NFPA 5000: a new model building code

A new code provides challenges for the roofing industry

by Mark S. Graham

In August 2002, the National Fire Protection Association (NFPA) published its first model building code. *Building Construction and Safety Code™ NFPA 5000*, complements NFPA's other codes, some of which have existed for years and been adopted by many code jurisdictions.

Because NFPA 5000's scope and roofing-related provisions are somewhat different from those of other codes, you should be aware of NFPA 5000 and whether it may apply in the jurisdictions in which you conduct business.

Scope and purpose

According to NFPA, the new code " … addresses those construction, protection and occupancy features necessary to minimize danger to life and property."

The code's purpose is to provide minimum design regulations to safeguard life, health, property and public welfare, as well as minimize injuries, by regulating and controlling the permitting, design, construction, quality of materials, use and occupancy, location and maintenance of all buildings within jurisdictions where the code is adopted.

Format and organization

NFPA 5000 consists of 508 pages encompassing 55 chapters, four annexes and one index. The specific titles of the individual chapters are provided on *Professional Roofing*'s Web site, www.professionalroofing.net.

The four annexes provide some useful additional information to code users though the information is not necessarily considered enforceable. For example, Annex A—Explanatory Material—offers explanatory information applicable to specific code provisions. An asterisk within a section in the text indicates a provision with explanatory information in Annex A. More than 75 pages of information are provided in Annex A.

A majority of the code's roofing-related requirements are contained in Chapter 38—Roof Assemblies and Roof Structures. The section format for this chapter also is available on *Professional Roofing*'s Web site. Some roofing-related requirements provided in Chapter 38 follow.

General requirements

Section 38.1 provides the chapter's scope and some general requirements applicable to all roof assemblies. The scope indicates, "All roof assemblies and rooftop structures shall comply with the requirements of this chapter."

Section 38.1.3 requires all materials used in roof assemblies be specified in the chapter or tested according to the code's Table 38.1.3.1. This table provides specific standard requirements, typically ASTM International material standards, for 84 roofing product types.

Exterior fire exposure

Section 38.2 provides requirements for roof assemblies' resistances to exterior

continues on page 38

NFPA facts

- A not-for-profit organization founded in 1896 and headquartered in Quincy, Mass.
- About 75,000 members
- About 320 staff members
- Mission—to reduce the worldwide burden of fire and other hazards on the quality of life by developing and advocating scientifically based consensus codes and standards, research, training and education
- Publishes more than 300 codes and standards that influence many aspects of building design, construction, operation and maintenance

continued from page 36

fire exposure. Roof assemblies generally must be tested according to NFPA 256, "Standard Methods of Fire Tests of Roof Coverings," or other approved test methods. The code's annex indicates FM 4470, "Approval for Class I Roof Covers"; UL 790, "Standard for Safety for Tests for Fire Resistance of Roof Covering Materials"; and ASTM E108, "Standard Test Methods for Fire Tests of Roof Coverings," yield results similar to NFPA 256. These are the test methods that provide Class A, Class B and Class C exterior fire ratings to which you are accustomed.

Roof systems' minimum required exterior fire ratings are determined by buildings' construction types. Chapter 7—Construction Types and Height and Area Requirements—provides the specific guidelines for determining buildings' construction types (Type I, Type II, etc.). Interestingly, NFPA 5000 does not appear to require a Class A fire rating for any particular building type; Class B or Class C fire ratings are required for roof assemblies for most building types. However, most single-family and townhouse dwellings, some one- and two-story buildings, and agricultural buildings can be constructed with nonclassified roof assemblies, meaning they don't require exterior fire exposure ratings.

Interior fire exposure

Section 38.3 provides specific requirements for roof assemblies' resistances to interior fire exposure. Interior fire exposure requirements are based on buildings' construction types as determined by Chapter 7. For certain buildings of Type I or Type II construction, roof assemblies must be tested according to FM 4470; FM 4450, "Test Standard for Class 1 Insulated Steel Deck Roofs"; or UL 1256, "Standard for Safety for Fire Tests of Roof Deck Construction."

Wind resistance

Section 38.4 requires roof assemblies and flashings be designed to withstand design wind pressures. Design wind pressures are determined using Chapter 35—Structural Design, Section 35.9 (Wind Loads). The code permits the use of ASCE 7-02 (2002 edition), "Minimum Design Loads for Buildings and Other Structures."

Most roof assemblies must be tested for wind-uplift resistances. The test methods used to evaluate specific roof systems are provided in Table 38.4.2.1. Generally, these are the Underwriters Laboratories Inc., FM Global and ASTM test methods recognized in the roofing industry.

Concrete and clay tile and loose-laid ballasted roof assemblies are exempted from wind-uplift resistance testing if they are installed according to code-prescribed methods. Section 38.4.3.2 requires concrete or clay tile roof assemblies be installed according to FRSA/NTRMA 07320/1, "Concrete and Clay Roof Tile Installation Manual." Section 38.4.3.2 requires loose-laid ballasted roof assemblies be designed and installed according to ANSI/SPRI RP-4, "Wind Design Standard for Ballasted Single-ply Roofing Systems."

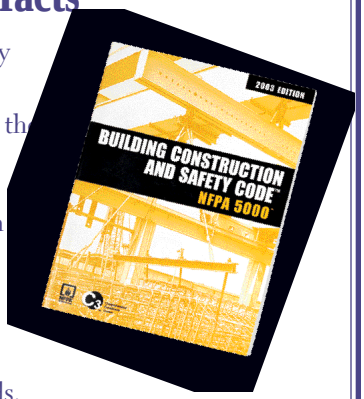
Regarding edge metal flashings, Section 38.4.2.2 requires flashing details be tested and listed according to FM 4435, "Test Standard for Roof Perimeter Flashing," or ANSI/SPRI ES-1, "Wind Design Guide for Edge Systems Used with Low-slope Roofing Systems" (see "FM Research approves NRCA details," March 2002 issue, page 64, and "NRCA receives an approval listing," February 2001 issue, page 100).

Section 38.4.4 indicates gravel or stone cannot be used on roof assemblies on buildings higher than 60 feet (18 m) or buildings located in hurricane-prone regions, such as the Atlantic and Gulf coasts, American Samoa, Guam, Hawaii, Puerto Rico and the U.S. Virgin Islands.

Hail

NFPA 5000 provides specific requirements for buildings' roof assemblies to be hail-resistant in specific hail-prone regions. A map defining these regions is provided in the code. Generally, the central region and a portion of the east region of the United States are considered hail-prone in NFPA 5000.

NFPA 5000 facts



- NFPA 5000 development was supervised by NFPA's Standards Council.
- Seventeen committees were established by the Standards Council to develop various code chapters. For example, NFPA's Technical Committee on Structures and Construction primarily developed the code's roofing-related provisions.
- In March 2000, NFPA began its initiative to develop its own model building code to complement its existing codes and standards.
- A complete draft of the entire code was submitted to NFPA's membership and approved at NFPA's Technical Meeting in Minneapolis May 19-23, 2002.
- On July 19, 2002, NFPA's Standards Council issued the current NFPA 5000 edition, which is designated as a 2003 edition with an effective date of Aug. 8, 2002.
- NFPA 5000's 2003 edition has been approved as an American National Standard by the American National Standards Institute.

Roof assemblies in the regions defined on the map must be tested and classified according to FM 4470; FM 4473, "Specification Test Protocol for Impact Resistance Testing of Roofing Materials by Impacting with Freezer Ice Balls"; or UL 2218, "Standard for Impact Resistance of Prepared Roof Coverings."

Section 38.5.2.3 exempts most aggregate-, slag- and paver-surfaced roof assemblies from the requirement for impact-resistance testing.

Roof drainage

Section 38.11.1 requires roof assemblies be sloped a minimum of ¼-in-12 toward drainage except for coal-tar built-up roof (BUR) assemblies, which are permitted to be sloped at a minimum of ⅛-in-12.

NFPA 5000 requires roof drainage (roof drains, scuppers, gutters, etc.) be designed with independent primary and secondary roof drainage systems according to the *Uniform Plumbing Code*.

Rooftop structures

Chapter 38 also includes specific requirements for common rooftop structures though these typically are not considered part of roof assemblies. The code defines rooftop structures as penthouses, towers and spires, sloped glazing and skylights, light-transmitting plastics and rooftop heliports.

Reroofing

In NFPA 5000, replacement or recovering of existing roof assemblies is not addressed in the roofing chapter but in Chapter 15—Building Rehabilitation, Section 15.4—Renovation. In general, this section permits a maximum of two layers of roof coverings (one roof assembly and one re-cover assembly) before complete roof system removal is necessary.

For roof re-covers, Section 15.4.2.6 requires any existing wet roof system components be replaced.

Also, for roof re-covers, NFPA 5000 requires the completed composite roof assembly (existing roof system and re-cover roof system) to comply with the code's requirements for new roofing in Section 38.2 (exterior fire exposure), Section 38.3 (interior fire exposure), Section 38.4 (wind resistance) and Section 38.5 (hail resistance).

Other requirements

In addition to the roofing-related requirements in Chapter 37 and reroofing requirements in Chapter 15, roofing-related requirements also appear in other chapters. For example, requirements relating to the use of plastic-foam insulation are provided in Chapter 48—Plastics. Requirements for using minimum amounts of thermal insulation in roof assemblies are provided in Chapter 51—Energy Efficiency.

Also, specific requirements applicable to below-grade dampproofing and

waterproofing are featured in Chapter 36—Soils, Foundations and Retaining Walls.

Challenges

NFPA 5000 provides some unique challenges for roofing industry professionals because it mandates requirements that do not appear in other model building codes.

For example, NFPA 5000 does not permit the use of aggregate on roof assemblies on buildings greater than 60 feet (18 m) high or any buildings in hurricane-prone regions. The net result of this requirement is that coal-tar BUR systems and other aggregate-surfaced roof systems, including ballasted roof systems, will not comply with NFPA 5000 on such buildings. This requirement significantly limits the number of roof system options available for use on these buildings.

Similarly, NFPA 5000's impact-resistance requirements limit the number of roof systems that can be used in hail-prone regions. Many common asphalt shingle products and nonaggregate-surfaced membrane roof systems will not comply with the code's required tests for hail resistance.

Interestingly, NFPA 5000 exempts aggregate-surfaced roof systems from hail-testing requirements, essentially allowing their use in hail-prone regions. However, considering the code's wind-resistance requirements, which do not permit aggregate-surfaced roof systems on buildings higher than 60 feet (18 m), roof system options available for use on high-rise buildings in hail-prone regions significantly are limited.

Adoption of NFPA 5000

NFPA 5000 is available for adoption by code jurisdictions, but at this point, I am not aware of any code jurisdiction that has adopted the code. This is largely because the code recently was published. Adoption of NFPA 5000 currently is being considered in a number of code jurisdictions in the west and southwest regions of the United States. ■

Mark S. Graham is NRCA's associate executive director of technical services.