



A

COMPENDIUM

OF

CHANGES

by Mark S. Graham

Updates to the I-Codes will affect roof system design and installation



During the past several months, the International Code Council® has updated its model codes,

commonly referred to as the I-Codes. Because the I-Codes serve as the technical basis for most state, county and parish, and local jurisdictions' codes, publication of new, revised and updated editions can affect roof system designs and applications. As jurisdictions begin the processes of updating their codes, you should be aware of the roofing-related changes incorporated into the 2021 I-Codes.

This month, I will address significant roofing-related changes to the 2021 editions of the International Building Code,® International Existing Building Code® and International Fire Code.® In the September issue, I will address the roofing-related changes to the International Energy Conservation Code,® International Residential Code,® and International Plumbing Code.®

Code development process

The 2021 editions of the I-Codes present the codes as originally issued in 2000 with changes reflected in the 2003 through 2018 editions and further changes approved by ICC's subsequent code development process through 2019.

For the 2021 I-Codes, ICC's code development process occurred in two groups: Group A and Group B. Eleven code development committees from the two groups met during a span of two years to review the code change proposals and make recommendations for consideration by ICC membership. Final consideration of the code change proposals from each group occurred at ICC's annual conference where ICC code official members voted to approve the committees' recommendations and considered the individual code change proposals. ICC also has an online voting procedure where members who did

not attend the annual conference could submit their votes.

In the 2021 I-Codes, solid vertical lines in the margins within the body of the code indicate technical changes from the 2018 edition. A bold arrow in the margins indicates where an entire section, paragraph, exception or table has been deleted or an item in a list of items or a row of a table has been deleted.

A single asterisk placed in the margin indicates text or a table has been relocated. A double asterisk placed in the margin indicates the text or table immediately following it has been relocated there from elsewhere in the code.

IBC 2021

IBC 2021 was published Oct. 23, 2020. Most of the roofing-related provisions in IBC 2021 are contained in Chapter 15-Roof Assemblies and Rooftop Structures.

In Section 1503.3-Parapet Walls, new language has been added clarifying parapet walls shall be coped or covered with weatherproof materials of a width not less than the thickness of the parapet wall. For fire-resistance-rated parapet walls, the weatherproof materials must ensure the fire-resistance rating of the wall is not decreased. This revision is intended to permit fire-classified roof coverings to be used for coping fire-resistance-rated parapet walls.

In Section 1504.6-Edge Systems for Low-slope Roofs, the requirement for ANSI/SPRI ES-1 testing of metal edge systems has been expanded to include all built-up, polymer-modified bitumen and single-ply roof systems having slopes less than 2:12. Previously, the code's ES-1 requirement only applied where the edge metal secured the edges of roof membranes.

A further clarification in this section indicates metal counterflashings are outside the scope of the code's ES-1 testing requirement.

THE ICC FAMILY OF CODES

The ICC family of model codes, commonly referred to as the “I-Codes,” is a complete set of complementary documents that provides users with full integration and coordination of technical provisions. Individual codes also can be used in subsets or as stand-alone documents. So that each individual code is as complete as possible, some technical provisions that are relevant to more than one

subject area are duplicated in some of the model codes. For example, the provisions for reroofing contained in Section 1512-Reroofing of IBC 2021 are also contained in Section 705-Reroofing of IEBC 2021. This allows jurisdictions flexibility in their application of the I-Codes.

The 14 model codes comprising the I-Codes are as follows:

Section 1504.6.1-Gutter Securement for Low-slope Roofs adds a requirement for gutters to be tested for wind resistance according to ANSI/SPRI GT-1’s Test Methods G-1 and G-2 on built-up, polymer-modified bitumen and single-ply roof systems having slopes less than 2:12 where a gutter is used to secure the edge of the roof membrane.

Section 1504.9-Wind Resistance of Aggregate-surfaced Roofs provides new requirements for the use of aggregate surfacing on built-up and polymer-modified bitumen roof systems. A new table has been added, Table 1504.9-Minimum Required Parapet Height (inches) for Aggregate Surfaced Roofs, that prescribes minimum permitted parapet heights based on aggregate size by ASTM International designation, mean roof height, basic design wind speed and wind exposure.

Minimum parapet heights range from 2 inches to 56 inches (64 inches in Exposure D) depending on the building’s parameters. Where minimum parapet height is indicated as 2 inches, the table indicates a metal gravel stop is permitted and must extend no less than 2 inches from the roof surface and no less than the height of the aggregate.

Applicable to clay and concrete tile roof systems, in Section 1507.3-Clay and Concrete Tile, Sub-section 1507.3.1-Deck Requirements an exception has been added indicating spaced lumber sheathing shall be permitted in Seismic Design Categories A, B and C. In previous code editions, tile roofs were limited to solid sheathing roof decks.

Section 1507.12-Single-ply Roofing is new in IBC 2021 and combines two sections from previous code editions that addressed thermoset and thermoplastic single-ply roof systems separately. This revision is strictly a change in formatting; there are no technical changes to the requirements for single-ply membrane roof systems.

In Section 1507.14-Liquid-applied Roofing, ASTM International product standards for protective roof coatings have been moved to a new section specifically addressing protective roof coatings.

In Section 1507.16-Photovoltaic Shingles and Section 1507.17-Building-integrated Photovoltaic Roof Panels, UL 7103, “Outline of Investigation for Building-Integrated

Photovoltaic Roof Coverings,” or both UL 61730-1, “Standard for Photovoltaic (PV) Module Safety Qualification—Part 1: Requirements for Construction,” and UL 61730-2, “Photovoltaic (PV) Module Safety Qualification—Part 2: Requirements for Testing,” have been added as product standards and listing and labeling requirements. UL 1703 has been deleted from IBC 2021.

Section 1509-Roof Coatings is new to IBC 2021 and provides minimum requirements for protective roof coatings installed on a roof covering. Protective roof coatings must comply with one of the product standards listed in Table 1509.2-Roof Coating Materials Standards, the fire classification requirements in Section 1505-Fire Classification and manufacturers’ installation instructions. Table 1509.2 provides a list of ASTM International product standards for acrylic, aluminum-pigmented asphalt, asphalt, asphaltic emulsion, moisture-cured polyurethane and silicone roof coatings.

In Section 1512-Reroofing, a provision has been added in Section 1512.4-Reinstallation of Materials permitting existing aggregate, paver and lightweight interlocking paver ballast to be reused if not damaged, cracked or broken.

Chapter 12-Interior Environment includes requirements for attic ventilation in Section 1202-Ventilation. IBC 2021 includes a change in Section 1202.3-Unvented Attic and Unvented Enclosed Rafter Assemblies requiring the design and installation of a vapor diffusion port in unvented attics using air-permeable insulation in Climate Zones 1, 2 and 3. Such a vapor diffusion port is not required if air-impermeable insulation is used.

Chapter 16-Structural Design provides requirements for determining design wind loads applicable to buildings, including buildings’ roof assemblies. Section 1603-Construction Documents provides the code’s longstanding requirement for wind design data, including the basic design wind speed and design wind pressures, to be included in construction documents. With IBC 2021, a provision has been added requiring the design wind zones (field, perimeter and corners) be denoted and

- International Building Code®
- International Code Council Performance Code® for Buildings and Facilities
- International Energy Conservation Code®
- International Existing Building Code®
- International Fire Code®
- International Fuel Gas Code®
- International Mechanical Code®
- International Plumbing Code®
- International Private Sewage Disposal Code®
- International Property Maintenance Code®
- International Residential Code® for One- and Two-Family Dwellings
- International Swimming Pool and Spa Code®
- International Wildland-Urban Interface Code®
- International Zoning Code®

dimensioned in the construction documents. This should assist with better understanding of complex roof zones and the resulting additional attachment requirements.

IEBC 2021

IEBC 2021 was published Dec. 28, 2020, and applies to the repair, alteration, change of occupancy, addition to and relocation of existing buildings. Its intent is to provide some degree of flexibility to permit the use of alternative approaches to achieve compliance with the code's minimum requirements.

Most of the roofing-related provisions in IEBC 2021 apply to reroofing and are contained in Chapter 7—Alterations—Level 1. IEBC's Level 1 alterations are described to include removal and replacement of existing materials that serve the same purpose as the original.

Section 705-Reroofing specifically addresses recovering and replacing existing roof systems. The requirements in Section 705 closely—nearly identically—match those of IBC 2021's Section 1512-Reroofing.

Section 706-Structural also provides specific building structural requirements when reroofing. Section 706.3.2 lists requirements for analyzing and, if necessary, strengthening a roof diaphragm's resistance (a roof deck's lateral resistance) to wind loads in high-wind regions where a reroofing permit is required. IEBC 2021 raises the threshold where analysis is required to an ultimate design wind speed greater than 130 mph. In IEBC 2018, that threshold was greater than 115 mph.

Also, for the same diaphragm requirement, IEBC 2021 adds an exception for buildings that have complied with the wind load provisions of ASCE 7-88, "Minimum Design Loads for Buildings and Other Structures," or later editions.

IFC 2021

IFC 2021 was published Nov. 3, 2020, and establishes regulations relating to structures, processes, premises

and safeguards from the hazard of fire and explosion arising from the storage, handling or use of structures, materials or devices. As an example, though the IBC or IEBC apply to a completed roof assembly, the IFC largely applies to the installation (or reroofing) operations of a building roof assembly.

In the IFC, roofing-related requirements are provided in Section 303-Asphalt Kettles, Section 317-Landscaped Roofs, Section 905-Standpipe Systems (as they apply to landscaped roofs) and Section 3318-Safeguarding Roofing Operations. Also, a definition of torch-applied roof system is provided in Chapter 2-Definitions.

In IFC 2021, minor wording changes apply to the requirements in Section 317 and Section 905 for landscaped roofs; however, these changes do not appear to result in technical changes to the code's requirements.

There are no other roofing-related changes in IFC 2021.

Get the I-Codes

As jurisdictions begin the processes of updating their codes, which I expect will occur later this year, you should be aware of the roofing-related changes incorporated into the 2021 I-Codes and have a copy of the applicable codes on hand. Jurisdictions' adoption processes typically are based on specifically defined periods after a code is first published.

You can purchase the 2021 I-Codes in soft cover or loose-leaf format or download them. ICC also offers a web-based version, Digital Codes Premium, which is available by either a monthly or annual subscription. To purchase the I-Codes, go to code.iccsafe.org.

NRCA has a limited amount of the IBC 2021 and IECC 2021 available in soft cover format at ICC member pricing. To take advantage of the special pricing, go to shop.nrca.net. 📄🔗

MARK S. GRAHAM is NRCA's vice president of technical services.



A COMPENDIUM
OF CHANGES:

PART TWO / BY MARK S. GRAHAM

BE AWARE
OF BUILDING
CODES THAT
REFERENCE
**ROOF SYSTEM
INSTALLATIONS**



The International Code Council® promulgates a comprehensive set of 14 model building codes that serve as the basis for most jurisdictions' construction codes. ICC's codes are updated and published on a three-year cycle with the most current editions having a 2021 edition date.

In the April issue, I discussed the roofing-related changes incorporated into the *International Building Code,® 2021 Edition*; *International Existing Building Code,® 2021 Edition*; and *International Fire Code,® 2021 Edition*. Here, I will provide an overview of the roofing-related changes incorporated into the *International Energy Conservation Code,® 2021 Edition*; *International Plumbing Code,® 2021 Edition*; and *International Residential Code® for One- and Two-Family Dwellings, 2021 Edition*.

IECC 2021

IECC 2021 contains two sets of provisions: commercial and residential.

IECC's commercial provisions apply to all buildings except residential buildings three stories or less in height. IECC's residential provisions apply to detached one- and two-family dwellings as well as Group R-2, R-3 and R-4 buildings three stories or less in height. IECC's commercial provisions apply to residential buildings four stories or greater in height.

IECC's commercial provisions are designated having a "[CE]" in chapter numbering and a "C" in section numbering. Residential provisions are designated having an "[RE]" in chapter numbering and an "R" in section numbering.

IECC's commercial provisions

IECC 2021's roofing-related provisions applicable to commercial buildings occur in Chapter 3[CE]—General Requirements, Chapter 4[CE]—Commercial Energy Efficiency and Chapter 5[CE]—Existing Buildings.

In Chapter 3[CE], the climate zone map has been revised. Climate Zone 0 has been added, and the climate zones in the continental U.S. have shifted slightly northward. Figure C301.1—Climate Zones provides a climate zone map. ICC reports about 10% of counties' and parishes' climate zones have changed. Table C301.1—Climate Zones, Moisture Regimes, and Warm Humid Designations by State, County and Territory provides a list of climate zones. Counties and parishes in this table with a revision bar in the margin indicate climate zone changes from IECC 2018.

In Chapter 4[CE]—Commercial Energy Efficiency, Section C401.2—Application, the explanation of compliance options has been reformatted and reworded. There are two compliance options: a prescriptive option, which requires compliance with Sections C402 through C406 and Section C408, and a total building

performance option, which requires compliance with Section C407.

An alternative compliance option also is available: complying with ANSI/ASHRAE/IESNA 90.1-19, “Energy Standard for Buildings Except Low-Rise Residential Buildings.”

Repairs to roof systems and reroofing are addressed in Chapter 5[CE]—Existing Buildings.

Table C402.1.3—Opaque Thermal Envelope Insulation Component Minimum Requirements, R-value Method, provides minimum R-values for building components, including roof assemblies, applicable when using IECC’s

In Section 402.1.4—Assembly U-factor, C-factor or F-factor-based Method, a new section has been added to the prescriptive compliance option allowing the U-factor method to be used for roof/ceiling assemblies. Section C402.1.4.1—Roof/Ceiling Assembly now provides specific requirements for using above-deck tapered insulation, suspended ceilings and above-deck insulation in two or more layers with joints staggered.

In Section C402.2—Specific Building Thermal Envelope Insulation Requirements, changes have been made to the prescriptive compliance option’s R-value method. Section C402.2.1.1—Tapered, Above-Deck Insulation

Based on Thickness now allows the R-value of tapered insulation systems to be calculated on the average R-value method. The minimum thickness at a low point is 1 inch.

Section C402.2.1.3—Suspended Ceilings stipulates insulation, such as batt insulation, installed on removeable ceiling tiles is not permitted to be considered toward the minimum required R-value.

Section C402.2.1.4—Joints Staggered requires above-deck thermal insulation to be installed in two or more layers with edge joints staggered between each layer except where roof insulation tapers at gutter edges, roof drains and scuppers.

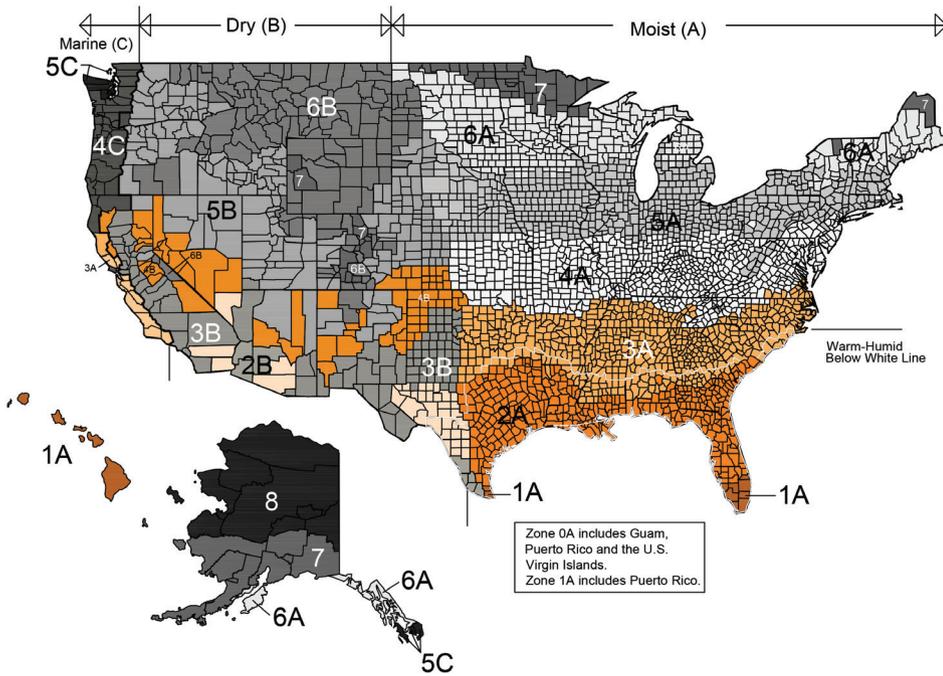
There are no changes in IECC 2021’s requirements for roof reflectance and solar emittance.

Regarding air retarders (IECC refers to them as air barriers), in Section C402.5.1.2—Air Barrier Compliance, the applicability of IECC 2021’s air retarder requirements have changed somewhat. The code’s air retarder requirements are required in all occupancies except

Groups R and I are exempted in Climate Zones 0B, 1, 2B, 3B, 3C, 4B, 4C, 5B and 5C in specifically defined circumstances. In IECC 2018, the air retarder requirements applied to all buildings except in Climate Zone 2B.

In Section C402.5.1.4—Assemblies, ASTM D8052, “Standard Test Method for Quantification of Air Leakage in Low-Sloped Membrane Roof Assemblies,” has been added as an additional test method for determining the air leakage of building assemblies.

Section C402.5.1.5—Building Envelope Performance Verification provides new requirements for performance verification of installed air retarders. Separate guidance



IECC 2021’s climate zone map

prescriptive compliance option. For roof components designated as “attic and other,” the minimum required R-values have increased to R-49 in Climate Zones 4 and 5 and R-60 in Climate Zones 7 and 8. In Climate Zone 8 for roof components designated as “metal buildings,” the minimum required R-values have increased to R-25 and R-11 layers and an additional R-11 layer, which includes a liner system.

Similar increases (those being reductions in U-factors) are incorporated into IECC 2021’s maximum U-factor table, Table C402.1.4—Opaque Thermal Envelope Assembly Maximum Requirements, U-factor Method.

is provided for construction document review, inspection of accessible components and final commissioning.

Section 402.5.3—Building Thermal Envelope Testing provides new requirements for testing a building envelope’s air retarder effectiveness.

Roof system repairs and reroofing are addressed in IECC 2021’s Chapter 5[RE]-Existing Buildings. In Section C503.2.1—Roof Replacement, a requirement is added indicating a roof assembly’s R-value shall not be decreased or U-factor increased because of roof system replacement. Because this section already requires insulation levels identical to IECC 2021’s for new construction, it appears this added requirement is intended to address existing buildings with insulation levels exceeding the code’s current requirements.

IECC’s residential provisions

IECC 2021’s roofing-related provisions applicable to residential buildings occur in Chapter 3[RE]—General Requirements, Chapter 4[RE]—Residential Energy Efficiency and Chapter 5[RE]—Existing Buildings.

In Chapter 3[RE]—General Requirements, the same changes made to the climate zones in Chapter 3[CE]—General Requirements also apply.

In Chapter 4[RE]—Residential Energy Efficiency, Section R401.2—Application, the explanation of the permissible compliance paths has been reformatted and reworded.

There are four compliance options:

- A prescriptive option, which requires compliance with Sections R401 through R404
- A total building performance option, which requires compliance with Section R405
- An Energy Rating Index option, which requires compliance with Section R406
- A tropical climate region option, which requires compliance with Section R407

Repairs to roof systems and reroofing are addressed in Chapter 5[RE]—Existing Buildings.

For the prescriptive compliance path, clarifying language has been added in Section R402.1.4—R-value Computation addressing R-value calculation methods and in Section R402.2.3—Eave Baffle addressing continuous vent baffle installation.

There are no roofing-specific revisions to IECC 2021’s total building performance, Energy Rating Index option and tropical climate region options. Similarly, there are no revisions to IECC 2021’s requirements for roof system

repairs and reroofing in IECC 2021’s Chapter 5[RE]-Existing Buildings.

IPC 2021

IPC 2021 provides minimum requirements for buildings’ plumbing systems, including roof drains. Roof drains, drain piping, parapet wall scuppers, gutters and other secondary roof drains are addressed in IPC 2021’s Chapter 11—Storm Drainage.

Section 1102.6—Roof Drains now requires roof drains, other than siphonic roof drains, to be tested and rated for flow rate according to ASME A112.6.4, “Roof, Deck, and Balcony Drains,” or ASPE/IAPMO Z1034, “Test Method for Evaluating Roof Drain Performance.” Roof drain manufacturers should publish flow rate data for their specific roof drain models and sizes.

In Section 1106.2—Size of Storm Drain Piping and Section 1106.2.1—Rainfall Rate Conversion Method, a method has been added for converting rainfall intensity to flow rate for code-compliant drain piping sizing.

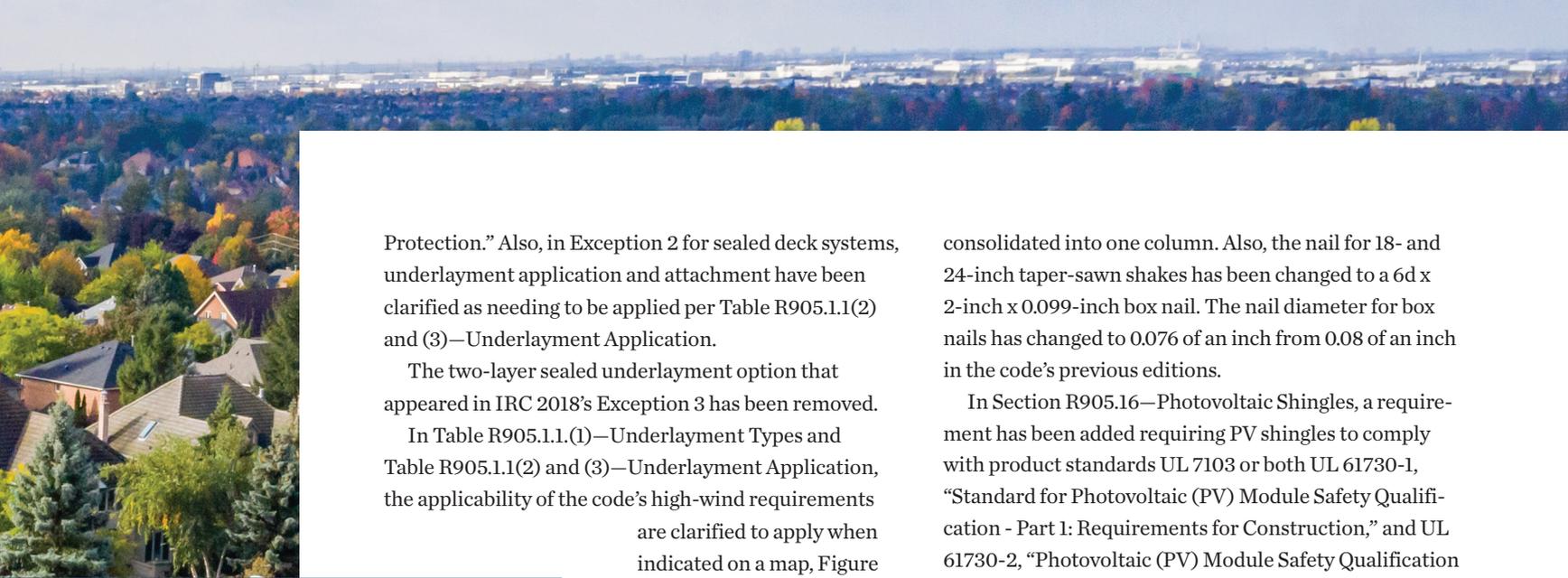
IRC 2021

IRC 2021 applies to detached one- and two-family dwellings and townhouses not more than three stories in height with separate means of egress.

Most of IRC 2021’s roofing-related content is contained in Chapter 9—Roof Assemblies.

In Section R902—Fire Classification, new fire testing requirements have been added for rooftop-mounted photovoltaic products. Building-integrated PV products, such as PV shingles, are required to be tested, listed and labeled using UL 7103, “Outline of Investigation for Building-integrated Photovoltaic Roof Coverings.” Roof-mounted PV panel systems are required to be tested, labeled and identified using UL 2703, “Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-plate Photovoltaic Modules and Panels.” Both UL 7103 and UL 2703 provide for fire classification of roof-mounted PV systems as Class A, B or C.

In Section R905.1.1—Underlayment, the requirements for underlayment used in steep-slope roof systems have been revised. Self-adhering polymer-modified bitumen underlayment now is required to be labeled indicating compliance with ASTM D1970, “Specification for Self-adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam



 To read part one of this article, go to professionalroofing.net.



Protection.” Also, in Exception 2 for sealed deck systems, underlayment application and attachment have been clarified as needing to be applied per Table R905.1.1(2) and (3)—Underlayment Application.

The two-layer sealed underlayment option that appeared in IRC 2018’s Exception 3 has been removed.

In Table R905.1.1.(1)—Underlayment Types and Table R905.1.1(2) and (3)—Underlayment Application, the applicability of the code’s high-wind requirements are clarified to apply when indicated on a map, Figure R301.2.1.1—Regions Where Wind Design is Required. This map indicates wind design is required where the design wind speed is 130 mph or greater along the Atlantic

coastline from Florida to North Carolina and along the Gulf of Mexico. Wind design also is required along Alaska’s coastline where the design wind speed is 140 mph or greater.

In Section R905.3—Clay and Concrete Tile, the deck requirements have been revised to only allow spaced lumber sheathing in Seismic Design Categories A, B or C. Previously, the code permitted the use of tile over spaced lumber sheathing in all areas, including Seismic Design Category D.

In Section R905.4—Metal Roof Shingles, a requirement for wind resistance testing has been added. Metal roof shingles now are required to be tested for wind resistance according to one of the following standards:

- ASTM D3161, “Standard Test Method for Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method)”
- FM 4474, “Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies”
- UL 580, “Standard for Tests for Uplift Resistance of Roof Assemblies”
- UL 1897, “Standard for Safety, Uplift Tests for Roof Covering Systems”

Metal roof shingles tested using ASTM D3161 are required to comply with the classifications in Table R905.4.4.1—Classification of Steep Slope Metal Roof Shingles Tested in Accordance with ASTM D3161 and have package labeling indicating the tested classification.

Table R905.7.5(2)—Nail Requirements for Wood Shakes and Wood Shingles has been reformatted with the nail type, minimum length and shank diameter now

consolidated into one column. Also, the nail for 18- and 24-inch taper-sawn shakes has been changed to a 6d x 2-inch x 0.099-inch box nail. The nail diameter for box nails has changed to 0.076 of an inch from 0.08 of an inch in the code’s previous editions.

In Section R905.16—Photovoltaic Shingles, a requirement has been added requiring PV shingles to comply with product standards UL 7103 or both UL 61730-1, “Standard for Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction,” and UL 61730-2, “Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing.” PV shingles also are required to be tested for wind resistance and be classified per a new Table R905.16.6—Classification of Photovoltaic Shingles, which requires wind classification Class A, D or F.

In Section R905.17—Building-integrated Photovoltaic Roof Panels Applied Directly to the Roof Deck, a new requirement has been added requiring PV shingles to comply with product standards UL 7103 or both UL 61730-1 and UL 61730-2.

In Section R906—Roof Insulation, NFPA 276, “Standard Method of Fire Test for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components,” has been added and FM 4450, “Approval Standard for Class 1 Insulated Steel Roof Decks,” has been removed as an allowable fire test method.

Attic ventilation is addressed in IRC’s Chapter 8—Roof-Ceiling Construction. In Section R806—Roof Ventilation, the requirements for using air-impermeable insulation for dwellings and townhouses in Climate Zones 1, 2 and 3 have been clarified in Section R806.5, Item 5.2, Subitems 5.2.8 through 5.2.10.

GET THE I-CODES

As jurisdictions begin the process of updating their codes, you should be aware of the roofing-related changes incorporated into the 2021 I-Codes and have a copy of the applicable codes on hand.

You can purchase the 2021 I-Codes in soft cover or loose-leaf format or download them. ICC also offers a web-based version, Digital Codes Premium, which is available by either a monthly or annual subscription. To purchase the I-Codes, go to code.iccsafe.org. 

MARK S. GRAHAM is NRCA’s vice president of technical services.