

NFPA 261
Standard Method
of Test for Determining
Resistance of Mock-up
Upholstered Furniture
Material Assemblies
to Ignition by
Smoldering Cigarettes
1994 Edition



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NFPA 261

Standard Method of Test for

**Determining Resistance of Mock-Up Upholstered
Furniture Material Assemblies to
Ignition by Smoldering Cigarettes**

1994 Edition

This edition of NFPA 261, *Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes*, was prepared by the Technical Committee on Fire Tests and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 15-18, 1993 in Phoenix, Arizona. It was issued by the Standards Council on January 14, 1994, with an effective date of February 11, 1994, and supersedes all previous editions.

The 1994 edition of this document has been approved by the American National Standards Institute.

Origin and Development of NFPA 261

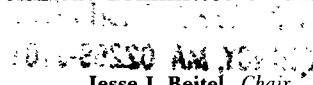
Regulation of the manufacture of furniture has been a subject of research and debate since 1967, when the Flammable Fabrics Act was amended by Congress to include products in addition to wearing apparel and home textiles that might constitute an unreasonable flammability risk. The National Bureau of Standards (NBS) began funding laboratory research on the subject in 1968. With its formation in 1973, the U.S. Consumer Product Safety Commission (CPSC) became the government agency responsible for administration of the Flammable Fabrics Act, including the adoption of any program or standard regulating upholstered furniture. NBS retained responsibility for designing test methods related to flammable fabrics.

In 1976, NBS submitted a draft to the CPSC for a proposed cigarette-ignition resistance standard for upholstered furniture. Shortly thereafter, however, CPSC was reorganized into separate program areas, which was followed by nearly a year's worth of work on its children's sleepwear standards due to findings that a chemical added to sleepwear to make it flame-retardant might be carcinogenic. In November 1978, the CPSC staff, after modifying the original standard on upholstered furniture proposed by NBS, recommended to the CPSC commissioners that they publish the standard.

This standard was developed subsequent to the CPSC actions of 1978-79 by the Technical Committee on Fire Tests and drew heavily on the NBS research and proposed test methodology. The first edition, published in 1983, was identified as NFPA 260B. The 1989 edition was a reconfirmation of the first edition and was renumbered as NFPA 261.

The 1994 edition represents a reconfirmation of the 1989 edition with minor editorial clarifications.

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NFPA 261

Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes

1994 Edition

NOTICE: Information on referenced publications can be found in Appendix B.

Chapter 1 General

1-1 Purpose. This method is designed to evaluate the ignition resistance of upholstered furniture when exposed to smoldering cigarettes under specified conditions.

1-2 Scope. This method is recommended for upholstered furniture.

1-2.1 This test shall apply to upholstered furniture mock-ups.

1-2.2 Mock-up testing is useful in assessing the relative resistance to continuing combustion of individual materials used in furniture, such as cover fabrics, filling materials, welt tape, etc., in realistic combinations and in an ideal geometric arrangement of the seat cushions, back, and arms of furniture items.

1-3 Summary of Method.

1-3.1 The test uses lighted cigarettes (covered with a piece of sheeting material) to determine the ignition resistance of upholstered furniture items reproduced in mock-up.

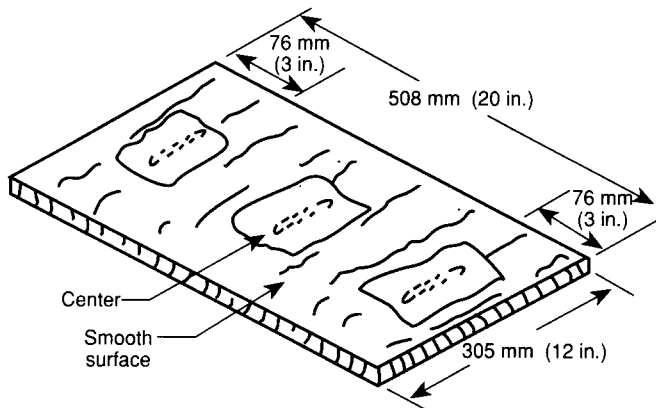


Figure 1-3.2(a) Upholstered furniture mock-up test: armrest, top of back, and seat support system.

1-3.2 Locations to be tested include horizontal crevices formed where seat cushions and vertical test panels meet; seat cushion surfaces including smooth surface, quilt, tuft, and welt edges; and top surfaces of armrests, backs, and loose seat support systems. [See Figures 1-3.2(a) and (b).]

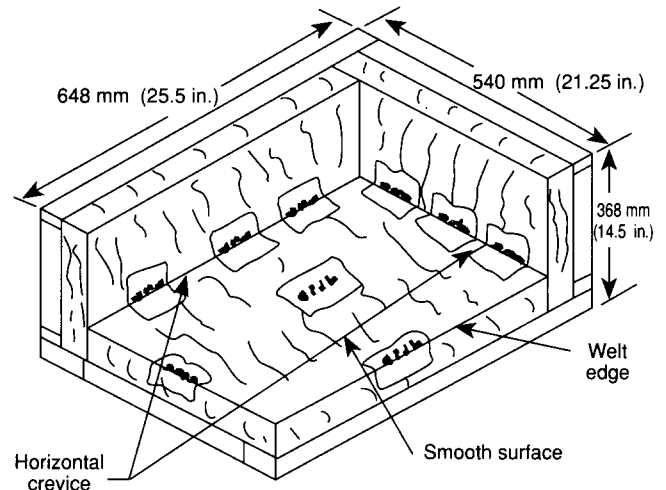


Figure 1-3.2(b) Upholstered furniture mock-up test: seat cushion, side, and back.

1-3.3 Obvious ignitions or char length measurements shall be used to determine if a particular combination of upholstering materials meets test criteria.

1-4 Significance.

1-4.1 This method is intended to measure the performance of upholstered furniture under conditions of exposure to a smoldering cigarette. This is accomplished by testing furniture mock-ups.

1-4.2 This method is not intended to measure the performance of upholstered furniture under conditions of open flame exposure and does not indicate whether the furniture will resist the propagation of flame under severe fire exposure or when tested in a manner that differs substantially from the test standard.

1-4.3 The results obtained with a material assembly tested in mock-up using this method shall not necessarily indicate the performance of the same material assembly in other geometric configurations.

1-5 Definitions.

Bolsters. Pillows or similarly shaped units containing upholstery material covered by upholstery cover material, which might or might not be attached to the upholstered furniture item but are sold and delivered with it.

Char. Carbonaceous material formed by pyrolysis or incomplete combustion.

Deck. The upholstered support under the seat cushion in a loose seat construction.

Furniture Mock-Up. A representation of production furniture that uses the same upholstery cover material and upholstery material, assembled in the same manner as in production furniture but with straight, vertical sides.

Quilted. Fused or stitched with thread through the upholstery cover material and one or more layers of upholstery material.

Shall. Indicates a mandatory requirement.

Should. Indicates recommendations or that which is advised but not required.

Tufted. Buttoned or laced through the upholstery cover material and upholstery material.

Upholstered Furniture. For the purpose of this test method, a unit of interior furnishing that (1) has any surface covered, in whole or in part, with a fabric or related upholstery cover material, (2) contains upholstery material, and (3) is intended or promoted for sitting or reclining.

Upholstery Cover Material. The outermost layer of fabric or related material used to enclose the main support system or upholstery materials, or both, used in a furniture item.

Upholstery Material. The padding, stuffing, or filling material used in a furniture item, which can be either loose or attached, enclosed by an upholstery cover material, or located between the upholstery cover material and support system, if present. (This definition includes, but is not limited to, material such as foam, cotton batting, polyester fiberfill, bonded cellulose, or down.)

Welt. The seam or border edge of a cushion, pillow, arm, or the back of an item.

Chapter 2 Test Apparatus

2-1 Mock-Ups. Mock-up elements for the mock-up test jigs are illustrated in Figures 2-1 (a), (b), and (c). Figures 1-3.2(a) and (b) show the completed mock-up assemblies.

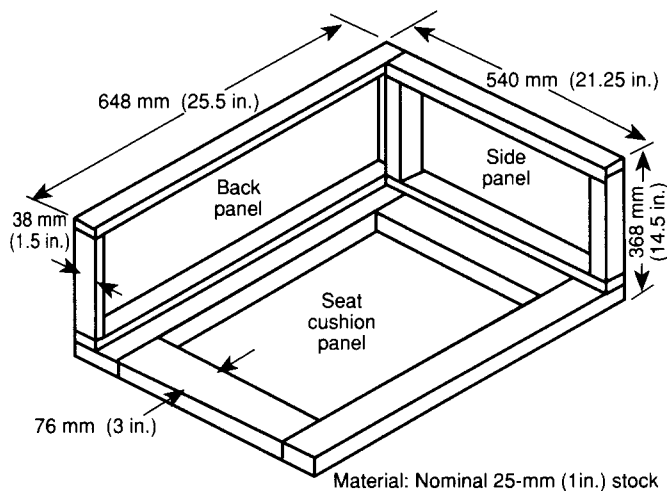


Figure 2-1(a) Frame for upholstered furniture mock-up test.

2-2 Ignition Sources. The ignition source for the test shall be cigarettes without filter tips, made from natural tobacco, 85 mm $\pm$ 2 mm (3.4 in. $\pm$ 0.1 in.) long with a packing density of 0.270 g/cm³ $\pm$ 0.020 g/cm³ (0.156 oz/in.³

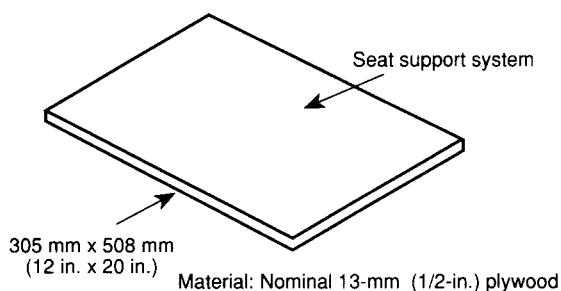


Figure 2-1(b) Armrest and top of back mock-up test.

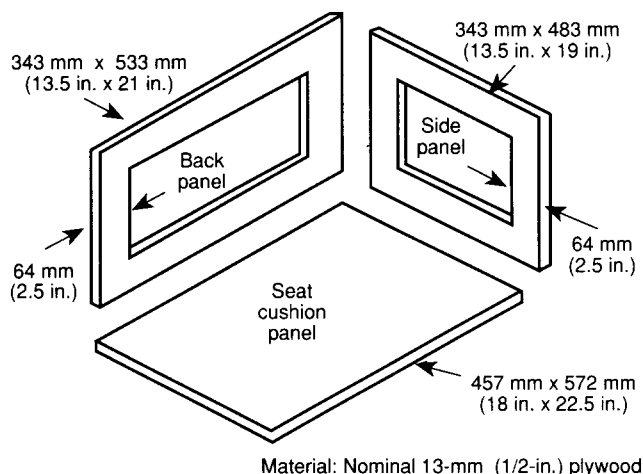


Figure 2-1(c) Panels for upholstered furniture mock-up test.

$\pm$ 0.012 oz/in.³) and a total weight of 1.1 g $\pm$ 0.1 g (0.039 oz $\pm$ 0.004 oz). The smoldering rate of this cigarette shall be 0.10 mm/sec $\pm$ 0.01 mm/sec (0.236 in./min. $\pm$ 0.024 in./min) when the cigarette is allowed to burn downward in a draft-protected area.

NOTE: With the cigarette supported at the bottom in a vertical position, the burning rate is determined in the region of 10 mm to 50 mm (0.39 in. to 1.97 in.), measured from the top.

2-3 Sheeting Material. The sheeting material used to cover the test cigarettes shall be 50 percent cotton/50 percent polyester or 100 percent cotton bed sheeting material, and shall weigh 125 g/m² $\pm$ 28 g/m² (3.7 oz/yd² $\pm$ 0.8 oz/yd²). The material shall be laundered in an automatic home clothes washing machine and dried in a tumble drier at least once before use. For testing, the sheeting material shall be cut into pieces approximately 12.5 cm $\times$ 12.5 cm (5 in. $\times$ 5 in.).

2-4 Test Area. The test room shall be draft-protected and equipped with a suitable system for exhausting smoke and noxious gases produced during testing.

2-5 Extinguishing Equipment. A pressurized water fire extinguisher or other suitable fire extinguishing equipment shall be immediately available. A water bottle fitted with a spray nozzle shall be provided to extinguish any

ignited portions of the mock-up. A bucket of water shall be provided for immersing smoldering or burning materials removed from the mock-up.

2-6 Miscellaneous. Other apparatus required to carry out the testing include: straight pins, a knife or scissors, tongs, and a linear scale at least 15 cm (6 in.) long and graduated in millimeters or in $\frac{1}{10}$ -in. or $\frac{1}{16}$ -in. divisions.

Chapter 3 Conditioning

3-1 General. Test samples, cigarettes, and sheeting material shall be conditioned at a temperature of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($73.4^{\circ}\text{F} \pm 9^{\circ}\text{F}$) and a relative humidity of 50 percent ± 5 percent for at least 48 hours immediately prior to testing. If the test room conditions do not meet the above specifications, then testing shall be initiated within 10 minutes after the materials are removed from the conditioned room. The mock-up assembly shall be constructed in the conditioned area.

Chapter 4 Test Specimens

4-1 General. Furniture mock-ups shall be created by arranging upholstery cover material and upholstery materials in the same sequence in which they are used in production furniture.

The various parts of the mock-up shall be constructed as described in Sections 4-2 through 4-6. In all cases, the arrangement and thickness of upholstery material in the mock-up shall reproduce the construction details of production furniture.

4-2 Loose Seat Cushions.

4-2.1 Seat cushions shall be made in the same size and manner and with the same material as production furniture.

Exception: Cushions 68 cm x 55 cm (25 in. x 22 in.) shall be permitted to be used if production furniture cushion dimensions exceed these values.

4-2.2 The cushion thickness shall be a maximum of 13 cm (5 in.).

4-3 Decks. Decks shall be prepared (if they are part of the furniture item) by attaching to the horizontal panel [see Figure 2-1(b)] of the test apparatus the same materials in the same thickness as used in actual furniture construction. The decking or upholstery cover material shall be stretched over the upholstery materials and securely fastened to the underside of the wood panel.

4-4 Tight Seat. If a furniture item is constructed with tight seats only, then the seat shall be duplicated for test in mock-up. Tight seat cushions shall be made $45 \text{ cm} \pm 5 \text{ cm} \times 55 \text{ cm} \pm 5 \text{ cm}$ ($18 \text{ in.} \pm 2 \text{ in.} \times 22 \text{ in.} \pm 2 \text{ in.}$) and with the same fabric and the same thickness used in production furniture. The cushion assembly shall be attached to the horizontal panel of the test apparatus [see Figure 2-1(c)] by extending the upholstery cover material around the panel edges and fastening the cover material to the underside of the wood panel.

4-5 Side and Back Panels. Furniture sides and backs shall be mocked-up if, in the type of furniture to be represented by the mock-up, they are located within 2.5 cm (1 in.) of a seat cushion. Mock-ups shall be made by upholstering one surface of the vertical test panel [see Figure 2-1(c)] with the same upholstery material and upholstery cover material used in production furniture. The upholstery cover material shall be stretched over the upholstery material and fastened to the back side of the framework. All edges of the panels shall be covered with upholstery cover material. If the side panel and back panel constructions of the furniture item are the same, only one vertical panel shall be required to be assembled and tested.

4-6 Bolsters. Bolsters resting on the seat cushion or suspended above it tend to confine the heat from the cigarette and often create a spatial arrangement that differs from the crevice space found in production furniture. In such cases, a mock-up bolster shall be prepared, with dimensions that fit into the mock-up and create the same spatial arrangement for the cigarette as in production furniture.

4-7 Armrests and Tops of Backs. Tops of armrests and backs shall be tested if (1) they present a surface large enough and so oriented as to support a cigarette and (2) if the construction differs in any way from the side panel and back panel constructions. Tops of armrests and backs shall be made by upholstering a piece of 1.3-cm (0.5-in.) thick plywood, approximately 30 cm $\times$ 50 cm (12 in. $\times$ 20 in.), with the same materials used in the furniture item. The mock-up shall reproduce significant details of the construction of full-size furniture.

Chapter 5 Testing Procedures

5-1 Mock-up Test Sample. A mock-up test sample shall be assembled by attaching the side or back panel, or both, to the mock-up frame and placing a seat cushion (either loose or tight seat construction) against the panels, as shown in Figure 1-3.2(b). The assembly shall be permitted to be placed on a table or platform in the test area and shall be under an exhaust hood or other suitable means for exhausting the products of combustion from testing. The decks for loose cushion items, tops of armrests, and backs shall be tested separately. The test to evaluate upholstered furniture material assemblies for cigarette ignition resistance might require two vertical panels, one seat cushion (loose or tight), one bolster, one deck, one top of armrest, and one top of back.

5-2 Cigarette Locations. At least three cigarettes shall be burned on each surface location [see Figures 1-3.2(a) and (b)]. These locations include the crevice(s) where seat cushion and vertical panels meet, seat cushion surfaces (including welt and smooth, quilted, or tufted areas), top of upholstered armrest, and tops of upholstered back and deck.

5-3 Crevice Location. For crevice locations, the two cigarettes on either side of the center cigarette shall be placed in the crevice so that their butt ends burn out at least 7.5 cm (3 in.) from the outermost edge of the side of the back panel. The cigarettes shall be placed horizontally.

Two of the three cigarettes shall be placed so that their entire length burns out against the welt cord and the vertical panel surface. The third cigarette shall be placed so that its entire length burns out against the welt cord and a horizontal surface of the seat cushion.

5-4 Test Cigarette. Each test cigarette shall be well-lighted and burned not more than 4 mm (0.16 in.) when placed at a specific test location. After placement, each cigarette shall be covered with a piece of sheeting material. For crevice tests, one end of the sheeting material shall be pinned to the vertical panels [approximately 5 cm (2 in.) above the cigarette] and the remaining material dropped to completely cover the test cigarette. For all tests, proper sheeting material-to-cigarette contact shall be ensured by running a finger across the full length of the covered cigarette.

5-5 Seat Cushion.

5-5.1 For the test of a seat cushion (either loose or tight), three covered cigarettes shall be burned on each different surface location encountered.

5-5.2 For the purposes of this test, smooth surfaces, welt edges, fused or threaded portions of quilts, and tuft depressions shall be considered different surface locations on a seat cushion. Test cigarettes shall be arranged so that the butt ends burn out on the threads of a quilt or in tuft depressions. The smooth surface of a quilted or tufted cushion shall not be required to be tested. For smooth surface cushions, the test cigarettes shall be burned in the center of the cushion.

5-6 Test Cigarette. Three test cigarettes shall be burned on each horizontal mock-up test panel duplicating armrests, tops of backs, and seat cushion support systems. One cigarette shall be burned at the center of the panel, and the other two shall be burned at least 7.5 cm (3 in.) from the edges of the test panel. Refer to Figure 1-3.2(a) for the location of the cigarettes on the test panels.

5-7 Test Acceptance. A test at any location is considered complete if any of the following occurs:

- (a) Three cigarettes in a given location have burned their full lengths without sustained ignition.
- (b) Three cigarettes in a given location have self-extinguished before burning their full lengths.
- (c) Three cigarettes in a given location sustained ignition.

5-8 Ignition. If continuing ignition occurs (i.e., fabric and filling materials are ignited and are smoldering and generating smoke at a rapid rate), it is not a requirement to wait until a cigarette has burned its full length; the test shall be stopped and the burning material extinguished. The test room shall be ventilated and an ignition recorded for the cigarette test location.

5-9 Char Length Measurement.

5-9.1 If the cigarette burns to completion at a test location, the maximum char length in any direction of any material, from the point nearest to the original location of the cigarette shall be measured.

5-9.2 The char length measurement for each cigarette shall be recorded, except when the cigarette has extinguished without burning to completion or where continuous combustion occurs. If the char from one cigarette runs into that from another, the results of the test are invalid and the test shall be repeated, burning one cigarette at a time.

All mock-ups shall be disassembled. When disassembling the apparatus, if it is shown that smoldering is still in progress, the test is invalid and shall be repeated.

5-10 Testing Environment. The test shall be carried out in a draft-protected area. The maximum airflow across the sample face shall be less than 15.2 m/min (50 ft/min).

Chapter 6 Safety Precautions

6-1 CAUTION: Even under the most carefully observed conditions, smoldering combustion can progress to a point where it cannot be readily extinguished. A test shall be stopped as soon as continuing combustion has definitely occurred. Immediately wet the exposed area with a water spray from the water bottle, remove the charred or burned material, and immerse the material in a bucket of water. Ventilate the test area.

6-2 Exposure. Products of combustion can be physically irritating and dangerous to test personnel. Test personnel shall avoid exposure to smoke and gases produced during testing as much as possible. A large hood with a low air velocity shall be permitted to be in operation during testing to remove products of combustion.

Chapter 7 Report

7-1 Reporting. The maximum char distance measured to the nearest 0.5 cm (0.2 in.) from the center of the original location of the test cigarette shall be recorded for each cigarette location, except when a continuing combustion occurs. In this case, an ignition shall be recorded for the test location.

Appendix A Commentary

This Appendix is not a part of the requirements of this NFPA document, but is included for informational purposes only.

A-1 Introduction. The test for determining the smoldering cigarette ignition resistance of mock-up furniture material assemblies was developed by the National Bureau of Standards with the cooperation of various industry groups and individuals. The work was done in response to data indicating that cigarette ignition of upholstered furniture is a major cause of life loss due to fire in the United States.

A-2 Nature of Test.

A-2.1 Upholstered furniture consists of upholstery cover fabric and interior components (filling/padding), such as foam, polyester, or cotton batting. Often a welt cord is attached to the pillow and other edges of the upholstery.

These materials are arranged in complex geometrical forms, including flat, tufted, convex, concave, and horizontal and vertical surfaces. Both the combination of fabric and filling/padding materials and their geometrical arrangement affect their propensity to ignite when exposed to burning cigarettes.

A-2.2 Originally, an attempt was made to develop separate tests for each of the component materials: fabric, filling/padding, and welt cord. It soon became obvious that there was considerable interaction among these components, and it was decided that they would have to be tested in the combination in which they would be used in actual furniture. However, to avoid the cost and effort required to build prototype furniture for each combination of materials, the test is limited to a simple mock-up of the seating surface and vertical members, with the fabric, filling/padding, and welt cord arranged as in the proposed construction of actual furniture.

A-3 Experimental Studies. In a controlled study, the relationship between the results of the mock-up test and the performance of actual furniture was shown to be very close.

Thirty-eight locations in both mock-up and full-size chairs were tested in each of 3 laboratories for a total of

114 tests. Fourteen test locations out of 114 provided different results for the mock-up than for the actual item of furniture. There was 87 percent agreement.

A-4 Agreement Between Laboratories. In a controlled study, the percentage of agreement between laboratories was high.

More than 2,200 tests were conducted on mock-ups in 38 laboratories. One hundred twenty-six test results differed from the majority. There was 94 percent agreement. For additional information, see NBSIR 78-1438, PFF6-76, June 1978, Loftus, NBS.

Appendix B Referenced Publication

B-1 The following document or portions thereof are referenced within this standard for informational purposes only and thus is not considered part of the requirements of this document.

NBSIR, Back-Up Report for the Proposed Standard for the Flammability (Cigarette Ignition Resistance) of Upholstered Furniture, PFF6-76, Joseph J. Loftus, Final Report, June 1978.

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The NFPA Codes and Standards Development Process

Since 1896, one of the primary purposes of the NFPA has been to develop and update the standards covering all areas of fire safety.

Calls for Proposals

The code adoption process takes place twice each year and begins with a call for proposals from the public to amend existing codes and standards or to develop the content of new fire safety documents.

Report on Proposals

Upon receipt of public proposals, the technical committee members meet to review, consider, and act on the proposals. The public proposals – together with the committee action on each proposal and committee-generated proposals – are published in the NFPA's Report on Proposals (ROP). The ROP is then subject to public review and comment.

Report on Comments

These public comments are considered and acted upon by the appropriate technical committees. All public comments – together with the committee action on each comment – are published as the Committee's supplementary report in the NFPA's Report on Comments (ROC).

The committee's report and supplementary report are then presented for adoption and open debate at either of NFPA's semi-annual meetings held throughout the United States and Canada.

Association Action

The Association meeting may, subject to review and issuance by the NFPA Standards Council, (a) adopt a report as published, (b) adopt a report as amended, contingent upon subsequent approval by the committee, (c) return a report to committee for further study, and (d) return a portion of a report to committee.

Standards Council Action

The Standards Council will make a judgement on whether or not to issue an NFPA document based upon the entire record before the Council, including the vote taken at the Association meeting on the technical committee's report.

Voting Procedures

Voting at an NFPA Annual or Fall Meeting is restricted to members of record for 180 days prior to the opening of the first general session of the meeting, except that individuals who join the Association at an Annual or Fall Meeting are entitled to vote at the next Fall or Annual Meeting.

"Members" are defined by Article 3.2 of the Bylaws as individuals, firms, corporations, trade or professional associations, institutes, fire departments, fire brigades, and other public or private agencies desiring to advance the purposes of the Association. Each member shall have one vote in the affairs of the Association. Under Article 4.5 of the Bylaws, the vote of such a member shall be cast by that member individually or by an employee designated in writing by the member of record who has registered for the meeting. Such a designated person shall not be eligible to represent more than one voting privilege on each issue, nor cast more than one vote on each issue.

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Sequence of Events Leading to Publication of an NFPA Committee Document

Call for proposals to amend existing document or for recommendations on new document.



Committee meets to act on proposals, to develop its own proposals, and to prepare its report.



Committee votes on proposals by letter ballot. If two-thirds approve, report goes forward.
Lacking two-thirds approval, report returns to committee.



Report is published for public review and comment. (Report on Proposals - ROP)



Committee meets to act on each public comment received.



Committee votes on comments by letter ballot. If two-thirds approve, supplementary report goes forward. Lacking two-thirds approval, supplementary report returns to committee.



Supplementary report is published for public review. (Report on Comments - ROC).



NFPA membership meets (Annual or Fall Meeting) and acts on committee report (ROP and ROC).



Committee votes on any amendments to report approved at NFPA Annual or Fall Meeting.



Complaints to Standards Council on Association action must be filed
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Standards Council decides, based on all evidence, whether or not to issue standard
or to take other action, including hearing any complaints.



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Company

Street Address 9 Seattle St., Seattle, WA 02255

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b) Section/Paragraph 1-5.8.1 (Exception No.1)

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