International Building Code - Roof Assemblies And Rooftop Structures

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Module 15: Roof Assemblies and Rooftop Structures

Learning Objectives

By the end of this section, you will be able to:

- **Identify** and define various roofing materials and components in compliance with IBC standards.
- **Evaluate** performance requirements for wind resistance, fire classification, and weather protection.
- **Select** appropriate installation methods and material standards for specific roof coverings and rooftop structures.

Executive Summary: Module 15 governs the design, materials, construction, and quality of roof assemblies and rooftop structures. It establishes critical safety and performance thresholds—specifically regarding fire classification (Classes A, B, and C) and wind resistance—while providing detailed material and installation standards for systems ranging from asphalt shingles to high-performance single-ply membranes.

Section 1501: Design Fundamentals

Scope

The provisions of this chapter shall govern the design, materials, construction, and quality of roof assemblies and rooftop structures.

Section 1502: Definitions

General

The following words and terms shall have the meanings shown herein:

- **Built-up Roof Covering:** Two or more layers of felt cemented together and surfaced with a cap sheet, mineral aggregate, smooth coating, or similar surfacing material.
- **Interlayment:** A layer of felt or nonbituminous saturated felt not less than **18 inches** (457 mm) wide, shingled between each course of a wood-shake roof covering.
- **Mechanical Equipment Screen:** A partially enclosed rooftop structure used to aesthetically conceal HVAC, electrical, or mechanical equipment from view.
- **Metal Roof Panel:** An interlocking metal sheet having a minimum installed weather exposure of **3 square feet** (0.279 m2) per sheet.
- **Metal Roof Shingle:** An interlocking metal sheet having an installed weather exposure less than **3 square feet** (0.279 m2) per sheet.

- **Modified Bitumen Roof Covering:** One or more layers of polymer-modified asphalt sheets, fully adhered, mechanically attached, or held by an approved ballast layer.
- **Penthouse:** An enclosed, unoccupied structure above the roof occupying not more than **one-third** of the roof area.
- **Positive Roof Drainage:** Drainage condition ensuring the roof drains within **48 hours** of precipitation, considering all loading deflections.
- **Reroofing:** The process of recovering or replacing an existing roof covering.
- **Roof Assembly:** A system including the roof deck, vapor retarder, substrate or thermal barrier, insulation, and roof covering designed for weather protection and resistance to design loads.
- **Roof Covering:** The material applied to the roof deck for weather resistance, fire classification, or appearance.
- **Roof Deck:** The flat or sloped surface not including its supporting members or vertical supports.
- **Roof Recover:** Installing an additional roof covering over an existing one without removing it.
- **Roof Repair:** Reconstruction or renewal of any part of an existing roof for maintenance.
- **Roof Replacement:** Removing the existing roof covering, repairing damaged substrate, and installing a new covering.
- **Roof Ventilation:** Natural or mechanical process of air movement in attics or enclosed spaces over which a roof assembly is installed.
- **Rooftop Structure:** An enclosed structure on or above the roof of any part of a building.
- **Scupper:** An opening in a wall or parapet that allows water to drain from a roof.
- **Single-ply Membrane:** A roofing membrane field-applied using one layer of membrane material.
- **Underlayment:** One or more layers of felt or other approved material over which a steep-slope roof covering is applied.

Section 1503: Weather Protection

General

Roof decks shall be covered with approved roof coverings secured in accordance with this chapter and manufacturer instructions.

Flashing

Flashing shall prevent moisture from entering walls and roofs through joints, moisture-permeable materials, and intersections.

- **Locations:** Flashing is required at wall/roof intersections, gutters, changes in slope/direction, and around roof openings.
- **Metal Thickness:** Corrosion-resistant metal flashing must be at least **0.019 inch** (0.483 mm) thick (No. 26 galvanized sheet).

Coping

Parapet walls shall be coped with noncombustible, weatherproof materials no narrower than the thickness of the wall.

Roof Drainage

Design and installation shall comply with the plumbing subcode.

- **Gutters:** Gutters/leaders on the building exterior (except Group R-3, private garages, and Type V construction) shall be noncombustible or minimum **Schedule 40** plastic pipe.

Roof Ventilation

Vents shall be provided per Section 1203.2 and manufacturer instructions.

Section 1504: Performance Requirements

Wind Resistance

Roofs shall be designed for wind loads in accordance with Chapter 16.

- **Asphalt Shingles:** In areas where the basic wind speed is **110 mph** or greater, shingles must be tested to **ASTM D 3161, Class F**.

Wind Resistance of Clay and Concrete Tile.

Tile coverings shall be connected to the deck in accordance with Chapter 16.

- **Alternative Test Method:** Shingle resistance to wind uplift is determined using **UL 2390** and **ASTM D 6381**. This applies to buildings less than **60 feet** high in Wind Exposures B and C.

Table 1504.2.1: Roof Covering Classification Using Alternative Method

MAXIMUM BASIC WIND SPEED (mph)	ASTM D 6381 CLASSIFICATION
90	Class D
120	Class G
150	Class H

For SI: 1 mile per hour = 0.447m/s.

Wind Resistance of Nonballasted Roofs.

Mechanically attached or adhered coverings must resist design wind load pressures for cladding.

- **Other Systems:** Membrane coverings must be tested per **FM 4450, FM 4470, UL 580, or UL 1897**.
- **Metal Panels:** Must be tested to **UL 580 or ASTM E 1592**.

Ballasted Low-slope Roof Systems.

Systems with a slope **< 2:12** shall be designed per Section 1504.8 and **ANSI/SPRI RP-4**.

Edge Securement

Metal edge securement (except gutters) for low-slope roofs must be tested to **ANSI/SPRI ES-1**.

Physical Properties

Low-slope roof coverings must demonstrate integrity over **2,000 hours** of accelerated weathering (ASTM G 152, G 155, or G 154).

Impact Resistance

Low-slope coverings must resist impact per **ASTM D 3746, ASTM D 4272, CGSB 37-GP-52M, or FM 4470**.

Gravel and Stone

Gravel or stone is prohibited in **hurricane-prone regions** or where building height exceeds Table 1504.8.

Table 1504.8: Maximum Allowable Mean Roof Height Permitted for Buildings with Gravel or Stone on the Roof in Areas Outside a Hurricane-Prone Region

BASIC WIND SPEED FROM FIGURE 1609 (mph)[b]	MAXIMUM MEAN ROOF HEIGHT (ft)[a,c] Exposure category		
	B	C	D
85	170	60	30
90	110	35	15
95	75	20	NP
100	55	15	NP
105	40	NP	NP
110	30	NP	NP
115	20	NP	NP
120	15	NP	NP
Greater than 120	NP	NP	NP

For SI: 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s.
a. Mean roof height in accordance with Section 1609.2.
b. For intermediate values of basic wind speed, the height associated with the next higher value of wind speed shall be used, or direct interpolation is permitted.
c. NP = gravel and stone not permitted for any roof height.

Section 1505: Fire Classification

General

Roof assemblies must be tested to **ASTM E 108 or UL 790**.

Table 1505.1: Minimum Roof Covering Classification for Types of Construction

IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
B	B	B	C[c]	B	C[c]	B	B	C[c]

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2.
a. Deleted.
b. Nonclassified roof coverings shall be permitted on buildings of Group R-3 occupancies, where there is a minimum fire-separation distance of 6 feet measured from the leading edge of the roof.
c. Buildings that are not more than two stories in height and having not more than 6,000 square feet of projected roof area and where there is a minimum 10-foot fire-separation distance from the leading edge of the roof to a lot line on all sides of the building, except for street fronts or public ways, shall be permitted to have roofs of No. 1 cedar or redwood shakes and No. 1 shingles.

- **Class A:** Effective against **severe** fire exposure (e.g., masonry, slate, clay tile).
- **Class B:** Effective against **moderate** fire exposure (e.g., metal sheets/shingles).
- **Class C:** Effective against **light** fire exposure.
- **Nonclassified:** Approved material not listed as Class A, B, or C.
- **Fire-retardant-treated Wood:** Must be chemical-impregnated per **AWPA C1**.
- **Special Purpose Roofs:** Requires wood grading per Section 1507.8/9 and specific gypsum underlayment.

Purchase this course to see the remainder of the technical materials.