Low Slope Roofing Systems
The University of Wisconsin Madison
Madison, Wisconsin – November 27-28, 2018

Codes and standards

presented by

Mark S. Graham
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National Roofing Contractors Association
Rosemont, Illinois

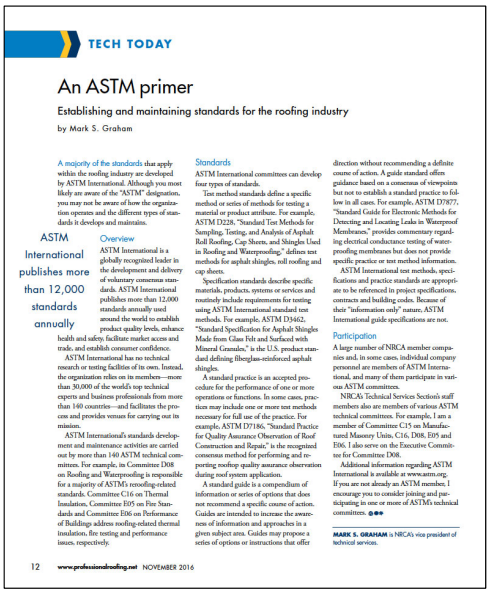
Definitions

Standard: something established for use as a rule or basis of comparison in measuring or judging capacity, quantity, content, extent, value or quality.

Code: 1) a body of laws, as a nation, city, etc., arranged systematically for easy reference; 2) any set of principles or rules of conduct (e.g., the moral code).

Roofing-related standards

- Promulgators: AAMA, ASCE, ASTM, CSA, CSSB, FM, SPRI, UL and WDMA
- Types of standards:
  - Test method (e.g., ASTM E108)
  - Specification/product standard (ASTM D6878)
  - Practice (ASTM D7186)
  - Guide (ASTM D6630) – Not enforceable



TECH TODAY

An ASTM primer

Establishing and maintaining standards for the roofing industry

by Mark S. Graham

A majority of the standards that apply within the roofing industry are developed by ASTM International. Although you most likely are aware of the "ASTM" designation, you may not be aware of how the organization operates and the different types of standards it develops and maintains.

ASTM International publishes more than 12,000 standards annually

Overview

ASTM International is a globally recognized leader in the development and delivery of voluntary consensus standards. ASTM International publishes more than 12,000 standards annually used around the world to establish product quality levels, enhance health and safety, facilitate market access and trade, and establish consumer confidence.

ASTM International has no technical research or testing facilities of its own. Instead, the organization relies on its members—more than 30,000 of the world's top technical experts and business professionals from more than 140 countries—and facilitates the process and provides venues for carrying out its mission.

ASTM International's standards development and maintenance activities are carried out by more than 140 ASTM technical committees. For example, its Committee D08 on Roofing and Waterproofing is responsible for a majority of ASTM's reroofing-related standards. Committee C16 on Thermal Insulation, Committee E05 on Fire Standards and Committee E06 on Performance of Buildings address roofing-related thermal insulation, fire testing and performance issues, respectively.

Standards

ASTM International committees can develop four types of standards.

Test method standards define a specific method or series of methods for testing a material or product attribute. For example, ASTM D228, "Standard Test Methods for Sampling, Testing, and Analysis of Asphalt Roll Roofing, Cap Sheets, and Shingles Used in Roofing and Waterproofing," defines test methods for asphalt shingles, roll roofing and cap sheets.

Specification standards describe specific materials, products, systems or services and routinely include requirements for testing using ASTM International standard test methods. For example, ASTM D3462, "Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules," is the U.S. product standard defining fiberglass-reinforced asphalt shingles.

A standard practice is an accepted procedure for the performance of one or more operations or functions. In some cases, practices may include one or more test methods necessary for full use of the practice. For example, ASTM D7186, "Standard Practice for Quality Assurance Observation of Roof Construction and Repair," is the recognized consensus method for performing and reporting rooftop quality assurance observation during roof system application.

A standard guide is a compendium of information or series of options that does not recommend a specific course of action. Guides are intended to increase the awareness of information and approaches in a given subject area. Guides may propose a series of options or instructions that offer direction without recommending a definite course of action. A guide standard offers guidance based on a consensus of viewpoints but not to establish a standard practice to follow in all cases. For example, ASTM D7877, "Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes," provides commentary regarding electrical conductance testing of waterproofing membranes but does not provide specific practice or test method information.

ASTM International test methods, specifications and practice standards are appropriate to be referenced in project specifications, contracts and building codes. Because of their "information only" nature, ASTM International guide specifications are not.

Participation

A large number of NRCA member companies and, in some cases, individual company personnel are members of ASTM International, and many of them participate in various ASTM committees.

NRCA's Technical Services Section's staff members also are members of various ASTM technical committees. For example, I am a member of Committee C15 on Manufactured Masonry Units, C16, D08, E05 and E06. I also serve on the Executive Committee for Committee D08.

Additional information regarding ASTM International is available at www.astm.org. If you are not already an ASTM member, I encourage you to consider joining and participating in one or more of ASTM's technical committees.

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

12 www.professionalroofing.net NOVEMBER 2016

Professional Roofing,
November 2016

Consider becoming an ASTM member…

www.astm.org

Most roofing-related standards are developed/maintained by Committee D08. Most roofing-related standards are contained in Vol. 4.04

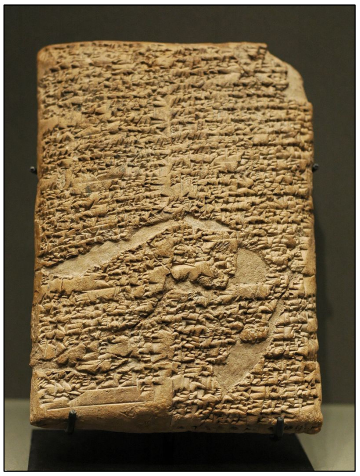
The purpose of the code

International Building Code, 2018

[A] 101.3 Intent. The purpose of this code is to establish the minimum requirements to provide a reasonable level of safety, public health and general welfare through structural strength, *means of egress* facilities, stability, sanitation, adequate light and ventilation, energy conservation, and safety to life and property from fire, explosion and other hazards, and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

Code of Hammurabi

- Babylonian empire (1754 BC)
- 282 laws, scaled punishment
- "…an eye for an eye, a tooth for a tooth…"
- Specific provisions to construction and contracts



Legacy codes

Early 1900s up to 1999

- Building Officials and Code Administrators International (BOCA)
  - *The BOCA National Building Code*
- Southern Building Code Congress International (SBCCI)
  - *The Standard Building Code*
- International Conference of Building Officials
  - *Uniform Building Code*

I-code publication cycle

- 2000 edition
- 2003 edition
- 2006 edition
- 2009 edition
- 2012 edition
- 2015 edition
- 2018 edition

Three-year code development and publication cycle

Some background

Current code concept

- The I-codes are “model codes” developed by the International Code Council (ICC)
- Model codes serve as the technical basis for state or local code adoption
- The code provides the minimum legal requirements for building construction…and operation
- The code is enforced by the “authority having jurisdiction” (AHJ)
- The code can also provide a basis for construction claims-related litigation

Code enforcement

- Code official
- Construction litigation

Legal considerations

"In most states, a building code violation is considered to be evidence of negligence. In some situations, a building code violation may be considered *negligence per se…*"

--Stephen M. Phillips
Hendrick, Phillips, Salzman & Flatt

Who is responsible?

- The building owner
- And, everyone else involved

AIA General Conditions

AIA A201 – General Conditions of The Contract for Construction

Article 3 Contractor

3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statues, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by and made known to the Contractor as a request for information in such a form as the Architect may require.

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3.2.4 …If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay the costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages …for nonconformities of the Contract Documents to… codes…

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So, it pays to know...

or, it can cost you if you don't know.

International Building Code, 2018 Edition

- Applicable to all buildings and structures, excepts those applicable to IRC 2018
- Roofing-related requirements:
  - Ch. 10-Means of egress
  - Ch. 12-Interior environment
  - Ch. 13-Energy efficiency
  - Ch. 15-Roof assemblies and rooftop structures
  - Ch. 16-Structural design
  - Ch. 20-Aluminum
  - Ch. 22-Steel
  - Ch. 24-Glass and glazing
  - Ch. 26-Plastic

Significant roof requirements

International Building Code, 2015 Edition

- Wind resistance
- Fire classification
- Installation requirements
- Prescriptive requirements
- Reroofing

Wind resistance

International Building Code, 2018 Edition

SECTION 1504
PERFORMANCE REQUIREMENTS

1504.1 Wind resistance of roofs. Roof decks and roof coverings shall be designed for wind loads in accordance with Chapter 16 and Sections 1504.2, 1504.3 and 1504.4.

1504.3 Wind resistance of nonballasted roofs. Roof coverings installed on roofs in accordance with Section 1507 that are mechanically attached or adhered to the roof deck shall be designed to resist the design wind load pressures for components and cladding in accordance with Section 1609.5.2. The wind load on the roof covering shall be permitted to be determined using allowable stress design.

1504.3.1 Other roof systems. Built-up, modified bitumen, fully adhered or mechanically attached single-ply roof systems, metal panel roof systems applied to a solid or closely fitted deck and other types of membrane roof coverings shall be tested in accordance with FM 4474, UL 580 or UL 1897.

1609.5 Roof systems. Roof systems shall be designed and constructed in accordance with Sections 1609.5.1 through 1609.5.3, as applicable.

1609.5.1 Roof deck. The roof deck shall be designed to withstand the wind pressures determined in accordance with ASCE 7.

1609.5.2 Roof coverings. Roof coverings shall comply with Section 1609.5.1.

Exception: Rigid tile roof coverings that are air permeable and installed over a roof deck complying with Section 1609.5.1 are permitted to be designed in accordance with Section 1609.5.3.

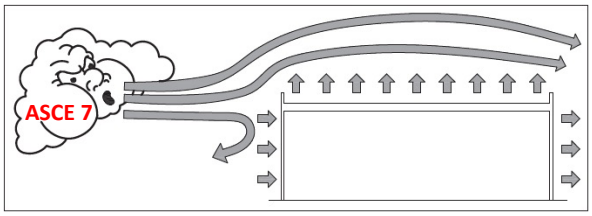
SECTION 1603
CONSTRUCTION DOCUMENTS

1603.1 General. *Construction documents* shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents*.

1603.1.4 Wind design data. The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force-resisting system of the structure:

1. Basic design wind speed, V, miles per hour and allowable stress design wind speed, V_{asd}, as determined in accordance with Section 1609.3.1.
2. *Risk category*.
3. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
4. Applicable internal pressure coefficient.
5. Design wind pressures to be used for exterior component and cladding materials not specifically designed by the *registered design professional* responsible for the design of the structure, psf (kN/m^2).

The fundamental concept



Wind creates pressures/forces
on building elements

The fundamental concept – cont.

Wind resistance ≥ Design wind load

FM or UL

ASCE 7

TECH TODAY

Specifying wind design

Many roof system designers inadequately address wind loads in contract documents

by Mark S. Graham

NRCA is receiving an increasing number of reports indicating project drawings and specifications incompletely, inadequately or inaccurately address proper wind design for low-slope membrane roof systems. Some designs, according to reports, only include a specification requirement for the roof system manufacturer to provide a wind warranty.

But there are minimum requirements for proper wind design of low-slope membrane roof systems.

Code requirements

Building codes typically provide specific requirements for reporting design loads, including wind loads, in contract documents.

Specifying wind speed warranties is not a substitute for code-required wind design data

The *International Building Code,® 2012 Edition* (IBC 2012), Chapter 16-Structural Design, Section 1603-Contract Documents, indicates contract documents need to include a roof system's live load, snow load data, wind design data and any special loads.

Required wind design data includes identifying the ultimate design wind speed, nominal design wind speed, risk category, wind exposure and applicable internal pressure coefficient. For component and cladding systems that are not specifically designed by a registered design professional, design wind pressures in terms of psf (pounds per square foot) also are required. Roof systems typically are considered component and cladding systems. Design wind pressures in the field, perimeter and corner regions of roof areas should be noted in contract documents.

IBC's previous editions include similar contract document requirements.

For new construction projects, design loads most commonly will be identified on structural drawings in the project drawing set. For projects without specific structural drawings, design loads may be provided on architectural drawings or drawing notes or in project specifications.

ANSI/SPRI ES-1

ANSI/SPRI ES-1, "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems," which is referenced in IBC 2012, includes two primary elements: determination of design wind loads at roof edges (fascia, copings) and testing for resistance loads of copings and fascia.

Designers should not simply specify compliance with ANSI/SPRI ES-1 in project specifications; they should determine and clearly include design wind loads at roof edges in contract documents.

IBC 2012 indicates in Section 1504.5 Edge Securement for Low-slope Roofs design wind loads should be determined using the ultimate design wind speed and IBC 2012's Chapter 16, which is based on ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures."

IBC 2012 references ANSI/SPRI ES-1-03. ANSI/SPRI ES-1-03 is based upon ASCE 7-02, which is not an ultimate design wind speed-based method. Therefore, the design wind load determination method contained in ANSI/SPRI ES-1 does not satisfy IBC 2012's requirements for design wind loads at roof edges.

Design wind loads at roof edges should be determined using IBC 2012's Chapter 16 and be clearly noted in contract documents.

Responsibilities

Designers should not place the responsibility for determining roof system or individual component design wind loads on manufacturers, component suppliers or installers, or roofing contractors.

Also, designers' sole reliance on specifying wind speed warranties is not a substitute for code-required wind design data. Such warranties typically do not address consideration of ultimate and nominal design wind speeds, building height, risk category, wind exposure and internal pressure coefficients applicable to the specific building necessary for properly determining roof systems' design wind loads.

Responsibility for properly determining and clearly identifying wind design data, including design wind loads for roof systems, is required by the building code and is clearly that of roof system designers. Designers may retain a structural engineer or qualified consultant to help them fulfill their design responsibilities.

To help designers determine wind loads for commonly encountered low-slope roof systems, NRCA, the Midwest Roofing Contractors Association and North/East Roofing Contractors Association have developed and offer a free online application, Roof Wind Designer.

Roof Wind Designer is a web application that allows users to determine design wind loads using ASCE 7's "Minimum Design Loads for Buildings and Other Structures," 2005 or 2010 editions.

Roof Wind Designer is accessible at www.roofwinddesigner.com. ■■■

MARK S. GRAHAM is NRCA's associate executive director of technical services.

Professional Roofing
March 2014

THE UNIVERSITY OF WISCONSIN MADISON

Design wind load determination

THE UNIVERSITY OF WISCONSIN MADISON

Fire classification

International Building Code, 2018 Edition, Sec. 1505-Fire Classification

Roof assemblies shall be tested and listed:

- Class A: Severe fire-exposure

  Exceptions: Brick, masonry, exposed concrete deck; metal shingles or sheets, tile or slate on non-combustible decks; and copper or slate on non-combustible decks
- Class B: Moderate fire-test exposure
- Class C: Light fire-test exposure

TABLE 1505.1[a, b]
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]

[Footnoted omitted for clarity]

Look for listing or certification marks

Installation requirements

International Building Code, 2018 Edition, Sec. 1506-Materials

"…Roof coverings shall be applied in accordance with this chapter and the manufacturer's installation instructions...."

Prescriptive requirements

International Building Code, 2018 Edition, Sec. 1507-Requirements for Roof Coverings

- Deck
- Slope: ¼" per ft., ⅛" per ft. for coal tar BUR
- Material standards: Typically ASTM standards
- Installation

Reroofing

International Building Code, 2018 Edition, Sec. 1511-Reroofing

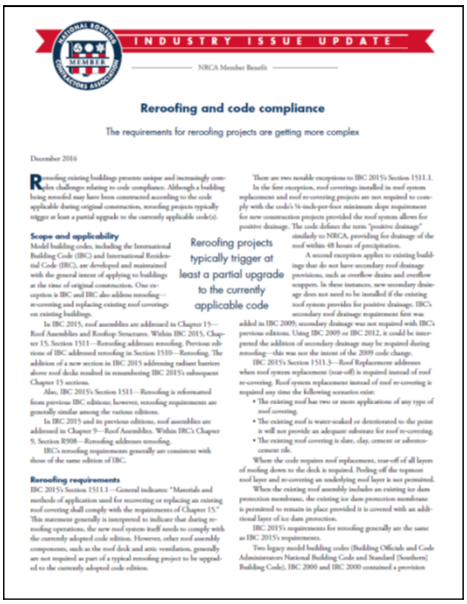
"…recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15...."

Exceptions:

- Roof slope: "positive drainage" instead of ¼"per ft.
- Secondary roof drains: Not required

NRCA "Industry Issue Update"

November 2016



INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Reroofing and code compliance

The requirements for reroofing projects are getting more complex

December 2016

Reroofing existing buildings presents unique and increasingly complex challenges relating to code compliance. Although a building being reroofed may have been constructed according to the code applicable during original construction, reroofing projects typically trigger at least a partial upgrade to the currently applicable code(s).

Scope and applicability

Model building codes, including the International Building Code (IBC) and International Residential Code (IRC), are developed and maintained with the general intent of applying to buildings at the time of original construction. One exception is IBC and IRC also address reroofing—re-covering and replacing existing roof coverings on existing buildings.

In IBC 2015, roof assemblies are addressed in Chapter 15—Roof Assemblies and Rooftop Structures. Within IBC 2015, Chapter 15, Section 1511—Reroofing addresses reroofing. Previous editions of IBC addressed reroofing in Section 1510—Reroofing. The addition of a new section in IBC 2015 addressing radiant barriers above roof decks resulted in renumbering IBC 2015's subsequent Chapter 15 sections.

Also, IBC 2015's Section 1511—Reroofing is reformatted from previous IBC editions; however, reroofing requirements are generally similar among the various editions.

In IBC 2015 and its previous editions, roof assemblies are addressed in Chapter 9—Roof Assemblies. Within IBC's Chapter 9, Section R908—Reroofing addresses reroofing.

IBC's reroofing requirements generally are consistent with those of the same edition of IBC.

Reroofing projects typically trigger at least a partial upgrade to the currently applicable code

Reroofing requirements

IBC 2015's Section 1511.1—General indicates: "Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15." This statement generally is interpreted to indicate that during reroofing operations, the new roof system itself needs to comply with the currently adopted code edition. However, other roof assembly components, such as the roof deck and attic ventilation, generally are not required as part of a typical reroofing project to be upgraded to the currently adopted code edition.

There are two notable exceptions to IBC 2015's Section 1511.1. In the first exception, roof coverings installed in roof system replacement and roof re-covering projects are not required to comply with the code's ¼-inch-per-foot minimum slope requirement for new construction projects provided the roof system allows for positive drainage. The code defines the term "positive drainage" similarly to NRCA, providing for drainage of the roof within 48 hours of precipitation.

A second exception applies to existing buildings that do not have secondary roof drainage provisions, such as overflow drains and overflow scuppers. In these instances, new secondary drainage does not need to be installed if the existing roof system provides for positive drainage. IBC's secondary roof drainage requirement first was added in IBC 2009; secondary drainage was not required with IBC's previous editions. Using IBC 2009 or IBC 2012, it could be interpreted the addition of secondary drainage may be required during reroofing—this was not the intent of the 2009 code change.

IBC 2015's Section 1511.3—Roof Replacement addresses when roof system replacement (tear-off) is required instead of roof re-covering. Roof system replacement instead of roof re-covering is required any time the following scenarios exist:

- The existing roof has two or more applications of any type of roof covering.
- The existing roof is water-soaked or deteriorated to the point it will not provide an adequate substrate for roof re-covering.
- The existing roof covering is slate, clay, cement or asbestos-cement tile.

Where the code requires roof replacement, tear-off of all layers of roofing down to the deck is required. Peeling off the topmost roof layer and re-covering an underlying roof layer is not permitted.

When the existing roof assembly includes an existing ice dam protection membrane, the existing ice dam protection membrane is permitted to remain in place provided it is covered with an additional layer of ice dam protection.

IBC 2015's requirements for reroofing generally are the same as IBC 2015's requirements.

Two legacy model building codes (Building Officials and Code Administrators National Building Code and Standard [Southern] Building Code), IBC 2000 and IBC 2000 contained a provision

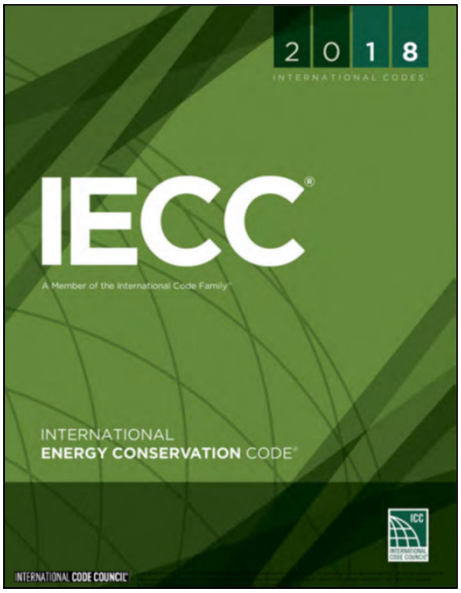
International Residential Code, 2018 Edition

- Applicable to one- and two-family dwellings and townhouses no more than three stories in height
- Roofing-related requirements:
  - Ch. 8-Roof/ceiling construction
  - Ch. 9-Roof assemblies

Ch. 9-Roof assemblies

International Residential Code, 2018 Edition

- Ch. 9 closely mirrors IBC Ch. 15's requirements
- Except IRC only requires fire classified roof assemblies where:
  - Required by local ordinance
  - Roof edge is less than 3 ft. from the lot line



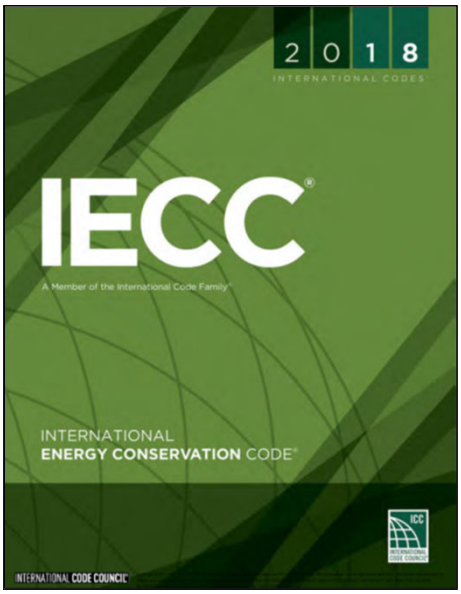
IECC 2015:

Commercial buildings:

- All except "Residential Buildings"

Residential buildings:

- One- and two-family dwellings, multiple single-family dwellings and Group R-2, R-3 and R-4 buildings three stories or less

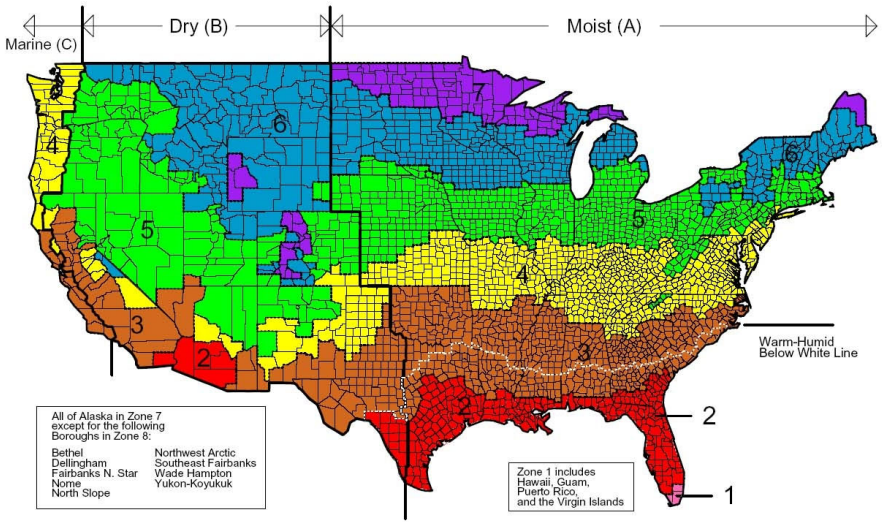


Roof requirements:

- R-value
- Roof reflectivity
- Air retarder

IECC 2018, Fig. C301.1-Climate zones

Fig. R301.1 (residential climate zones) is similar



Minimum R-value

IECC 2018: Commercial Buildings (Insulation component R-value-based method)

Climate zone	Assembly description		
	Insulation entirely above deck	Metal buildings	Attic and other
1	R-20ci (all other) R-25ci (Group R)	R-19 + R-11 LS	R-38
2	R-25ci		
3			
4	R-30ci		R-38 (except Marine 4)
5			R-38 (all other) R-49 (Group R, Marine 4)
6		R-25 + R-11 LS	R-49
7	R-35ci	R-30 + R-11 LS	
8			

ci = Continuous insulation; LS = Liner system

Comparison of IECC's various editions

Commercial Buildings (Insulation component R-value-based method)

Climate Zone	IECC 2003	IECC 2006	IECC 2009	IECC 2012*	IECC 2015*	IECC 2018*
1	R-12 ci	R-15 ci	R-15 ci	R-20 ci	R-20 ci	R-20 ci
2	R-14 ci		R-20ci		R-25 ci	R-25 ci
3	R-10 ci					
4	R-12 ci			R-25 ci	R-30 ci	R-30 ci
5	R-15 ci	R-20 ci				
6	R-11 ci					
7	R-15 ci	R-25 ci	R-25 ci	R-30 ci	R-35 ci	R-35 ci
8						

* Applies to roof replacement projects
ci = continuous insulation

Reflectivity

International Energy Conservation Code, 2018 Edition (Commercial)

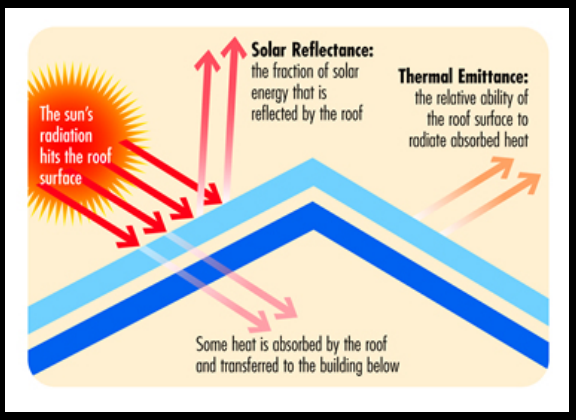
C402.3 Roof solar reflectance and thermal emittance. Low-sloped roofs directly above cooled conditioned spaces in Climate Zones 1, 2 and 3 shall comply with one or more of the options in Table C402.3.

Exceptions: [omitted for clarity]

TABLE C402.3
MINIMUM ROOF REFLECTANCE AND EMITTNCE OPTIONS

Three-year solar reflectance of 0.55 and 3-year aged thermal emittance of 0.75
Three-year-aged solar reflectance index of 64

[Footnotes omitted for clarity]



Courtesy of the Cool Roofs Rating Council

Definitions

Solar reflectance: The fraction of solar flux reflected by a surface expressed within the range of 0.00 and 1.00.

Thermal emittance: The ratio of radiant heat flux emitted by a surface to that emitted by a black body radiator at the same temperature expressed within a range of 0.00 to 1.00.

Definitions – cont.

Solar reflectance index (SRI): The relative steady-state surface temperature of a surface with respect to the standard white (SRI = 100) and standard black (SRI = 0) under standard solar and ambient conditions.

--ASTM E 1980

Air barriers

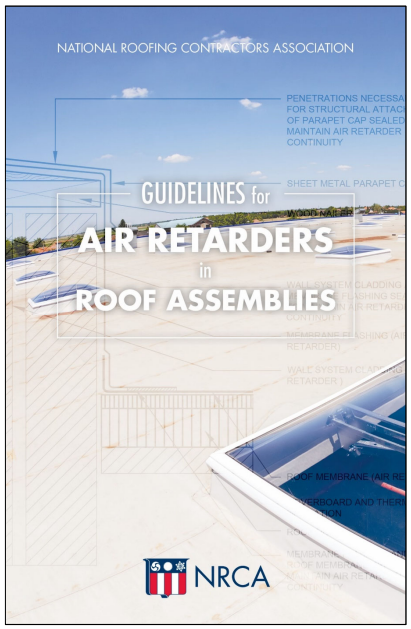
International Energy Conservation Code, 2018 Edition (Commercial), Sec. C402.5

"A continuous building envelope air barrier shall be provided throughout the building envelope…." (Except 2B)

Test methods:

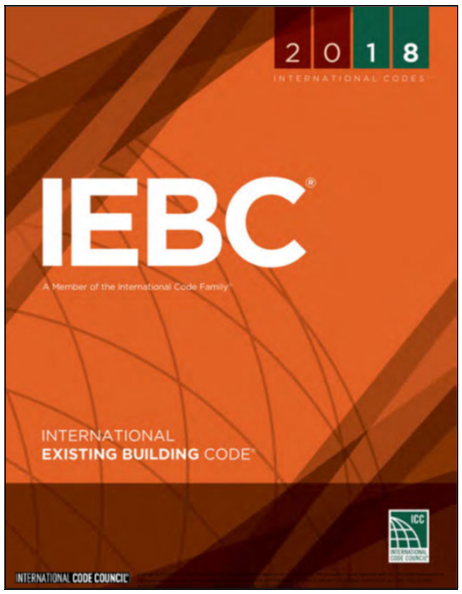
- Whole building: Not greater than 0.40 cfm/ft^3
- Assembly: Not greater than 0.04 cfm/ft^3
- Material: Not greater than 0.004 cfm/ft^3
  - Deemed to comply: BUR, MB, adhered single ply and SPF

Air barrier not required in reroofing projects unless also recladding (IECC 2018: Sec. C503.3.1 and C504.2)

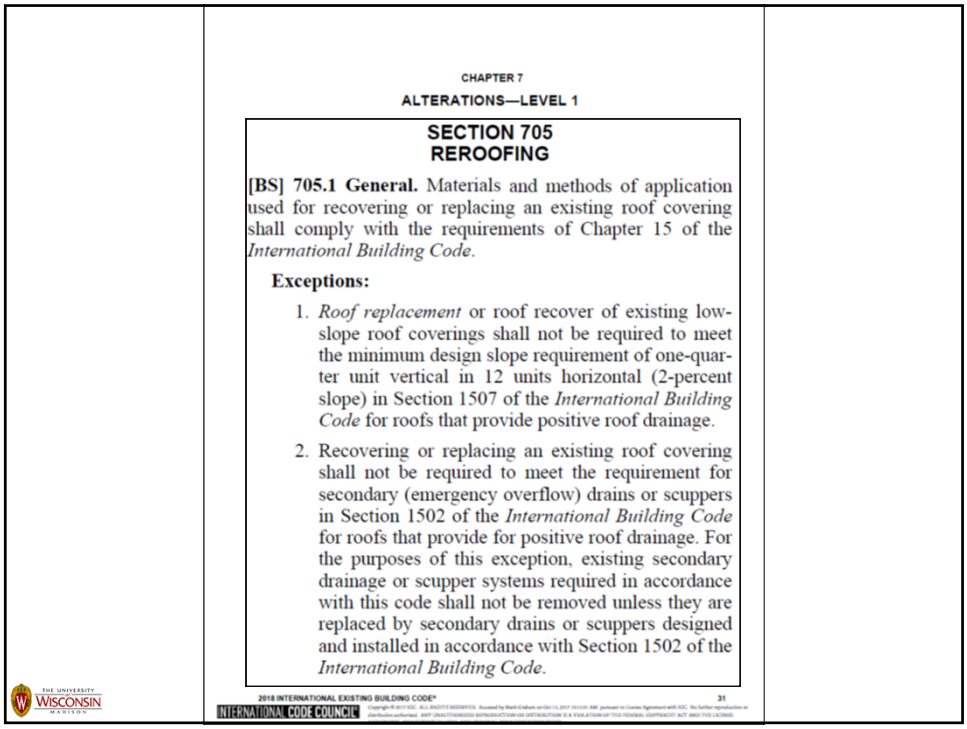


Guidelines for Air Retarders in Roof Assemblies

- Ch. 1: IECC and ASHRAE
- Ch. 2: Industry research
- Ch. 3: Recommendations



International Existing Building Code, 2018 Edition



CHAPTER 7

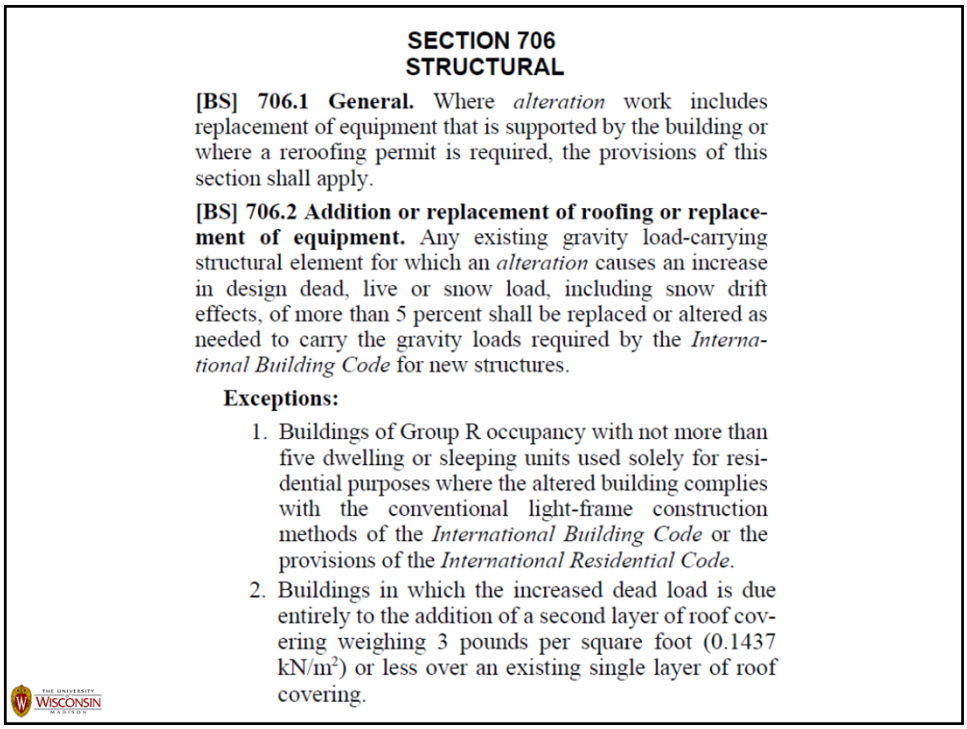
ALTERATIONS—LEVEL 1

SECTION 705
REROOFING

[BS] 705.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 of the *International Building Code*.

Exceptions:

1. *Roof replacement* or roof recover of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the *International Building Code* for roofs that provide positive roof drainage.
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1502 of the *International Building Code* for roofs that provide for positive roof drainage. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1502 of the *International Building Code*.



SECTION 706
STRUCTURAL

[BS] 706.1 General. Where *alteration* work includes replacement of equipment that is supported by the building or where a reroofing permit is required, the provisions of this section shall apply.

[BS] 706.2 Addition or replacement of roofing or replacement of equipment. Any existing gravity load-carrying structural element for which an *alteration* causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the *International Building Code* for new structures.

Exceptions:

1. Buildings of Group R occupancy with not more than five dwelling or sleeping units used solely for residential purposes where the altered building complies with the conventional light-frame construction methods of the *International Building Code* or the provisions of the *International Residential Code*.
2. Buildings in which the increased dead load is due entirely to the addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m^2) or less over an existing single layer of roof covering.

[BS] 706.3 Additional requirements for reroof permits. The requirements of this section shall apply to *alteration* work requiring reroof permits.

[BS] 706.3.1 Bracing for unreinforced masonry bearing wall parapets. Where a permit is issued for reroofing for more than 25 percent of the roof area of a building assigned to Seismic Design Category D, E or F that has parapets constructed of unreinforced masonry, the work shall include installation of parapet bracing unless an evaluation demonstrates compliance of such items. Reduced seismic forces shall be permitted.

[BS] 706.3.2 Roof diaphragms resisting wind loads in high-wind regions. Where roofing materials are removed from more than 50 percent of the roof diaphragm or section of a building located where the ultimate design wind speed, V_{ult}, determined in accordance with Figure 1609.3(1) of the *International Building Code,* is greater than 115 mph (51 m/s) or in a special wind region, as defined in Section 1609 of the *International Building Code*, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the *International Building Code*, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the *International Building Code.*

TECH TODAY

New roofing rules

IEBC 2015 presents challenges when reroofing

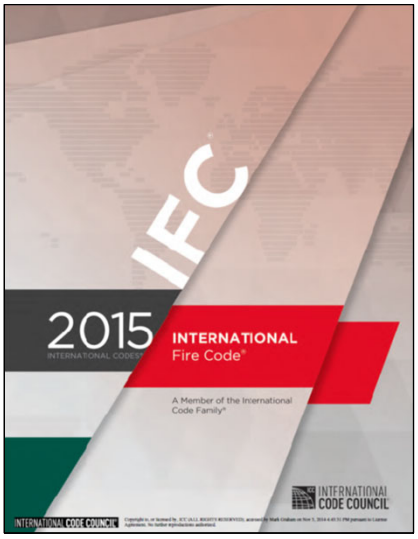
by Mark S. Graham

Where adopted, IEBC 2015's structural reroofing requirements may be more stringent

14 www.professionalroofing.net SEPTEMBER 2016

Professional Roofing,
September 2016

International Fire Code, 2018 Edition



Applicability:

- Structures, facilities and conditions
- Existing conditions and operations

Roofing-related provisions

International Fire Code, 2018 Edition

- Sec. 303-Asphalt kettles
- Sec. 317-Rooftop gardens
- Sec. 1204-Solar photovoltaic systems
- Sec. 3317-Safeguarding roofing operations

International Plumbing Code, 2018 Edition

- Applicable to all plumbing systems, except those applicable to IRC 2018
- Roofing-related requirements:
  - Ch. 11-Storm drainage

SECTION 1105
ROOF DRAINS

1105.1 General. Roof drains shall be installed in accordance with the manufacturer's instructions. The inside opening for the roof drain shall not be obstructed by the roofing membrane material.

1105.2 Roof drain flow rate. The published roof drain flow rate, based on the head of water above the roof drain, shall be used to size the storm drainage system in accordance with Section 1106. The flow rate used for sizing the storm drainage piping shall be based on the maximum anticipated ponding at the roof drain.

1102.6 Roof Drains. Roof drains shall conform to ASME A112.6.4 or ASME A112.3.1.

1106.5 Parapet wall scuppers. Where scuppers are used for primary roof drainage or for secondary (emergency overflow) roof drainage or both, the quantity, size, location and inlet elevation of the scuppers shall be chosen to prevent the depth of ponding water on the roof from exceeding the maximum water depth that the roof was designed for as determined by Section 1611.1 of the *International Building Code*. Scupper openings shall be not less than 4 inches (102 mm) in height and have a width that is equal to or greater than the circumference of a roof drain sized for the same roof area. The flow through the primary system shall not be considered when locating and sizing secondary scuppers.

1106.6 Size of roof gutters. Horizontal gutters shall be sized based on the flow rate from the roof surface. The flow rate in horizontal gutters shall not exceed that specified in Table 1106.6.

SECTION 1107
SIPHONIC ROOF DRAINAGE SYSTEMS

1107.1 General. Siphonic roof drains and drainage systems shall be designed in accordance with ASME A112.6.9 and ASPE 45.

SECTION 1108
SECONDARY (EMERGENCY) ROOF DRAINS

1108.1 Secondary (emergency overflow) drains or scuppers. Where roof drains are required, secondary (emergency overflow) roof drains or scuppers shall be provided where the roof perimeter construction extends above the roof in such a manner that water will be entrapped if the primary drains allow buildup for any reason. Where primary and secondary roof drains are manufactured as a single assembly, the inlet and outlet for each drain shall be independent.

1108.2 Separate systems required. Secondary roof drain systems shall have the end point of discharge separate from the primary system. Discharge shall be above grade, in a location that would normally be observed by the building occupants or maintenance personnel.

1108.3 Sizing of secondary drains. Secondary (emergency) roof drain systems shall be sized in accordance with Section 1106 based on the rainfall rate for which the primary system is sized. Scuppers shall be sized to prevent the depth of ponding water from exceeding that for which the roof was designed as determined by Section 1101.7. Scuppers shall have an opening dimension of not less than 4 inches (102 mm). The flow through the primary system shall not be considered when sizing the secondary roof drain system.

How should I deal with alternatives to what is permitted by the Code?

Alternative materials, design and methods of construction and equipment

- IBC 2018, Sec. 104.11
- IRC 2018, Sec. R104.11
- IECC 2018, Sec. C102 and Sec. R102
- IEBC 2018, Sec. 104.11
- IFC 2018, Sec. 104.9
- IPC 2018, Sec. 105.2

Tech Today

Other options

Take advantage of alternative approval provisions in building codes

by Mark S. Graham

Alternative approval

Evaluation reports

Roofing products

20

July 2008 www.professionalroofing.net

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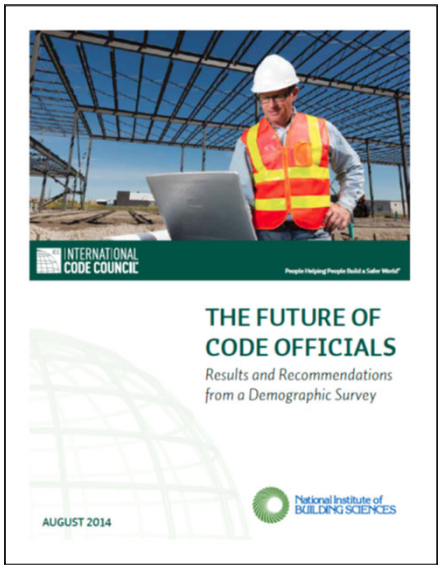
ICC/NIBS survey

www.ICCsafe.org

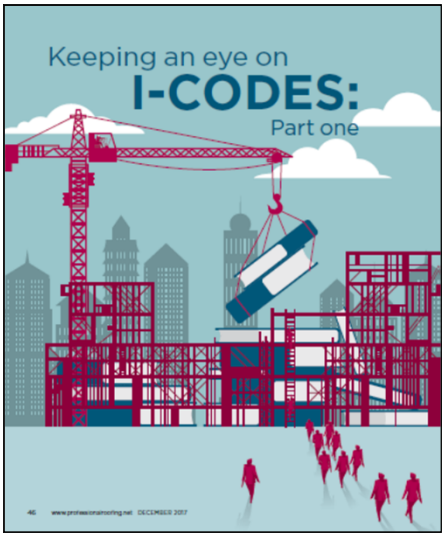


A typical code official

- Between the ages of 55 and 64
- A jurisdiction employee (rather than third-party provider)
- Works in a one- to nine-person jurisdiction, less than 75,000 in population
- Earns between $50,000 and $75,000 (mean 2012 salary was $51,017 according to the U.S. Census Bureau)
- Has 26 to 35 years of experience in the building industry, but only five to 15 years as a code official
- Entered the code profession in their 30s; held one to three prior jobs; first job was as a tradesperson

A typical code official - continued

- May possess a bachelor's degree (27 percent), or have no additional education beyond high school (25 percent)
- If they hold a bachelor's degree, it is probably in engineering, but it could be in management, accounting, finance, etc.
- Holds a professional license, certificate, certification or other credential
- Current role is as a inspector, plan reviewer or department manager; possibly all of these roles
- Expect to leave the profession in the next five to 15 years.



Professional Roofing, December 2017
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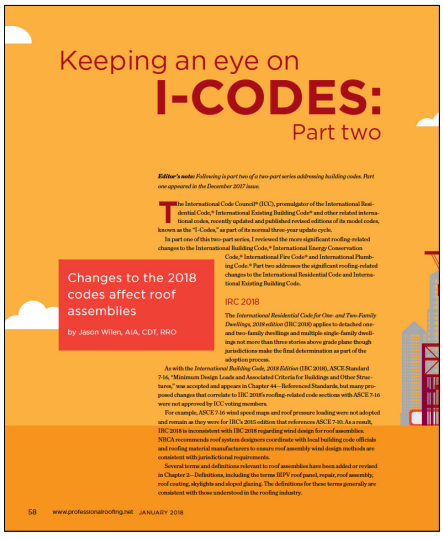

Professional Roofing, January 2018
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Code compliance is becoming increasingly challenging and presents significant liability risks

Consider joining ICC

Membership categories:

- Corporate member: $450 (complete collection)
- Building safety professional member: $170 (1 code)

http://www.iccsafe.org/Membership/Pages/join.aspx

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An ASTM primer

Establishing and maintaining standards for the roofing industry

by Mark S. Graham

A majority of the standards that apply within the roofing industry are developed by ASTM International. Although you most likely are aware of the "ASTM" designation, you may not be aware of how the organization operates and the different types of standards it develops and maintains.

ASTM International publishes more than 12,000 standards annually

Overview

ASTM International is a globally recognized leader in the development and delivery of voluntary consensus standards. ASTM International publishes more than 12,000 standards annually used around the world to establish product quality levels, enhance health and safety, facilitate market access and trade, and establish consumer confidence.

ASTM International has no technical research or testing facilities of its own. Instead, the organization relies on its members—more than 30,000 of the world's top technical experts and business professionals from more than 140 countries—and facilitates the process and provides venues for carrying out its mission.

ASTM International's standards development and maintenance activities are carried out by more than 140 ASTM technical committees. For example, its Committee D08 on Roofing and Waterproofing is responsible for a majority of ASTM's reroofing-related standards. Committee C16 on Thermal Insulation, Committee E05 on Fire Standards and Committee E06 on Performance of Buildings address roofing-related thermal insulation, fire testing and performance issues, respectively.

Standards

ASTM International committees can develop four types of standards.

Test method standards define a specific method or series of methods for testing a material or product attribute. For example, ASTM D228, "Standard Test Methods for Sampling, Testing, and Analysis of Asphalt Roll Roofing, Cap Sheets, and Shingles Used in Roofing and Waterproofing," defines test methods for asphalt shingles, roll roofing and cap sheets.

Specification standards describe specific materials, products, systems or services and routinely include requirements for testing using ASTM International standard test methods. For example, ASTM D3462, "Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules," is the U.S. product standard defining fiberglass-reinforced asphalt shingles.

A standard practice is an accepted procedure for the performance of one or more operations or functions. In some cases, practices may include one or more test methods necessary for full use of the practice. For example, ASTM D7186, "Standard Practice for Quality Assurance Observation of Roof Construction and Repair," is the recognized consensus method for performing and reporting rooftop quality assurance observation during roof system application.

A standard guide is a compendium of information or series of options that does not recommend a specific course of action. Guides are intended to increase the awareness of information and approaches in a given subject area. Guides may propose a series of options or instructions that offer direction without recommending a definite course of action. A guide standard offers guidance based on a consensus of viewpoints but not to establish a standard practice to follow in all cases. For example, ASTM D7877, "Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes," provides commentary regarding electrical conductance testing of waterproofing membranes but does not provide specific practice or test method information.

ASTM International test methods, specifications and practice standards are appropriate to be referenced in project specifications, contracts and building codes. Because of their "information only" nature, ASTM International guide specifications are not.

Participation

A large number of NRCA member companies and, in some cases, individual company personnel are members of ASTM International, and many of them participate in various ASTM committees.

NRCA's Technical Services Section's staff members also are members of various ASTM technical committees. For example, I am a member of Committee C15 on Manufactured Masonry Units, C16, D08, E05 and E06. I also serve on the Executive Committee for Committee D08.

Additional information regarding ASTM International is available at www.astm.org. If you are not already an ASTM member, I encourage you to consider joining and participating in one or more of ASTM's technical committees.

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

Specifying wind design

Many roof system designers inadequately address wind loads in contract documents

by Mark S. Graham

NRCA is receiving an increasing number of reports indicating project drawings and specifications incompletely, inadequately or inaccurately address proper wind design for low-slope membrane roof systems. Some designs, according to reports, only include a specification requirement for the roof system manufacturer to provide a wind warranty.

But there are minimum requirements for proper wind design of low-slope membrane roof systems.

Code requirements

Building codes typically provide specific requirements for reporting design loads, including wind loads, in contract documents.

Specifying wind speed warranties is not a substitute for code-required wind design data

The *International Building Code,® 2012 Edition* (IBC 2012), Chapter 16-Structural Design, Section 1603-Contract Documents, indicates contract documents need to include a roof system's live load, snow load data, wind design data and any special loads.

Required wind design data includes identifying the ultimate design wind speed, nominal design wind speed, risk category, wind exposure and applicable internal pressure coefficient. For component and cladding systems that are not specifically designed by a registered design professional, design wind pressures in terms of psf (pounds per square foot) also are required. Roof systems typically are considered component and cladding systems. Design wind pressures in the field, perimeter and corner regions of roof areas should be noted in contract documents.

IBC's previous editions include similar contract document requirements.

For new construction projects, design loads most commonly will be identified on structural drawings in the project drawing set. For projects without specific structural drawings, design loads may be provided on architectural drawings or drawing notes or in project specifications.

ANSI/SPRI ES-1

ANSI/SPRI ES-1, "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems," which is referenced in IBC 2012, includes two primary elements: determination of design wind loads at roof edges (fascia, copings) and testing for resistance loads of copings and fascia.

Designers should not simply specify compliance with ANSI/SPRI ES-1 in project specifications; they should determine and clearly include design wind loads at roof edges in contract documents.

IBC 2012 indicates in Section 1504.5-Edge Securement for Low-slope Roofs design wind loads should be determined using the ultimate design wind speed and IBC 2012's Chapter 16, which is based on ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures."

IBC 2012 references ANSI/SPRI ES-1-03. ANSI/SPRI ES-1-03 is based upon ASCE 7-02, which is not an ultimate design wind speed-based method. Therefore, the design wind load determination method contained in ANSI/SPRI ES-1 does not satisfy IBC 2012's requirements for design wind loads at roof edges.

Design wind loads at roof edges should be determined using IBC 2012's Chapter 16 and be clearly noted in contract documents.

Responsibilities

Designers should not place the responsibility for determining roof system or individual component design wind loads on manufacturers, component suppliers or installers, or roofing contractors.

Also, designers' sole reliance on specifying wind speed warranties is not a substitute for code-required wind design data. Such warranties typically do not address consideration of ultimate and nominal design wind speeds, building height, risk category, wind exposure and internal pressure coefficients applicable to the specific building necessary for properly determining roof systems' design wind loads.

Responsibility for properly determining and clearly identifying wind design data, including design wind loads for roof systems, is required by the building code and is clearly that of roof system designers. Designers may retain a structural engineer or qualified consultant to help them fulfill their design responsibilities.

To help designers determine wind loads for commonly encountered low-slope roof systems, NRCA, the Midwest Roofing Contractors Association and North/East Roofing Contractors Association have developed and offer a free online application, Roof Wind Designer.

Roof Wind Designer is a web application that allows users to determine design wind loads using ASCE 7's, "Minimum Design Loads for Buildings and Other Structures," 2005 or 2010 editions.

Roof Wind Designer is accessible at www.roofwinddesigner.com.

MARK S. GRAHAM is NRCA's associate executive director of technical services.

INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Reroofing and code compliance

The requirements for reroofing projects are getting more complex

December 2016

Reroofing existing buildings presents unique and increasingly complex challenges relating to code compliance. Although a building being reroofed may have been constructed according to the code applicable during original construction, reroofing projects typically trigger at least a partial upgrade to the currently applicable code(s).

Scope and applicability

Model building codes, including the International Building Code (IBC) and International Residential Code (IRC), are developed and maintained with the general intent of applying to buildings at the time of original construction. One exception is IBC and IRC also address reroofing—re-covering and replacing existing roof coverings on existing buildings.

Reroofing projects typically trigger at least a partial upgrade to the currently applicable code

In IBC 2015, roof assemblies are addressed in Chapter 15—Roof Assemblies and Rooftop Structures. Within IBC 2015, Chapter 15, Section 1511—Reroofing addresses reroofing. Previous editions of IBC addressed reroofing in Section 1510—Reroofing. The addition of a new section in IBC 2015 addressing radiant barriers above roof decks resulted in renumbering IBC 2015's subsequent Chapter 15 sections.

Also, IBC 2015's Section 1511—Reroofing is reformatted from previous IBC editions; however, reroofing requirements are generally similar among the various editions.

In IRC 2015 and its previous editions, roof assemblies are addressed in Chapter 9—Roof Assemblies. Within IRC's Chapter 9, Section R908—Reroofing addresses reroofing.

IRC's reroofing requirements generally are consistent with those of the same edition of IBC.

Reroofing requirements

IBC 2015's Section 1511.1—General indicates: "Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15." This statement generally is interpreted to indicate that during reroofing operations, the new roof system itself needs to comply with the currently adopted code edition. However, other roof assembly components, such as the roof deck and attic ventilation, generally are not required as part of a typical reroofing project to be upgraded to the currently adopted code edition.

There are two notable exceptions to IBC 2015's Section 1511.1.

In the first exception, roof coverings installed in roof system replacement and roof re-covering projects are not required to comply with the code's ¼-inch-per-foot minimum slope requirement for new construction projects provided the roof system allows for positive drainage. The code defines the term "positive drainage" similarly to NRCA, providing for drainage of the roof within 48 hours of precipitation.

A second exception applies to existing buildings that do not have secondary roof drainage provisions, such as overflow drains and overflow scuppers. In these instances, new secondary drainage does not need to be installed if the existing roof system provides for positive drainage. IBC's secondary roof drainage requirement first was added in IBC 2009; secondary drainage was not required with IBC's previous editions. Using IBC 2009 or IBC 2012, it could be interpreted the addition of secondary drainage may be required during reroofing—this was not the intent of the 2009 code change.

IBC 2015's Section 1511.3—Roof Replacement addresses when roof system replacement (tear-off) is required instead of roof re-covering. Roof system replacement instead of roof re-covering is required any time the following scenarios exist:

- The existing roof has two or more applications of any type of roof covering.
- The existing roof is water-soaked or deteriorated to the point it will not provide an adequate substrate for roof re-covering.
- The existing roof covering is slate, clay, cement or asbestos-cement tile.

Where the code requires roof replacement, tear-off of all layers of roofing down to the deck is required. Peeling off the topmost roof layer and re-covering an underlying roof layer is not permitted.

When the existing roof assembly includes an existing ice dam protection membrane, the existing ice dam protection membrane is permitted to remain in place provided it is covered with an additional layer of ice dam protection.

IRC 2015's requirements for reroofing generally are the same as IBC 2015's requirements.

Two legacy model building codes (Building Officials and Code Administrators National Building Code and Standard [Southern] Building Code), IBC 2000 and IRC 2000 contained a provision

applicable to reroofing commonly referred to as the "25 percent rule." This provision exempted reroofing projects limited to 25 percent or less of a building's roof area from needing to comply with the currently applicable code's reroofing requirements. It is important to note this provision was removed in IBC 2003, IRC 2003 and subsequent editions and no longer applies to reroofing. It generally is interpreted any roof system replacement or roof re-covering project regardless of its size or scope now is required to comply with the code's reroofing requirements.

Roof repairs (small patches) typically are interpreted as being exempt for code upgrades provided the repair is of like material and application method to the surface being repaired.

Energy code compliance

Beginning with the *International Energy Conservation Code, 2012 Edition* (IECC 2012) and continuing in IECC 2015, compliance with currently adopted energy code is a requirement for roof system replacement projects on commercial buildings (nonresidential buildings). IECC 2012's Section C401.2.1—Application to Existing Buildings makes compliance with the energy code applicable to "Additions, alterations and repairs to existing buildings ... ." This requirement typically is interpreted as being applicable to roof system replacement projects; roof re-covering projects generally are considered exempt.

As a result, when IECC 2012 is adopted, roof system replacement projects are required to comply with the code's minimum thermal insulation (R-value), roof reflectivity and air barrier requirements similar to those for new construction projects.

An exception in IECC 2012's residential requirements (Section R101.4.3—Exception 5) exempts the need to make R-value upgrades to comply with IECC 2012 " ... for roofs where neither the sheathing or the insulation is exposed ... ." It generally is interpreted this exemption applies to reroofing residential steep-slope roof systems where the existing attic insulation is not exposed (the roof deck is not replaced).

In IECC 2015, energy code requirements applicable to existing buildings are more clearly provided in Chapter 5 [CE]-Existing Buildings for commercial buildings and Chapter 5 [RE]-Existing Buildings for residential buildings.

Although IECC 2015's requirements for reroofing are substantially the same as IECC 2012's requirements, one notable change relates to air barriers. Exception 5 to IECC 2015's Section C503—Alterations indicates "*Air barriers* shall not be required for *roof recover* and roof replacement where the *alterations* or renovations to the building do not include alterations, renovations or repairs to the remainder of the building envelope." In the code's text, italicized terms are specifically defined terms.

Also, IECC 2015 clearly indicates "roof repairs" are not intended to be subject to the code's requirements and are defined as reconstruction or renewal of any part of an existing roof for the purpose of its maintenance.

IEBC 2015

For the first time, the *International Existing Building Code, 2015 Edition* (IEBC 2015) includes specific code requirements applicable to reroofing. IEBC 2015 only is applicable where it is specifically adopted, and in many cases IEBC 2015 may not be adopted concurrently with IBC 2015 and IRC 2015. Where adopted, IEBC 2015's structural reroofing requirements may be more stringent than IBC's and IRC's reroofing provisions.

IEBC 2015's scope indicates it " ... shall apply to the repair, alteration, change of occupancy, addition to and relocation of existing buildings." Furthermore, IEBC 2015 classifies work on existing buildings into three categories: Level 1, Level 2 and Level 3.

Level 1 alterations include removing and replacing or covering existing materials, elements, equipment or fixtures using new materials, elements, equipment or fixtures that serve the same purpose. Reroofing projects are considered Level 1 alterations.

Level 2 and Level 3 alterations are larger in scope. For example, Level 3 alterations apply when the work area exceeds 50 percent of the building (floor) area.

IEBC 2015's Chapter 7—Alterations—Level 1 includes a new section, Section 706—Reroofing, that was not included in IEBC's previous editions. This section's requirements are identical to IBC 2012's (not IBC 2015's) Section 1510—Reroofing.

For the first time, IEBC 2015 includes specific code requirements applicable to reroofing

IEBC 2015's Section 707—Structural includes some additional requirements applicable to reroofing.

Section 707.2—Addition or Replacement of Roofing or Replacement of Equipment indicates when roof system replacement results in additional dead load; structural components supporting the new roofing materials need to comply with IBC. Exceptions to this requirement include where the dead load does not increase element forces by more than 5 percent; buildings designed in accordance with IBC's conventional light-frame construction methods or IRC; or where the new second layer weighs less than 3 pounds per square foot.

Section 707.3—Additional Requirements for Reroof Permits provides additional structural requirements for projects where the authority having jurisdiction (AHJ) requires reroofing permits.

Section 707.3.1 requires unreinforced masonry parapets for buildings where more than 25 percent of the roof area is being reroofed in Seismic Design Category D, E or F to have new parapet bracing installed to resist IBC's seismic forces.

Section 707.3.2 requires buildings located in high-wind regions (V_{ult} greater than 115 mph or in special wind regions) designed with roof diaphragms (roof decks) to be evaluated for structural adequacy. This requirement applies when more than 50 percent of the diaphragm is exposed during roof system replacement. The roof diaphragm, connections of the roof diaphragm to roof framing members and roof-to-wall connections are required to be evaluated using the current code's wind loads. If the diaphragm and connections are not capable of resisting 75 percent of the current code's wind loads, they must be strengthened or replaced according to IBC's requirements.

Designers should determine whether IEBC 2015 is applicable and clearly indicate any additional work required for compliance in the construction documents. The International Code Council (ICC), publisher of IEBC 2015, indicates it already applies in California and Colorado and in specific jurisdictions in Massachusetts, Mississippi, Oklahoma, Washington, West Virginia and Wyoming.

Local AHJs can verify whether IEBC 2015 applies.

Which code applies?

Because building, residential, energy and existing building codes, as well as other codes, can be adopted at the municipal, county or state levels, when your company performs reroofing projects in multiple jurisdictions, different combinations of codes may apply. Therefore, it is important you be aware of which codes—and which specific editions of those codes—apply to each reroofing project.

Code applicability can be determined by contacting the AHJ (building code department) for the location of a specific reroofing project.

NRCA encourages all roofing professionals—roof system designers, material and product manufacturers and suppliers, roof consultants and roofing contractors—to be aware of the specific codes that apply in the areas where they do business. You also should be aware of the specific codes' provisions applicable to the work for which your company is responsible.

Additional information regarding IBC, IRC, IECC and IEBC is available from ICC's website, www.iccsafe.org

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Mark S. Graham is NRCA's vice president of technical services.

New roofing rules

IEBC 2015 presents challenges when reroofing

by Mark S. Graham

For the first time, the *International Existing Building Code, 2015 Edition* (IEBC 2015) includes specific code requirements applicable to reroofing. IEBC 2015 also provides additional and sometimes more complex code requirements than those contained in the International Building Code (IBC) and International Residential Code (IRC).

Reroofing requirements

IBC and IRC were developed and are maintained with the primary intent of applying to new construction. One exception is both codes also address reroofing—re-covering and replacing existing roof coverings on existing buildings.

Where adopted, IEBC 2015's structural reroofing requirements may be more stringent

For example, in IBC 2015, reroofing is addressed in Chapter 15—Roof Assemblies and Rooftop Structures, Section 1511—Reroofing. Similar requirements are included in IRC's Chapter 9—Roof Assemblies where Section R908—Reroofing specifically addresses re-covering and replacing existing roof coverings.

Additional requirements

IEBC 2015's scope indicates it "… shall apply to the *repair, alteration, change of occupancy, addition* to and relocation of *existing buildings*." Italicized terms are defined in Chapter 2—Definitions.

New definitions have been added in IEBC 2015 for reroofing, roof re-cover, roof repair and roof replacement. The terms and their definitions are the same as those in IBC.

IEBC 2015 classified work on existing buildings into three categories: Level 1, Level 2 and Level 3.

Level 1 alterations include the removal and replacement or the covering of existing materials, elements, equipment or fixtures using new materials, elements, equipment or fixtures that serve the same purpose. Reroofing projects are considered Level 1 alterations.

Level 2 and Level 3 alterations are larger in scope. For example, Level 3 alterations apply when the work area exceeds 50 percent of the building (floor) area.

IEBC 2015's Chapter 7—Alterations—Level 1 includes a new section, Section 706—Reroofing, that was not included in IEBC's previous editions. This section's requirements are identical to those of IBC 2012's Section 1510—Reroofing.

IEBC 2015's Section 707—Structural includes some additional requirements applicable to reroofing.

Section 707.2—Addition or Replacement of Roofing or Replacement of Equipment indicates when roof system replacement results in additional dead load; structural components supporting the new roofing materials need to comply with IBC. Exceptions to this requirement include where the dead load does not increase element forces by more than 5 percent; buildings designed in accordance with IBC's conventional light-frame construction methods or IRC; or where the new second layer weighs less than 3 pounds per square foot.

Section 707.3—Additional Requirements for Reroof Permits provides additional structural requirements for projects where the authority having jurisdiction (AHJ) requires reroofing permits.

Section 707.3.1 requires unreinforced masonry parapets for buildings where more than 25 percent of the roof area is being reroofed in Seismic Design Category D, E or F to have new parapet bracing installed to resist IBC's seismic forces.

Section 707.3.2 requires buildings located in high-wind regions (V_{ult} greater than 115 mph or in special wind regions) that are designed with roof diaphragms (roof decks) to be evaluated for structural adequacy. This requirement applies when more than 50 percent of the diaphragm is exposed during roof system replacement. The roof diaphragm, connections of the roof diaphragm to roof framing members and roof-to-wall connections are required to be evaluated using the current code's wind loads. If the diaphragm and connections are not capable of resisting 75 percent of the current code's wind loads, they must be strengthened or replaced according to IBC's requirements.

Being knowledgeable

Where adopted, IEBC 2015's structural reroofing requirements may be more stringent than IBC's and IRC's reroofing provisions.

Designers should determine whether IEBC 2015 is applicable and clearly indicate any additional work that is required for compliance in the construction documents.

The International Code Council, publisher of IEBC 2015, indicates the code currently applies in California and Colorado and in specific jurisdictions in Massachusetts, Mississippi, Oklahoma, Washington, West Virginia and Wyoming. Local AHJs can verify whether IEBC 2015 applies.

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Other options

Take advantage of alternative approval provisions in building codes

by Mark S. Graham

BUILDING CODES by their nature tend to be limiting—they limit designs, materials and construction methods to those specifically prescribed in codes and meeting codes' performance requirements. However, most codes contain provisions that allow building officials to approve alternatives that are not specifically permitted by the codes.

You should be aware of these alternative approval provisions because they apply to an increasing number of roofing products and roof systems.

Alternative approval

The 2006 edition of the International Building Code (IBC) includes the following statement regarding alternatives: "104.11 Alternative materials, design and methods of construction and equipment. The provisions of the code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work is, for the purpose intended, at least the equivalent of that prescribed in this code for quality, strength, effectiveness, fire resistance, durability and safety."

Evaluation reports

To assist in evaluating alternatives, building officials likely will request supporting data in the form of valid research reports from recognized sources.

ICC Evaluation Service (ICC-ES) Inc. issues research reports, commonly referred to as "evaluation reports," based on technical evaluations the company performs on building products, components and materials. Because ICC-ES is a subsidiary of the International Code Council, which publishes IBC, ICC-ES evaluation reports are considered by most building officials to be valid research reports when considering alternative approvals.

ICC-ES evaluation reports are available for hundreds of manufacturers' building components, products and systems, including many roofing products. These reports can be obtained from the individual manufacturers that have requested evaluations and on ICC-ES' Web site.

Roofing products

IBC's alternative approval provisions provide a viable means for you to gain a building official's approval of newly developed roofing products and roof systems and those not yet specifically permitted by IBC.

Roofing products that are not specifically permitted by IBC but have evaluation reports include synthetic steep-slope underlayments; fiber cement and synthetic shingles, shakes and slates; metal shingles; some specialty asphalt shingles; and hot, fluid-applied membrane roof systems.

IBC's alternative approval provisions also can be used to gain a building official's approval for roof system types the code does not completely address.

For example, vegetative green roof systems are described in the code; however, the code does not contain specific external fire- and wind-resistance classification information that is considered appropriate for vegetative green roof systems.

At this time, I am not aware of any manufacturer of vegetative green roof systems that has obtained a system-specific evaluation report. However, I hope manufacturers will pursue evaluation reports to help roofing professionals obtain building officials' approvals through the code's alternative approval provisions.

Additional information about building code requirements specific to roofing products and roof systems is provided in *The NRCA Building Codes Manual, Third Edition*.

For links to ICC-ES' Web site and lists of ICC-ES acceptance criteria and evaluation reports, as well as a link to more information about *The NRCA Building Codes Manual, Third Edition*, log on to www.professionalroofing.net.

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