

Chapter 3—Roof System-specific Code Requirements

In this section, code language containing requirements that pertain to specific roof systems is quoted. The roof systems specifically identified in IBC 2009 are:

- Asphalt shingles
- Clay and concrete tile
- Metal roof panels
- Metal roof shingles
- Mineral-surfaced roll roofing
- Slate shingles
- Wood shingles
- Wood shakes
- Built-up roofing
- Modified bitumen roofing
- Thermoset single-ply roofing
- Thermoplastic single-ply roofing
- Spray polyurethane foam roofing
- Liquid-applied coatings
- Roof gardens and landscaped roofs

The terminology used in the list is in IBC 2009 and may not be consistent with current NRCA terms.

Roof system-specific requirements are contained within the Material and Installation sections in Chapter 15—Roof Assemblies and Rooftop Structures. Section 1504 Performance Requirements contains requirements for physical properties of roof coverings that pertain to each of the roof coverings detailed in Section 1507 Requirements for Roof Coverings. Section 1507 contains requirements for each specific roof covering and assembly. Section 1508 Roof Insulation contains requirements for roof insulation.

IBC 2009 uses the term Roof Covering to refer to a particular type of roofing product or system. The term is defined in Section 1502 Definitions as:

“**ROOF COVERING.** The covering applied to the roof deck for weather resistance, fire classification or appearance.”

Also within Section 1507, there are requirements for other components that are applicable when a particular roof covering is being used. IBC 2009 refers to these other components that are used with the roof covering as parts of the roof assembly. Roof assembly is defined in Section 1502 Definitions as:

“**ROOF ASSEMBLY.** A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof deck, *vapor retarder*, substrate or thermal barrier, insulation, *vapor retarder* and roof covering.”

In the following sections, the general physical requirements that apply for all roof coverings will be presented followed by requirements that apply to each of the individual roof coverings and assemblies.

REQUIREMENTS APPLICABLE TO ALL ROOF COVERINGS

In Section 1504 Performance Requirements, there is the following requirement regarding the physical properties of roof coverings. The section states:

“**1504.6 Physical properties.** Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 1507 shall demonstrate physical integrity over the working life of the roof based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G152, ASTM G155 or ASTM G154. Those roof coverings that are subject to cyclical flexural response due to wind loads shall not demonstrate any significant loss of tensile strength for unreinforced membranes or breaking strength for reinforced membranes when tested as herein required.”

There are three acceptable test methods to determine roof coverings’ physical properties:

ASTM G152, “Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Non-

metallic Materials,” covers the basic principles and operating procedures for using open flame carbon-arc light and water apparatus intended to reproduce the weathering effects that occur when materials are exposed to sunlight (either direct or through window glass) and moisture as rain or dew in actual use.

ASTM G155, “Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials,” covers the basic principles and operating procedures for using xenon arc light and water apparatus intended to reproduce the weathering effects that occur when materials are exposed to sunlight (either direct or through window glass) and moisture as rain or dew in actual use.

ASTM G154, “Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials,” covers the basic principles and operating procedures for using fluorescent UV light and water apparatus intended to reproduce the weathering effects that occur when materials are exposed to sunlight (either direct or through window glass) and moisture as rain or dew in actual usage.

In Section 1506 Materials, there are general requirements for roofing materials. They are:

“**1506.1 Scope.** The requirements set forth in this section shall apply to the application of roof-covering materials specified herein. Roof coverings shall be applied in accordance with this chapter and the manufacturer’s installation instructions. Installation of roof coverings shall comply with the applicable provisions of Section 1507.

1506.2 Compatibility of materials. Roofs and roof coverings shall be of materials that are compatible with each other and with the building or structure to which the materials are applied.

1506.3 Material specifications and physical characteristics. Roof-covering materials shall conform to the applicable standards *listed* in this chapter. In the absence of applicable standards or where materials are of questionable suitability, testing by an *approved* agency shall be required by the *building code official* to determine the character, quality and limitations of application of the materials.

1506.4 Product identification. Roof-covering materials shall be delivered in packages bearing the manufacturer’s identifying marks and *approved* testing agency labels required in accordance with Section 1505. Bulk shipments of materials shall be accompanied with the same information issued in the form of a certificate or on a bill of lading by the manufacturer.”

REQUIREMENTS FOR ROOF COVERINGS, ASSEMBLIES AND ROOF INSULATION

In Section 1507 Requirements for Roof Coverings, there are requirements for specific roof assemblies. Section 1507.1 Scope states:

“**1507.1 Scope.** Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer’s installation instructions.”

Requirements specific to particular roof coverings begin with IBC 2009 Section 1507.2 on page 26 of this document.

Section 1508 addresses the requirements for roof insulation. The section states:

“**1508.1 General.** The use of above-deck thermal insulation shall be permitted provided such insulation is covered with an *approved* roof covering and passes the tests of FM 4450 or UL 1256 when tested as an assembly.

Exceptions:

1. Foam plastic roof insulation shall conform to the material and installation requirements of Chapter 26.
2. Where a concrete roof deck is used and the above-deck thermal insulation is covered with an *approved* roof covering.

1508.1.1 Cellulosic fiberboard. Cellulosic fiberboard roof insulation shall conform to the material and installation requirements of Chapter 23.

1508.2 Material standards. Above-deck thermal insulation board shall comply with the standards in Table 1508.2.”

TABLE 1508.2**MATERIAL STANDARDS FOR ROOF INSULATION**

Cellular glass board	ASTM C552
Composite boards	ASTM C1289, Type III, IV, V or VI
Expanded polystyrene	ASTM C578
Extruded polystyrene board	ASTM C578
Perlite board	ASTM C728
Polyisocyanurate board	ASTM C1289, Type I or Type II
Wood fiberboard	ASTM C208

FM 4450, “Approval Standard for Class 1 Insulated Steel Deck Roofs,” provides FM Approvals requirements for the approval of Class 1 insulated steel roof decks. A Class 1 insulated steel roof deck is one that meets the criteria of this standard for fire, wind uplift, live load resistance, corrosion of metal parts and fatigue of plastic parts. The standard is referenced in this section as part of the criteria for when the use of above-deck thermal insulation shall be permitted.

UL 1256, “Standard for Fire Test of Roof Deck Constructions,” covers fire test methods to evaluate the performance of metallic and nonmetallic roof deck constructions subjected to internal (under deck) fire exposures for the purpose of determining the contribution of the roof covering material, insulation and other components of the roof system to the spread of fire within a building. This standard is referenced in this section as part of the criteria for when the use of above-deck thermal insulation shall be permitted.

ASTM C552, “Standard Specification for Cellular Glass Thermal Insulation,” addresses four types of cellular glass insulation. Generally, Type I—flat block and Type IV—board are used in roofing. Both are available as tapered stock that may be used to provide slope for roof drainage. The standard is referenced in this section as an acceptable material standard for cellular glass board used as roof insulation.

ASTM C1289, “Standard Specification for Faced Rigid Board Cellular Polyisocyanurate Thermal Insulation,” provides a material composition description, physical property requirements, test protocols and dimensional tolerances for faced polyisocyanurate board insulation and composite board insulation composed of polyisocyanurate and another type of rigid board material. The standard provides a classification for seven types of material. Type I products generally are used in wall sheathing applications. Type II generally designates products appropriate for roof system applications. Types III-VII designate various polyisocyanurate composite roof board products. The standard is referenced in this section as an acceptable material standard for polyisocyanurate board and composite boards used as roof insulation.

ASTM C578, “Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation,” provides a classification for 13 types of rigid cellular polystyrene insulation: six are types of expanded polystyrene (EPS) insulation and seven are types extruded polystyrene (XPS) insulation. The different product types are characterized by distinctive physical properties, such as density, compressive strength and thermal resistance (R-value). EPS is more sensitive to UV degradation and moisture absorption than XPS. XPS used in roof and waterproofing systems usually is referred to by its compressive strength value, such as 15 pounds per square inch (psi), 25 psi or 40 psi. XPS is more weather-resistant and is used in protected membrane and vegetative roof systems where insulation is not covered by a roof membrane. The standard is referenced in this section as an acceptable material standard for EPS and XPS board used as roof insulation.

ASTM C728, “Standard Specification for Perlite Thermal Insulation Board,” provides a material composition description, physical property requirements and dimensional tolerances for perlite thermal insulation board used principally in roof system construction. The standard is referenced in this section as an acceptable material standard for perlite board used as roof insulation.

ASTM C208, “Standard Specification for Cellulosic Fiber Insulation Board,” provides a classification for six types of cellulosic-fiber insulating board. Roof insulation board, also referred to as wood fiber roof insulation and wood fiberboard, is classified as Type II in the standard.

Two grades of Type II materials are defined. Grade 1 is primed and designed primarily for use under built-up and polymer-modified bitumen roof systems. Grade 2 is unprimed and designed primarily for use under single-ply roof systems and generally has higher density and higher-quality physical properties. The standard is referenced in this section as an acceptable material standard for wood fiberboard used as roof insulation.

3.1 ASPHALT SHINGLES

Section 1507.2 addresses the requirements for asphalt shingle roof assemblies. The section states:

“1507.2 Asphalt shingles. The installation of asphalt shingles shall comply with the provisions of this section.

1507.2.1 Deck requirements. Asphalt shingles shall be fastened to solidly sheathed decks.

1507.2.2 Slope. Asphalt shingles shall only be used on roof slopes of two units vertical in 12 units horizontal (17-percent slope) or greater. For roof slopes from two units vertical in 12 units horizontal (17-percent slope) up to four units vertical in 12 units horizontal (33-percent slope), double underlayment application is required in accordance with Section 1507.2.8.

1507.2.3 Underlayment. Unless otherwise noted, required underlayment shall conform to ASTM D226, Type I, ASTM D4869, Type I, or ASTM D6757.

1507.2.4 Self-adhering polymer modified bitumen sheet. Self-adhering polymer modified bitumen sheet shall comply with ASTM D1970.

1507.2.5 Asphalt shingles. Asphalt shingles shall comply with ASTM D225 or ASTM D3462.

1507.2.6 Fasteners. Fasteners for asphalt shingles shall be galvanized, stainless steel, aluminum or copper roofing nails, minimum 12 gage [0.105 inch (2.67 mm)] shank with a minimum $\frac{3}{8}$ inch-diameter (9.5 mm) head, of a length to penetrate through the roofing materials and a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing. Where the roof sheathing is less than $\frac{3}{4}$ inch (19.1 mm) thick,

the nails shall penetrate through the sheathing. Fasteners shall comply with ASTM F1667.

1507.2.7 Attachment. Asphalt shingles shall have the minimum number of fasteners required by the manufacturer, but not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12), shingles shall be installed as required by the manufacturer.

1507.2.7.1 Wind resistance. Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingles shall meet the classification requirements of Table 1507.2.7.1(1) for the appropriate maximum basic wind speed. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D7158 and the required classification in Table 1507.2.7.1(1).”

**TABLE 1507.2.7.1(1)
CLASSIFICATION OF ASPHALT SHINGLES
PER ASTM D7158^a**

MAXIMUM BASIC WIND SPEED FROM FIGURE 1609	CLASSIFICATION REQUIREMENT
85	D, G or H
90	D, G or H
100	G or H
110	G or H
120	G or H
130	H
140	H
150	H

a. The standard calculations contained in ASTM D7158 assume exposure category B or C and building height of 60 feet (18,288 mm) or less. Additional calculations are required for conditions outside of these assumptions.

An exception to Section 1507.2.7.1 is:

“Exception: Asphalt shingles not included in the scope of ASTM D7158 shall be tested and labeled to indicate compliance with ASTM D3161 and the required classification in Table 1507.2.7.1(2).”

TABLE 1507.2.7.1(2)
CLASSIFICATION OF ASPHALT SHINGLES
PER ASTM D3161

MAXIMUM BASIC WIND SPEED FROM FIGURE 1609	CLASSIFICATION REQUIREMENT
85	A, D or F
90	A, D or F
100	A, D or F
110	F
120	F
130	F
140	F
150	F

Table 1507.2.7.1(1) and Table 1507.2.7.1(2) reference Figure 1609, Basic Wind Speed (3-second Gust). Section 1609 Wind Loads, Figure 1609, as it appears in the code text, follows: