2 The pressure shall be measured by not fewer than two pressure-sensing probes using a differential pressure instrument capable of being read in graduated increments no greater than 0.01 in. wg (2.5 Pa), with a precision of not more than ±0.005 in. wg (±1.25 Pa).

Table 4.6.1.1 Time-Temperature Curve

Time (minutes)	Temperature °F	Temperature °C
0	68	20
5	1000	538
10	1300	704
15	1399	760

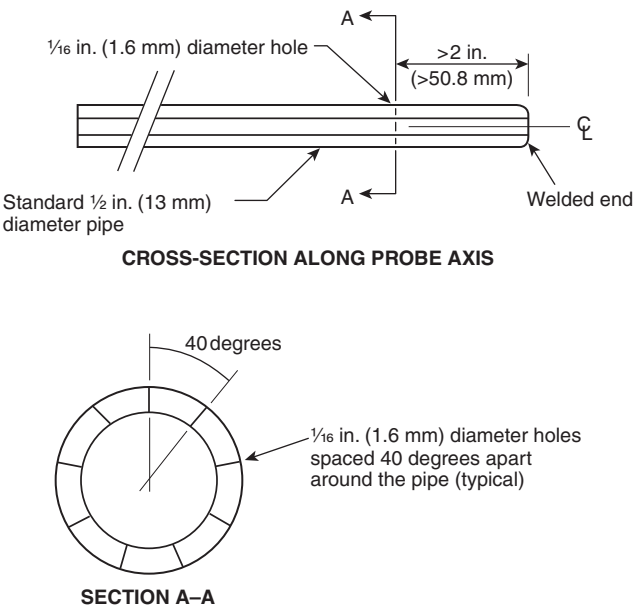

FIGURE 4.6.4.1 Furnace Pressure-Sensing Probe.

4.6.4.3 The differential pressure measurement instruments shall be located to minimize stack effects caused by vertical runs of pressure tubing between the pressure-sensing probes and the differential pressure measurement instrument locations.

4.6.4.4 Control of the furnace pressure shall be established beginning no later than 5 minutes after the start of the test and shall be maintained throughout the remainder of the fire test period.

4.6.4.5 The furnace pressure shall be measured and recorded throughout the fire test at intervals not exceeding 1 minute.

4.6.4.6* The pressure shall be reported as the average of each consecutive 3-minute period at 1-minute intervals, starting at 3 minutes after the start of the fire test.

4.6.4.7 The pressure-sensing probes shall be located along the longitudinal centerline of the furnace and shall be 12 in. ± ½ in. (305 mm ± 13 mm) below the exposed surface of the test specimen.

4.6.4.8 The tips of the probes shall protrude into the furnace a minimum of 3 in. (76 mm) from the interior surface of a furnace wall.

4.6.4.9 During the fire test, the neutral pressure plane in the furnace shall be established below the exposed face of the test specimen such that a positive pressure exists over the entire exposed face of the test specimen after the first 5 minutes of the fire test.

4.7 Duration of Fire Test. The fire test shall be conducted for a period of 15 minutes or until the thermal barrier falls away from the thermal barrier supporting structure or disintegrates, whichever occurs first.

4.8 Conditions of Acceptance.

4.8.1 During the 15-minute test period, the average measured temperature rise above the average temperature at the start of the fire test for the thermocouples described in Section 4.3 shall not exceed 250°F (139°C), and the measured temperature rise of any such single thermocouple shall not exceed 325°F (181°C).

4.8.2 If the average temperature rise or the temperature rise of a single thermocouple exceeds the limits specified in 4.8.1 during the test period, the time of occurrence shall be reported.

Chapter 5 Integrity Fire Test (Part II)

5.1* Test Method. The thermal barrier and foam plastic insulation or MCM shall be tested in accordance with NFPA 286; FM Approval 4880, *Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall Systems*; ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*; or ANSI/UL 1715, *Standard for Fire Test of Interior Finish Material.*

5.1.1 The specific type of foam plastic insulation or MCM to be protected by the thermal barrier shall be installed on a substrate and shall form the interior surface of the test walls and ceiling.

5.1.2 The thermal barrier shall be installed over the interior face of the foam plastic insulation or MCM in the manner for which recognition is desired.

5.1.3 The foam plastic insulation or MCM shall be tested at the maximum thickness intended for use.

5.1.4 The assemblage of foam plastic insulation or MCM and applied thermal barrier described in 5.1.2 shall be considered the test assembly.

5.2 Conditions of Acceptance.

5.2.1 The conditions of acceptance for fire tests conducted in accordance with FM Approval 4880, *Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall Systems*; ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*; or ANSI/UL 1715, *Standard for Fire Test of Interior Finish Material*; shall be as specified in the fire test standard used.

5.2.2 For fire tests conducted using NFPA 286, the conditions of acceptance shall be as specified in 5.2.2.1 through 5.2.2.2.4.

5.2.2.1 During the 40 kW fire exposure portion of the test, flames shall not spread to the ceiling.

5.2.2.2 During the 160 kW fire exposure portion of the test, the test assembly shall comply with 5.2.2.2.1 through 5.2.2.2.4.

5.2.2.2.1 Flames shall not spread to the outer extremity of the test assembly on any wall or ceiling.

5.2.2.2.2 Flashover, as defined by NFPA 286, shall not occur.

5.2.2.2.3 The peak rate of heat release throughout the NFPA 286 test shall not exceed 800 kW.

5.2.2.2.4 The total smoke released throughout the NFPA 286 test shall not exceed 1000 m^2.

Chapter 6 Test Report

6.1 Test Report. A test report shall include the following information at a minimum:

(1) Name of the testing laboratory and the test date
(2) Names of the sponsor or customer, the manufacturer, and the material, product, or assembly tested
(3) Documentation of how and when the test specimen and test assembly were prepared and details of the application of the thermal barrier for both fire test methods (Parts I and II)
(4) Temperature readings of the furnace thermocouples and a comparison to the standard time-temperature curve
(5) Temperature readings of the thermocouples described in Section 4.3
(6) Pressure measurements in the furnace during the Part I test
(7) Statement as to whether the thermal barrier met the conditions of acceptance in the Part I test
(8) Density, thickness, and type of foam plastic insulation or MCM used in the Part II test
(9) The information required to be reported as specified in the fire test used in the Part II test
(10) Statement as to whether the thermal barrier met the conditions of acceptance in the Part II test
(11) Observations made during both fire tests (Parts I and II) by the laboratory personnel conducting the tests and the times at which such observations were made
(12) Statement as to whether the proposed thermal barrier material, product, or assembly met the conditions of acceptance in both the Part I and Part II tests

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1.1 Model building codes require foam plastic insulation and, in some installations, metal composite material (MCM), to be covered by a thermal barrier, or separated from the interior of the building by, a thermal barrier to reduce the possibility of ignition or delay its occurrence. The typical time specified is 15 minutes based on a fire exposure similar to that in ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*. The fire exposure conditions in these test methods are similar.

A.4.6.4.6 This is equivalent to a 3-minute running average.

A.5.1 The previous edition of FM Approval 4880, *Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall Systems,* was retained because it contains tests appropriate for use within NFPA 275. The parallel panel test contained in the newer edition has not yet been evaluated.

Annex B Informational References

B.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

B.1.1 NFPA Publications. (Reserved)

B.1.2 Other Publications.

B.1.2.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 10016-5990.

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2015.

B.1.2.2 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, 2011, revised 2014.

B.2 Informational References. (Reserved)

B.3 References for Extracts in Informational Sections. (Reserved)

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Sequence of Events for the Standards Development Process

Once the current edition is published, a Standard is opened for Public Input.

Step 1 – Input Stage

- Input accepted from the public or other committees for consideration to develop the First Draft
- Technical Committee holds First Draft Meeting to revise Standard (23 weeks); Technical Committee(s) with Correlating Committee (10 weeks)
- Technical Committee ballots on First Draft (12 weeks); Technical Committee(s) with Correlating Committee (11 weeks)
- Correlating Committee First Draft Meeting (9 weeks)
- Correlating Committee ballots on First Draft (5 weeks)
- First Draft Report posted on the document information page

Step 2 – Comment Stage

- Public Comments accepted on First Draft (10 weeks) following posting of First Draft Report
- If Standard does not receive Public Comments and the Technical Committee chooses not to hold a Second Draft meeting, the Standard becomes a Consent Standard and is sent directly to the Standards Council for issuance (see Step 4) or
- Technical Committee holds Second Draft Meeting (21 weeks); Technical Committee(s) with Correlating Committee (7 weeks)
- Technical Committee ballots on Second Draft (11 weeks); Technical Committee(s) with Correlating Committee (10 weeks)
- Correlating Committee Second Draft Meeting (9 weeks)
- Correlating Committee ballots on Second Draft (8 weeks)
- Second Draft Report posted on the document information page

Step 3 – NFPA Technical Meeting

- Notice of Intent to Make a Motion (NITMAM) accepted (5 weeks) following the posting of Second Draft Report
- NITMAMs are reviewed and valid motions are certified by the Motions Committee for presentation at the NFPA Technical Meeting
- NFPA membership meets each June at the NFPA Technical Meeting to act on Standards with "Certified Amending Motions" (certified NITMAMs)
- Committee(s) vote on any successful amendments to the Technical Committee Reports made by the NFPA membership at the NFPA Technical Meeting

Step 4 – Council Appeals and Issuance of Standard

- Notification of intent to file an appeal to the Standards Council on Technical Meeting action must be filed within 20 days of the NFPA Technical Meeting
- Standards Council decides, based on all evidence, whether to issue the standard or to take other action

Notes:

1. Time periods are approximate; refer to published schedules for actual dates.
2. Annual revision cycle documents with certified amending motions take approximately 101 weeks to complete.
3. Fall revision cycle documents receiving certified amending motions take approximately 141 weeks to complete.

Committee Membership Classifications[1,2,3,4]

The following classifications apply to Committee members and represent their principal interest in the activity of the Committee.

1. M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.
2. U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.
3. IM *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.
4. L *Labor:* A labor representative or employee concerned with safety in the workplace.
5. RT *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.
6. E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.
7. I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.
8. C *Consumer:* A person who is or represents the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in (2).
9. SE *Special Expert:* A person not representing (1) through (8) and who has special expertise in the scope of the standard or portion thereof.

NOTE 1: "Standard" connotes code, standard, recommended practice, or guide.

NOTE 2: A representative includes an employee.

NOTE 3: While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of member or unique interests need representation in order to foster the best possible Committee deliberations on any project. In this connection, the Standards Council may make such appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.

NOTE 4: Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.