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NFPA 203 Roof Coverings and Roof Deck Constructions 1992 Edition

NFPA®

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

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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RP, G-FM-91

NFPA 203

Guideline on

Roof Coverings and Roof Deck Constructions

1992 Edition

This edition of NFPA 203, *Guideline on Roof Covering and Roof Deck Constructions*, was prepared by the Technical Committee on Building Construction, released by the Correlating Committee on Building Construction, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 18-20, 1991 in Montréal, Québec, Canada. It was issued by the Standards Council on January 17, 1992, with an effective date of February 10, 1992, and supersedes all previous editions.

The 1992 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 203

The then NFPA Committee on Devices and Materials presented a report in 1909 on the Classification of Roofing Materials, which was revised and officially adopted in 1910. This report included standards on testing and certain other details that have since become obsolete. When the Committee was suspended in 1911 the responsibility for the classification of roofing materials was assumed by Underwriters Laboratories Inc., and the U.L. classification system was adopted and published by NFPA in 1960 in NFPA 203, together with the 1910 Classification and a Suggested Roofing Ordinance.

The 1970 edition was issued as a manual giving general information on roof coverings and their fire characteristics. The 1970 edition was revised in 1980 and editorially updated to reflect the NFPA *Manual of Style*. The 1987 edition represented a reconfirmation of the 1980 edition. For 1992 the Committee updated terminology and revised paragraphs needing clarification. The document has been revised as a Guideline as well.

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Gregory J. Cahanin, NFPA Staff Liaison

This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or any document developed by the Committee on which the member serves.

Contents

NFPA 203

Guideline on

Roof Coverings and Roof Deck Constructions

1992 Edition

Information on referenced publications can be found in Chapter 6.

Chapter 1 Introduction

1-1 General.

1-1.1 The term *roof covering* refers to the material or the combination of materials applied on top of the roof deck for weatherproofing and may include insulation.

1-1.2 Since most roof coverings are combustible to some degree, they may be vulnerable to external fire exposure. Some roof coverings will propagate a rapidly spreading fire over the surface or may allow the fire to penetrate the roof covering and to communicate to the interior of the building and must be avoided.

1-1.3 Roof coverings over metal and some other decks should also be considered for their possible contribution to fire spread originating on the interior of the building. The heat of the interior fire rises to the ceiling and may cause the liberation of combustible gases and flaming droplets through the joints, overlaps, and distortions of the deck. This can contribute significantly to the fire by flame spread beneath the roof and ignition of combustible contents by burning droplets of flowing materials.

1-1.4 A wide variety of roof coverings and roof deck constructions have been fire tested and listed by testing laboratories as to their characteristic behavior when subjected to external and internal fire exposure, respectively.

Chapter 2 General Types of Roof Coverings

2-1 Composition Built-up. As the term implies, these coverings consist of alternate layers of felt and bitumen built up into a weatherproof membrane. The felts are supplied in rolls and may be composed of organic, glass, or asbestos or other fibers saturated with bituminous material. Bitumen is used to bond the felts to each other and in some cases to the deck. It may consist of hot or cold applied asphalt or hot applied coal tar pitch. The finished surface may be a smooth flood coat of bitumen, or it may have gravel or slag imbedded in it. The gravel or slag surfacing acts to reflect heat, to prevent flow and cracking of the bitumen, and to improve the fire performance of the coverings. Another finish may be a granular surfaced capsheet. These coverings are normally applied to low slope roofs.

2-2 Prepared. These are coverings that are factory produced and ready for attachment to the deck, providing the complete weatherproofing. They include tile, slate, metal, shingle, and sheet goods. The shingle and sheet materials are of organic, glass felt, or other felt base coated with asphalt and surfaced with granules. Prepared coverings require sufficient slope for drainage.

2-3 Wood Shingles and Shakes. These are usually made from red cedar, redwood, or cypress wood. The shingles are sawed with a taper and applied with nails exposing one-third of the thick end. Shakes are split pieces resulting in a rough and uneven surface. They are applied like shingles. A sufficient slope for drainage is required.

2-4 Elastomer. Elastomer is a term given to essentially one-ply coverings applied in a thin membrane having elastic properties. Some of the advantages include light weight, reflectivity, color, resistance to corrosive atmospheres, and capability of being placed on steep or complex-shaped roofs. The materials are generally synthetic rubber or plastic products, supplied in sheet form cemented to the deck or in liquid form for brush, spray, or roller application. The sheets are usually 35 to 60 mil thick, and the dry film of the liquid method is about 20 mil thick. A solid deck is required with grouted or taped joints and cracks. The manufacturers' specifications must be carefully observed for proper applications.

Chapter 3 Fire Performance Classification

3-1 Exterior Exposure.

3-1.1 One test method for the evaluation of roof coverings from exterior fire exposure has gained national recognition. In fact, no other method of evaluation is known to be acceptable by any approval authorities. A detailed description of the test procedure, apparatus, and criteria for classification can be obtained by reference to Underwriters Laboratories Inc., UL 790, *Tests for Fire Resistance of Roof Covering Materials*. Essentially the same test methods are also given in NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*, and ASTM E108, *Standard Methods of Fire Tests of Roof Coverings*.

3-1.2 In brief, the tests consist of exposing the top surface of specimen roof decks to both gas flames and burning wood brands to determine if the coverings permit:

(a) Exposure of the deck below, or

(b) Excessive flame propagation of the covering itself, or

(c) Release of flaming or glowing material from the covering or the deck.

3-1.3 The tests are arranged to provide three levels of severity by adjusting the temperature and duration of the gas flame and the sizes of the burning wood brands. Successful coverings are rated Class A, B, or C with Class A passing the most severe exposure, Class B intermediate, and Class C the least severe. A photograph of the test apparatus is shown in Figure 1 and a drawing of the wood brands in Figure 2.

3-1.4 Supplementary rain and weathering tests are conducted on wood shingles and shakes to assure a high level of permanence of the treating materials.

3-1.5 In addition to roof coverings that have been classified in accordance with NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*, concrete, slate, concrete masonry, brick, metal, and tile are generally considered acceptable where Class A roof coverings are required by building codes.

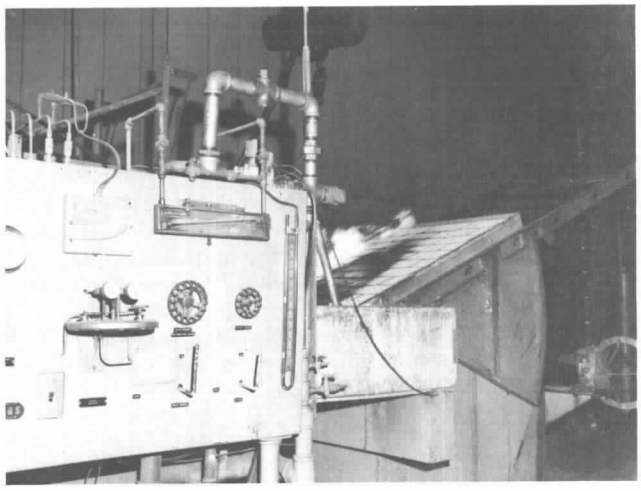

Figure 1 Test apparatus.

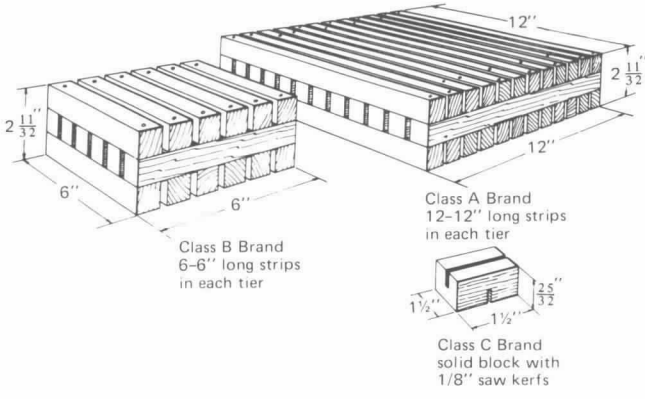

Figure 2 A, B, and C Brands.

Chapter 4 Fire Classification—Interior Exposure

4-1 Insulated Metal Deck.

4-1.1 General. With interior fires, the entire assembly of metal deck, vapor retarder, adhesives, insulation, and roof covering must be considered. A rapidly spreading under-the-deck fire is possible in such an assembly. Since the insulation is frequently thought of as part of the covering, a discussion of insulated metal deck is appropriate here.

4-1.2 Fire experience has illustrated that the nature and quantity of combustible adhesives, vapor retarder, insulation, roof covering, or combination thereof above a metal roof deck may contribute significantly to the development of an interior fire. The heat from the fire is readily transmitted to the combustibles directly above the metal decking, where destructive distillation liberates combustible gases. These hot gases build up pressure and, unable to vent to atmosphere because of the watertight roof covering, are forced downward through the joints in the metal deck, where they are ignited.

4-1.3 If these gases are liberated in sufficient quantity, they may progressively vaporize surrounding insulation, vapor retarder, and adhesive in a cyclic manner. Thus, the fire beneath the roof may propagate rapidly and independently of the fire in the contents. Adhesive may drip through the roof deck joints, rain down on combustible contents, and ignite them.

4-1.4 The Factory Mutual Research Corporation and Underwriters Laboratories Inc. conducted comprehensive large-scale fire tests to determine the fire characteristics of insulated metal deck roof constructions. In a 20-ft by 100-ft (6.1-m by 30.5-m) fire test building with a severe fire source at one end, they were able to demonstrate fire propagation beneath the roof deck and exhibit droplets of adhesive ahead of the fire source. Continued studies established that a roof assembly consisting of a metal deck, 1-in. (25.4-mm) thick vegetable fiberboard mechanically fastened to the deck, and a built-up roof covering would not propagate a rapidly spreading fire. The performance of this assembly established the criteria for judging other assemblies. Views of the test building are shown in Figures 3 (a), (b), and (c).

Figure 3(a) Overall view of 20-ft by 100-ft fire test building from exhaust end.

4-1.5 Small-scale tests have been developed by both the Factory Mutual Research Corporation and Underwriters Laboratories Inc. for the classification of roof decks based upon performance in the large building tests of acceptable constructions.

4-2 Factory Mutual Classification. Assemblies are placed in the Construction Materials Calorimeter, which yields results in terms of rate of heat release. Those assemblies

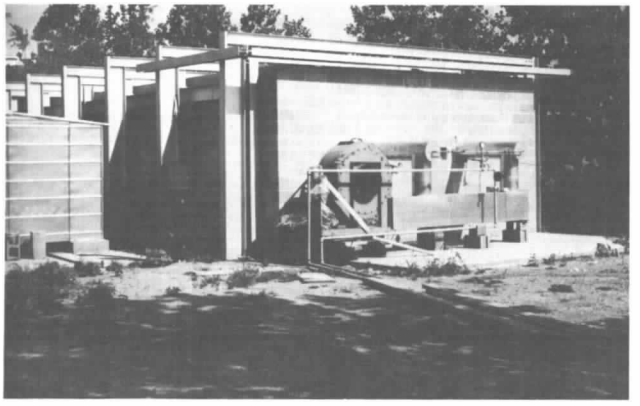

Figure 3(b) View of firing mechanism of fire test building.

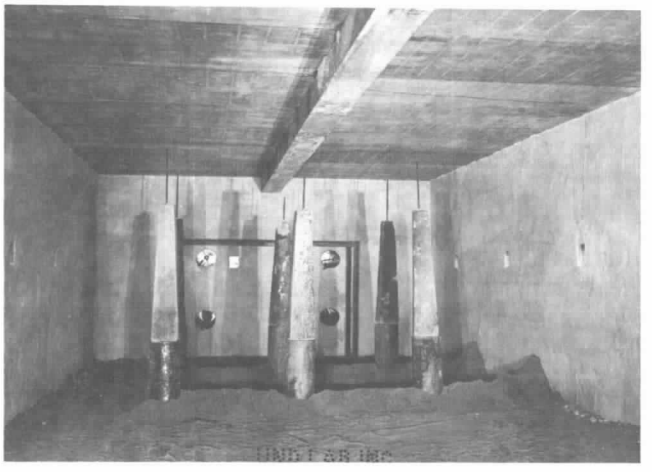

Figure 3(c) Interior view of firing end of fire test building.

that release heat at a sufficiently low rate are placed in Class I. Metal roof deck assemblies that fail to meet the fire requirements are placed in Class II.

4-3 Underwriters Laboratories Inc. Classification. When a basic roof deck design has demonstrated its performance in the 100-ft (30.5-m) building test, variations of that design can be tested in the Steiner Tunnel furnace and compared to the performance of the acceptable roof assembly. If comparable, it is listed and given a construction number. Comparability is judged on the basis of flame spread, absence of drippage, and extent of damage.

Chapter 5 Selection of Roof Coverings from a Fire Standpoint

5-1 General. The selection of roof coverings and roof deck constructions to resist fire propagation must be based on the proximity and severity of the external fire exposure and on the threat of internal fire from the contents and operation within the building. Those roof coverings with the greatest resistance to severe fire (Class A) are preferable. Both built-up and prepared roof coverings can be specified with a Class A rating, while treated wood shingles generally qualify for Class B or Class C ratings. The manufacturer's specifications should be followed carefully, and no variation from the materials or methods of construction for classified systems should be permitted.

5-2 Built-up Coverings. Gravel or slag may be required on the roofing surface for their fire resisting qualities. (They are also desirable for resistance to hailstones.) Many built-up roofs are limited in maximum slope.

5-3 Prepared Roofs. As with built-up roofs, roof slope is a design consideration.

5-4 Wood Shingles and Shakes. Untreated wood shingle roofs have been looked at with disfavor by the NFPA for many years. NFPA statistics indicate that wood shingles have been a contributing factor in more conflagrations than any other of twenty-seven factors during the period 1901 to 1967. This was particularly true in the first half of the period, before the full impact of modern building codes, which restricted the building of wood shingled roofs. If wood shingles or shakes are to be used, they should be fire-retardant treated and classified. Untreated shingles or shakes should not be considered. When wood shingles or shakes are to be used, they should be fire-retardant treated by a pressure impregnation process and classified in accordance with NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*.

5-5 Elastomeric Covering. Some of the liquids used in applying these coverings are flammable, and no open flames should be permitted near the areas of application.

Chapter 6 Referenced Publications

6-1 The following documents or portions thereof are referenced within this document and should be considered part of the recommendations of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

6-1.1 NFPA Publication. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*, 1987 edition

6-1.2 UL Publication. Underwriters Laboratories Inc., 333 Pfingsten Rd., Northbrook, IL 60062.

UL 790-1983, *UL Standard for Tests for Fire Resistance of Roof Covering Materials*, Fifth edition

6-1.3 ASTM Publication. American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103.

ASTM E108-1990, *Standard Methods of Fire Tests of Roof Coverings*

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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:

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(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.

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Fax No.: 617-770-3500

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

Date 5/18/85 **Name** John B. Smith **Tel. No.** 617-555-1212

Address 9 Seattle St., Seattle, WA 02255

Representing (Please indicate organization, company or self) Fire Marshals Assn. of North America

1. a) **Document Title:** Protective Signaling Systems **NFPA No. & Year** NFPA 72D

   b) **Section/Paragraph:** 2-7.1 (Exception)

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Log #: _____
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2. **Proposal recommends: (Check one)** ☐ **new text**
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3. **Proposal (include proposed new or revised wording, or identification of wording to be deleted):**

   Delete exception.

4. **Statement of Problem and Substantiation for Proposal:**

   A properly installed and maintained system should be free of ground faults. The occurrence of one or more ground faults should be required to cause a "trouble" signal because it indicates a condition that could contribute to future malfunction of the system. Ground fault protection has been widely available on these systems for years and its cost is negligible. Requiring it on all systems will promote better installations, maintenance and reliability.

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