

NFPA® 275

Standard Method of Fire Tests for the Evaluation of Thermal Barriers

2013 Edition



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NFPA® 275

Standard

Method of Fire Tests for the Evaluation of Thermal Barriers

2013 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, and acted on by NFPA at its June Association Technical Meeting held June 11–14, 2012, in Las Vegas, NV. It was issued by the Standards Council on August 9, 2012, with an effective date of August 29, 2012, and supersedes all previous editions.

This edition of NFPA 275 was approved as an American National Standard on August 29, 2012.

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 have traditionally 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 has been revised to address both foam plastic insulation and metal composite materials (MCM). References have been updated to reflect the most recent editions.

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Contents

Chapter 1 Administration	275- 4	4.2 Thermal Barrier Test Specimen	275- 5
1.1 Scope	275- 4	4.3 Test Specimen Instrumentation	275- 6
1.2 Purpose	275- 4	4.4 Test Specimen Conditioning	275- 6
1.3 Application	275- 4	4.5 Test Furnace	275- 6
Chapter 2 Referenced Publications	275- 4	4.6 Control of Fire Test	275- 6
2.1 General	275- 4	4.7 Duration of Fire Test	275- 7
2.2 NFPA Publications	275- 4	4.8 Conditions of Acceptance	275- 7
2.3 Other Publications	275- 4	Chapter 5 Integrity Fire Test (Part II)	275- 7
2.4 References for Extracts in Mandatory Sections	275- 4	5.1 Test Method	275- 7
Chapter 3 Definitions	275- 5	5.2 Conditions of Acceptance	275- 7
3.1 General	275- 5	Chapter 6 Test Report	275- 7
3.2 NFPA Official Definitions	275- 5	6.1 Test Report	275- 7
3.3 General Definitions	275- 5	Annex A Explanatory Material	275- 8
Chapter 4 Temperature Transmission Fire Test (Part I)	275- 5	Annex B Informational References	275- 8
4.1 Thermal Barrier Supporting Structure	275- 5	Index	275- 9

NFPA 275

Standard

Method of Fire Tests for the Evaluation of Thermal Barriers

2013 Edition

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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 when it is subjected to a standard fire exposure specified in ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*.

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*, 2011 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 E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2010a.

2.3.2 FMGR Publications. FM Global, 1301 Atwood Avenue, P.O. Box 7500, Johnston, RI 02919.

FM 4880, *Approval Standard for 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*, 2003, reaffirmed 2007.

ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*, 1996, including revisions through September 17, 2007.

ANSI/UL 1715, *Standard for Fire Test of Interior Finish Material*, 1997, including revisions through April 8, 2008.

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*®, 2012 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. A document, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and which 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 *Manual of Style for NFPA Technical Committee Documents*.

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/ft³ (320 kg/m³) or less, containing open or closed cells, and formed by a foaming agent. [5000, 2012]

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, 2012]

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.

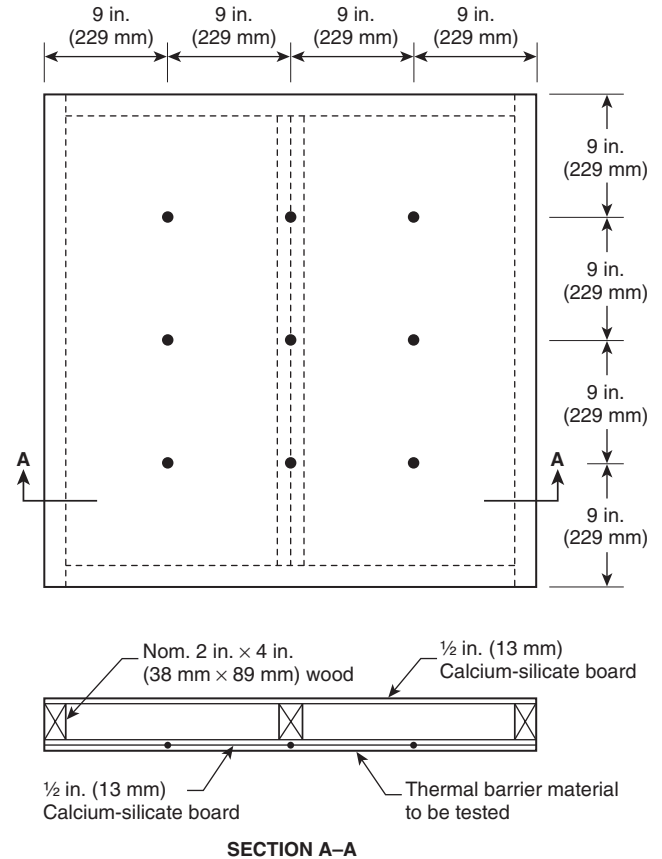
4.1.1.2 One additional wood stud shall be positioned in the center of the wood stud framing, parallel to two opposite sides.

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/ft³ (736 kg/m³) 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.



● Thermocouple

FIGURE 4.1.4 Thermal Barrier Supporting Structure.

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.

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 E 119 or ANSI/UL 263 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.

Table 4.6.1.1 Time-Temperature Curve

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

4.6.2.2 The furnace thermocouples shall be as described in ASTM E 119 or ANSI/UL 263.

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.

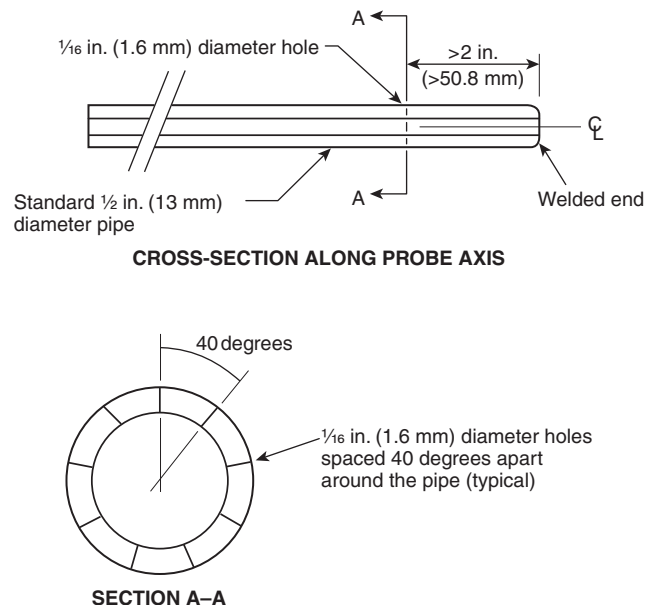


FIGURE 4.6.4.1 Furnace Pressure-Sensing Probe.

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).

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. $\pm \frac{1}{2}$ in. (305 mm $\pm$ 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, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, FM 4880, ANSI/UL 1040, or ANSI/UL 1715.

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 4880, ANSI/UL 1040, or ANSI/UL 1715 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 5.2.2.4.

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 m².

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 E 119 or ANSI/UL 263. The fire exposure conditions in these test methods are similar.

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

Annex B Informational References

B.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informa-

tional 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 E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2000.

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*, 2003, reaffirmed 2007.

B.2 Informational References. (Reserved)

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

Index

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-A-		NFPA Publications	2.2
Administration	Chap. 1	Other Publications	2.3
Application	1.3	References for Extracts in Mandatory Sections	2.4
Purpose	1.2		
Scope	1.1	-S-	
-D-		Shall	
Definitions	Chap. 3	Definition	3.2.1
-E-		Should	
Explanatory Material	Annex A	Definition	3.2.2
-F-		Standard	
Foam Plastic Insulation		Definition	3.2.3
Definition	3.3.1	-T-	
-I-		Temperature Transmission Fire Test (Part I)	Chap. 4
Informational References	Annex B	Conditions of Acceptance	4.8
Integrity Fire Test (Part II)	Chap. 5	Control of Fire Test	4.6
Conditions of Acceptance	5.2	Accuracy of Furnace Control	4.6.3
Test Method	5.1	Furnace Pressure	4.6.4
-M-		Furnace Temperatures	4.6.2
Metal Composite Material (MCM)		Time-Temperature Curve	4.6.1
Definition	3.3.2	Duration of Fire Test	4.7
-R-		Test Furnace	4.5
Referenced Publications	Chap. 2	Test Specimen Conditioning	4.4
General	2.1	Test Specimen Instrumentation	4.3
		Thermal Barrier Supporting Structure	4.1
		Thermal Barrier Test Specimen	4.2
		Test Report	Chap. 6
		Test Report	6.1
		Thermal Barrier	
		Definition	3.3.3

Sequence of Events Leading to Issuance of this NFPA Committee Document

Step 1: Call for Proposals

- Proposed new Document or new edition of an existing Document is entered into one of two yearly revision cycles, and a Call for Proposals is published.

Step 2: Report on Proposals (ROP)

- Committee meets to act on Proposals, to develop its own Proposals, and to prepare its Report.
- Committee votes by written ballot on Proposals. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Proposals (ROP) is published for public review and comment.

Step 3: Report on Comments (ROC)

- Committee meets to act on Public Comments to develop its own Comments, and to prepare its report.
- Committee votes by written ballot on Comments. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Comments (ROC) is published for public review.

Step 4: Technical Report Session

- “*Notices of intent to make a motion*” are filed, are reviewed, and valid motions are certified for presentation at the Technical Report Session. (“Consent Documents” that have no certified motions bypass the Technical Report Session and proceed to the Standards Council for issuance.)
- NFPA membership meets each June at the Annual Meeting Technical Report Session and acts on Technical Committee Reports (ROP and ROC) for Documents with “certified amending motions.”
- Committee(s) vote on any amendments to Report approved at NFPA Annual Membership Meeting.

Step 5: Standards Council Issuance

- Notification of intent to file an appeal to the Standards Council on Association action must be filed within 20 days of the NFPA Annual Membership Meeting.
- Standards Council decides, based on all evidence, whether or not to issue Document or to take other action, including hearing any appeals.

Committee Membership Classifications

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

- M *Manufacturer*: A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.
- U *User*: A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.
- I/M *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.
- L *Labor*: A labor representative or employee concerned with safety in the workplace.
- R/T *Applied Research/Testing Laboratory*: A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.
- E *Enforcing Authority*: A representative of an agency or an organization that promulgates and/or enforces standards.
- I *Insurance*: A representative of an insurance company, broker, agent, bureau, or inspection agency.
- 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 the *User* classification.
- SE *Special Expert*: A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

NOTES:

1. “Standard” connotes code, standard, recommended practice, or guide.
2. A representative includes an employee.
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 members 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 appointments as it deems appropriate in the public interest, such as the classification of “Utilities” in the National Electrical Code Committee.
4. Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.