

NFPA 256

Fire Tests of Roof Coverings

1993 Edition



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There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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NFPA 256

**Standard Methods of
Fire Tests of Roof Coverings**

1993 Edition

This edition of NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*, 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 16-18, 1992, in Dallas, TX. It was issued by the Standards Council on January 15, 1993, with an effective date of February 12, 1993, and supersedes all previous editions.

The 1993 edition of this document has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

Origin and Development of NFPA 256

The test procedure covered by this standard was developed prior to 1920 by Underwriters Laboratories Inc. The test procedure was put in standard form by the E5 Committee on Fire Standards of the American Society for Testing and Materials, adopted by ASTM as a tentative standard in 1955, and revised in 1956. It was adopted by the NFPA on May 22, 1958, on recommendation of the Committee on Fire Tests and was subsequently published as NFPA 256, in May 1958. It was adopted by ASTM as a standard later in 1958 and published by ASTM as E108-58. It was also published by Underwriters Laboratories Inc., as No. 790, September 1958. Revised NFPA editions were published in 1964, 1970, 1976, 1981, and 1987. The 1993 edition of NFPA 256 was revised editorially to bring this document into conformance with its ASTM and UL counterparts.

To the User

Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI). The unit liter, which is outside of but recognized by SI, is commonly used and is therefore used in this standard. In this standard, values for measurements are followed by an equivalent in SI units. The first stated value shall be regarded as the requirement because the given equivalent value may be approximate.

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Committee Scope: To develop standards for fire testing procedures when such standards are not available; review existing fire test standards and recommend appropriate action to NFPA; recommend the application of and advise on the interpretation of acceptable test standards for fire problems of concern to NFPA technical committees and members; act in a liaison capacity between NFPA and the committees of other organizations writing fire test standards. The Committee is not responsible for fire tests that are used to evaluate extinguishing agents, devices, or systems.

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NFPA 256
Standard Methods of
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NOTICE: Information on referenced publications can be found in Chapter 13.

Chapter 1 General

1-1 Scope.

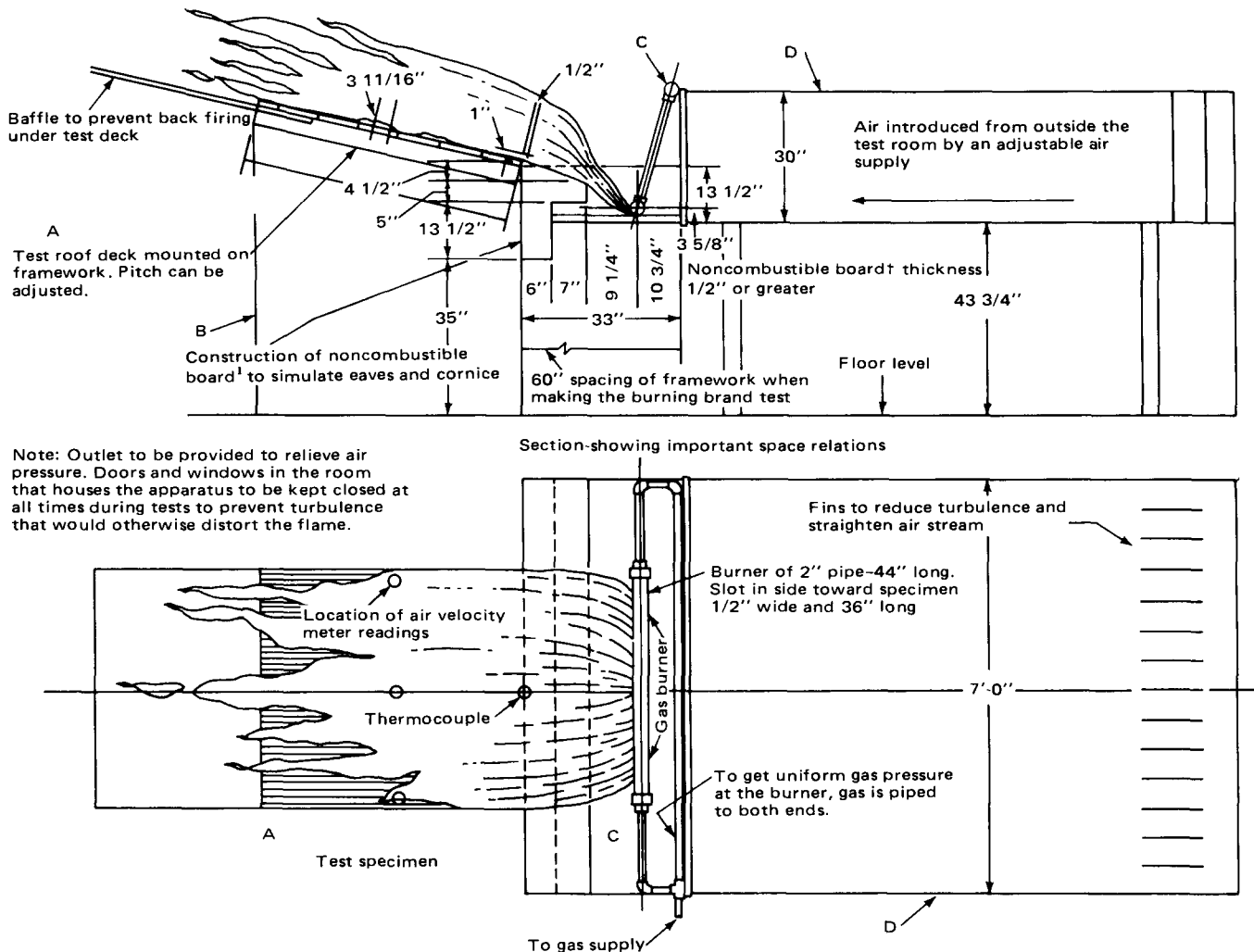
1-1.1 These methods are intended to measure the relative fire characteristics of roof coverings under a simulated fire originating outside the building. They shall be applica-

ble to roof coverings intended for installation on either combustible or noncombustible decks, when applied as intended for use.

The following methods are included:

- (a) Intermittent Flame Exposure Test (*see Chapter 6*)
- (b) Spread of Flame Test (*see Chapter 7*)
- (c) Burning Brand Test (*see Chapter 8*)
- (d) Flying Brand Test (*see Chapter 9*)
- (e) Rain Test (*see Chapter 10*)
- (f) Weathering Test (*see Chapter 11*).

1-1.2 Three classes of fire test exposure are described.



†Johns Manville Marinite or equivalent
 For SI units: 1 in. = 25.4 mm, 1 ft = 0.305 m

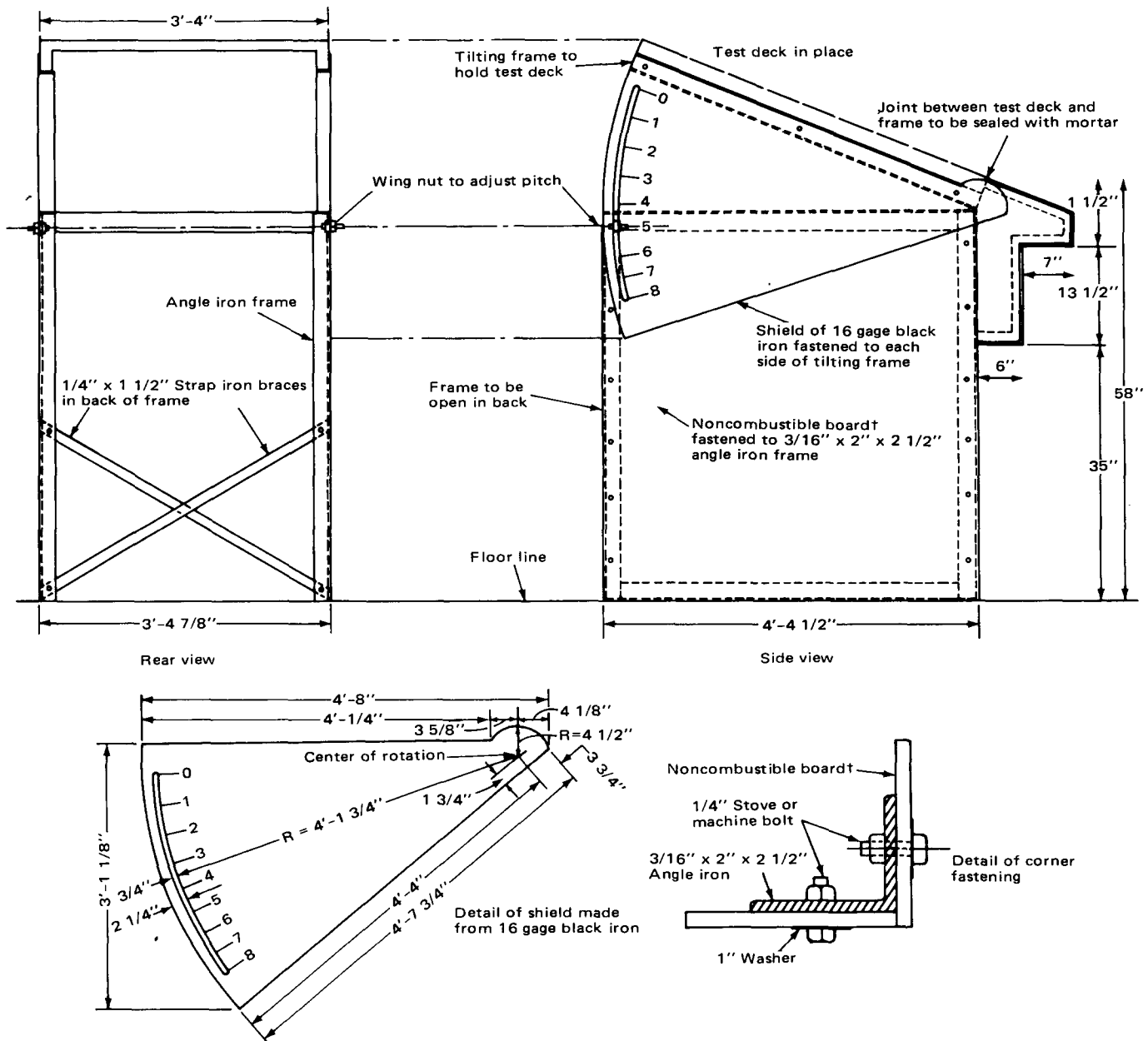
Figure 1 Schematic drawing of fire test apparatus.

1-1.2.1 Class A. Class A tests shall be applicable to roof coverings that are effective against severe test exposure, afford a high degree of fire protection to the roof deck, do not slip from position, and do not present a flying brand hazard.

1-1.2.2 Class B. Class B tests shall be applicable to roof coverings that are effective against moderate test exposure, afford a moderate degree of fire protection to the roof deck, do not slip from position, and do not present a flying brand hazard.

1-1.2.3 Class C. Class C tests shall be applicable to roof coverings that are effective against light test exposure, afford a light degree of fire protection to the roof deck, do not slip from position, and do not present a flying brand hazard.

1-1.3 It is the intent of the tests to demonstrate the relative performance of materials under the test exposure involved. These tests shall not be construed as having determined suitability for use after fire exposure.



† Johns Manville Marinite or equivalent.

For SI units: 1 in. = 25.4 mm, 1 ft = 0.305 m

Figure 2 Detail of tilting frame to hold test roof deck.

Chapter 2 Equipment and General Test Procedures

2-1 Apparatus.

2-1.1 The essential elements of the fire test apparatus are illustrated in Figure 1. These shall include a test roof deck (A), an adjustable frame [see (B) in Figure 2] on which the test roof deck is mounted, a gas burner (C) as a source of flame, a wind tunnel (D), an air velocity meter¹, a gas pressure gauge, a control valve, and an adjustable air supply.

2-1.2 Figure 3 illustrates the essential elements of the rain test apparatus.

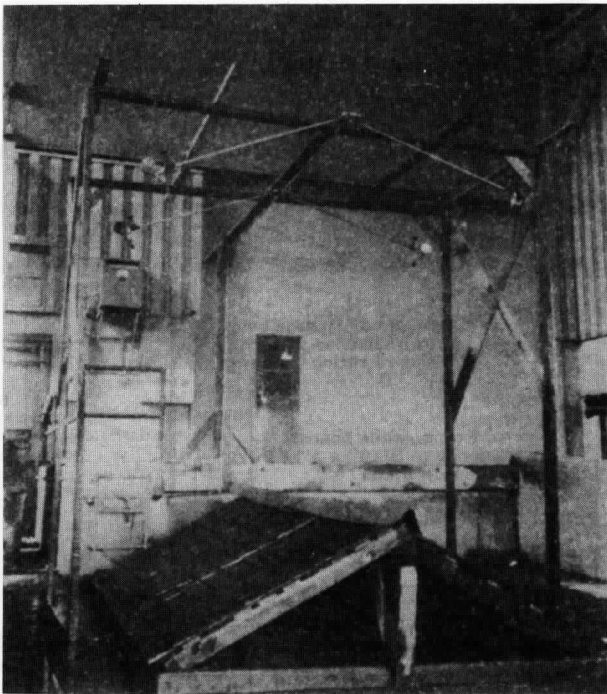


Figure 3 Rain test apparatus.

2-2 Test Flame. Control of the shape and size of the flame depends on minimizing air turbulence in the immediate vicinity of the apparatus. To do this it is important that:

(a) Free outlet to outside air beyond and above the test apparatus so as to exhaust air introduced into the test room by the blower shall be provided, and

(b) All openings into the test room other than those mentioned in 2-1.1, such as doors and windows, shall be closed.

¹Any direct reading instrument with a scale graduated in increments of not more than 20 ft/min (6 m/min) or any timed instrument with a scale graduated in increments of not more than 20 ft/min (6 m/min) for a timed interval of 1 min should be used.

2-3 Supply Air. The temperature of the room shall be between 50°F and 90°F (10°C and 32.2°C).

Chapter 3 Calibration

3-1 Air Current.

3-1.1 The test apparatus shall be set up for the intermittent flame test, and a smooth, noncombustible calibration deck 4 ft 4 in. (1320 mm) long shall be positioned on the framework at an incline of 0.416:1 [5 in. (127 mm) per horizontal ft (305 mm)].

3-1.2 The air velocity shall be measured midway up the slope of the calibration deck, at its center, and 3 in. (76 mm) from each edge.

3-1.3 The center of the air-measuring device shall be positioned $3\frac{3}{4}$ in. $\pm$ $\frac{1}{8}$ in. (95 mm $\pm$ 3 mm) above the surface. The airflow through and around the instrument shall be as free and undisturbed as possible.

3-1.4 The air supply system shall be adjusted to produce a 1-minute time average velocity of 1056 ft $\pm$ 44 ft/min (5.36 m $\pm$ 0.2 m/min) at each of the three locations detailed in 3-1.2.

3-2 Flame Temperature.

3-2.1 The test apparatus shall be set up for the intermittent flame test in accordance with 3-1.1, and the air velocity shall be adjusted in accordance with 3-1.4.

3-2.2 The temperature shall be measured with a No. 14 gauge (1.6 mm diameter) Type K wire thermocouple located 1 in. (25 mm) above the surface and $\frac{1}{2}$ in. (13 mm) toward the source of the flame from the lower front edge of the calibration deck.

3-2.3 The gas flow shall be adjusted to produce a 2-minute average flame temperature of 1400°F $\pm$ 50°F (760°C $\pm$ 28°C) for Class A and Class B and 1300°F $\pm$ 50°F (704°C $\pm$ 28°C) for Class C tests. The response of the thermocouple to the test flame shall be allowed to stabilize before the 2-minute average flame temperature is measured. The average shall be based on readings taken at 5-second intervals.

3-2.4 The top surface of the leading edge of the calibration deck shall be flush with the top edge of the simulated eave within a tolerance of $0 \pm \frac{1}{2}$ in. (0 $\pm$ 13 mm).

3-2.5 If the above conditions are satisfied, the flame shall be approximately the width of the deck at its bottom edge and the top surface of the calibration deck shall be uniformly bathed except for the two upper corners. The flame shall extend approximately to the upper edge of the calibration deck with licks of flame extending another 1 - 2 ft (300 - 600 mm).

3-3 Rain Test.

3-3.1 The horizontal projected area over which each nozzle discharges water to the nearest sq ft (0.1 m²) shall be measured. The discharge of water for each nozzle shall be measured for 1 minute.

3-3.2 The total water utilized during the test shall be monitored (a commercial water meter is suitable for the purpose). For a 7-day cycle, the water usage shall be 73 U.S. gal $\pm$ 1.7 U.S. gal/sq ft (2974 L $\pm$ 40 L/m²) or 0.435 U.S. gal/sq ft/hr (17.7 L/m²/hr).

3-4 Frequency of Calibration.

3-4.1 The apparatus shall be calibrated for air velocity and flame temperature prior to each day's use. The apparatus shall be calibrated for flame temperature when shifting from Class A or B to Class C tests or vice versa.

3-4.2 Any indication of off-limit condition, such as unusual flame appearance or flame contour, excess turbulence, unusual noise, etc., shall be cause for calibration prior to further use.

3-4.3 The water flow from each nozzle shall be visually checked for obvious water obstruction in the nozzle and uneven spray pattern each day during the water cycle, and adjustments shall be made when necessary.

3-4.4 A review of the total water flow shall be made at the end of each day and at the end of each water cycle. The cause of any off-limit conditions shall be corrected.

Chapter 4 Preparation of Test Specimens

4-1 Construction of Test Decks. [Also see Figures 4(a), 4(b), 4(c), and 4(d).]

4-1.1 The test deck for the intermittent flame exposure, burning brand tests, flying brand test, rain test, and weathering test shall be 3 ft 4 in. $\times$ 4 ft 4 in. (1020 mm $\times$ 1320 mm) and shall be made of No. 1 white pine lumber having not less than 8 percent nor more than 12 percent moisture content.

Exception: As specified in 4-1.2 through 4-1.5.

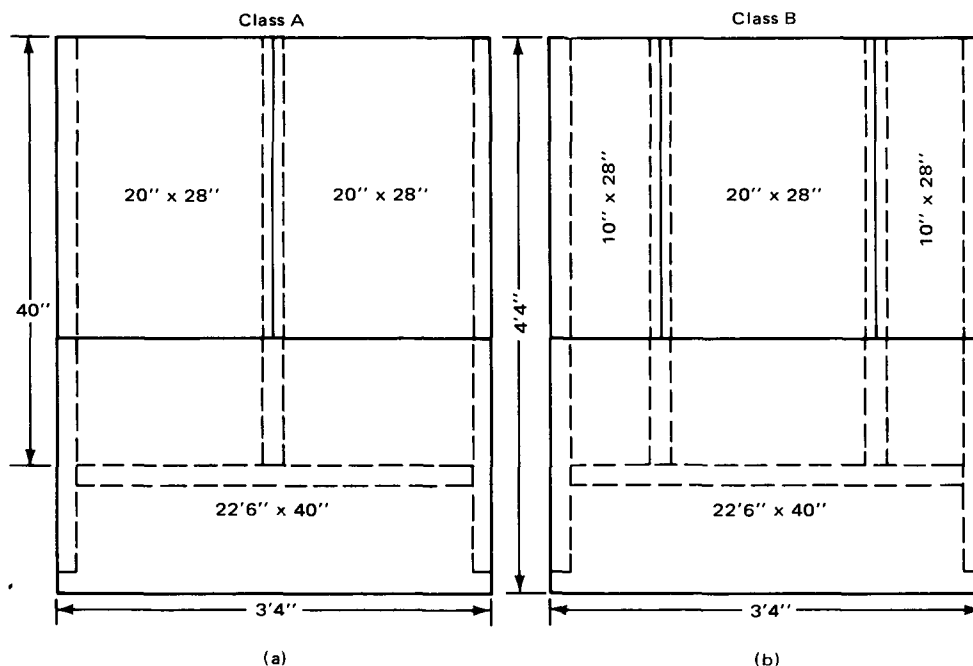
4-1.1.1 The lumber shall be free of large or loose knots, sapwood, rot, or pitch pockets and shall contain no edge knots.

4-1.1.2 Individual deck boards shall be of nominal 1 in. $\times$ 8-in. (25 mm $\times$ 200-mm) lumber (S4S).

4-1.1.3 The boards shall be laid across the shorter dimension of the test deck spaced $\frac{1}{4}$ in. (6 mm) apart and shall be securely nailed to two nominal 2 in. $\times$ 4-in. (50 mm $\times$ 100-mm) wood battens located under and flush with the outer edges of the deck [see Figure 4(d)].

4-1.1.4 Decks so constructed shall be even and uniform.

4-1.2 Where the roof covering is intended to be installed over other than solid deck, the test decks shall be constructed of nominal 1 in. $\times$ 4-in. (25 mm $\times$ 100-mm) lumber (S4S) spaced a minimum of $1\frac{5}{8}$ in. (41 mm) apart and shall be securely nailed to two nominal 2 in. $\times$ 4-in. (50 mm $\times$ 100-mm) wood battens. The lumber shall be of the same quality as specified in 4-1.1.



For SI units: 1 in. = 25.4 mm

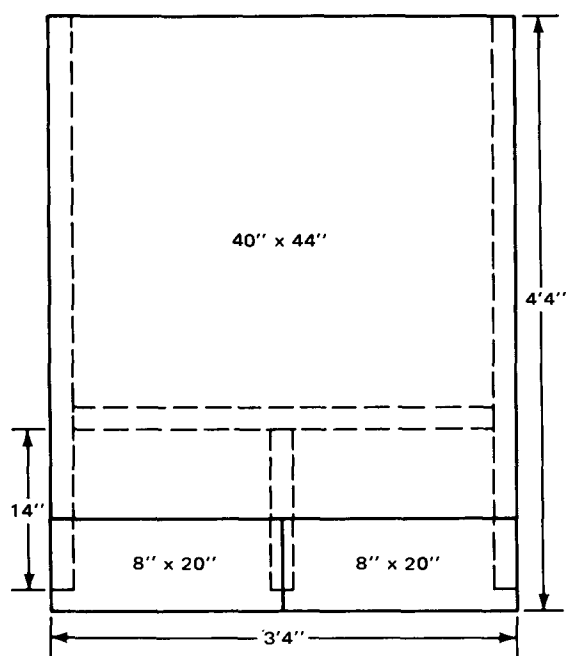
Figures 4(a) (left) and 4(b) (right) Plywood—decks burning brand tests. Plywood overhangs 2 $\times$ 4s by $1\frac{1}{4}$ in. at leading edge. 2 $\times$ 4 supports are indicated by dotted lines. Plywood joint width — $\frac{1}{8}$ in.

4-1.3 Roof coverings shall be permitted to be applied to panel-type test decks such as plywood, wafer board, particle board, or oriented strand board in the minimum thickness recommended by the manufacturer. *This deviation shall be noted in the report.*

4-1.3.1 Plywood, if used, shall be exterior Type C-C plugged or higher grade, conforming to PS1-83, *Construction and Industrial Plywood*.

4-1.3.2 These decks shall have $\frac{1}{8}$ -in. (3-mm) vertical and horizontal joints located as specified in 4-1.4 through 4-1.5.3 with all vertical joints centered on nominal 2 in. $\times$ 4-in. (50 mm $\times$ 100-mm) wood battens.

4-1.3.3 If wood battens or tongue and groove joints are specified for horizontal joints, it shall be so noted in reporting the tests.



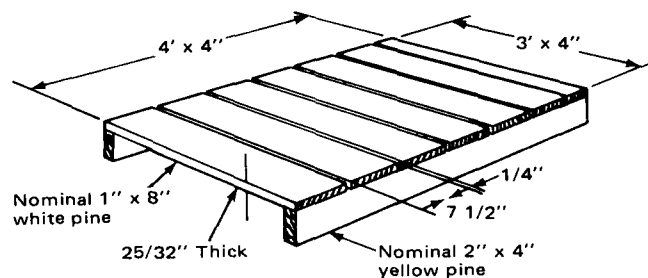
For SI units: 1 in. = 25.4 mm

Figure 4(c) Plywood deck intermittent flame test, Class A or Class B. Plywood overhangs 2 $\times$ 4s by $1\frac{1}{4}$ in. at leading edge. 2 $\times$ 4 supports are indicated by dotted lines. Plywood joint width — $\frac{1}{8}$ in.

4-1.4 Decks constructed of panel-type material for intermittent flame tests shall have a $\frac{1}{8}$ -in. (3-mm) horizontal joint 8 in. (203 mm) from and parallel to the 3 ft 4-in. (1020-mm) long leading edge.

4-1.4.1 In addition, a $\frac{1}{8}$ -in. (3-mm) vertical joint centered on the deck and extending from the leading edge of the deck to the $\frac{1}{8}$ -in. (3-mm) horizontal joint shall be provided.

4-1.4.2 Since the lower $1\frac{1}{2}$ in. (38 mm) of this joint is not protected by the 2 in. $\times$ 4-in. (50 mm $\times$ 100-mm) batten, due to the mounting arrangement on the carriage, the



For SI units: 1 in. = 25.4 mm

Figure 4(d) Construction of test deck for other than wood shingles and shakes.

underside of this joint shall be covered from the end of the 2 in. $\times$ 4 in. (50 mm $\times$ 100 mm) to the leading edge of the deck by a piece of sheet steel, nominally 2 in. (50 mm) in width.

4-1.5 For Class A and Class B burning brand tests on decks other than 1 in. $\times$ 8-in. (25 mm $\times$ 200-mm) nominal lumber, the $\frac{1}{8}$ -in. (3-mm) horizontal joint shall be 22 $\frac{1}{2}$ in. (570 mm) from and parallel to the leading edge of the deck.

4-1.5.1 Class A test decks shall have a $\frac{1}{8}$ -in. (3-mm) vertical joint centered on the deck that extends above the horizontal joint.

4-1.5.2 For Class B test decks, two $\frac{1}{8}$ -in. (3-mm) vertical joints, extending above the horizontal joint with each vertical joint located 10 in. (250 mm) from and parallel to the edge of the deck, shall be provided.

4-1.5.3 For Class C burning brand test, five evenly spaced horizontal joints, with a minimum width of $\frac{1}{8}$ in. (3 mm) between joints in the plywood, shall be provided.

4-1.6 For the spread of flame tests, the deck shall be constructed in the same manner as specified for the intermittent flame test, except that (1) the vertical and horizontal joints need not be provided and (2) the length of the deck shall be as specified in 4-1.6.1.

4-1.6.1 The length of the test deck shall be 13 ft (4000 mm) for Class C tests, 9 ft (2700 mm) for Class B tests, and 8 ft (2400 mm) for Class A tests.

4-1.6.2 For tests of materials intended to be installed only over noncombustible decks, a noncombustible deck of the applicable length as specified in 4-1.6.1 shall be permitted to be used. This deviation shall be noted in the report.

4-2 Application of Roofing on Test Roof Deck.

4-2.1 Representative samples of roof covering materials shall be applied to test decks as specified in Table 1.

4-2.2 The roof covering materials under investigation shall be applied in accordance with the manufacturer's instructions and shall extend to and be flush with the edges of the deck.

Table 1 Required Tests and Test Assemblies

Material to Be Tested	Intermittent Flame Test	Minimum Required Number of Test Assemblies			Rain Test	Weathering Test
		Spread of Flame Test	Burning Brand Test	Flying-Brand Test		
I. Other than wood shakes or shingles, for installation on:						
Combustible decks						
Class A	2	2	4	NA ^a	NA	NA
Class B	2	2	2	NA	NA	NA
Noncombustible decks only ^b	NA	2	NA	NA	NA	NA
II. Wood Shakes and shingles ^c :						
Class A	3 (2) [5]	3	6 (2) [5]	3 (2) [5]	6	15
Class B or Class C	3 (2) [5]	3	3 (2) [5]	3 (2) [5]	6	15

^a NA - Test is not required.

^b The flying brand, rain, and weathering tests may be required. (See Sections 9-1, 10-1.1, and Section 11-1.)

^c Number in parentheses is number of samples from rain test to be tested. Number in brackets is number of samples from weathering test to be tested.

Note: Where roof covering materials exhibit variable performance, more than the minimum number of test decks may be required.

Exception: A 1-in. (25-mm) overhang is permitted at the leading edge.

4-3 Storage and Conditioning of Test Roof Decks. The completed test roof decks shall be stored indoors at a temperature of not lower than 60°F (16°C) nor more than 90°F (32°C). The completed test roof decks shall be conditioned to a constant mass. The moisture content of the sample immediately prior to the test shall be measured and recorded.

Chapter 5 General Conditions

5-1 The required tests, the applicable number of test decks, and the types of test assemblies are detailed in Table 1.

5-2 In the fire tests described below, mortar (cementitious mixture, lime, and water) shall be troweled into the joint formed by the leading edge of the roof covering material and the framework of the carriage. This is to prevent air or the test flame from traveling under the material being tested.

5-3 In these tests, all decks shall be subjected to an air current as calibrated in Chapter 3.

5-4 Prepared roof coverings shall be tested at a slope of 0.416:1 [5 in. (127 mm) per horizontal ft (305 mm)].

5-5 Built-up roof coverings shall be tested at the maximum slope recommended by the manufacturer but shall not exceed 0.416:1 [5 in. (127 mm) per horizontal ft (305 mm)].

5-6 The slope used shall be noted in the report.

Chapter 6 Intermittent Flame Exposure Test

6-1 General. This test shall be performed on a minimum of two test decks.

NOTE: Where the roof covering materials exhibit a variable performance, more than two test decks shall be required.

6-2 Procedure.

6-2.1 A test deck 4 ft 4 in. (1320 mm) long shall be mounted on the framework at the required incline (see Sections 5-4 through 5-6), and the blower shall be adjusted to produce the specified air current.

6-2.2 The test deck shall be subjected to a luminous gas flame as calibrated in accordance with Section 3-2.

6-3 Application of Flame. The flame shall be applied intermittently for the specified periods and specified time intervals between applications, as indicated below.

Method of Test	Flame On, minutes	Flame Off, minutes	No. of Test Cycles
Class A	2	2	15
Class B	2	2	8
Class C	1	2	3

6-4 Air Current. The air current shall be maintained throughout the test and after the last application of flame until all evidence of flame, glow, and smoke has disappeared from both the exposed surface of the material being tested and the underside of the test deck, or until failure occurs. In no case shall the air current or test duration be maintained for more than 1 hour after the last flame cycle for a Class A or B test or 1/2 hour after the last flame cycle for the Class C test.

6-5 Observations. During and after the intermittent flame test, including "on" and "off" periods of flame application, observations shall be made for the appearance of sustained flaming on the underside of the test deck, production of flaming or glowing brands, displacement of portions of the test sample, and exposure or falling away of portions of the roof deck.

Chapter 7 Spread of Flame Test

7-1 General. This test shall be performed on a minimum of two test decks.

NOTE: Where the roof covering materials exhibit a variable performance, more than two test decks shall be required.

7-2 Procedure. A test deck, of a length as specified in 4-1.6.1 shall be mounted in the same manner, and shall use a luminous gas flame as described in Section 6-2 for the intermittent flame tests.

7-3 Application of Flame.

7-3.1 For Class A and Class B tests, the gas flame shall be applied continuously for 10 minutes or until the flame (actual flaming of the material being tested) permanently recedes from a point of maximum spread, whichever is shorter.

7-3.2 For Class C test the gas flame shall be applied for a period of 4 minutes, or until recession occurs, and then removed.

7-4 Observations. During the application of the test flame, the test sample shall be observed for the distance to which flaming of the material has spread, production of flaming or glowing brands, and displacement of portions of the test sample.

Chapter 8 Burning Brand Test

8-1 General. This test shall be performed on a minimum of four test decks for Class A fire test exposure and two test decks for Class B or Class C fire test exposure.

NOTE: Where the roof covering materials exhibit a variable performance, more than the minimum number of test decks shall be required.

8-2 Procedure. A 4 ft 3-in. (1320-mm) long test deck shall be mounted in the same manner as specified in Section 6-2 for the intermittent flame test.

Exception: The framework shall be 60 in. (1520 mm) from the air duct outlet (see Figure 1), and the gas piping and burner shall be removed so as not to obstruct the airflow.

8-3 Size and Construction of Brands.

8-3.1 General. The brands (as shown in Figure 5) shall be constructed as follows and shall be conditioned in an oven at 105°F-120°F (40.55°C-48.9°C) for at least 24 hours.

8-3.2 Class A Test Brand.

8-3.2.1 The Class A test brand shall consist of a grid 12 in. (305 mm) square and approximately 2 1/4 in. (57 mm) thick, made of dry Douglas fir lumber free of knots and pitch pockets.

8-3.2.2 Thirty-six, nominal 1 in. × 1 in. × 12-in. (25 mm × 25 mm × 305-mm) strips, dressed on all four sides to 3/4 in. × 3/4 in. (19 mm × 19 mm) and placed in three layers of 12 strips each, with strips spaced 1/4 in. (6 mm) apart, shall be used.

8-3.2.3 These strips shall be placed at right angles to those in adjoining layers and shall be nailed at each end of each strip on one face and in a diagonal pattern (as shown in Figure 5) on the other face.

8-3.2.4 The dry weight of the finished brand shall be 2000 g ± 150 g at time of test.

8-3.3 Class B Test Brand.

8-3.3.1 The Class B brand shall consist of a grid 6 in. (150 mm) square and approximately 2 1/4 in. (57 mm) thick, made of dry Douglas fir lumber free from knots and pitch pockets.

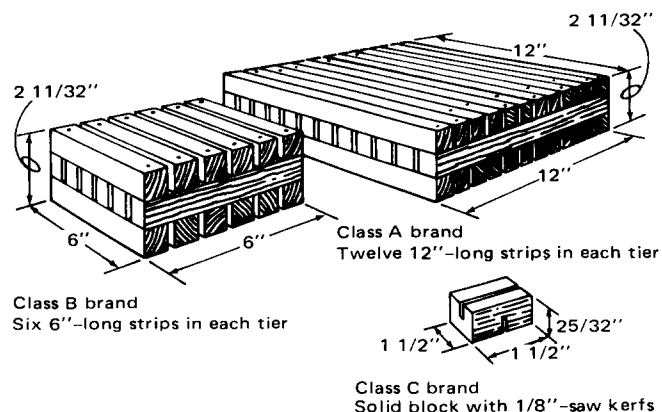


Figure 5 Brands for Class A, B, and C tests.

NOTE: Nails used in the construction of Class A and B brands should be No. 16, 1 1/2-in. (38-mm) long, bright, flat-head, diamond point, wire nails. Sixty-eight nails weighing approximately 1.48 oz (42 g) should be used for Class A brand and 32 nails weighing approximately 0.74 oz (21 g) should be used for the Class B brand.

8-3.3.2 Eighteen, nominal 1 in. × 1 in. × 6-in. (25 mm × 25 mm × 150-mm) strips, dressed on all four faces to 3/4 in. × 3/4 in. (19 mm × 19 mm) and placed in three layers of six strips each, with strips placed 1/4 in. (6 mm) apart, shall be used.

8-3.3.3 These strips shall be placed at right angles to those in adjoining layers and shall be nailed at each end of each strip on one face and in a diagonal pattern (as shown in Figure 5) on the other face.

8-3.4 Class C Test Brand.

8-3.4.1 The Class C test brand shall consist of a piece of dry, nonresinous, white pine lumber, free from knots and pitch pockets, 1 1/2 in. × 1 1/2 in. × 25/32 in. (38 mm × 38 mm × 19 mm) thick, with a saw kerf 1/8 in. (3 mm) wide, one half the thickness of the brand across the center of the top and bottom faces.

8-3.4.2 The saw kerf on opposite faces shall be at right angles to each other.

8-3.4.3 The dry weight of the finished brand shall be $9\frac{1}{4}$ g $\pm$ $1\frac{1}{4}$ g at time of test.

8-4 Ignition of Brands.

8-4.1 Before application to the test deck, the brands shall be ignited so as to burn freely in still air.

8-4.2 The brands shall be considered to be free burning after they have been subjected to the flame of a gas burner of such size that, during the process of ignition, the brands are nearly enveloped in the burner flame.

8-4.3 The flame temperature of the igniting flame shall be $1630^{\circ}\text{F} \pm 50^{\circ}\text{F}$ ($887^{\circ}\text{C} \pm 28^{\circ}\text{C}$) and shall be measured with a No. 14 gauge (1.6 mm diameter) Type K thermocouple $2\frac{7}{16}$ in. (59 mm) above the top of the burner, which shall be shielded from drafts.

8-4.4 The test brands shall be subjected to the required size of flame of the gas burner for the following periods of time:

(a) Class A test brands shall be exposed to the flame for 5 minutes, during which time they shall be rotated so as to expose each surface to the flame in the following manner and sequence:

Each 12 in. $\times$ 12-in. (305 mm $\times$ 305-mm) face for 30 seconds.

Each $2\frac{1}{4}$ in. $\times$ 12-in. (57 mm $\times$ 305-mm) face for 45 seconds.

Each 12 in. $\times$ 12-in. (305 mm $\times$ 305-mm) face again for 30 seconds.

(b) Class B test brands shall be exposed to the flame for 4 minutes, during which time they shall be rotated so as to expose each surface to the flame in the following manner and sequence:

Each 6 in. $\times$ 6-in. (150 mm $\times$ 150-mm) face for 30 seconds.

Each $2\frac{1}{4}$ in. $\times$ 6-in. (57 mm $\times$ 150-mm) face for 30 seconds.

Each 6 in. $\times$ 6-in. (150 mm $\times$ 150-mm) face again for 30 seconds.

(c) Class C test brands shall be exposed to the flame for 2 minutes, during which time they shall be rotated so as to expose each of the $1\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ -in. (38 mm $\times$ 38-mm) faces to the flame for 1 minute.

8-5 Test Conditions.

8-5.1 Class A Tests.

8-5.1.1 A brand shall be placed on the surface of each test deck at the location considered most vulnerable (point of minimum coverage over deck joint) with respect to ignition

of the deck, but in no case shall it be closer than 4 in. (100 mm) from either side or 12 in. (305 mm) from the top or bottom edge of the deck.

8-5.1.2 The brand shall be placed so that the strips in both the upper and lower layers are parallel to the direction of airflow, and the upper edge of the brand shall be located 3 in. (75 mm) above the horizontal joint in the test deck.

8-5.1.3 The brand shall be secured to the deck by a No. 18 (1.02 mm diameter) gauge soft iron wire.

8-5.1.4 If the roof covering is being tested as applied to plywood or other panel-type decks, the brand shall be placed so that it is centered laterally with respect to the vertical panel joint in the test deck, and the upper edge of the brand shall be located 3 in. (75 mm) above the horizontal panel joint in the test deck.

8-5.2 Class B Tests.

8-5.2.1 A brand shall be placed on the surface of the test deck at each of the two locations considered most vulnerable (point of minimum coverage over deck joint) with respect to ignition of the deck.

8-5.2.2 Each brand shall be positioned with its upper edge $1\frac{1}{2}$ in. (38 mm) above the selected joint in the deck boards, but in no case shall it be closer than 6 in. (150 mm) from each side or 12 in. (305 mm) from the top or bottom edge of the deck.

8-5.2.3 The brands shall be placed so that the strips in both the upper and lower layers are parallel to the direction of airflow.

8-5.2.4 The brands shall be secured to the deck by a No. 18 (1.02 mm diameter) gauge soft iron wire.

8-5.2.5 The second brand shall be applied 30 minutes after placing of the first brand or sooner if all burning resulting from the first brand has ceased.

8-5.2.6 If the roof covering is applied to plywood or other panel-type decks, the brands shall be placed so that they are centered laterally with respect to the vertical panel joints in the test deck, and the upper edge of the brands shall be located $1\frac{1}{2}$ in. (38 mm) above the horizontal panel joint in the test deck.

8-5.3 Class C Tests.

8-5.3.1 At 1- to 2-minute intervals, a brand shall be placed on the surface of the test deck at each of the 20 locations considered most vulnerable (points of minimum coverage over deck joints) with respect to ignition of the deck.

8-5.3.2 Each brand shall be positioned with its upper edge $\frac{1}{2}$ in. (13 mm) above the selected joint in the deck boards, but in no case shall it be closer than 6 in. (150 mm) from each side or 12 in. (305 mm) from the top or bottom edge of the deck.

8-5.3.3 No brand shall be placed closer than 4 in. (100 mm) from a point where a previous brand was located.

8-5.3.4 The brands shall be secured by a No. 18 (1.02 mm diameter) gauge soft iron wire stretched across the width of the deck and placed in the saw kerf of the brand. The saw kerf on the deck side of the brand shall be parallel to the direction of airflow.

8-5.3.5 In addition to the above requirements, where the roof covering is comprised of lapped courses, no brand shall be placed closer than 1/2 in. (13 mm) from the bottom edge of the lapped course above nor shall it be closer than 2 in. (50 mm) from a joint in the roof covering material in the same course. Loose or unfastened portions of the roof covering that can be bent up to 90 degrees without injury to fastenings holding other portions of roof covering shall be cut away.

8-5.3.6 If the roof covering is applied to plywood or other panel-type decks, the brands shall be placed so that as many of the 20 brands as possible are centered over panel joints in the test deck.

8-5.3.7 For treated wood shingles, 20 ignited brands are to be placed on each deck at 1- or 2-minute intervals. For treated wood shakes, 20 ignited brands are to be distributed at 1- or 2-minute intervals on each pair of decks. Each brand is to be centered over the 1/4-in. (6-mm) joint approximately 1/2 in. (13 mm) below the butt of the shake or shingle in the course above. No brand is to be placed closer than 4 in. (100 mm) from the point where a previous brand was located. Positioning and securing of brands shall otherwise be in accordance with 8-5.3.1.

8-6 Duration of the Test. Each individual test, whether Class A, Class B, or Class C, shall be continued until the brand is totally consumed and until all evidence of flame, glow, and smoke has disappeared from both the exposed surface of the material being tested and the underside of the test deck, or until failure occurs, but shall not be continued for more than 1 1/2 hours.

8-7 Test Results.

8-7.1 The results of tests in which the brands do not show progressive and substantially complete consumption after application to the test deck shall be disregarded.

8-7.2 If brands are replaced, they shall not be located in the same area as the disregarded brand.

8-8 Observations. During and after the burning brand tests, observations for the appearance of sustained flaming on the underside of the test deck, production of flaming or glowing brands of roof covering material, displacement of the test sample, and the exposure or falling away of portions of the roof deck shall be made.

Chapter 9 Flying Brand Test

9-1 General. This test shall be performed where there is a possibility that the roof covering will break into flaming particles that support combustion on the floor during the test exposure. (See Table 1.)

9-2 Procedure. A test deck 4 ft 4 in. (1320 mm) long shall be mounted in the same manner, and a luminous gas flame shall be used as specified in Section 5-2 for the intermittent flame test.

9-3 Application of Flame.

9-3.1 The Class A and Class B test gas flame shall be applied continuously for 10 minutes.

9-3.2 The Class C test flame shall be applied continuously for 4 minutes.

9-4 Air Current. Maintain the 12 mph (5.36 m/s) air current until all evidence of flame, glow, and smoke has disappeared from the exposed surface of the material being tested to determine if flying brands will develop. On treated wood shakes, the velocity of the air current shall be increased to 18.0 mph $\pm$ 0.75 mph (8.0 m/s $\pm$ 0.3 m/s) after the gas flame is extinguished.

Chapter 10 Rain Test¹

10-1 General.

10-1.1 The rain test shall be conducted where the fire retardant characteristics of the roof covering may be adversely affected by water.

10-1.2 Asphalt shingles meeting ASTM D 225, *Standard Method for Steam Distillation of Bituminous Protective Coatings*, ASTM D 3018, *Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules*, or UL55B, *Class C Asphalt Organic-Felt Sheet Roofing and Shingles*, slate, concrete, clay tile, and metal roofing that have been shown not to be adversely affected by prolonged exposure to the weather shall be exempt from the rain test.

10-1.3 This test shall be conducted on six test decks. (See Table 1.)

10-2 Procedure.

10-2.1 Test decks 4 ft 4 in. (1320 mm) long shall be mounted in a framework at a slope of 0.33:1 [4 in. (100 mm) per horizontal ft (300 mm)].

10-2.2 Approximately 7 ft (2130 mm) above the test decks, spray nozzles that deliver an average of 0.7 in. (17.8 mm) of water per hour at a temperature between 35°F - 60°F (2.0°C - 15.5°C) for the test deck area shall be mounted.

10-3 Application of Water.

10-3.1 The test decks shall be exposed to 12 one-week cycles.

¹ This method referenced is described as Method A in ASTM D 2898-77, *Methods of Test for Durability of Fire Retardant Treatment of Wood*.

10-3.2 Each cycle shall consist of 96 hours of water exposure and 72 hours of drying time at 140°F (60°C).

10-3.3 An alternative test cycle shall be permitted to be utilized, at the manufacturer's option, whereby two sets of six decks shall be alternately exposed to seven days (168 hours) of water exposure, followed by two days (48 hours) draining and five days (120 hours) drying at 140°F (60°C). This cycle shall be repeated seven times, with the exception that the seventh water exposure shall be reduced to six days (144 hours).

10-3.4 The final drying cycle shall be controlled so that the moisture content of the deck lumber is between 8 percent and 12 percent.

10-3.5 The intermittent flame, burning brand, and the flying brand tests shall then be repeated.

Chapter 11 Weathering Test

11-1 General. This test shall apply to materials or constructions where the fire retardant characteristics of the roof covering may be adversely affected by weather. (See Table 1.) The test is to be conducted on 3 ft 4 in. × 4 ft 4 in. (1020 mm × 1320 mm) test decks, which are to be mounted outdoors at an incline of 0.416:1 [5 in. (127 mm) per horizontal ft (305 mm)], facing south. After one, two, three, five, and ten years of exposure, three test decks are to be brought indoors and conditioned until the deck lumber attains a moisture content between 8 percent and 12 percent. For plywood decks, the moisture content is to be not greater than 8 percent. These decks are then to be subjected to intermittent flame, burning brand, and flying brand tests. (See Table 1.)

Chapter 12 Conditions of Classification

12-1 Conditions to Be Met. A roof covering material shall meet the conditions below when subjected to the particular class of fire tests.

12-1.1 At no time during or after the intermittent flame, spread of flame, or burning brand tests shall:

- (a) Any portion of the roof covering material be blown off or fall off the test deck in the form of flaming or glowing brands that continue to glow after reaching the floor, or
- (b) The roof deck be exposed, or
- (c) Portions of the roof deck fall away in the form of particles that continue to glow after reaching the floor.

12-1.2 At no time during Class A, Class B, or Class C intermittent flame and burning brand tests shall there be sustained flaming of the underside of the deck. If flaming does occur, another series of tests shall be conducted during which no sustained flaming shall occur.

12-1.3 At the conclusion of the spread of flame tests, the flaming shall not have spread beyond 6 ft (1820 mm) for Class A, 8 ft (2.44 m) for Class B, or 13 ft (3960 mm) (the top of the deck) for Class C. There shall have been no significant lateral spread of flame from the path directly exposed to the test flame.

12-1.4 In the flying brand test, no flying, flaming brands, or particles that continue to glow after reaching the floor shall be produced.

12-1.5 For roof covering materials intended only for use on noncombustible decks, exposure of the roof deck during the spread of flame test shall not constitute failure.

Chapter 13 Referenced Publications

13-1 The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

13-1.1 ASTM Publications. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D 225-1992, *Standard Method for Steam Distillation of Bituminous Protective Coatings*

ASTM D 2898-1981, *Methods of Test for Durability of Fire Retardant Treatment of Wood*

ASTM D 3018-1990, *Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules*

13-1.2 UL Publication. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL55B-1983, *Class C Asphalt Organic-Felt Sheet Roofing and Shingles*

13-1.3 U.S. Government Publication. United States Department of Commerce, National Institute of Standards and Technology, Gaithersburg, MD 20899.

PS1-1983, *Construction and Industrial Plywood*

Index

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SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

**Contact NFPA Standards Administration for final date for receipt of proposals
on a specific document.**

Note: All proposals must be received by 5:00 p.m. E.S.T./E.D.S.T. on the published proposal closing date.

INSTRUCTIONS

Use a separate proposal form for submitting each proposed amendment.

1. Type or print legibly in black ink.
2. Indicate the number, edition year, and title of the document. Also indicate the specific section or paragraph that the proposed amendment applies to.
3. Check the appropriate box to indicate whether this proposal recommends adding new text, revising existing text, or deleting text.
4. In the space identified as "Proposal" indicate the exact wording you propose as new or revised text, or the text you propose be deleted.
5. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal. Include copies of test results, research papers, fire experience, or other materials that substantiate your recommendation.
6. Check the appropriate box to indicate whether or not this proposal is original material, and if it is not, indicate the source of the material.
7. Sign the proposal.

If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee. The technical committee is authorized to abstract the "Statement of Problem and Substantiation for Proposal" if it exceeds 200 words for publication in the Technical Committee Reports.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

- (a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and
- (b) identification of the document, paragraph of the document to which the proposal is directed, and
- (c) a statement of the problem and substantiation for the proposal, and
- (d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.