NRCA LEGAL
LEGALCON VIRTUAL

Tuesday, March 26, 2024
12:15 to 1:30 p.m. Central Time

Talking technical

NRCA

Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association
Rosemont, Illinois

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RESEARCH+TECH

Considering substitutions

Be aware of potential consequences with product substitution

by Mark S. Graham

With ongoing shortages of building materials and products, substitutions have become more commonplace—but they can have unintended consequences. One issue that has arisen involves substituting European lumber for North American lumber, a decision that could result in unintended consequences.

The situation

At the start of the COVID-19 pandemic, wood product producers were operating under the same uncertainty as the rest of the world. Many mills curtailed production in anticipation of worker shortages and reduced demand. At the same time, many wholesale and retail lumber customers significantly reduced inventory levels. Also, because of the Great Recession, several mills had closed permanently. The American Wood Council reports between 2007 and 2017, mill closures in the South resulted in a lumber capacity loss between 1.7 to 2 billion board feet. Mill closures in the Pacific Northwest represented 10% of the area's mills.

Although the demand for wood products had dipped, it quickly rebounded during the pandemic because of increased remodeling projects and new housing starts spurred, in part, by low interest

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Standards for wood structural panels

International Residential Code, 2021 Edition

Plywood:

- U.S. Department of Commerce PS-1, "Structural Plywood"
- CSA Group O325, "Construction Sheathing"

Oriented-strand board (OSB):

- U.S. Department of Commerce PS-2, "Performance Standard for Wood-based Structural-use Panels"
- CSA Group O437, "Standards for OSB and Waferboard"

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Common, but not referenced in the Code

Plywood and OSB:

- APA-The Engineered Wood Association Standard PRP-108, "Performance Standards and Policies for Structural-Use Panels"

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Roof sheathing attachment

IRC 2021 Table 602.3(1), Rows 31-33 (minimum attachment)

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING OF FASTENERS	
			Edges[h] (inches)	Intermediate supports[c, e] (inches)
Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing [see Table R602.3(3) for wood structural panel exterior wall sheathing to wall framing]				
31	$^3/_8$″ – $^1/_2$″	6d common or deformed (2″ × 0.113″ × 0.266″ head); or $2^3/_8$″ × 0.113″ × 0.266″ head nail (subfloor, wall)[i]	6	6[f]
		8d common ($2^1/_2$″ × 0.131″) nail (roof); or RSRS-01 ($2^3/_8$″ × 0.113″) nail (roof)[b]	6	6[f]
32	$^{19}/_{32}$″ – $^3/_4$″	8d common (2-$2^1/_2$″ × 0.131″) nail (subfloor, wall)	6	12
		8d common ($2^1/_2$″ × 0.131″) nail (roof); or RSRS-01; ($2^3/_8$″ × 0.113″) nail (roof)[b]	6	6[f]
		Deformed $2^3/_8$″ × 0.113″ × 0.266″ head (wall or subfloor)	6	12
33	$^7/_8$″ – $1^1/_4$″	10d common (3″ × 0.148″) nail; or ($2^1/_2$″ × 0.131 × 0.281″ head) deformed nail	6	12

f. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at 4 inches on center where the ultimate design wind speed is greater than 130 mph in Exposure B or greater than 110 mph in Exposure C.

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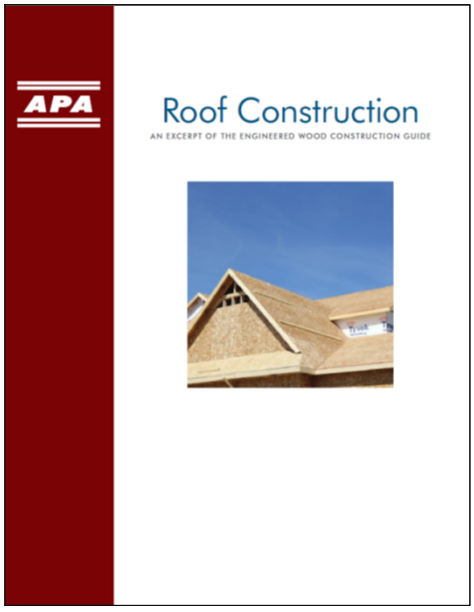

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APA Form E30, "Roof Construction"
--Roofing-specific excerpts from APA's *Engineered Wood Construction Guide* (102 pages)

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RESEARCH+TECH

Plywood or OSB?

Moisture-related concerns exist with wood structural panels

by Mark S. Graham

NRCA's technical services staff continues to hear from roofing contractors experiencing moisture-related dimensional stability problems with plywood and oriented strand board structural panel sheathing used with steep-slope roof systems. Following is a brief discussion of moisture mechanics, linear expansion and thickness swell testing, and NRCA's recommendations for plywood and OSB structural panel sheathing roof decks.

Moisture mechanics

Plywood and OSB sheathing, similar to all wood products, are hygroscopic, meaning they tend to absorb and release moisture from their surroundings.

When not exposed to direct wetting, structural panel sheathing's moisture content is a function of its environment's relative humidity and temperature. During construction and its service life, panels may be exposed to direct moisture. When exposed to direct wetting, structural panel sheathing's moisture content is influenced by wetting time and panel variables that affect capillarity, such as veneer species of plywood and wax additives in OSB.

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A Not-So-Perfect Storm:
The Convergence of Large Buildings, Wood Decks, and Mechanically Attached Low-Slope, Single-Ply Roofing Systems

ABSTRACT

Recent indicators suggest the potential need for additional design considerations when installing mechanically attached, low-slope, single-ply roof systems over oriented strand board (OSB) decking in large warehouse applications. Specifically, sustained wind uplift forces, building pressurization, or a combination of the two can sometimes coincide to subject the roof system to excessive stress. This, in turn, may cause the mechanical fasteners securing the roof to loosen or withdraw.

To gain a deeper understanding of the potential concerns associated with employing standard fastening patterns in such systems, we conducted a limited sampling of cyclic and dynamic testing. This limited sampling allowed us to formulate prospective conclusions on the potential effects of wind uplift and building pressurization on mechanical fastener pullout values.

This white paper is dedicated to exploring the potential performance of in-seam mechanical fastening patterns in OSB decking systems within large warehouse building environments when they are exposed to a variety of environmental conditions. Furthermore, we aim to provide suggestions for design professionals to consider when choosing to use a mechanically fastened single-ply roofing system over an OSB deck in large warehouse applications.

LEARNING OBJECTIVES

- Identify wind uplift and building pressurization issues with wood decks on large warehouse and industrial structures and the resulting effects on mechanically attached, single-ply roofing systems.
- Describe wind and pressure-related failures of single-ply roof systems on distribution centers in the western United States.
- Recognize variability in wood decking materials as well as the effect of pressure, cycling, and eccentric uplift forces in the acceleration of roof system failures.
- Explain design and installation best practices along with repair recommendations to reinforce roof system reliability.

SPEAKERS

Richard Gustin
Johns Manville, Denver, Colorado

Rick Gustin started his career as a roofing contractor before coming to Johns Manville (JM) in 1996, where he served as a field technical representative. He then held various roles, including technical services specialist, Six Sigma Black Belt, and application engineer before assuming responsibility as manager of Guarantee Services. In 2013, he became the EPDM product manager focusing on developing JM's offering. Today, Rick is the Owner Services Technical Manager responsible for large claims and technical marketing support. He holds a degree in mechanical engineering from Rensselaer Polytechnic Institute.

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March 8-11, 2024

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Considerations

Lumber, plywood and OSB

- Be extra cautious of plywood and OSB roof decks
- Limit your deck acceptance responsibilities
- Consider more proactive plywood and OSB deck replacement
- Consider pull tests for plywood and OSB roof decks when using mechanically-attached membrane systems

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Radio frequency radiation

Rooftop cell phone transmitters

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CRCA Advisory Bulletin

JUNE 2023

Radiofrequency Radiation and Electromagnetic Fields

The increased number of cellular antennas and other communication equipment that generates radiofrequency radiation (RF) and electromagnetic fields (EMF) may be exposing roofers and other contractors to harmful levels of radiations when working on rooftops, sides of buildings and other locations where RF generating antennas are located. This bulletin will focus on radiation types, safety limits and mitigating exposure.

With the ever-increasing use and development of communication technology, there is an increased risk for those working in and around communication devices and equipment that emit radiofrequency electromagnetic fields (EMF) such as smart meters, cell phone towers and equipment using 5G technology. Roof areas are often prime locations for this type of equipment and anyone accessing these roof areas for any reason should be aware of the Occupational Health and Safety requirements and the Safety Code 6. Consult with provincial and/or federal authorities having jurisdiction for further information/guidance for most stringent requirements.

What is Radiofrequency (RF) Radiation?

There are two types of radiation – ionizing radiation and non-ionizing radiation. Both are forms of electromagnetic energy, but ionizing radiation has more energy than non-ionizing radiation. Ionizing radiation, like x-rays or gamma rays, has enough energy to cause chemical changes by breaking chemical bonds. Sources of this type of radiation can be found in hospitals, nuclear energy plants, and nuclear weapons facilities. Non-ionizing radiation causes molecules to vibrate, which generates heat. RF radiation is a type of non-ionizing radiation and is the energy used to transmit wireless information. RF radiation is invisible and power levels of equipment and amount of RF radiation can fluctuate without warning.

About Safety Code 6

Health Canada publishes Safety Code 6[1] which sets out recommended safety limits for human exposure to radiofrequency electromagnetic fields (EMF) in the frequency range from 3 kHz to 300 GHz. This range covers the frequencies used by communications devices and equipment that emit radiofrequency EMF such as: Wi-Fi, cell phones, smart meters, cell phone towers, those using 5G technology.

Safety Code 6 is reviewed on a regular basis to confirm that it continues to provide protection against all known potentially adverse health effects. If new scientific evidence were to show that exposure to radiofrequency EMF below the levels found in Safety Code 6 poses a risk, the Government of Canada would take steps to protect the health of Canadians.

[1] https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/occupational-exposure-regulations/safety-code-6-radiofrequency-exposure-guidelines.html

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CRCA Advisory Bulletin

June 2023

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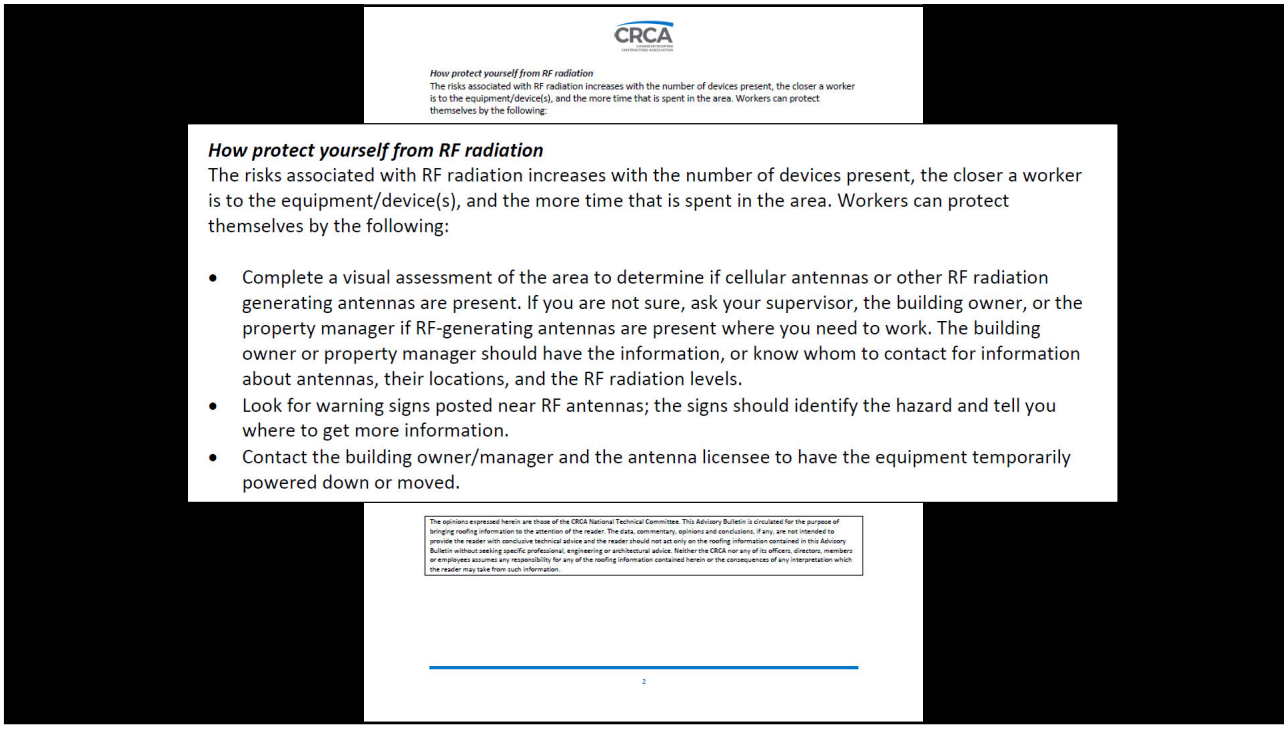

How protect yourself from RF radiation

The risks associated with RF radiation increases with the number of devices present, the closer a worker is to the equipment/device(s), and the more time that is spent in the area. Workers can protect themselves by the following:

- Complete a visual assessment of the area to determine if cellular antennas or other RF radiation generating antennas are present. If you are not sure, ask your supervisor, the building owner, or the property manager if RF-generating antennas are present where you need to work. The building owner or property manager should have the information, or know whom to contact for information about antennas, their locations, and the RF radiation levels.
- Look for warning signs posted near RF antennas; the signs should identify the hazard and tell you where to get more information.
- Contact the building owner/manager and the antenna licensee to have the equipment temporarily powered down or moved.

The opinions expressed herein are those of the CRCA National Technical Committee. This Advisory Bulletin is circulated for the purpose of bringing roofing information to the attention of the reader. The data, commentary, opinions and conclusions, if any, are not intended to provide the reader with conclusive technical advice and the reader should not act only on the roofing information contained in this Advisory Bulletin without seeking specific professional, engineering or architectural advice. Neither the CRCA nor any of its officers, directors, members or employees assumes any responsibility for any of the roofing information contained herein or the consequences of any interpretation which the reader may take from such information.

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Recognize the signage

Photos courtesy of Peter Shackford—Hettrick, Cyr & Associates, Inc.

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CRCA

How protect yourself from RF radiation

The risks associated with RF radiation increases with the number of devices present, the closer a worker is to the equipment/device(s), and the more time that is spent in the area. Workers can protect themselves by the following:

- Complete a visual assessment of the area to determine if cellular antennas or other RF radiation generating antennas are present. If you are not sure, ask your supervisor, the building owner, or the property manager if RF-generating antennas are present where you need to work. The building owner or property manager should have the information, or know whom to contact for information about antennas, their locations, and the RF radiation levels.
- Look for warning signs posted near RF antennas; the signs should identify the hazard and tell you where to get more information.
- Contact the building owner/manager and the antenna licensee to have the equipment temporarily powered down or moved.

If work needs to be performed within a potentially hazardous area:

- Check the site survey or roof plan for potential exposure levels
- Pre-plan work tasks and travel routes so you can limit trips through the RF field and time spent on tasks there – the goal is to get in and out as quickly as possible.
- Avoid standing directly in front of or close to an antenna. As a rule of thumb, stay 1.5 m (6 feet) away from a single antenna and 3 m (10 feet) away from a group of antennas.
- Use a personal RF monitor. The monitor will warn you if you are in an area where RF radiation is at a dangerous level. There are several handheld EMF personal safety monitors available on the market that measure exposure and allow workers to work in an exposed area for a limited time. Use personal monitors and protective clothing while work is being performed and if an alarm sounds, stop work and leave the area immediately.

the reader may take from such information.

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Some useful references

- CRCA Advisory Bulletin (Link)
- Health Canada's Safety Code 6 (Link)
- Federal Communications Commission (Link)
- Center for Construction Research and Training (Link)

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TOOLBOXTALKS

Radio frequency (RF) hazards

According to the Federal Communications Commission (FCC), radio waves and microwaves emitted by transmitting antennae are one form of electromagnetic energy that harm people. Harm from RF exposure will vary according to power levels, length of exposure time and distance from the antennae. Sources of RF energy on a rooftop often are not obvious and usually are not properly marked or defined as danger zones by warning signs. In many cases, antennae are hidden by building elements so workers may not be aware of their presence. Here are some important facts about RF energy and things that you can do to avoid it:

- High levels of RF may heat body tissue and increase body temperature, causing tissue damage because the body cannot cool quickly enough to prevent damage. This is called RF's thermal effects, and your eyes are the most vulnerable part of your body. Actual contact may cause a shock or burn.
- At lower, nonthermal levels of RF exposure, nervous system and immune system problems, kidney damage, neurological disorders and even some cancers may occur.
- Become familiar with what RF transmitters or antennae look like and the dangers of working near them. Be aware that warning signs for RF transmitters may not always be present on a roof.
- Your employer must inquire as to the presence of RF equipment and whether it may be shut down or shielded or other barrier device installed for the duration of the work period roofing workers will be in proximity to the transmitter.
- Symptoms of RF exposure often seem the same as physical exertion and can become heat exhaustion or heat stroke. Removing a worker from the area and cooling the body is important. Trained, professional medical care of the symptoms is critical.

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2024 I-codes

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The 2024 I-codes have already been published and are available, except for the *International Residential Code, 2024 Edition* and *International Energy Conservation Code, 2024 Edition*

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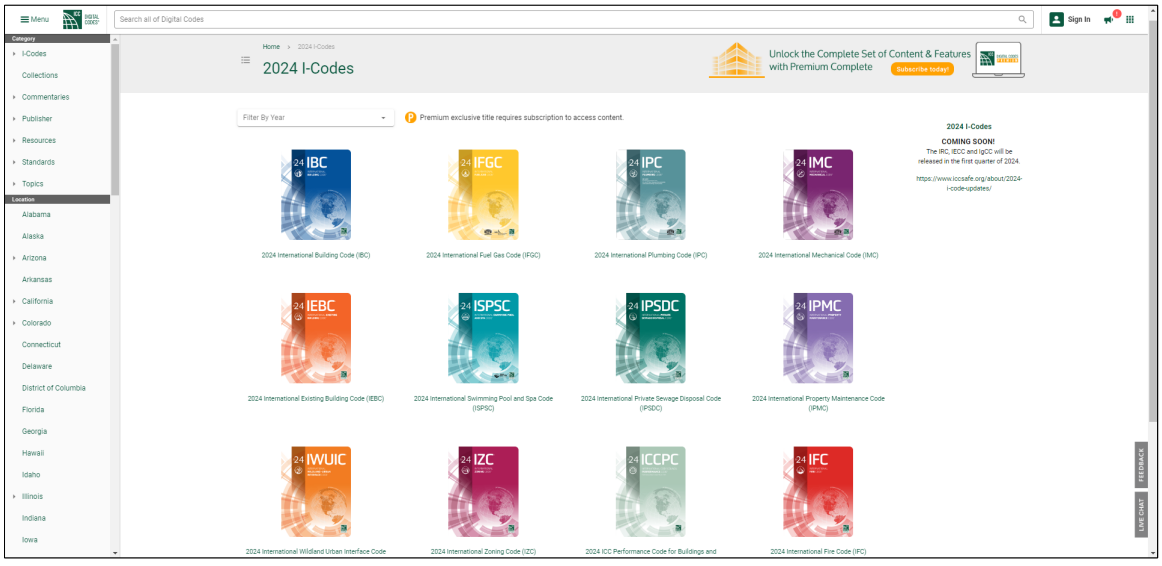
Accessing the I-codes

codes.iccsafe.org



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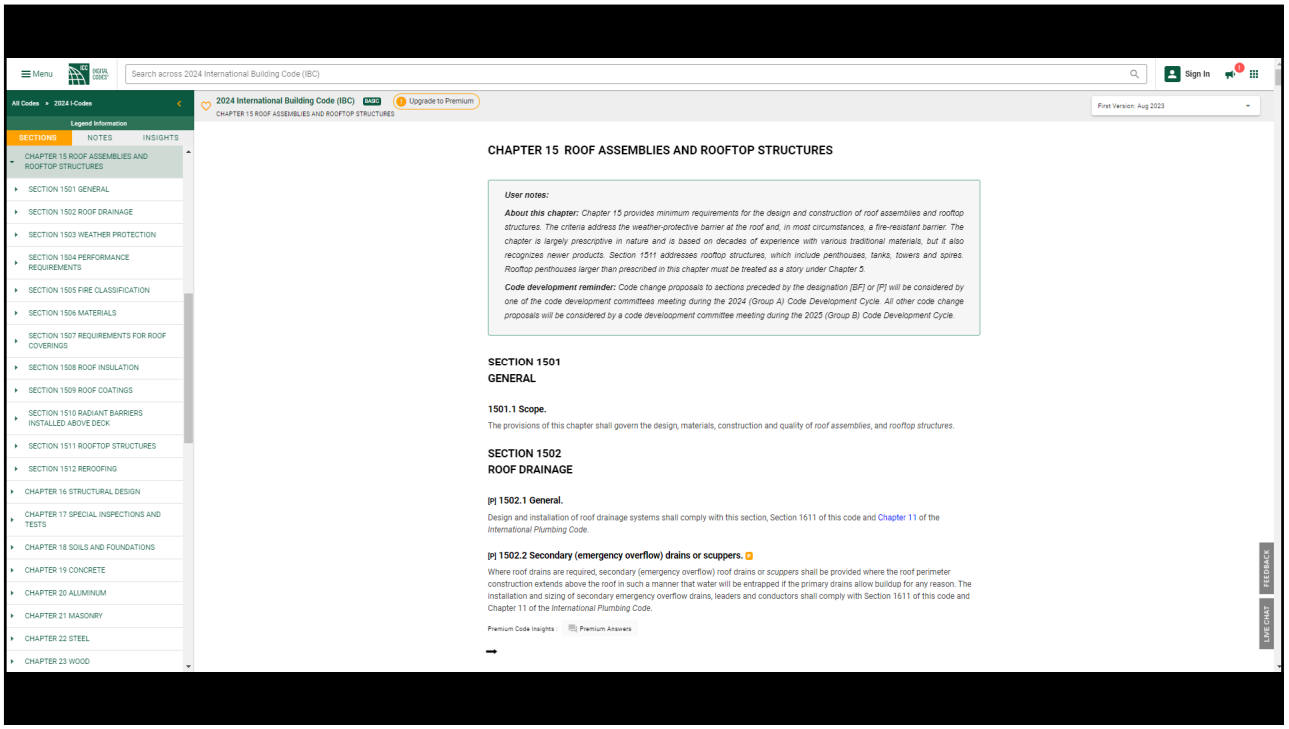

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Purchasing the I-codes

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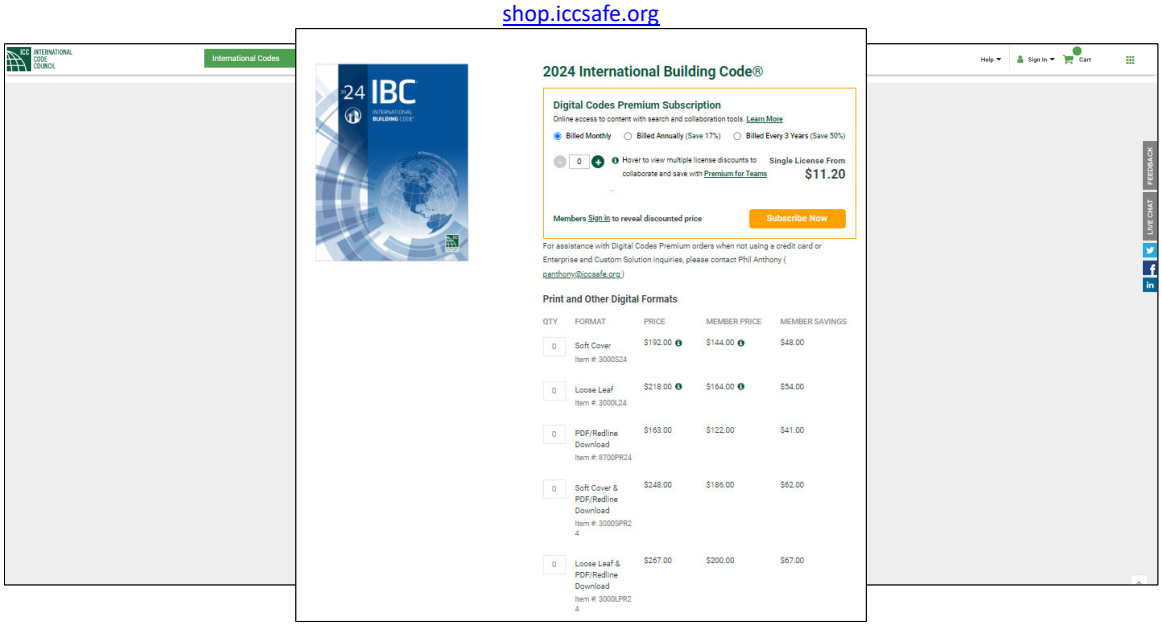

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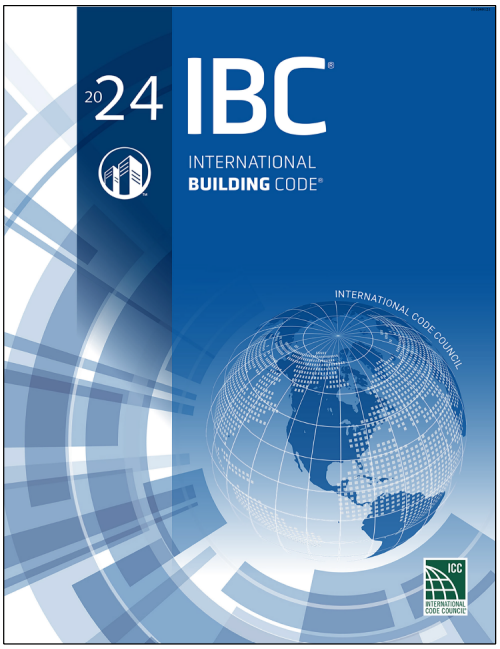

New to the 2024 I-codes

- Single column text format
- Updated font styles
- QR codes identifying changes
- Streamlined lists
- Consistent grouping of related text (e.g., tables follow parent sections)
- Shaded table headers and notes

iccsafe.org/design-updates

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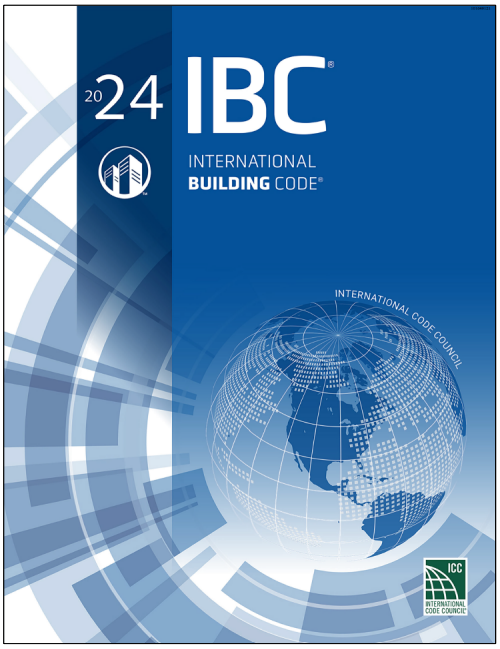

IBC 2024

- Ch. 15: Roof Assemblies and Rooftop Structures
- Ch. 27: Electrical
- Ch. 13: Interior Environment
- Ch. 16: Structural Design

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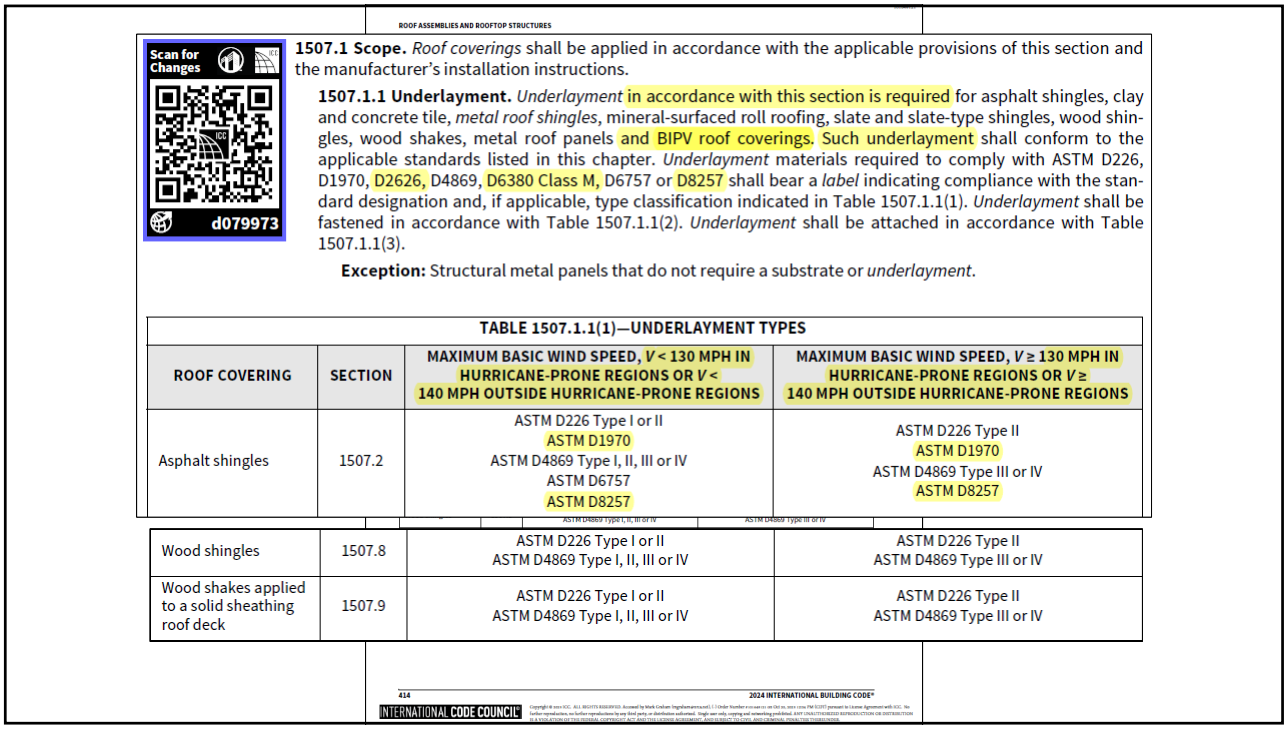

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

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

1507.1.1 Underlayment. *Underlayment* in accordance with this section is required for asphalt shingles, clay and concrete tile, *metal roof shingles*, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, metal roof panels and BIPV roof coverings. Such underlayment shall conform to the applicable standards listed in this chapter. *Underlayment* materials required to comply with ASTM D226, D1970, D2626, D4869, D6380 Class M, D6757 or D8257 shall bear a *label* indicating compliance with the standard designation and, if applicable, type classification indicated in Table 1507.1.1(1). *Underlayment* shall be fastened in accordance with Table 1507.1.1(2). *Underlayment* shall be attached in accordance with Table 1507.1.1(3).

Exception: Structural metal panels that do not require a substrate or *underlayment*.

TABLE 1507.1.1(1)—UNDERLAYMENT TYPES

ROOF COVERING	SECTION	MAXIMUM BASIC WIND SPEED, $V < 130$ MPH IN HURRICANE-PRONE REGIONS OR $V <$ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS	MAXIMUM BASIC WIND SPEED, $V \geq 130$ MPH IN HURRICANE-PRONE REGIONS OR $V \geq$ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS
Asphalt shingles	1507.2	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D6757 ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Wood shingles	1507.8	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or IV
Wood shakes applied to a solid sheathing roof deck	1507.9	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or IV

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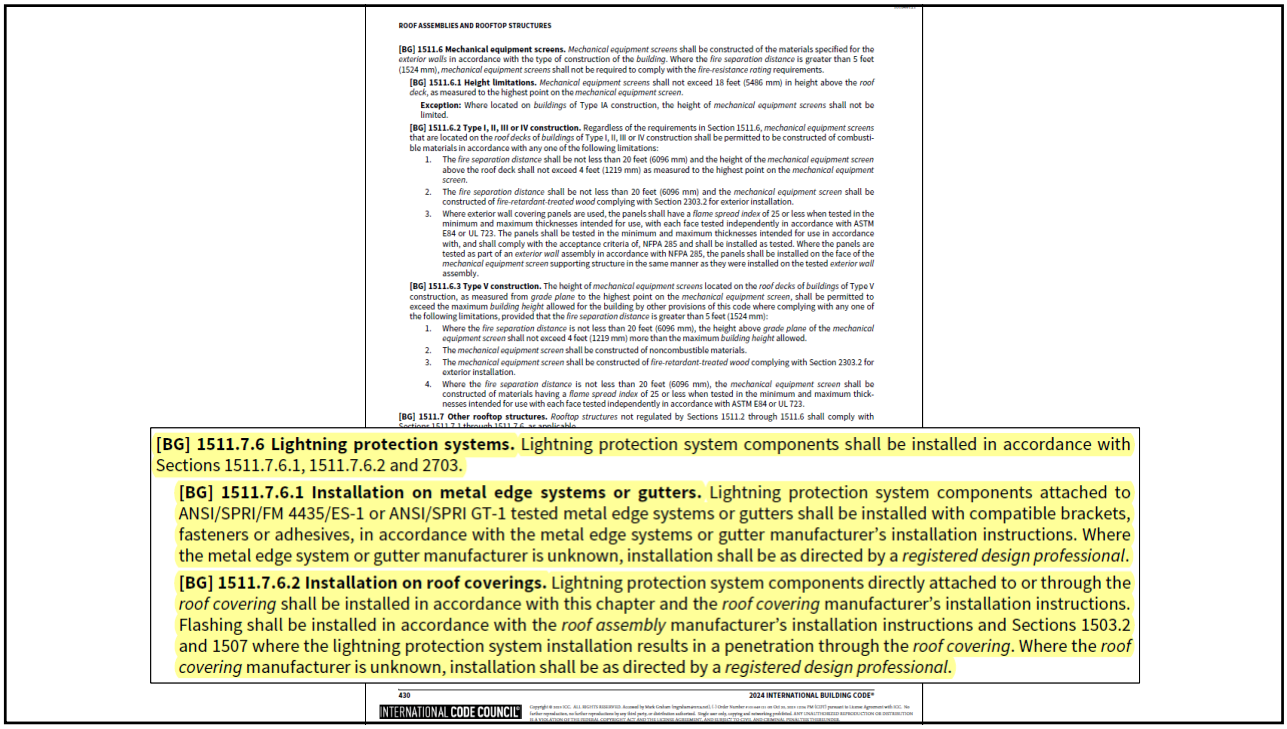

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

[BG] 1511.6 Mechanical equipment screens. *Mechanical equipment screens* shall be constructed of the materials specified for the *exterior walls* in accordance with the type of construction of the *building*. Where the *fire separation distance* is greater than 5 feet (1524 mm), *mechanical equipment screens* shall not be required to comply with the *fire-resistance rating* requirements.

[BG] 1511.6.1 Height limitations. *Mechanical equipment screens* shall not exceed 18 feet (5486 mm) in height above the *roof deck*, as measured to the highest point on the *mechanical equipment screen*.

Exception: Where located on *buildings* of Type IA construction, the height of *mechanical equipment screens* shall not be limited.

[BG] 1511.6.2 Type I, II, III or IV construction. Regardless of the requirements in Section 1511.6, *mechanical equipment screens* that are located on the *roof decks* of *buildings* of Type I, II, III or IV construction shall be permitted to be constructed of combustible materials in accordance with any one of the following limitations:

1. The *fire separation distance* shall be not less than 20 feet (6096 mm) and the height of the *mechanical equipment screen* above the roof deck shall not exceed 4 feet (1219 mm) as measured to the highest point on the *mechanical equipment screen*.
2. The *fire separation distance* shall be not less than 20 feet (6096 mm) and the *mechanical equipment screen* shall be constructed of *fire-retardant-treated wood* complying with Section 2303.2 for exterior installation.
3. Where exterior wall covering panels are used, the panels shall have a *flame spread index* of 25 or less when tested in the minimum and maximum thicknesses intended for use, with each face tested independently in accordance with ASTM E84 or UL 723. The panels shall be tested in the minimum and maximum thicknesses intended for use in accordance with, and shall comply with the acceptance criteria of, NFPA 285 and shall be installed as tested. Where the panels are tested as part of an *exterior wall* assembly in accordance with NFPA 285, the panels shall be installed on the face of the *mechanical equipment screen* supporting structure in the same manner as they were installed on the tested *exterior wall* assembly.

[BG] 1511.6.3 Type V construction. The height of *mechanical equipment screens* located on the *roof decks* of *buildings* of Type V construction, as measured from *grade plane* to the highest point on the *mechanical equipment screen*, shall be permitted to exceed the maximum *building height* allowed for the building by other provisions of this code where complying with any one of the following limitations, provided that the *fire separation distance* is greater than 5 feet (1524 mm):

1. Where the *fire separation distance* is not less than 20 feet (6096 mm), the height above *grade plane* of the *mechanical equipment screen* shall not exceed 4 feet (1219 mm) more than the maximum *building height* allowed.
2. The *mechanical equipment screen* shall be constructed of noncombustible materials.
3. The *mechanical equipment screen* shall be constructed of *fire-retardant-treated wood* complying with Section 2303.2 for exterior installation.
4. Where the *fire separation distance* is not less than 20 feet (6096 mm), the *mechanical equipment screen* shall be constructed of materials having a *flame spread index* of 25 or less when tested in the minimum and maximum thicknesses intended for use with each face tested independently in accordance with ASTM E84 or UL 723.

[BG] 1511.7 Other rooftop structures. *Rooftop structures* not regulated by Sections 1511.2 through 1511.6 shall comply with Sections 1511.7.1 through 1511.7.6, as applicable.

[BG] 1511.7.6 Lightning protection systems. Lightning protection system components shall be installed in accordance with Sections 1511.7.6.1, 1511.7.6.2 and 2703.

[BG] 1511.7.6.1 Installation on metal edge systems or gutters. Lightning protection system components attached to ANSI/SPRI/FM 4435/ES-1 or ANSI/SPRI GT-1 tested metal edge systems or gutters shall be installed with compatible brackets, fasteners or adhesives, in accordance with the metal edge systems or gutter manufacturer's installation instructions. Where the metal edge system or gutter manufacturer is unknown, installation shall be as directed by a *registered design professional*.

[BG] 1511.7.6.2 Installation on roof coverings. Lightning protection system components directly attached to or through the *roof covering* shall be installed in accordance with this chapter and the *roof covering* manufacturer's installation instructions. Flashing shall be installed in accordance with the *roof assembly* manufacturer's installation instructions and Sections 1503.2 and 1507 where the lightning protection system installation results in a penetration through the *roof covering*. Where the *roof covering* manufacturer is unknown, installation shall be as directed by a *registered design professional*.

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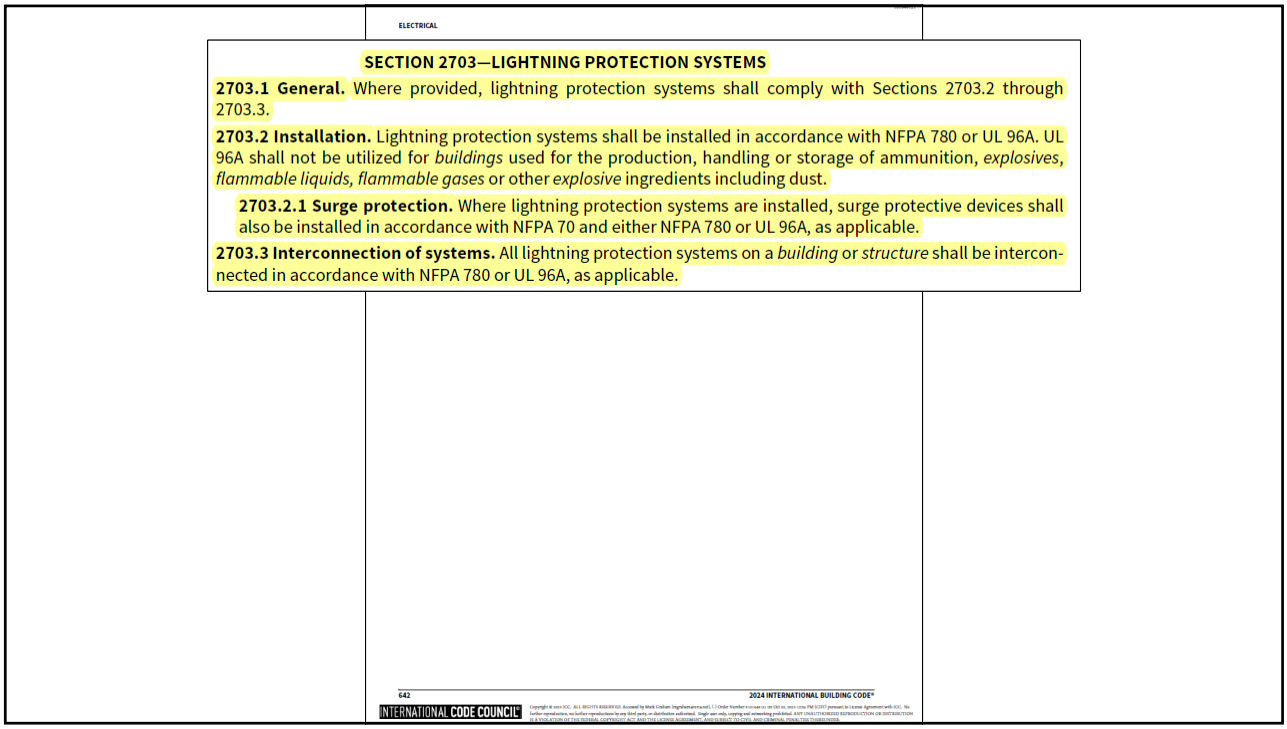

ELECTRICAL

SECTION 2703—LIGHTNING PROTECTION SYSTEMS

2703.1 General. Where provided, lightning protection systems shall comply with Sections 2703.2 through 2703.3.

2703.2 Installation. Lightning protection systems shall be installed in accordance with NFPA 780 or UL 96A. UL 96A shall not be utilized for *buildings* used for the production, handling or storage of ammunition, *explosives*, *flammable liquids*, *flammable gases* or other *explosive* ingredients including dust.

2703.2.1 Surge protection. Where lightning protection systems are installed, surge protective devices shall also be installed in accordance with NFPA 70 and either NFPA 780 or UL 96A, as applicable.

2703.3 Interconnection of systems. All lightning protection systems on a *building* or *structure* shall be interconnected in accordance with NFPA 780 or UL 96A, as applicable.

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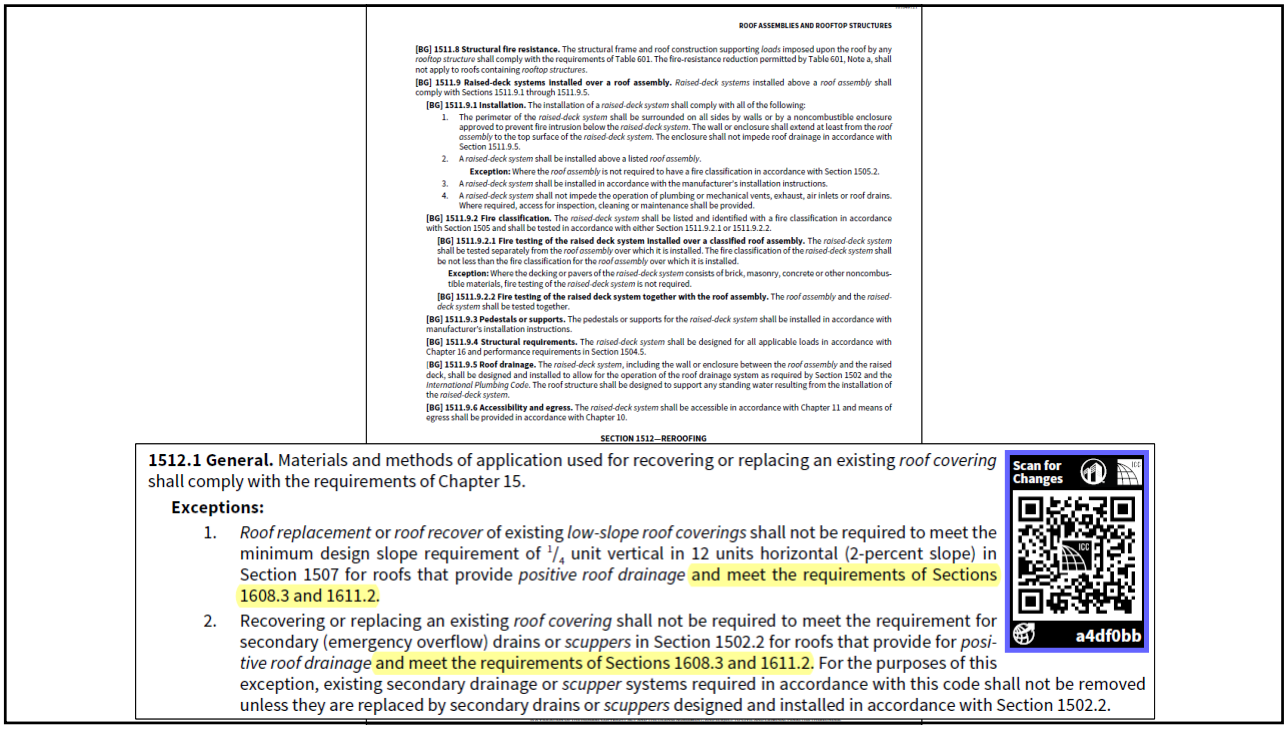

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

[BG] 1511.8 Structural fire resistance. The structural frame and roof construction supporting *loads* imposed upon the roof by any *rooftop structure* shall comply with the requirements of Table 601. The fire-resistance reduction permitted by Table 601, Note a, shall not apply to roofs containing *rooftop structures*.

[BG] 1511.9 Raised-deck systems installed over a roof assembly. *Raised-deck systems* installed above a *roof assembly* shall comply with Sections 1511.9.1 through 1511.9.5.

[BG] 1511.9.1 Installation. The installation of a *raised-deck system* shall comply with all of the following:

1. The perimeter of the *raised-deck system* shall be surrounded on all sides by walls or by a noncombustible enclosure approved to prevent fire intrusion below the *raised-deck system*. The wall or enclosure shall extend at least from the *roof assembly* to the top surface of the *raised-deck system*. The enclosure shall not impede roof drainage in accordance with Section 1511.9.5.
2. A *raised-deck system* shall be installed above a listed *roof assembly*.
   Exception: Where the *roof assembly* is not required to have a fire classification in accordance with Section 1505.2.
3. A *raised-deck system* shall be installed in accordance with the manufacturer's installation instructions.
4. A *raised-deck system* shall not impede the operation of plumbing or mechanical vents, exhaust, air inlets or roof drains. Where required, access for inspection, cleaning or maintenance shall be provided.

[BG] 1511.9.2 Fire classification. The *raised-deck system* shall be listed and identified with a fire classification in accordance with Section 1505 and shall be tested in accordance with either Section 1511.9.2.1 or 1511.9.2.2.

[BG] 1511.9.2.1 Fire testing of the raised deck system installed over a classified roof assembly. The *raised-deck system* shall be tested separately from the *roof assembly* over which it is installed. The fire classification of the *raised-deck system* shall be not less than the fire classification for the *roof assembly* over which it is installed.
Exception: Where the decking or pavers of the *raised-deck system* consists of brick, masonry, concrete or other noncombustible materials, fire testing of the *raised-deck system* is not required.

[BG] 1511.9.2.2 Fire testing of the raised deck system together with the roof assembly. The *roof assembly* and the *raised-deck system* shall be tested together.

[BG] 1511.9.3 Pedestals or supports. The pedestals or supports for the *raised-deck system* shall be installed in accordance with manufacturer's installation instructions.

[BG] 1511.9.4 Structural requirements. The *raised-deck system* shall be designed for all applicable loads in accordance with Chapter 16 and performance requirements in Section 1504.5.

[BG] 1511.9.5 Roof drainage. The *raised-deck system*, including the wall or enclosure between the *roof assembly* and the raised deck, shall be designed and installed to allow for the operation of the roof drainage system as required by Section 1502 and the *International Plumbing Code*. The roof structure shall be designed to support any standing water resulting from the installation of the *raised-deck system*.

[BG] 1511.9.6 Accessibility and egress. The *raised-deck system* shall be accessible in accordance with Chapter 11 and means of egress shall be provided in accordance with Chapter 10.

SECTION 1512—REROOFING

1512.1 General. Materials and methods of application used for recovering or replacing an existing *roof covering* shall comply with the requirements of Chapter 15.

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 $^1/_4$ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2.
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 1502.2 for roofs that provide for *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2. 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 1502.2.

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STRUCTURAL DESIGN

6. Design load-bearing values of soils.
7. Rain load data.

1603.1.1 Floor live load. The uniformly distributed, concentrated and impact floor *live load* used in the design shall be indicated for floor areas. Use of *live load* reduction in accordance with Section 1607.13 shall be indicated for each type of *live load* used in the design.

1603.1.2 Roof live load. The *roof live load* used in the design shall be indicated for roof areas.

1603.1.3 Roof snow load data. The ground snow *load*, p_g, shall be indicated. In areas where the ground snow *load*, p_g, exceeds 15 pounds per square foot (psf) (0.72 kN/m²), the following additional information shall also be provided, regardless of whether snow *loads* govern the design of the roof:

1. Flat-roof snow *load*, p_f.
2. Snow exposure factor, C_e.
3. *Risk category*.
4. Thermal factor, C_t.
5. Slope factor(s), C_s.
6. Drift surcharge load(s), p_d, where the sum of p_d and p_f exceeds 30 psf (1.44 kN/m²).
7. Width of snow drift(s), w.
8. Winter wind parameter for snow drift, W_2.

1603.1.4 Wind and tornado design data. The following information related to wind *loads* and, where required by Section 1609.5, tornado loads shall be shown, regardless of whether wind or tornado *loads* govern the design of the lateral force-resisting system of the *structure*:

1. Basic *wind speed*, *V*, mph (m/s), tornado speed, V_T, mph (m/s), and *allowable stress design wind speed*, V_{asd}, mph (m/s), as determined in accordance with Section 1609.3.1.
2. *Risk category*.
3. Effective plan area, A_e, for tornado design in accordance with Chapter 32 of ASCE 7.
4. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
5. Applicable internal pressure coefficients, and applicable tornado internal pressure coefficients.
6. Design wind pressures and their applicable zones with dimensions to be used for exterior component and cladding materials not specifically designed by the *registered design professional* responsible for the design of the *structure*, pounds per square foot (kN/m²). Where design for tornado loads is required, the design pressures shown shall be the maximum of wind or tornado pressures.

1603.1.6 Geotechnical information. The design load-bearing values of soils shall be shown on the *construction documents*.

1603.1.7 Flood design data. For *buildings* located in whole or in part in *flood hazard areas* as established in Section 1612.3, the documentation pertaining to design, if required in Section 1612.4, shall be included and the following information, referenced to the datum on the community's *Flood Insurance Rate Map* (*FIRM*), shall be shown, regardless of whether *flood loads* govern the design of the *building*:

1. *Flood design* class assigned according to ASCE 24.
2. In *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*, the elevation of the proposed *lowest floor*, including the basement.
3. In *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*, the elevation to which any nonresidential *building* will be dry floodproofed.
4. In *coastal high hazard areas* and *coastal A zones*, the proposed elevation of the bottom of the lowest horizontal structural member of the *lowest floor*, including the basement.

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I will have a feature article in the June issues of Professional Roofing addressing IBC 2024's roofing-related changes

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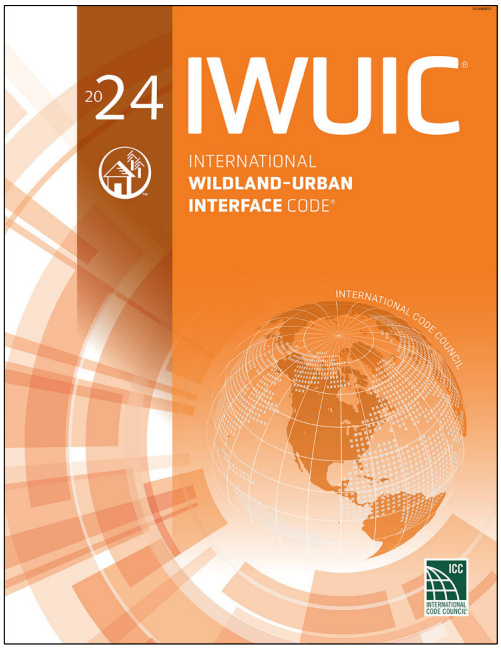

IWUIC 2024

- Overlays the Building Code
- Ch. 5: Special Building Construction Regulations
- Ignition-resistant Construction Class 1, 2 or 3
- Class 1 and 2: Class A roof
  Class 3: Class B roof
- Valley, eave, gutter and downspout and roof vent requirements

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RESEARCH+TECH

Wildfire mitigation

The International Code Council® provides mitigation regulations in code document

by Mark S. Graham

Catastrophic wildfires, such as those that recently occurred in California, Colorado and Hawaii, have resulted in an increased demand for improved wildfire mitigation. The International Code Council Inc.'s International Wildland-Urban Interface Code® provides code-based regulations for wildfire mitigation, including roofing-specific requirements.

IWUIC

ICC developed the IWUIC in 2003. The current edition is IWUIC 2024.

IWUIC's purpose is to mitigate the risk to life and structures from wildland fire exposures and fire exposures from adjacent structures and to mitigate structure fires from spreading to wildland fuels.

A wildland-urban interface area is a geographic area where structures and other human development meets or intermingles with wildland or vegetative fuels. The adopting agency designates the wildland-urban interface areas within its jurisdiction.

IWUIC is intended to supplement, not replace, a jurisdiction's building and fire codes (if such codes have been adopted) and provide specialized regulations. IWUIC is presented in tiered levels to

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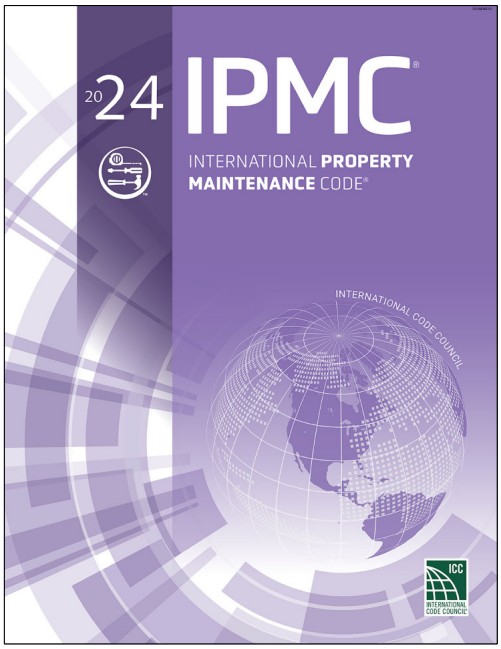

IPMC 2024

- Sec. 304-Exterior Structure
- Sec. 507-Storm Drainage

Link

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Updates to FM Global datasheets

www.FMGlobalDataSheets.com

- FM 1-15, “Roof-mounted Solar Photovoltaic Panels”
- FM 1-28, “Wind Design”
- FM 1-54, “Roof Loads and Drainage”

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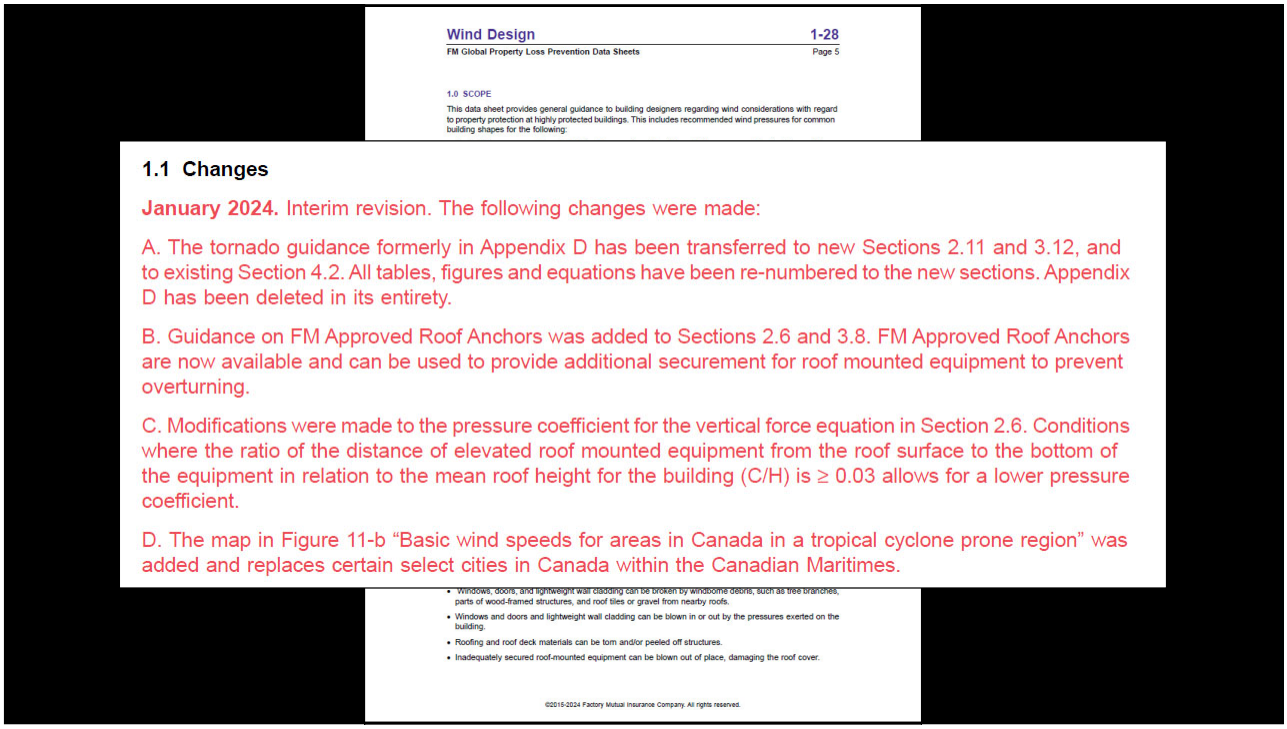

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2.8.5 One of the following may be done to account for the higher wind pressures in the perimeter and corner areas:

A. Use wind design pressures for the field, perimeter and corner areas based on the Eurocode, or

B. Use wind design pressures for the field-of-roof as determined by the Eurocode and provide prescriptive enhancements for the securement of above-deck roof components and metal deck securement for the perimeter and corner areas per DS 1-29 or DS 1-31.

2.8.6 Do not credit parapets for reducing roof design uplift pressures unless the parapet height (h_p) is at least 3 ft (0.9 m). In addition, use design pressures based on the Eurocode that are at least equal to that required for an h_p/h ratio of 0.025, regardless of the actual ratio.

2.8.7 Use Figure 30.3-7 of ASCE 7-16 for external pressure coefficients (GC_p) for domed roofs with an EWA of 10 ft² or 1 m² (CPE,1).

2.8.8 Design all structural framing, including beams, columns, trusses, purlins, and girts, using load factors and capacity-reduction factors specified in the Eurocode.

2.8.9 Use Eurocode factors that are modified by National Annexes only if they make the design more conservative.

2.11 Tornadoes

2.11.1 The following section provides guidance for building owners or occupants who have important facilities that warrant additional protection to reduce potential property damage and business interruption as a result of a tornado.

The tornado guidance in this standard should be applied to locations with tornado wind speeds ≥ 140 mph (63 m/s) as defined by the wind contours in the tornado wind speed map in Figure 2.11.1.

Design the building envelope, including walls, doors, windows, skylights, roof-mounted equipment and roofs to resist tornado wind speeds in accordance with Figure 2.11.1 and Section 3.0. Higher design wind speeds may also be used if desired.

Note for Figure 2.11.1: Hawaii, Alaska, Puerto Rico and Guam have a very low probability of tornado occurrence. The non-tornado design wind speeds exceed 100 mph (45 m/s) for all of Hawaii, Puerto Rico and Guam, and much of Alaska. One difference is that Hawaii, Puerto Rico and Guam are prone to tropical storms and should normally be designed for windborne debris, which is not true for Alaska.

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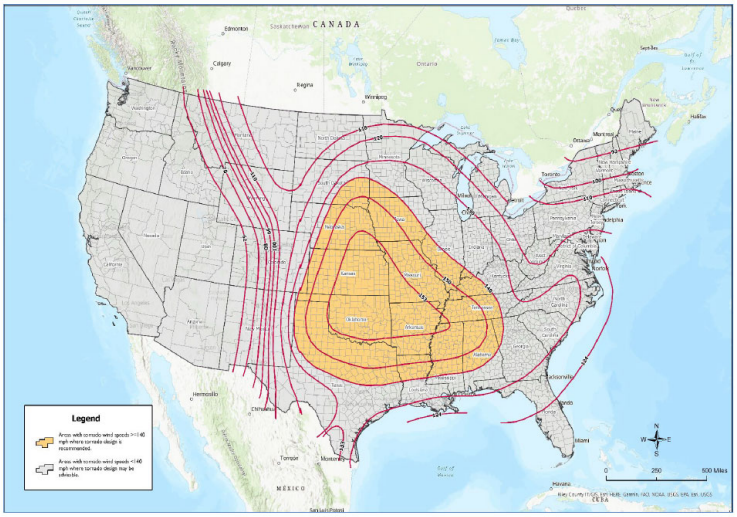

Fig. 2.11.1. Tornado speed based on ASCE 7-22 for 10,000-year MRI with effective plan area of 1,000,000 ft² (92,903 m²)

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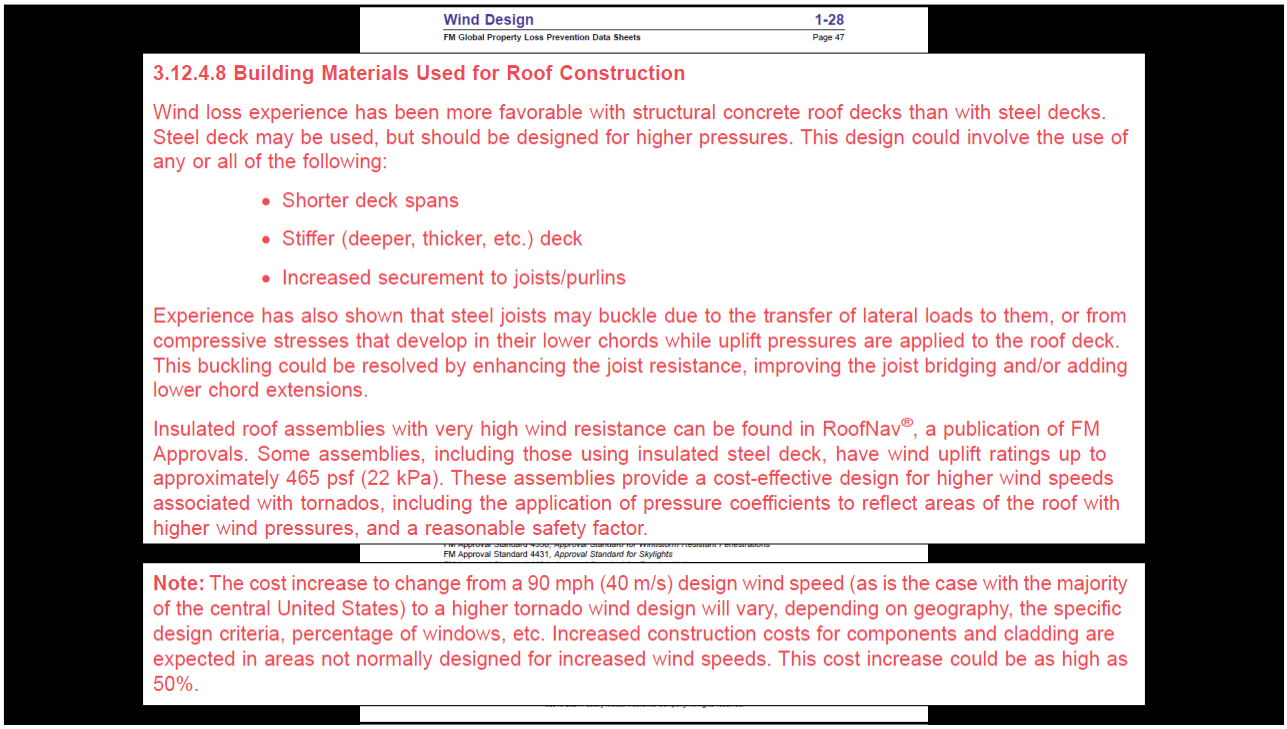

Wind Design 1-28
FM Global Property Loss Prevention Data Sheets Page 47

3.12.4.8 Building Materials Used for Roof Construction

Wind loss experience has been more favorable with structural concrete roof decks than with steel decks. Steel deck may be used, but should be designed for higher pressures. This design could involve the use of any or all of the following:

- Shorter deck spans
- Stiffer (deeper, thicker, etc.) deck
- Increased securement to joists/purlins

Experience has also shown that steel joists may buckle due to the transfer of lateral loads to them, or from compressive stresses that develop in their lower chords while uplift pressures are applied to the roof deck. This buckling could be resolved by enhancing the joist resistance, improving the joist bridging and/or adding lower chord extensions.

Insulated roof assemblies with very high wind resistance can be found in RoofNav®, a publication of FM Approvals. Some assemblies, including those using insulated steel deck, have wind uplift ratings up to approximately 465 psf (22 kPa). These assemblies provide a cost-effective design for higher wind speeds associated with tornados, including the application of pressure coefficients to reflect areas of the roof with higher wind pressures, and a reasonable safety factor.

FM Approval Standard 4431, *Approval Standard for Skylights*

Note: The cost increase to change from a 90 mph (40 m/s) design wind speed (as is the case with the majority of the central United States) to a higher tornado wind design will vary, depending on geography, the specific design criteria, percentage of windows, etc. Increased construction costs for components and cladding are expected in areas not normally designed for increased wind speeds. This cost increase could be as high as 50%.

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Look for more information on tornado design…

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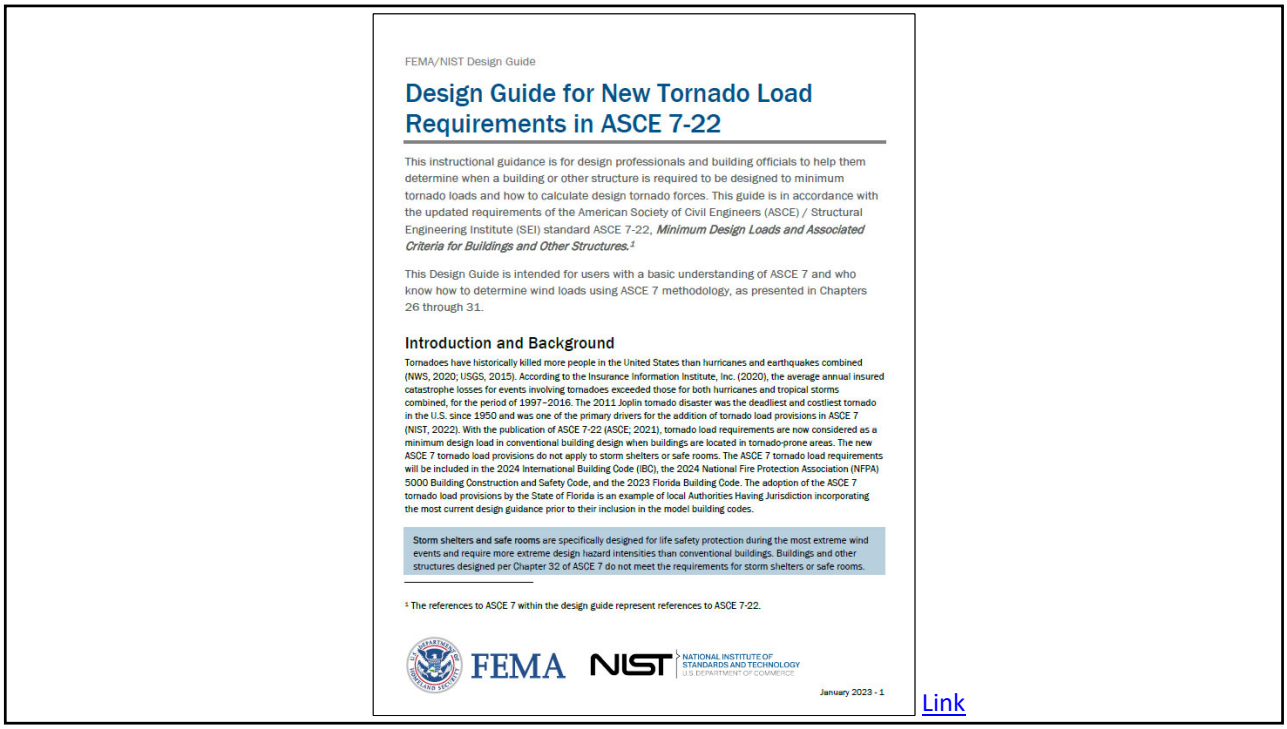

FEMA/NIST Design Guide

Design Guide for New Tornado Load Requirements in ASCE 7-22

This instructional guidance is for design professionals and building officials to help them determine when a building or other structure is required to be designed to minimum tornado loads and how to calculate design tornado forces. This guide is in accordance with the updated requirements of the American Society of Civil Engineers (ASCE) / Structural Engineering Institute (SEI) standard ASCE 7-22, ***Minimum Design Loads and Associated Criteria for Buildings and Other Structures.***[1]

This Design Guide is intended for users with a basic understanding of ASCE 7 and who know how to determine wind loads using ASCE 7 methodology, as presented in Chapters 26 through 31.

Introduction and Background

Tornadoes have historically killed more people in the United States than hurricanes and earthquakes combined (NWS, 2020; USGS, 2015). According to the Insurance Information Institute, Inc. (2020), the average annual insured catastrophe losses for events involving tornadoes exceeded those for both hurricanes and tropical storms combined, for the period of 1997–2016. The 2011 Joplin tornado disaster was the deadliest and costliest tornado in the U.S. since 1950 and was one of the primary drivers for the addition of tornado load provisions in ASCE 7 (NIST, 2022). With the publication of ASCE 7-22 (ASCE; 2021), tornado load requirements are now considered as a minimum design load in conventional building design when buildings are located in tornado-prone areas. The new ASCE 7 tornado load provisions do not apply to storm shelters or safe rooms. The ASCE 7 tornado load requirements will be included in the 2024 International Building Code (IBC), the 2024 National Fire Protection Association (NFPA) 5000 Building Construction and Safety Code, and the 2023 Florida Building Code. The adoption of the ASCE 7 tornado load provisions by the State of Florida is an example of local Authorities Having Jurisdiction incorporating the most current design guidance prior to their inclusion in the model building codes.

Storm shelters and safe rooms are specifically designed for life safety protection during the most extreme wind events and require more extreme design hazard intensities than conventional buildings. Buildings and other structures designed per Chapter 32 of ASCE 7 do not meet the requirements for storm shelters or safe rooms.

[1] The references to ASCE 7 within the design guide represent references to ASCE 7-22.

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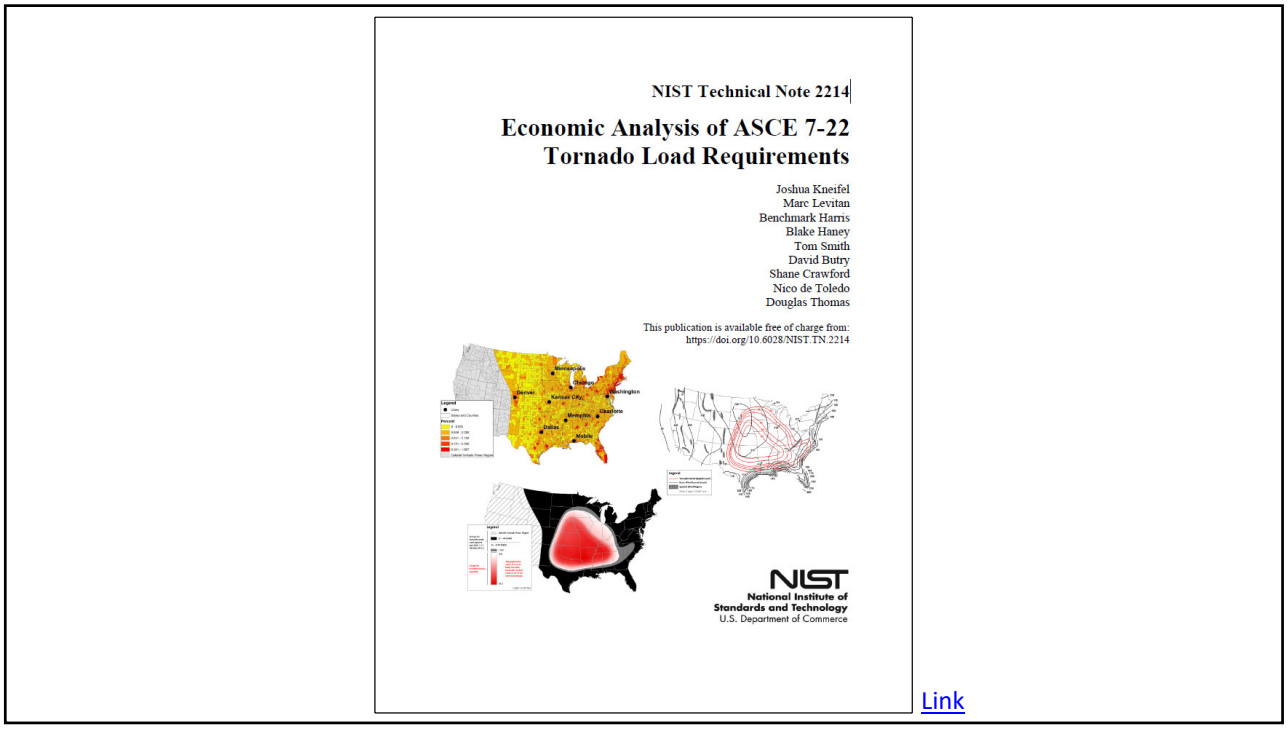

NIST Technical Note 2214

Economic Analysis of ASCE 7-22 Tornado Load Requirements

Joshua Kneifel
Marc Levitan
Benchmark Harris
Blake Haney
Tom Smith
David Butry
Shane Crawford
Nico de Toledo
Douglas Thomas

This publication is available free of charge from:
https://doi.org/10.6028/NIST.TN.2214

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

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“Moisture” meter concerns

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These meters do not read moisture…
…they are reading relative conductivity, which can be correlated to specific materials in specific conditions when properly calibrated.

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Considerations

"Moisture" meters

- Read/understand the instruction manual
- Understand device sensitivity
- Understand proper operating conditions
- Proper calibration/recalibration is critical
- Don't overstate the meter's capability
- Verify job-specific results with gravimetric analysis

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Questions… and other topics

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