RCAT Roofing Contractors Association of Texas

Texas Roofing Conference
Houston, Texas – October 6, 2023

Technical issue update – Steep- and low-slope roofing

presented by

Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association (NRCA)

NRCA

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Past presentations… at least the recent, local ones

2022 RCAT (Low-slope): Link
2022 RCAT (Steep-slope): Link
2023 HARCA: Link

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Roofing industry market conditions

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ASPHALT ROOFING MANUFACTURERS ASSOCIATION

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ARMA Releases Second Quarter 2023 Report on Asphalt Roofing Product Shipments

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Asphalt Roofing Product Shipments

Shipments (squares)	Q2 2023	Q2 2022	% Change	YTD 2023	YTD 2022	% Change
Shingles – U.S. (including individual shingles)	51,713,740	45,521,069	13.6%	85,541,254	88,449,004	-3.3%
BUR base, ply, and mineral cap sheets – U.S. (not including saturated felts)	1,806,472	2,019,867	-10.6%	3,183,661	3,837,525	-17.0%
Modified Bitumen – U.S.	12,069,534	11,457,575	5.3%	21,703,749	21,315,786	1.8%
Shingles – Canada (including Individual shingles)	2,401,536	3,906,364	-38.5%	5,792,325	7,455,919	-22.3%

About ARMA:

The Asphalt Roofing Manufacturers Association (ARMA) is a trade association representing North America's asphalt roofing manufacturing companies and their raw material suppliers. The association includes the majority of North American manufacturers of asphalt shingles and asphalt low slope roof membrane systems. Information that ARMA gathers on modern asphalt roofing materials and practices is provided to building and code officials, as well as to regulatory agencies and allied trade groups. Committed to advances in the asphalt roofing industry, ARMA is proud of the role it plays in promoting asphalt roofing to those in the building industry and to the public.

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Link

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ABC: Monthly Construction Input Prices Increased 1.5% in August

Producer Price Index, August 2023

	1-Month % Change	12-Month % Change	Change Since Feb 2020
Inputs to Industries			
Inputs to Construction	1.5%	-0.2%	40.7%
Inputs to Multifamily Construction	1.0%	0.8%	38.7%
Inputs to Nonresidential Construction	1.5%	0.2%	41.5%
Inputs to Commercial Construction	0.9%	0.1%	41.1%
Inputs to Healthcare Construction	0.9%	0.1%	40.5%
Inputs to Industrial Construction	1.4%	1.9%	36.7%
Inputs to Other Nonresidential Construction	1.7%	0.1%	41.7%
Inputs to Maintenance and Repair Construction	1.7%	-0.7%	38.9%
Commodities			
Adhesives and Sealants	-0.2%	2.8%	33.8%
Brick and Structural Clay Tile	-0.1%	6.4%	24.8%
Concrete Products	0.5%	8.7%	32.2%
Construction Machinery and Equipment	-0.5%	6.0%	26.5%
Copper Wire and Cable	0.1%	3.2%	28.8%
Crude Petroleum	8.9%	-12.5%	66.5%
Fabricated Structural Metal Products	0.1%	-1.5%	51.8%
Gypsum Products	-0.6%	-0.8%	41.0%
Hot Rolled Steel Bars, Plates, and Structural Shapes	1.3%	-9.7%	55.3%
Insulation Materials	-0.7%	2.3%	37.1%
Iron and Steel	0.3%	-10.3%	60.6%
Lumber and Wood Products	-1.1%	-9.4%	25.3%
Natural Gas	-6.3%	-77.7%	27.9%
Plumbing Fixtures and Fittings	0.5%	2.3%	18.2%
Prepared Asphalt, Tar Roofing and Siding Products	-1.2%	3.2%	39.4%
Softwood Lumber	-4.4%	-18.0%	16.3%
Steel Mill Products	-0.5%	-14.8%	75.0%
Switchgear, Switchboard, Industrial Controls Equipment	0.4%	6.7%	37.4%
Unprocessed Energy Materials	5.4%	-40.6%	72.9%

Source: U.S. Bureau of Labor Statistics

Link

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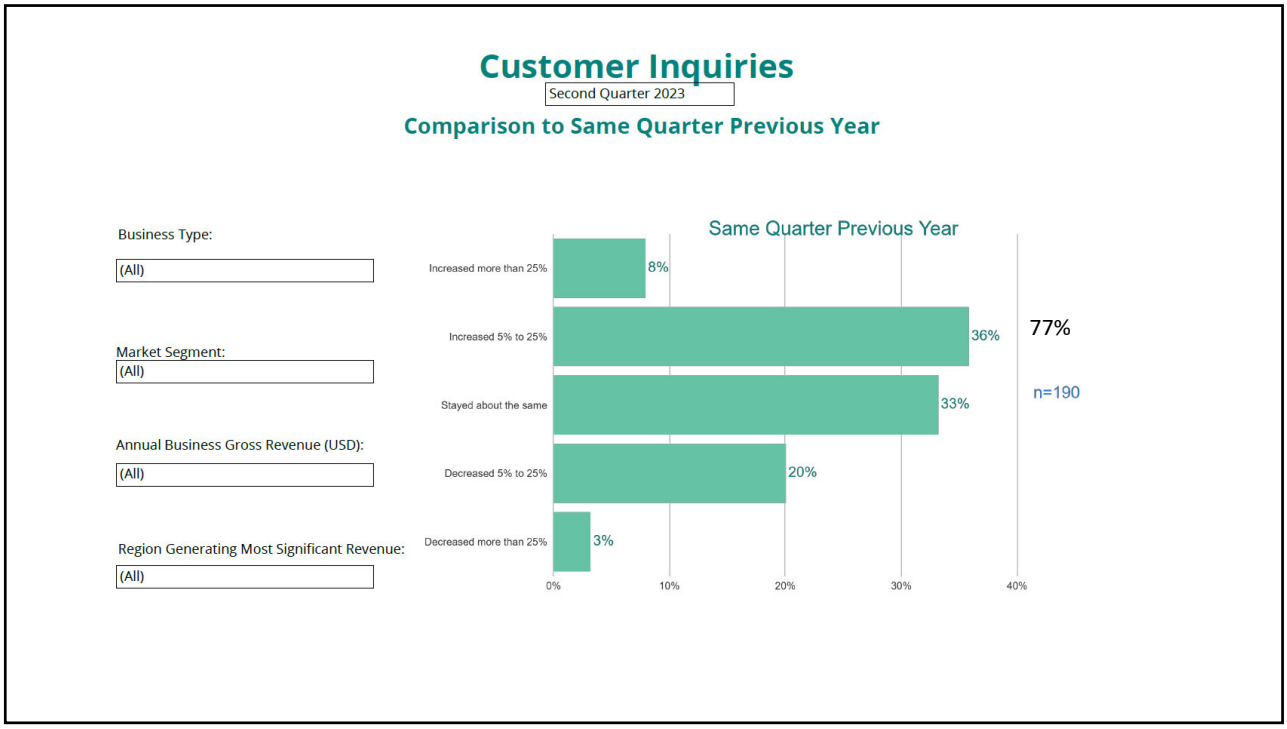
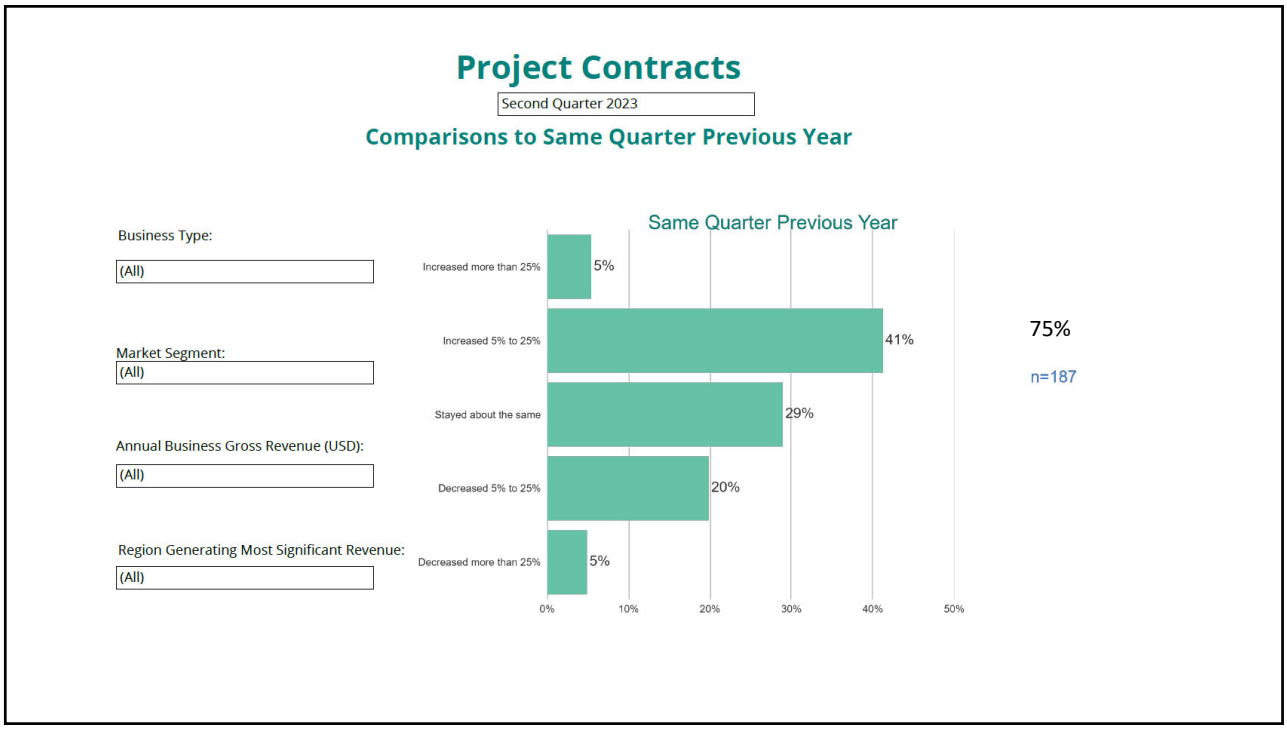

Customer Inquiries
Second Quarter 2023
Comparison to Same Quarter Previous Year
Business Type:
(All)
Market Segment:
(All)
Annual Business Gross Revenue (USD):
(All)
Region Generating Most Significant Revenue:
(All)
Same Quarter Previous Year
Increased more than 25%
8%
Increased 5% to 25%
36%
Stayed about the same
33%
Decreased 5% to 25%
20%
Decreased more than 25%
3%
0%
10%
20%
30%
40%
77%
n=190

7


Project Contracts
Second Quarter 2023
Comparisons to Same Quarter Previous Year
Business Type:
(All)
Market Segment:
(All)
Annual Business Gross Revenue (USD):
(All)
Region Generating Most Significant Revenue:
(All)
Same Quarter Previous Year
Increased more than 25%
5%
Increased 5% to 25%
41%
Stayed about the same
29%
Decreased 5% to 25%
20%
Decreased more than 25%
5%
0%
10%
20%
30%
40%
50%
75%
n=187

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Project Backlog

As of July 2023

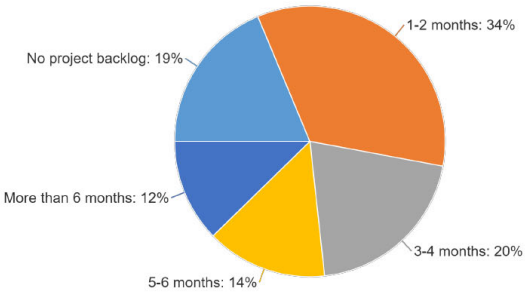
n=187

Business Type: (All)

Market Segment: (All)

Annual Business Gross Revenue (USD): (All)

Region Generating Most Significant Revenue: (All)



81%

46%

Note: For sample sizes under 3, this chart will generate an error message. The message does not indicate a problem with the data.

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Project Contracts Index

	Fourth Quarter 2020	First Quarter 2021	Second Quarter 2021	Third Quarter 2021	Fourth Quarter 2021	First Quarter 2022	Second Quarter 2022	Third Quarter 2022	Fourth Quarter 2022	First Quarter 2023	Second Quarter 2023
Primarily Steep Slope	59.5	73.1	65.7	62.5	58.0	51.8	50.0	42.0	43.3	60.0	50.0
Primarily Low Slope	43.5	58.0	67.4	61.8	61.6	68.4	66.0	65.5	58.9	61.7	60.5
Blend Between Steep Slope and Low Slope	53.2	54.9	69.6	55.7	61.5	57.6	51.0	62.8	53.8	64.5	65.9
Total	50.1	58.1	68.2	59.4	61.1	62.1	59.2	61.9	55.2	62.5	61.0

The index is equal to the percent indicating that project contracts have increased when compared to the same quarter of the previous year, plus one half who have reported no change. The total is multiplied by 100 to create the index. A score of 50 or higher suggests expansion or optimism, while a value below 50 indicates contraction or pessimism (red cells).

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Q3 2023 survey is open until October 16.
To participate: Link

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Radio frequency radiation

Rooftop cell phone transmitters

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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

Link

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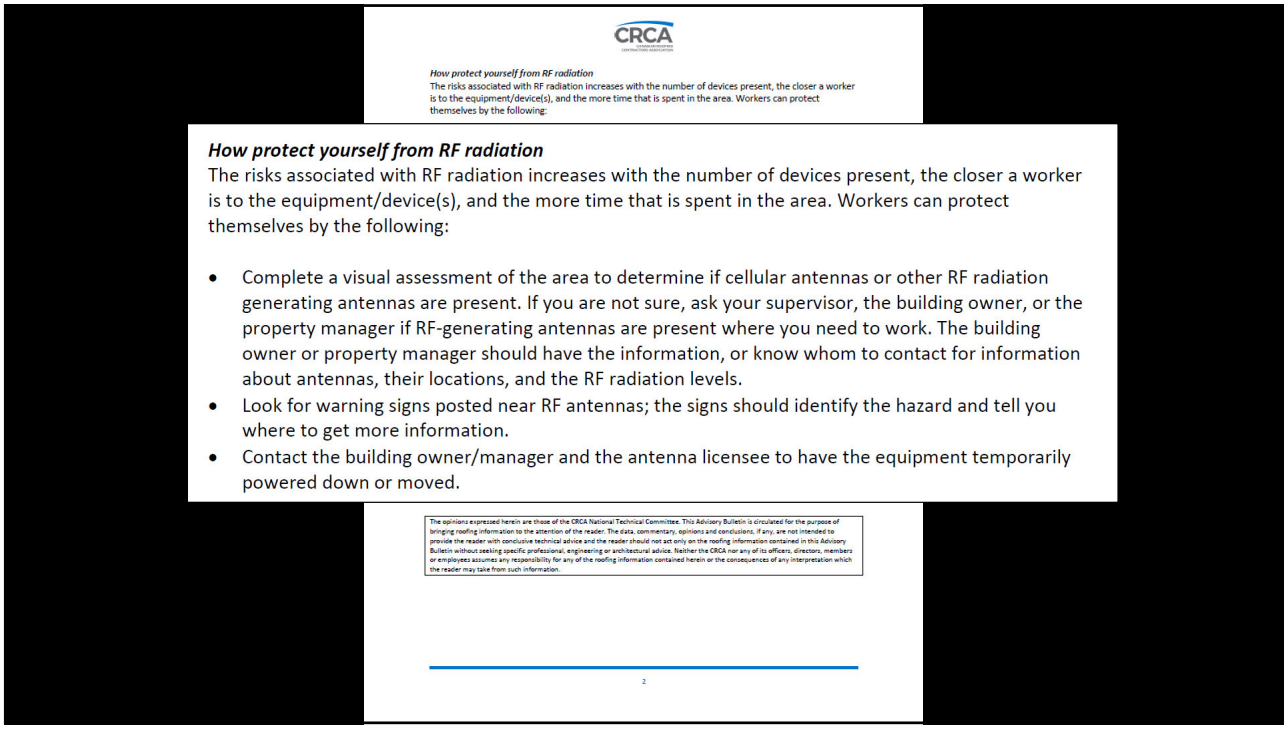

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Recognize the signage

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

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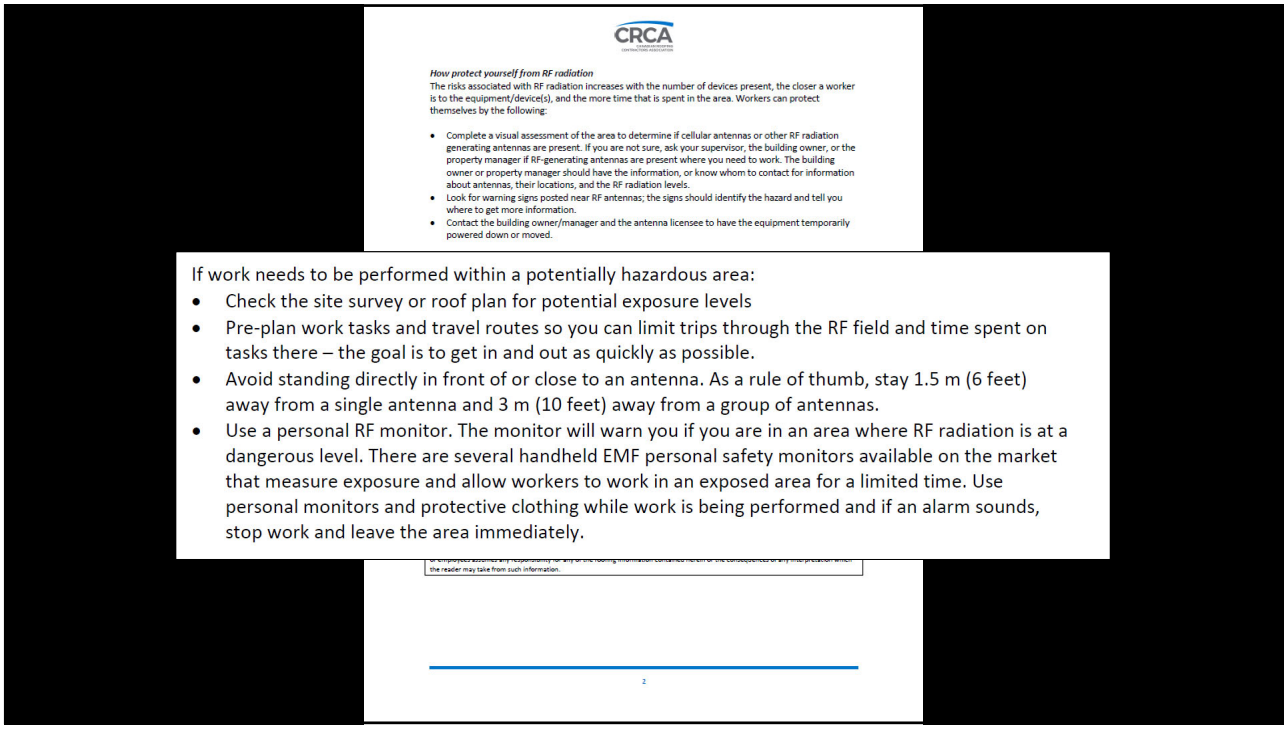

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Some useful references

- 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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Underlayment

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International Building Code 2021 Edition

IBC: Link
IRC: Link

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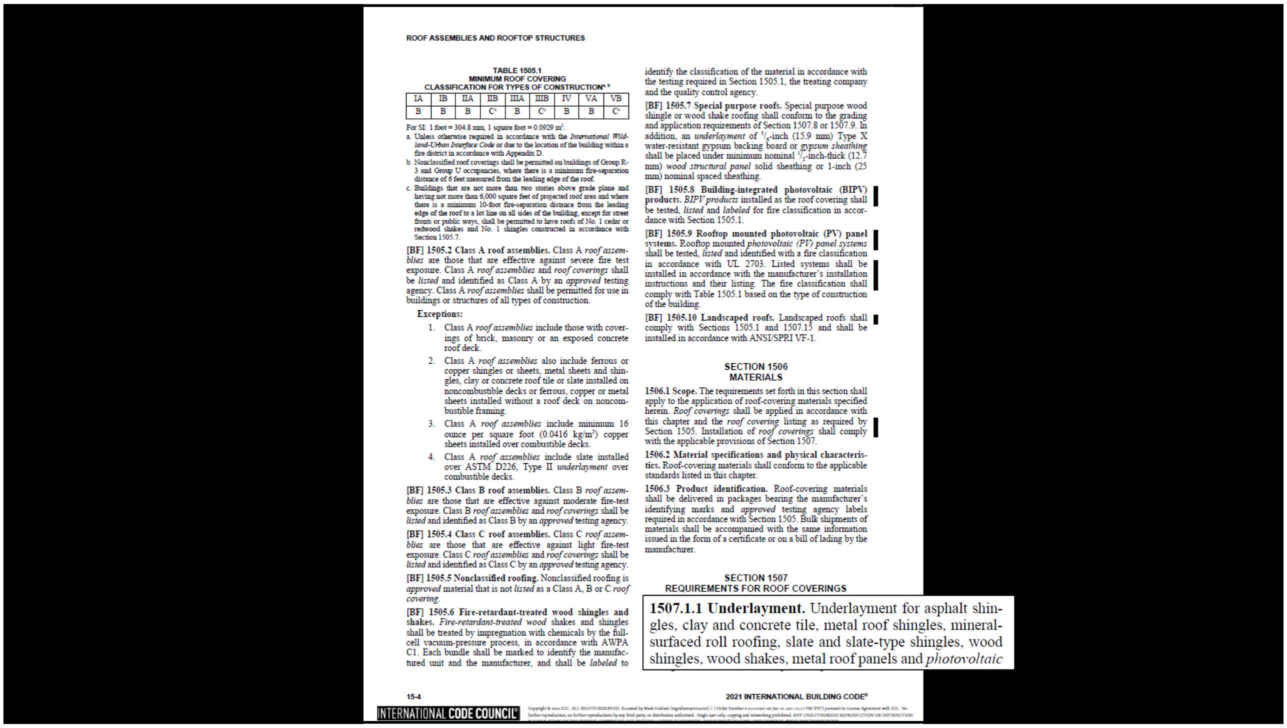

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

TABLE 1505.1
MINIMUM ROOF COVERING
CLASSIFICATION FOR TYPES OF CONSTRUCTION[a, b]

IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
B	B	B	C[c]	B	C[c]	B	B	C[c]

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2.

a. Unless otherwise required in accordance with the *International Wildland-Urban Interface Code* or due to the location of the building within a fire district in accordance with Appendix D.

b. Nonclassified roof coverings shall be permitted on buildings of Group R-3 and Group U occupancies, where there is a minimum fire-separation distance of 6 feet measured from the leading edge of the roof.

c. Buildings that are not more than two stories above grade plane and having not more than 6,000 square feet of projected roof area and where there is a minimum 10-foot fire-separation distance from the leading edge of the roof to a lot line on all sides of the building, except for street fronts or public ways, shall be permitted to have roofs of No. 1 cedar or redwood shakes and No. 1 shingles constructed in accordance with Section 1505.7.

[BF] 1505.2 Class A roof assemblies. Class A *roof assemblies* are those that are effective against severe fire test exposure. Class A *roof assemblies* and *roof coverings* shall be *listed* and identified as Class A by an *approved* testing agency. Class A *roof assemblies* shall be permitted for use in buildings or structures of all types of construction.

Exceptions:

1. Class A *roof assemblies* include those with coverings of brick, masonry or an exposed concrete roof deck.
2. Class A *roof assemblies* also include ferrous or copper shingles or sheets, metal sheets and shingles, clay or concrete roof tile or slate installed on noncombustible decks or ferrous, copper or metal sheets installed without a roof deck on noncombustible framing.
3. Class A *roof assemblies* include minimum 16 ounce per square foot (0.0416 kg/m^2) copper sheets installed over combustible decks.
4. Class A *roof assemblies* include slate installed over ASTM D226, Type II *underlayment* over combustible decks.

[BF] 1505.3 Class B roof assemblies. Class B *roof assemblies* are those that are effective against moderate fire-test exposure. Class B *roof assemblies* and *roof coverings* shall be *listed* and identified as Class B by an *approved* testing agency.

[BF] 1505.4 Class C roof assemblies. Class C *roof assemblies* are those that are effective against light fire-test exposure. Class C *roof assemblies* and *roof coverings* shall be *listed* and identified as Class C by an *approved* testing agency.

[BF] 1505.5 Nonclassified roofing. Nonclassified roofing is *approved* material that is not *listed* as a Class A, B or C *roof covering*.

[BF] 1505.6 Fire-retardant-treated wood shingles and shakes. *Fire-retardant-treated wood* shakes and shingles shall be treated by impregnation with chemicals by the full-cell vacuum-pressure process, in accordance with AWPA C1. Each bundle shall be marked to identify the manufactured unit and the manufacturer, and shall be *labeled* to identify the classification of the material in accordance with the testing required in Section 1505.1, the treating company and the quality control agency.

[BF] 1505.7 Special purpose roofs. Special purpose wood shingle or wood shake roofing shall conform to the grading and application requirements of Section 1507.8 or 1507.9. In addition, an *underlayment* of $^5/_8$-inch (15.9 mm) Type X water-resistant gypsum backing board or *gypsum sheathing* shall be placed under minimum nominal $^1/_2$-inch-thick (12.7 mm) *wood structural panel* solid sheathing or 1-inch (25 mm) nominal spaced sheathing.

[BF] 1505.8 Building-integrated photovoltaic (BIPV) products. *BIPV products* installed as the roof covering shall be tested, *listed* and *labeled* for fire classification in accordance with Section 1505.1.

[BF] 1505.9 Rooftop mounted photovoltaic (PV) panel systems. Rooftop mounted *photovoltaic (PV) panel systems* shall be tested, *listed* and identified with a fire classification in accordance with UL 2703. Listed systems shall be installed in accordance with the manufacturer's installation instructions and their listing. The fire classification shall comply with Table 1505.1 based on the type of construction of the building.

[BF] 1505.10 Landscaped roofs. Landscaped roofs shall comply with Sections 1505.1 and 1507.15 and shall be installed in accordance with ANSI/SPRI VF-1.

SECTION 1506
MATERIALS

1506.1 Scope. The requirements set forth in this section shall apply to the application of roof-covering materials specified herein. *Roof coverings* shall be applied in accordance with this chapter and the *roof covering* listing as required by Section 1505. Installation of *roof coverings* shall comply with the applicable provisions of Section 1507.

1506.2 Material specifications and physical characteristics. Roof-covering materials shall conform to the applicable standards listed in this chapter.

1506.3 Product identification. Roof-covering materials shall be delivered in packages bearing the manufacturer's identifying marks and *approved* testing agency labels required in accordance with Section 1505. Bulk shipments of materials shall be accompanied with the same information issued in the form of a certificate or on a bill of lading by the manufacturer.

SECTION 1507
REQUIREMENTS FOR ROOF COVERINGS

1507.1.1 Underlayment. Underlayment 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 *photovoltaic*

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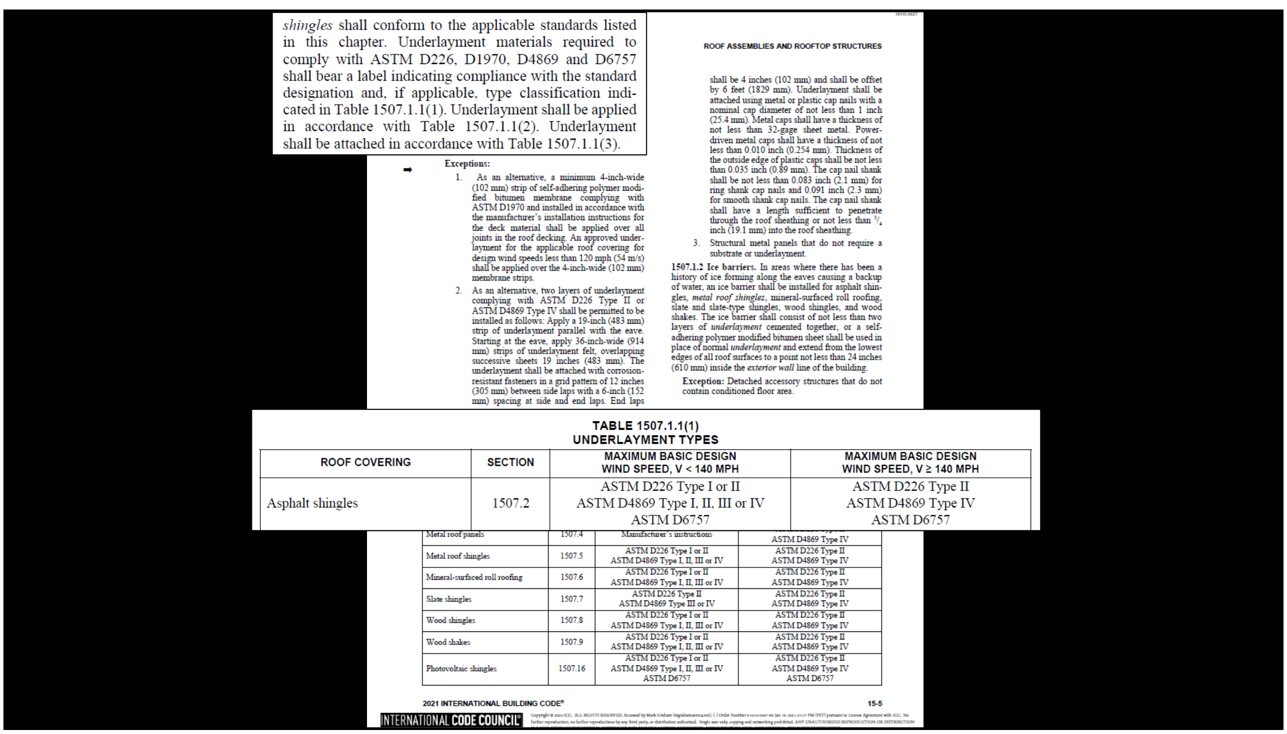

shingles shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance with the standard designation and, if applicable, type classification indicated in Table 1507.1.1(1). Underlayment shall be applied in accordance with Table 1507.1.1(2). Underlayment shall be attached in accordance with Table 1507.1.1(3).

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

Exceptions:

1. As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer modified bitumen membrane complying with ASTM D1970 and installed in accordance with the manufacturer's installation instructions for the deck material shall be applied over all joints in the roof decking. An approved underlayment for the applicable roof covering for design wind speeds less than 120 mph (54 m/s) shall be applied over the 4-inch-wide (102 mm) membrane strips.
2. As an alternative, two layers of underlayment complying with ASTM D226 Type II or ASTM D4869 Type IV shall be permitted to be installed as follows: Apply a 19-inch (483 mm) strip of underlayment parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of underlayment felt, overlapping successive sheets 19 inches (483 mm). The underlayment shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps. End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm). Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25.4 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.254 mm). Thickness of the outside edge of plastic caps shall be not less than 0.035 inch (0.89 mm). The cap nail shank shall be not less than 0.083 inch (2.1 mm) for ring shank cap nails and 0.091 inch (2.3 mm) for smooth shank cap nails. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $^3/_4$ inch (19.1 mm) into the roof sheathing.
3. Structural metal panels that do not require a substrate or underlayment.

1507.1.2 Ice barriers. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier shall be installed for asphalt shingles, *metal roof shingles*, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, and wood shakes. The ice barrier shall consist of not less than two layers of *underlayment* cemented together, or a self-adhering polymer modified bitumen sheet shall be used in place of normal *underlayment* and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the *exterior wall* line of the building.

Exception: Detached accessory structures that do not contain conditioned floor area.

TABLE 1507.1.1(1)
UNDERLAYMENT TYPES

ROOF COVERING	SECTION	MAXIMUM BASIC DESIGN WIND SPEED, V < 140 MPH	MAXIMUM BASIC DESIGN WIND SPEED, V ≥ 140 MPH
Asphalt shingles	1507.2	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D226 Type II ASTM D4869 Type IV ASTM D6757
Metal roof panels	1507.4	Manufacturer's instructions	ASTM D4869 Type IV
Metal roof shingles	1507.5	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Mineral-surfaced roll roofing	1507.6	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Slate shingles	1507.7	ASTM D226 Type II ASTM D4869 Type III or IV	ASTM D226 Type II ASTM D4869 Type IV
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 IV
Wood shakes	1507.9	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Photovoltaic shingles	1507.16	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D226 Type II ASTM D4869 Type IV ASTM D6757

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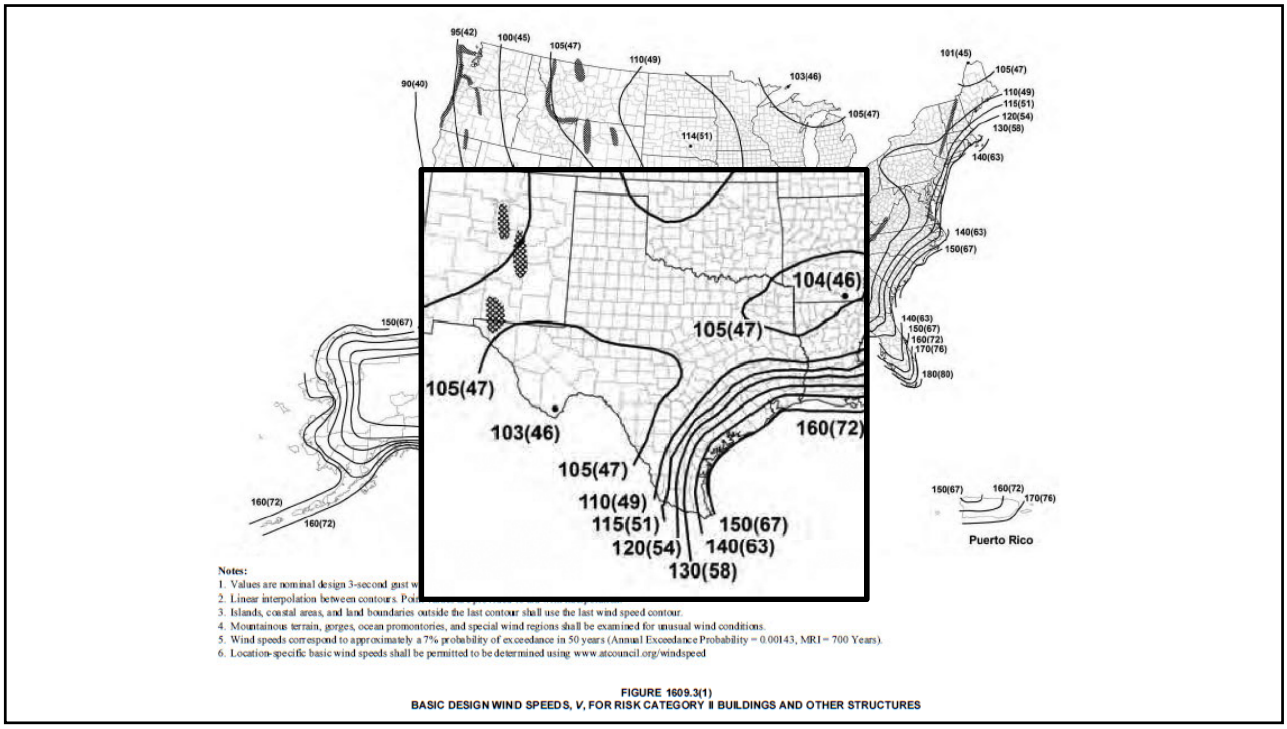

FIGURE 1609.3(1)
BASIC DESIGN WIND SPEEDS, *V*, FOR RISK CATEGORY II BUILDINGS AND OTHER STRUCTURES

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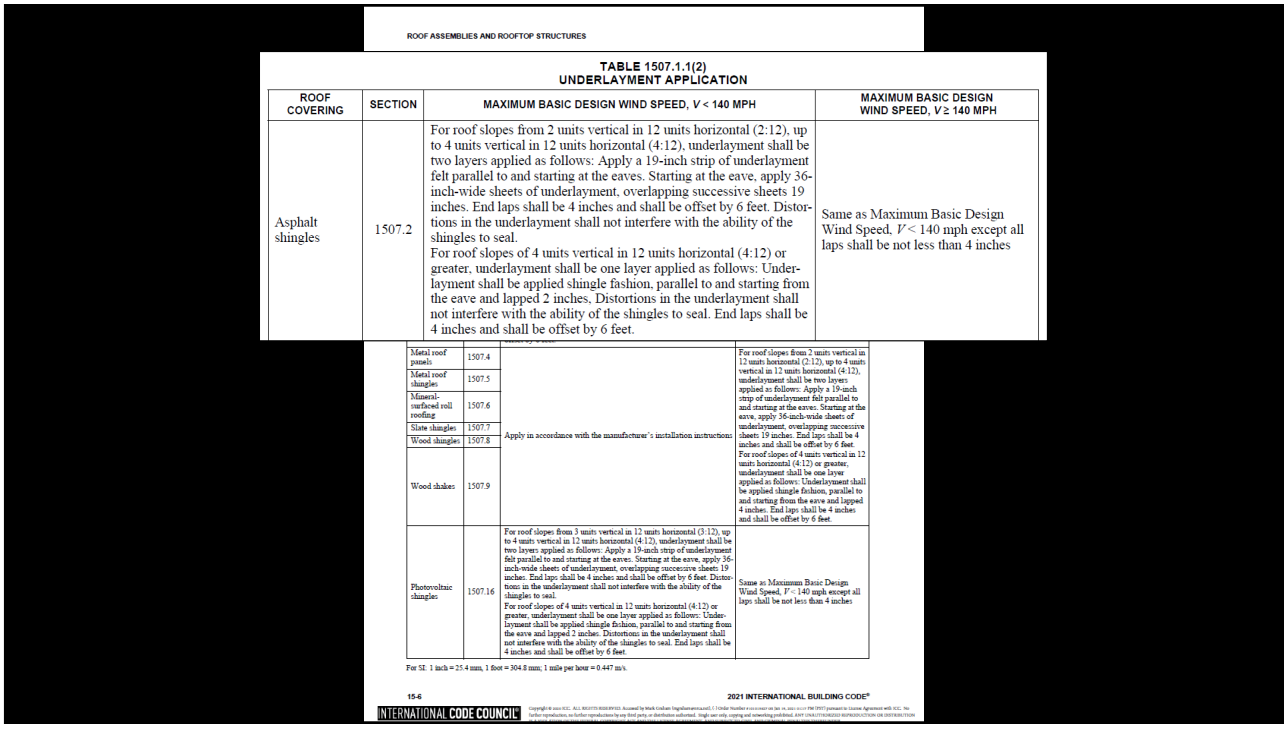

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

TABLE 1507.1.1(2)
UNDERLAYMENT APPLICATION

ROOF COVERING	SECTION	MAXIMUM BASIC DESIGN WIND SPEED, $V < 140$ MPH	MAXIMUM BASIC DESIGN WIND SPEED, $V \geq 140$ MPH
Asphalt shingles	1507.2	For roof slopes from 2 units vertical in 12 units horizontal (2:12), up to 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied as follows: Apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. End laps shall be 4 inches and shall be offset by 6 feet. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches, Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.	Same as Maximum Basic Design Wind Speed, $V < 140$ mph except all laps shall be not less than 4 inches
Metal roof panels	1507.4	Apply in accordance with the manufacturer's installation instructions	For roof slopes from 2 units vertical in 12 units horizontal (2:12), up to 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied as follows: Apply a 19-inch strip of underlayment felt parallel to and starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. End laps shall be 4 inches and shall be offset by 6 feet. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 4 inches. End laps shall be 4 inches and shall be offset by 6 feet.
Metal roof shingles	1507.5		
Mineral-surfaced roll roofing	1507.6		
Slate shingles	1507.7		
Wood shingles	1507.8		
Wood shakes	1507.9		
Photovoltaic shingles	1507.16	For roof slopes from 3 units vertical in 12 units horizontal (3:12), up to 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied as follows: Apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. End laps shall be 4 inches and shall be offset by 6 feet. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.	Same as Maximum Basic Design Wind Speed, $V < 140$ mph except all laps shall be not less than 4 inches

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s.

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TABLE 1507.1.1(3)
UNDERLAYMENT ATTACHMENT

ROOF COVERING	SECTION	MAXIMUM BASIC DESIGN WIND SPEED, $V < 140$ MPH	MAXIMUM BASIC DESIGN WIND SPEED, $V \geq 140$ MPH
Asphalt shingles	1507.2	Fastened sufficiently to hold in place	The underlayment shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches between side laps with a 6-inch spacing at side and end laps. Underlayment shall be attached using metal or plastic cap nails or cap staples with a nominal cap diameter of not less than 1 inch. Metal caps shall have a thickness of not less than 32-gage (0.0134 inch) sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails. Staples shall be not less than 21 gage (0.032 inch). The cap nail shank and cap staple legs shall have a length sufficient to penetrate through the roof sheathing or not less than $^3/_4$ inch into the roof sheathing.
Clay and concrete tile	1507.3		
Photovoltaic shingles	1507.16		

For SI: 1 inch = 25.4 mm; 1 mile per hour = 0.447 m/s.

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

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

1507.2.2 Slope. Asphalt shingles shall only be used on roof slopes of 2 units vertical in 12 units horizontal (17-percent slope) or greater. For roof slopes from 2 units vertical in 12 units horizontal (17-percent slope) up to 4 units vertical in 12 units horizontal (33-percent slope), double *underlayment* application is required in accordance with Section 1507.2.8.

1507.2.3 Underlayment. *Underlayment* shall comply with Section 1507.1.1.

1507.2.4 Asphalt shingles. Asphalt shingles shall comply with ASTM D3462.

1507.2.5 Fasteners. Fasteners for asphalt shingles shall be galvanized, stainless steel, aluminum or copper roofing nails, minimum 12-gage [0.105 inch (2.67 mm)] shank with a minimum $^3/_8$-inch-diameter (9.5 mm) head, of a length to penetrate through the roofing materials and not less than $^3/_4$ inch (19.1 mm) into the roof sheathing. Where the roof sheathing is less than $^3/_4$ inch (19.1 mm) thick, the nails shall penetrate through the sheathing. Fasteners shall comply with ASTM F1667.

1507.2.6 Attachment. Asphalt shingles shall have the minimum number of fasteners required by the manufacturer, but not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12), shingles shall be installed as required by the manufacturer.

1507.2.7 Ice barrier. Where required, ice barriers shall comply with Section 1507.1.2.

1507.2.8 Flashings. Flashing for asphalt shingles shall comply with this section. Flashing shall be applied in accordance with this section and the asphalt shingle manufacturer's printed instructions.

1507.2.8.1 Base and cap flashing. Base and cap flashing shall be installed in accordance with the manufacturer's instructions. Base flashing shall be of either corrosion-resistant metal of minimum nominal 0.019-inch (0.483 mm) thickness or mineral-surfaced roll roofing weighing not less than 77 pounds per 100 square feet (3.76 kg/m²). Cap flashing shall be corrosion-resistant metal of minimum nominal 0.019-inch (0.483 mm) thickness.

1507.2.8.2 Valleys. Valley linings shall be installed in accordance with the manufacturer's instructions before applying shingles. Valley linings of the following types shall be permitted:

1. For open valleys (valley lining exposed) lined with metal, the valley lining shall be not less than 24 inches (610 mm) wide and of any of

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shingles shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 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 applied in accordance with Table 1507.1.1(2). Underlayment shall be attached in accordance with Table 1507.1.1(3).

Exceptions:

1. As an alternative, a minimum 4-inch-wide (102 mm) strip of self-adhering polymer modified bitumen membrane complying with ASTM D1970 and installed in accordance with the manufacturer's installation instructions for the deck material shall be applied over all joints in the roof decking. An approved underlayment for the applicable roof covering for design wind speeds less than 120 mph (54 m/s) shall be applied over the 4-inch-wide (102 mm) membrane strips.

shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm). Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25.4 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.254 mm). Thickness of the outside edge of plastic caps shall be not less than 0.035 inch (0.89 mm). The cap nail shank shall be not less than 0.083 inch (2.1 mm) for ring shank cap nails and 0.091 inch (2.3 mm) for smooth shank cap nails. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $^3/_4$ inch (19.1 mm) into the roof sheathing.

3. Structural metal panels that do not require a substrate or underlayment.

1507.1.2 Ice barriers. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier shall be installed for asphalt shingles, *metal roof shingles*, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, and wood shakes. The ice barrier shall consist of not less than two layers of *underlayment* cemented together, or a self-adhering polymer modified bitumen sheet shall be used in place of normal *underlayment* and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the *exterior wall* line of the building.

Exception: Detached accessory structures that do not contain conditioned floor area.

TABLE 1507.1.1(1)
UNDERLAYMENT TYPES

ROOF COVERING	SECTION	MAXIMUM BASIC DESIGN WIND SPEED, $V < 140$ MPH	MAXIMUM BASIC DESIGN WIND SPEED, $V \geq 140$ MPH
Asphalt shingles	1507.2	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D226 Type II ASTM D4869 Type IV ASTM D6757
Clay and concrete tiles	1507.3	ASTM D226 Type II ASTM D2626 Type I ASTM D6380 Class M mineral surfaced roll roofing	ASTM D226 Type II ASTM D2626 Type I ASTM D6380 Class M mineral surfaced roll roofing
Metal roof panels	1507.4	Manufacturer's instructions	ASTM D226 Type II ASTM D4869 Type IV
Metal roof shingles	1507.5	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Mineral-surfaced roll roofing	1507.6	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Slate shingles	1507.7	ASTM D226 Type II ASTM D4869 Type III or IV	ASTM D226 Type II ASTM D4869 Type IV
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 IV
Wood shakes	1507.9	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Photovoltaic shingles	1507.16	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D226 Type II ASTM D4869 Type IV ASTM D6757

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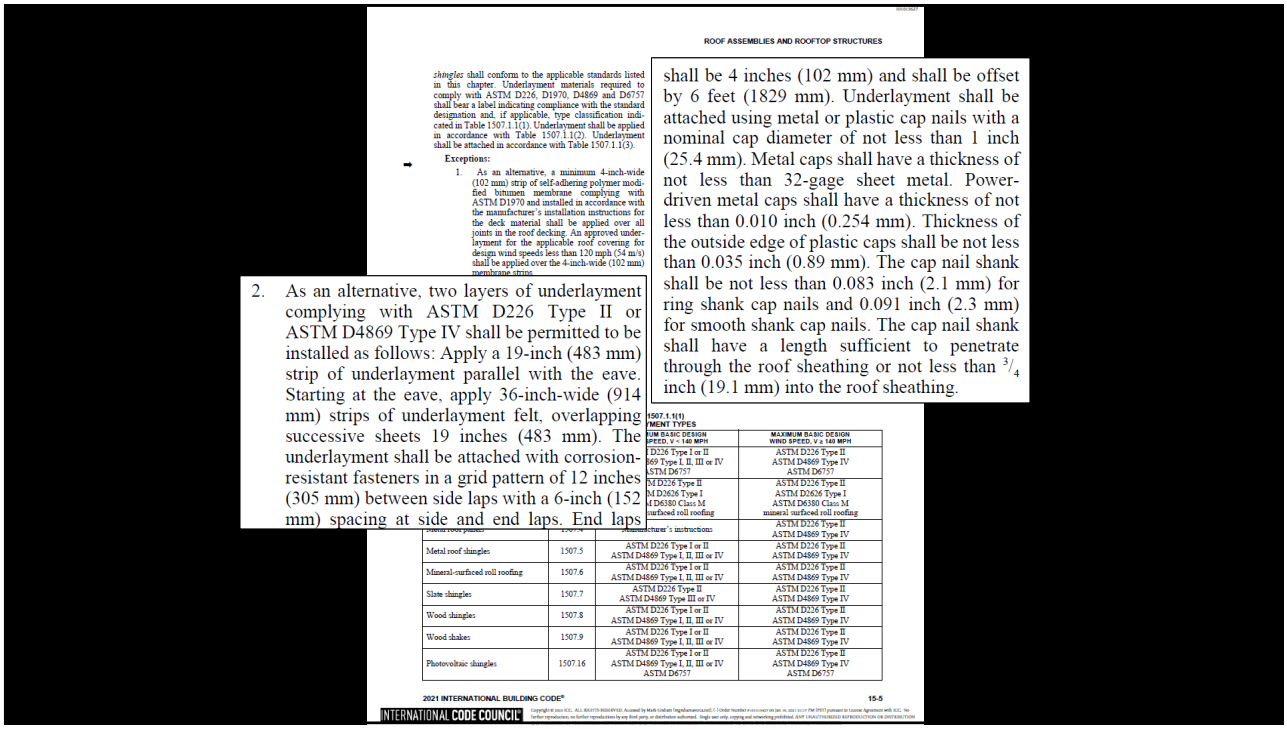

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

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2. As an alternative, two layers of underlayment complying with ASTM D226 Type II or ASTM D4869 Type IV shall be permitted to be installed as follows: Apply a 19-inch (483 mm) strip of underlayment parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of underlayment felt, overlapping successive sheets 19 inches (483 mm). The underlayment shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps. End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm). Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25.4 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.254 mm). Thickness of the outside edge of plastic caps shall be not less than 0.035 inch (0.89 mm). The cap nail shank shall be not less than 0.083 inch (2.1 mm) for ring shank cap nails and 0.091 inch (2.3 mm) for smooth shank cap nails. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $^{3}/_{4}$ inch (19.1 mm) into the roof sheathing.
3. Structural metal panels that do not require a substrate or underlayment.

1507.1.1(1)
UNDERLAYMENT TYPES

ROOF COVERING	SECTION	MINIMUM BASIC DESIGN WIND SPEED, V < 140 MPH	MAXIMUM BASIC DESIGN WIND SPEED, V ≥ 140 MPH
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Clay and concrete tiles	1507.3	ASTM D226 Type II ASTM D2626 Type I ASTM D6380 Class M mineral surfaced roll roofing	ASTM D226 Type II ASTM D2626 Type I ASTM D6380 Class M mineral surfaced roll roofing
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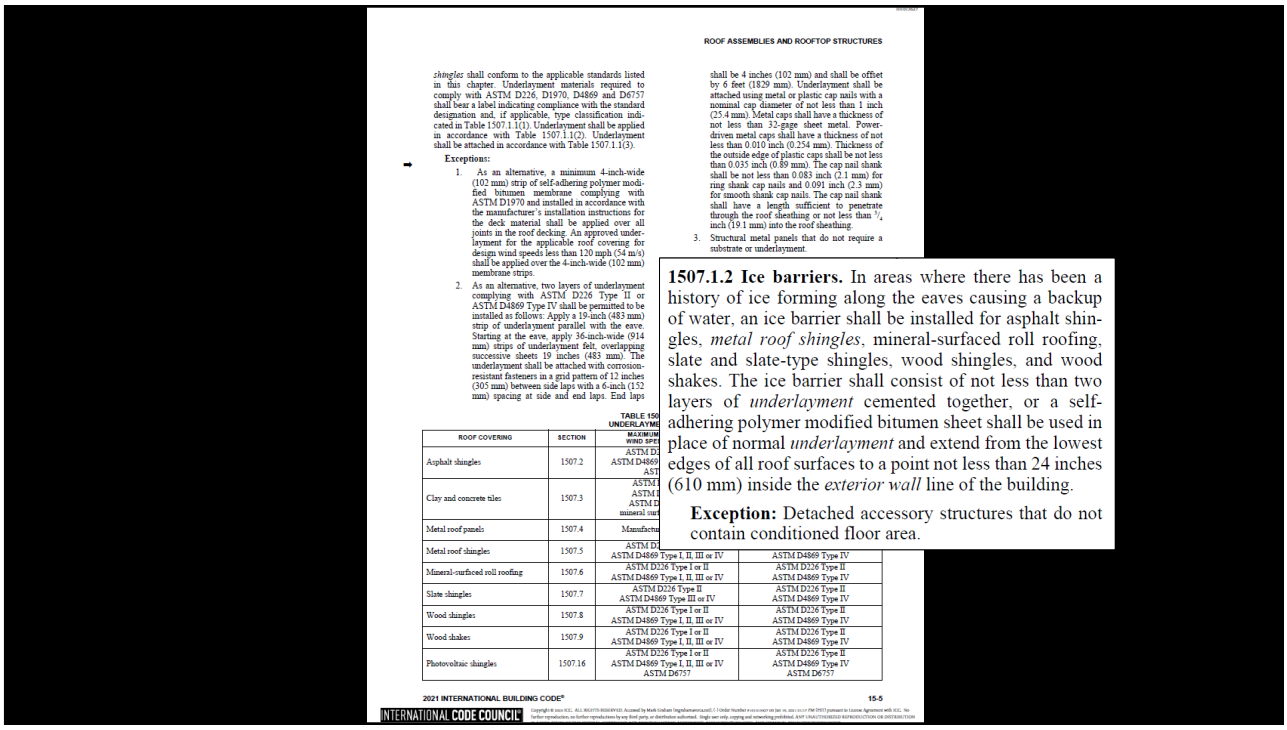

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

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RESEARCH+TECH

Understanding underlayment

Did you know I-Codes require enhanced underlayment in high-wind regions?

by Mark S. Graham

The *International Building Code,® 2021 Edition* and *International Residential Code,® 2021 Edition* require enhanced underlayment materials and application methods for asphalt shingle roof systems in certain situations, such as when installing them in low-slope applications or high-wind regions. Asphalt shingle roof system designers and installers should be aware of these enhancement requirements; highlights follow.

Low-slope applications

For asphalt shingle roofs with slopes between 2:12 and 4:14, IBC 2021 and IRC 2021 require a two-layer underlayment application. The underlayment is required to be applied as a 19-inch-wide starter parallel to and starting along the eaves. Next, full-width underlayment rolls must be applied shingle fashion starting at the eaves, overlapping successive sheets by 19 inches. End laps must be a minimum of 4 inches and offset by a minimum of 6 feet.

High-wind regions

IBC 2021 considers high-wind regions to be areas where the basic design wind speed is 140 mph or more. These areas include the Gulf

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Nailbase insulation

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Some considerations

Nailbase insulation

- Consider multiple layers
- Vented nailbase – air leakage through joints
- FRT or pressure-treated plywood top layer

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PIMA QualityMark^{CM} program

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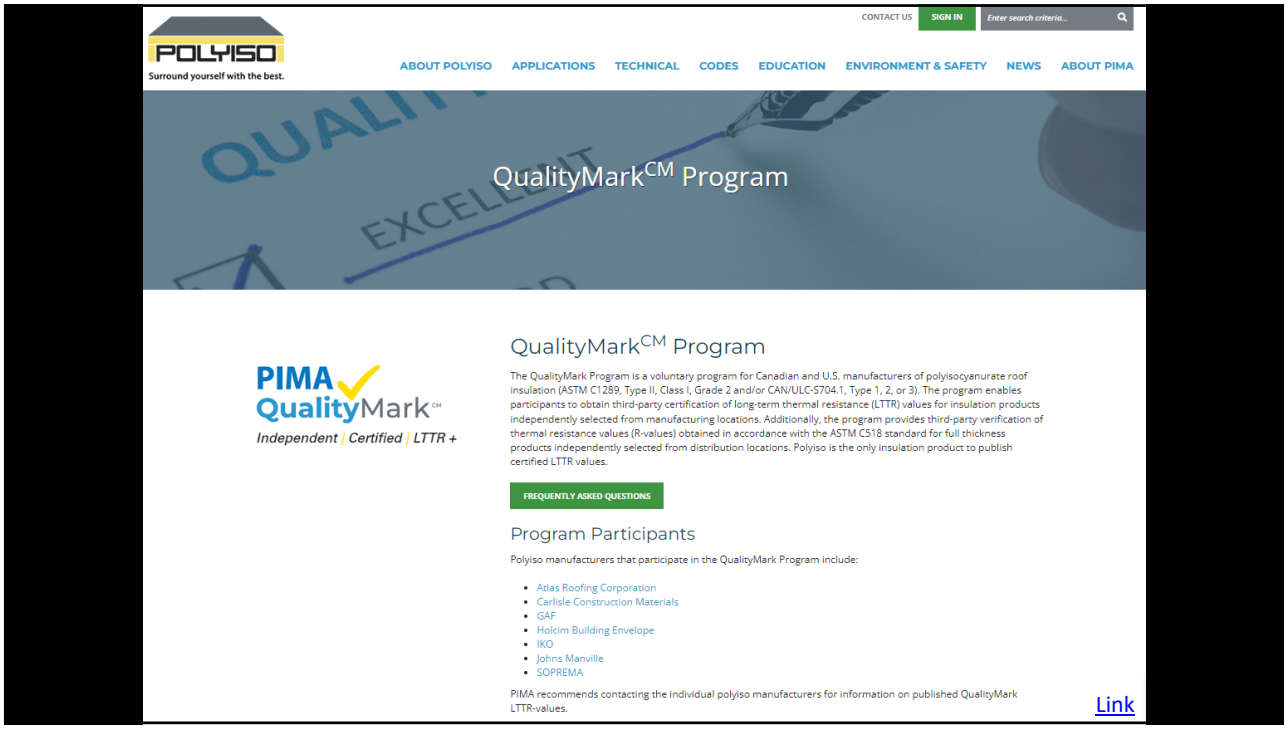
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QualityMark^CM Program
The QualityMark Program is a voluntary program for Canadian and U.S. manufacturers of polyisocyanurate roof insulation (ASTM C1289, Type II, Class I, Grade 2 and/or CAN/ULC-S704.1, Type 1, 2, or 3). The program enables participants to obtain third-party certification of long-term thermal resistance (LTTR) values for insulation products independently selected from manufacturing locations. Additionally, the program provides third-party verification of thermal resistance values (R-values) obtained in accordance with the ASTM C518 standard for full thickness products independently selected from distribution locations. Polyiso is the only insulation product to publish certified LTTR values.
FREQUENTLY ASKED QUESTIONS
Program Participants
Polyiso manufacturers that participate in the QualityMark Program include:
Atlas Roofing Corporation
Carlisle Construction Materials
GAF
Holcim Building Envelope
IKO
Johns Manville
SOPREMA
PIMA recommends contacting the individual polyiso manufacturers for information on published QualityMark LTTR-values.
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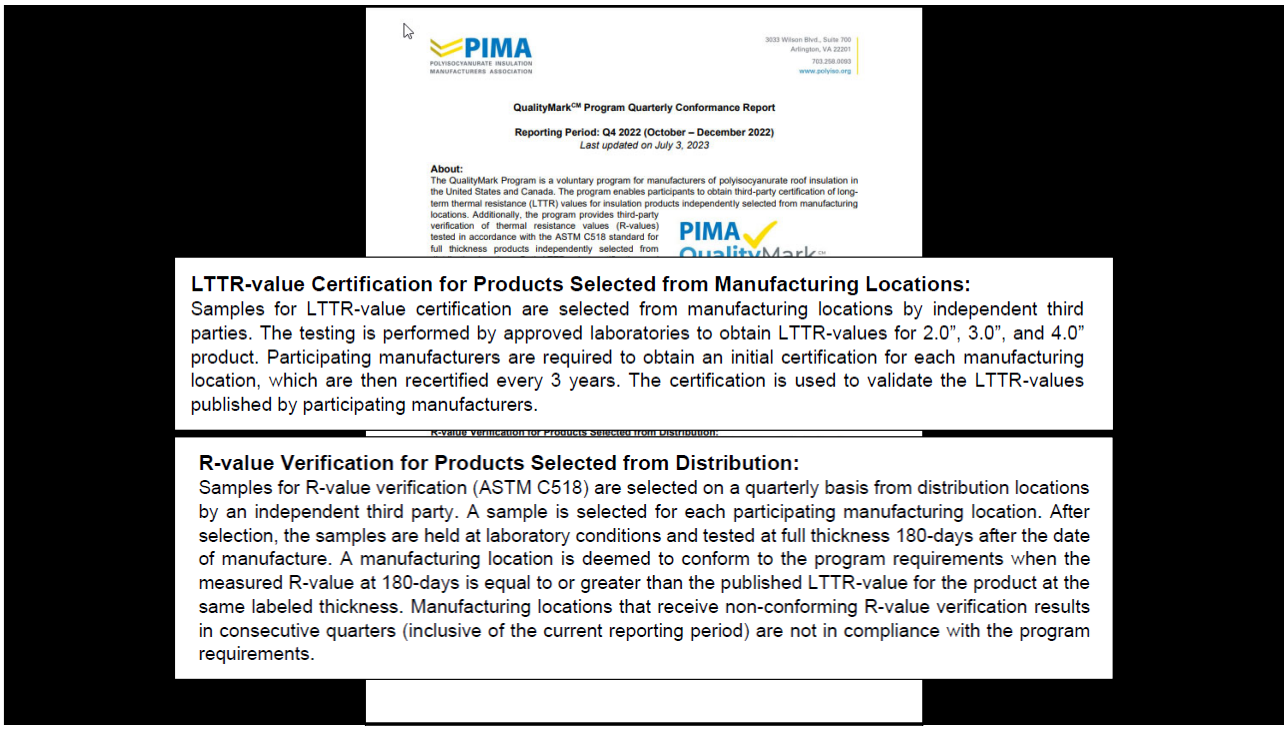
PIMA
POLYISOCYANURATE INSULATION MANUFACTURERS ASSOCIATION
3033 Wilson Blvd., Suite 700
Arlington, VA 22201
703.258.0092
www.polyiso.org
QualityMark^CM Program Quarterly Conformance Report
Reporting Period: Q4 2022 (October – December 2022)
Last updated on July 3, 2023
About:
The QualityMark Program is a voluntary program for manufacturers of polyisocyanurate roof insulation in the United States and Canada. The program enables participants to obtain third-party certification of long-term thermal resistance (LTTR) values for insulation products independently selected from manufacturing locations. Additionally, the program provides third-party verification of thermal resistance values (R-values) tested in accordance with the ASTM C518 standard for full thickness products independently selected from
LTTR-value Certification for Products Selected from Manufacturing Locations:
Samples for LTTR-value certification are selected from manufacturing locations by independent third parties. The testing is performed by approved laboratories to obtain LTTR-values for 2.0", 3.0", and 4.0" product. Participating manufacturers are required to obtain an initial certification for each manufacturing location, which are then recertified every 3 years. The certification is used to validate the LTTR-values published by participating manufacturers.
R-value Verification for Products Selected from Distribution:
Samples for R-value verification (ASTM C518) are selected on a quarterly basis from distribution locations by an independent third party. A sample is selected for each participating manufacturing location. After selection, the samples are held at laboratory conditions and tested at full thickness 180-days after the date of manufacture. A manufacturing location is deemed to conform to the program requirements when the measured R-value at 180-days is equal to or greater than the published LTTR-value for the product at the same labeled thickness. Manufacturing locations that receive non-conforming R-value verification results in consecutive quarters (inclusive of the current reporting period) are not in compliance with the program requirements.

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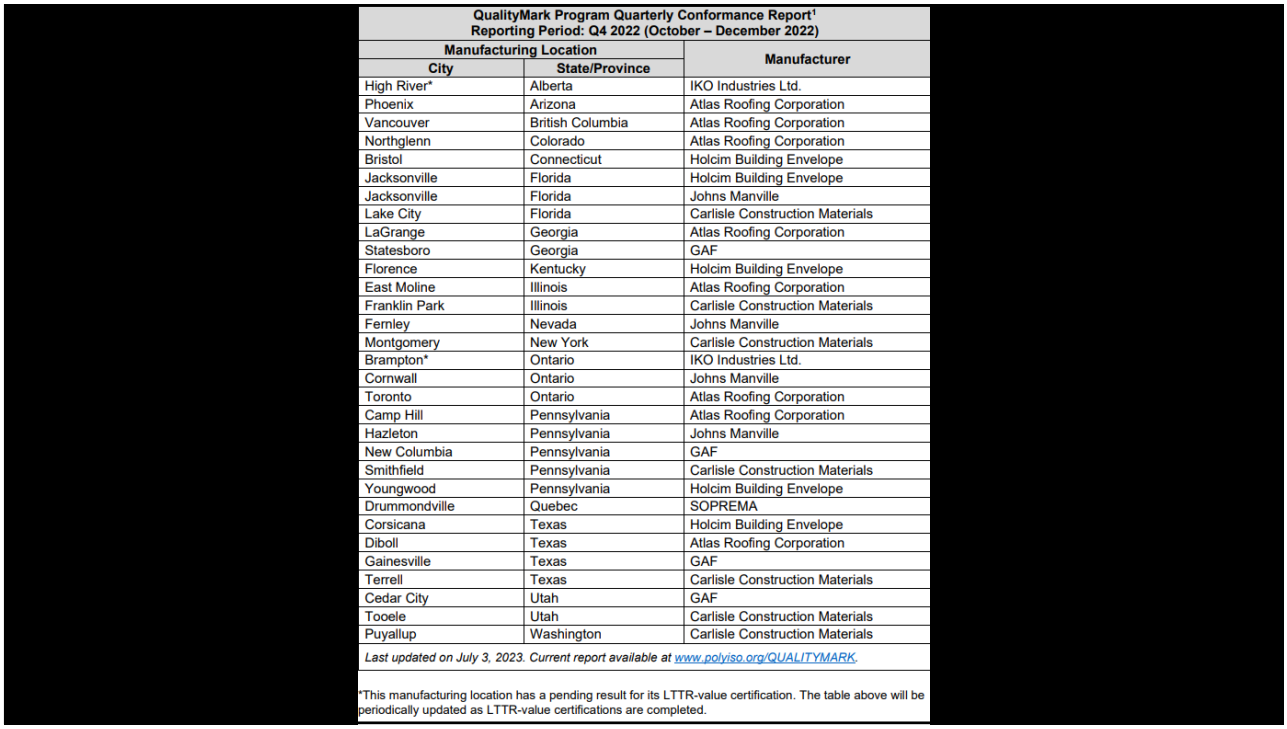

QualityMark Program Quarterly Conformance Report[1]
Reporting Period: Q4 2022 (October – December 2022)

Manufacturing Location		Manufacturer
City	State/Province	
High River*	Alberta	IKO Industries Ltd.
Phoenix	Arizona	Atlas Roofing Corporation
Vancouver	British Columbia	Atlas Roofing Corporation
Northglenn	Colorado	Atlas Roofing Corporation
Bristol	Connecticut	Holcim Building Envelope
Jacksonville	Florida	Holcim Building Envelope
Jacksonville	Florida	Johns Manville
Lake City	Florida	Carlisle Construction Materials
LaGrange	Georgia	Atlas Roofing Corporation
Statesboro	Georgia	GAF
Florence	Kentucky	Holcim Building Envelope
East Moline	Illinois	Atlas Roofing Corporation
Franklin Park	Illinois	Carlisle Construction Materials
Fernley	Nevada	Johns Manville
Montgomery	New York	Carlisle Construction Materials
Brampton*	Ontario	IKO Industries Ltd.
Cornwall	Ontario	Johns Manville
Toronto	Ontario	Atlas Roofing Corporation
Camp Hill	Pennsylvania	Atlas Roofing Corporation
Hazleton	Pennsylvania	Johns Manville
New Columbia	Pennsylvania	GAF
Smithfield	Pennsylvania	Carlisle Construction Materials
Youngwood	Pennsylvania	Holcim Building Envelope
Drummondville	Quebec	SOPREMA
Corsicana	Texas	Holcim Building Envelope
Diboll	Texas	Atlas Roofing Corporation
Gainesville	Texas	GAF
Terrell	Texas	Carlisle Construction Materials
Cedar City	Utah	GAF
Tooele	Utah	Carlisle Construction Materials
Puyallup	Washington	Carlisle Construction Materials

Last updated on July 3, 2023. Current report available at www.polyiso.org/QUALITYMARK.

*This manufacturing location has a pending result for its LTTR-value certification. The table above will be periodically updated as LTTR-value certifications are completed.

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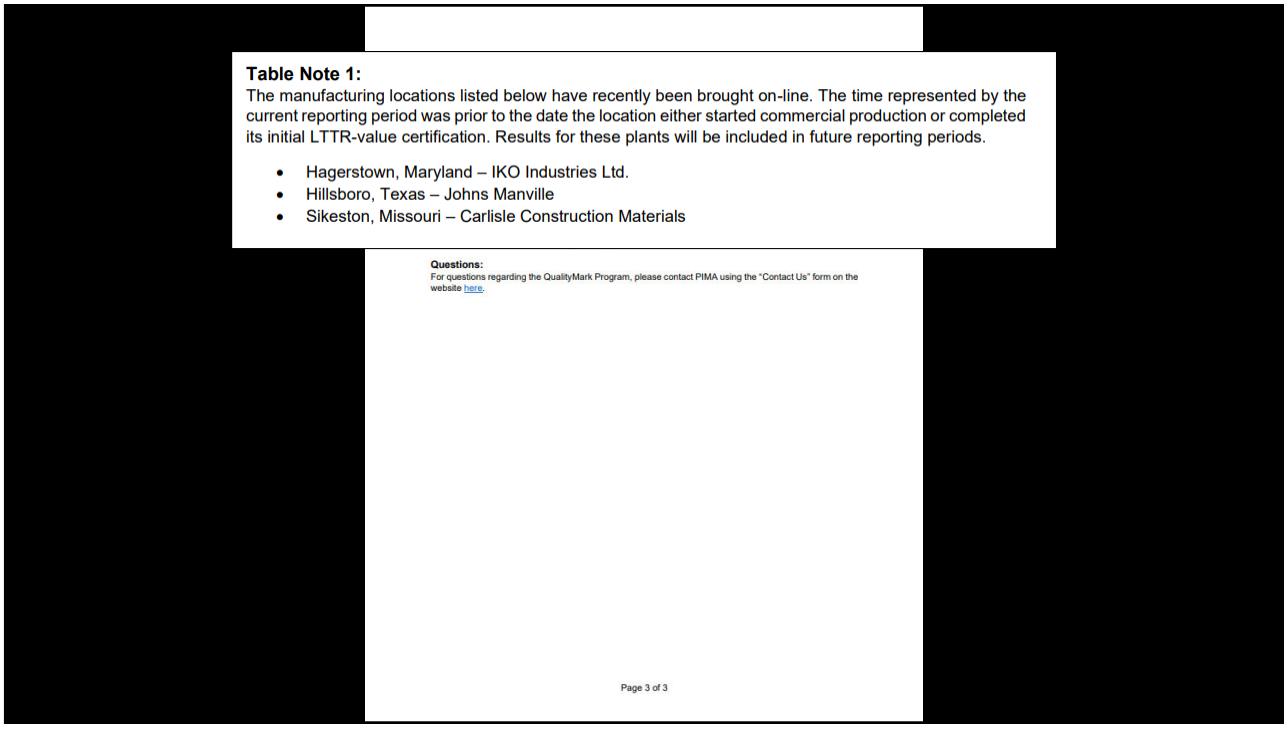

Table Note 1:
The manufacturing locations listed below have recently been brought on-line. The time represented by the current reporting period was prior to the date the location either started commercial production or completed its initial LTTR-value certification. Results for these plants will be included in future reporting periods.

- Hagerstown, Maryland – IKO Industries Ltd.
- Hillsboro, Texas – Johns Manville
- Sikeston, Missouri – Carlisle Construction Materials

Questions:
For questions regarding the QualityMark Program, please contact PIMA using the "Contact Us" form on the website here.

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Recommendations

- Watch for updates to PIMA's Quarterly Conformance Report
- Consider asking polyiso. manufacturers to certify their current compliance
- Be careful to represent/sell insulation on its thickness, not by its R-value

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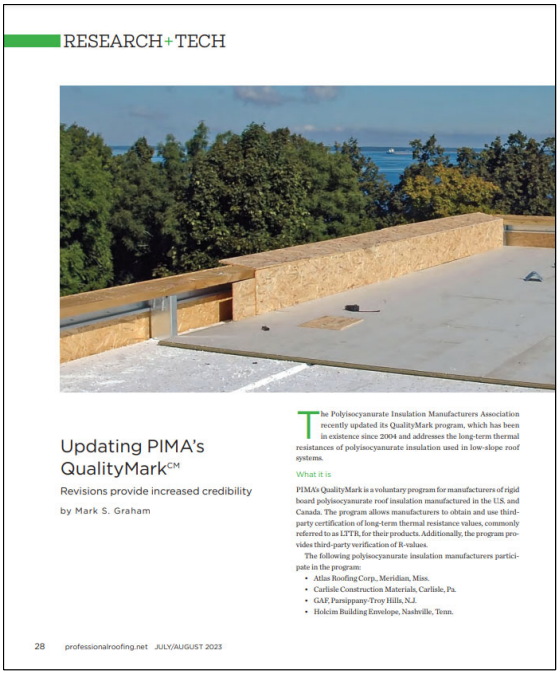
RESEARCH+TECH

Updating PIMA's QualityMark℠

Revisions provide increased credibility

by Mark S. Graham

The Polyisocyanurate Insulation Manufacturers Association recently updated its QualityMark program, which has been in existence since 2004 and addresses the long-term thermal resistances of polyisocyanurate insulation used in low-slope roof systems.

What it is

PIMA's QualityMark is a voluntary program for manufacturers of rigid board polyisocyanurate roof insulation manufactured in the U.S. and Canada. The program allows manufacturers to obtain and use third-party certification of long-term thermal resistance values, commonly referred to as LTTR, for their products. Additionally, the program provides third-party verification of R-values.

The following polyisocyanurate insulation manufacturers participate in the program:

- Atlas Roofing Corp., Meridian, Miss.
- Carlisle Construction Materials, Carlisle, Pa.
- GAF, Parsippany-Troy Hills, N.J.
- Holcim Building Envelope, Nashville, Tenn.

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Fastener concerns

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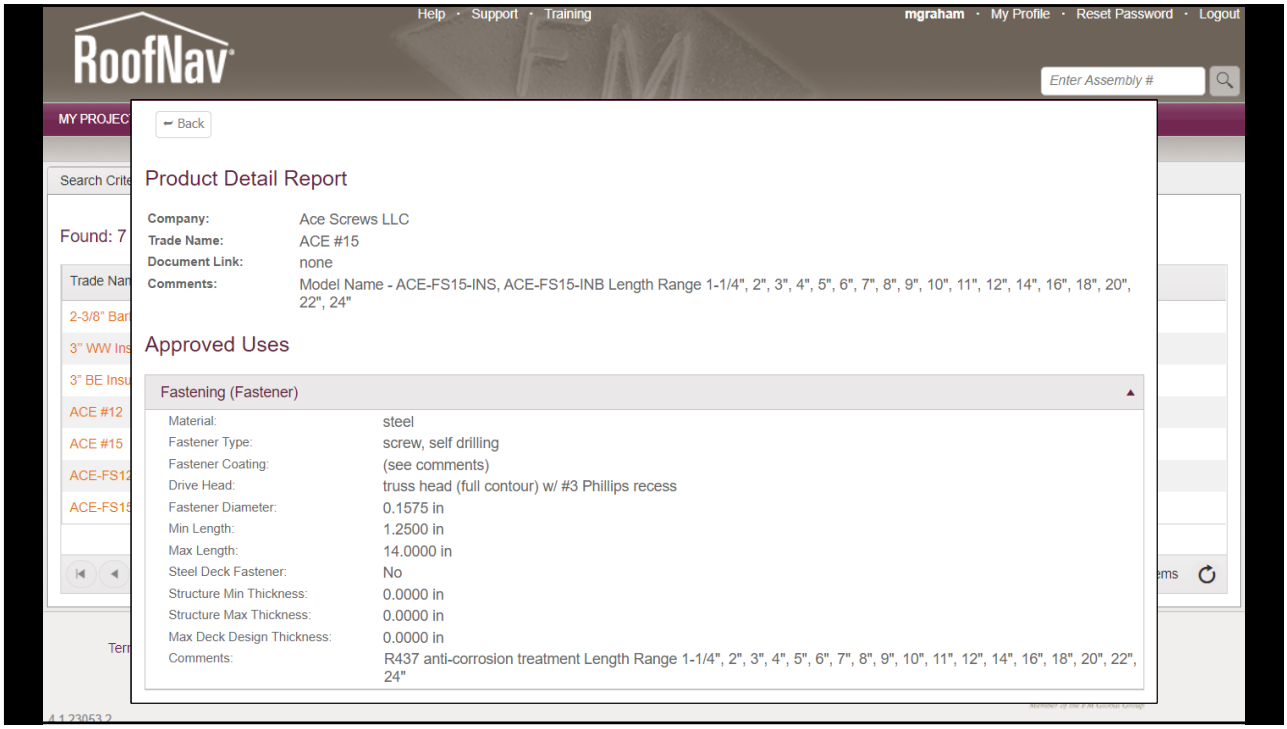

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Some considerations

Fastener concerns

- Purchase membrane and insulation fasteners supplied by the roof system manufacturer
- Listen to feedback from field applicators
- Contact NRCA Technical Services with questions or concerns

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FM Approvals' RoofNav -- New Beta test version

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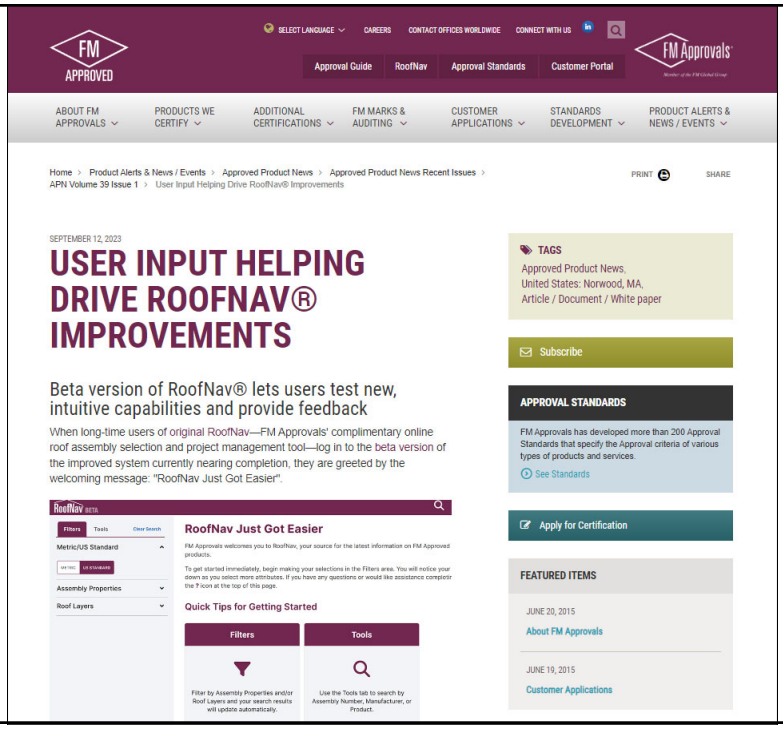

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RoofNav BETA
BETA Disclaimer: This version of the RoofNav website is in BETA form and may therefore contain defects. The primary purpose of this beta release is to obtain feedback on functionality and the identification of defects. You are advised to use caution and not to rely in any way on the content, functioning or performance of the beta version of RoofNav and/or accompanying materials.
RoofNav.com remains the authoritative website for access to the most up-to-date FM Approved roofing products and assemblies. By registering and logging into the site, you consent to the terms above.
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What's New
We continue to update RoofNav with new features to enhance your experience.
FM Approvals is pleased to launch the BETA release of the new and improved RoofNav. The goal is to make it easier and faster for you to reliably find RoofNav assemblies and products that match your project needs.
New functionality includes: No more zero results, Integrated product look-up with customizable Roof Layers, and immediate real-time results as you enter criteria.
Have additional questions about the BETA site? Read FAQs.

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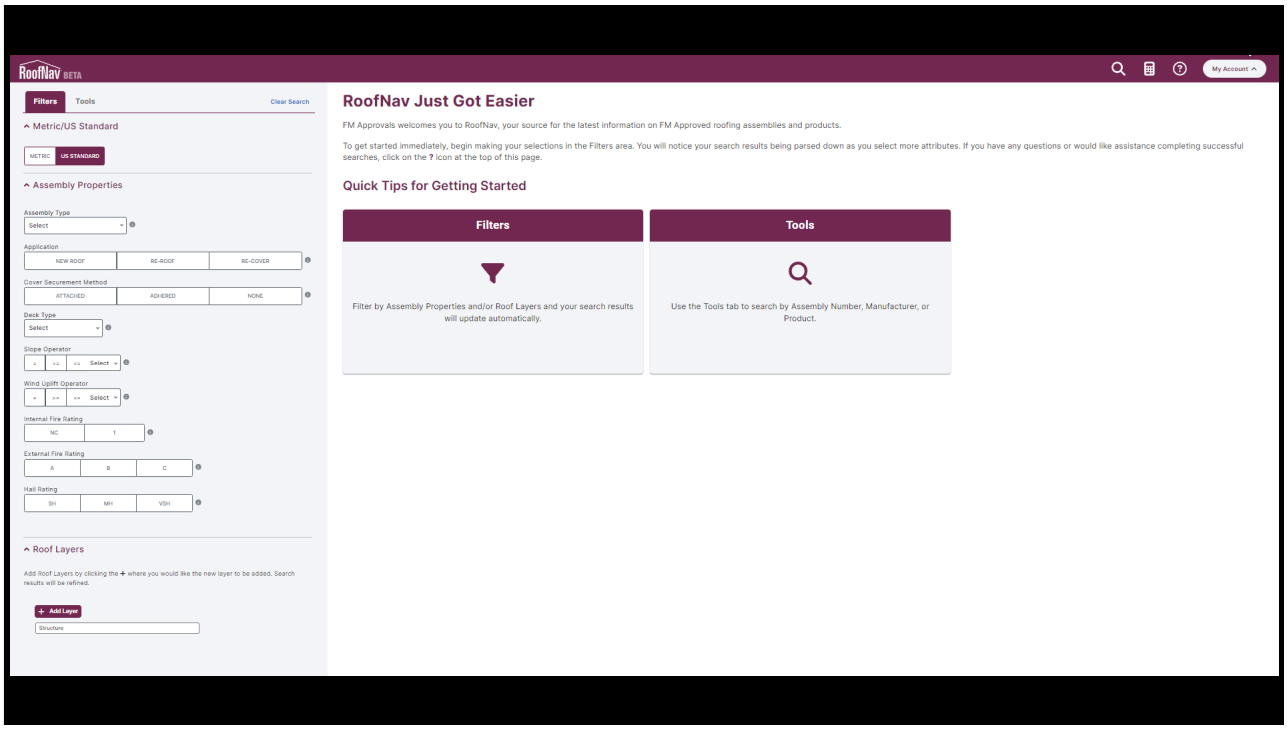
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Assembly Type
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Application
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RE-ROOF
RE-COVER
Cover Securement Method
ATTACHED
ADHERED
NONE
Deck Type
Select
Slope Operator
Select
Wind Uplift Operator
Select
Internal Fire Rating
NC
1
External Fire Rating
A
B
C
Hail Rating
SH
MH
VSH
Roof Layers
Add Roof Layers by clicking the + where you would like the new layer to be added. Search results will be refined.
Add Layer
Structure
RoofNav Just Got Easier
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To get started immediately, begin making your selections in the Filters area. You will notice your search results being parsed down as you select more attributes. If you have any questions or would like assistance completing successful searches, click on the ? icon at the top of this page.
Quick Tips for Getting Started
Filters
Filter by Assembly Properties and/or Roof Layers and your search results will update automatically.
Tools
Use the Tools tab to search by Assembly Number, Manufacturer, or Product.

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Field wind-uplift testing

Putting the field wind-uplift test to the test

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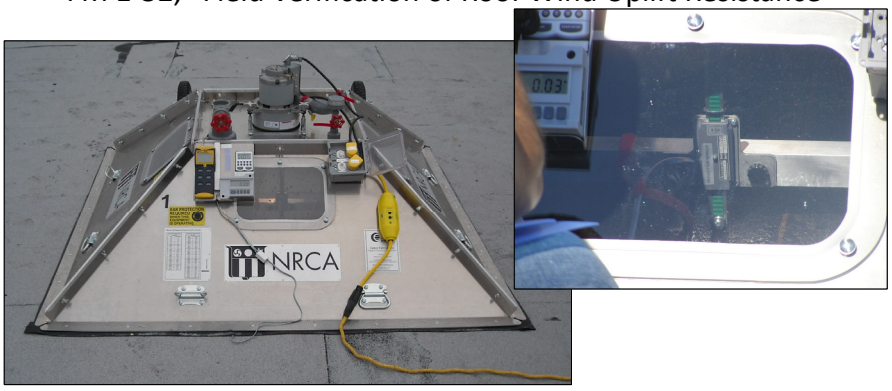
Field wind-uplift testing

- ASTM E907, “Standard Test Method for Field Testing Uplift Resistance for Adhered membrane Roofing Systems”
- FM 1-52, “Field Verification of Roof Wind Uplift Resistance”



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INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Field-uplift testing

ASTM E907 and FM 1-52 tests continue to be problematic

June 2015

NRCA continues to receive a significant number of reports from roofing contractors, manufacturers and designers regarding the use of and problems associated with field-uplift tests as post-installation quality assurance measures for membrane roof systems. NRCA has addressed these testing issues a number of times during the years. Following is a summary of NRCA's previous discussions, as well as updated information and recommendations.

ASTM E907/FM 1-52

There are two recognized field test methods for determining adhered membrane roof systems' uplift resistances: ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems," and FM Global Loss Prevention Data Sheet 1-52 (FM 1-52), "Field Verification of Roof Wind Uplift Resistance."

An example of a test chamber used for negative-pressure uplift testing.

Both test methods are similar and provide for affixing a 5- by 5-foot dome-like chamber to a roof surface's topside and applying a defined negative (uplift) pressure inside the chamber to the roof system's exterior-side surface using a vacuum pump (see photo). During the test, membrane surface deflection inside the chamber is visually monitored and measured to determine whether a roof system passes or is "suspect."

Using ASTM E907, a roof system is considered to be suspect if the deflection measured during the test is 25 mm (about 1 inch) or greater. During FM 1-52 testing, a roof system is suspect if the measured deflection is between ½ of an inch and ⅞ of an inch depending on the maximum test pressure: 1 inch where a thin topping board (cover board) is used; or 2 inches where a thin cover board or flexible, mechanically attached insulation is used.

If an ASTM E907 or FM 1-52 test yields a suspect result, a test cut should be taken in the test area to determine whether failure has occurred and the specific failure mode.

ASTM E907 and FM 1-52 differ notably in their test cycles and maximum test pressures for determining roof system deflections and whether a roof system passes or is suspect. ASTM E907 testing is conducted in 15-pounds per square foot (psf) pressure intervals up to the calculated design wind (uplift) pressure for the specific roof system being evaluated. FM 1-52 testing is conducted using an initial 15-pounds psf pressure followed by 7.5-pound psf increments up to a maximum test pressure of 1.25 times the design uplift pressure for the specific roof system being evaluated.

Considering maximum test loading and allowable test deflections in combination, FM 1-52 requires 25 percent higher test loads, yet only allows as little as ½ the test deflection of ASTM E907. That said, FM 1-52 is a significantly more stringent test than ASTM E907.

ASTM E907 originally was published as a recognized consensus standard in 1985, and it was revised in 1996. In 2013, ASTM withdrew ASTM E907 because a consensus could not be reached regarding necessary revisions—most significantly, defining the test method's precision and bias (accuracy). ASTM E907-96 still is available for use and can be obtained directly from ASTM's website, www.astm.org.

FM 1-52 is an FM Global-promulgated evaluation method and not a recognized industry-consensus test standard. FM 1-52's scope indicates it only is intended to confirm acceptable wind-uplift resistance on completed roof systems in hurricane-prone regions, where a partial blow-off has occurred or where inferior roof system construction is suspected or known to be present.

FM 1-52 originally was published by FM Global in October 1970. The negative-pressure uplift test was added in August 1980 and has been revised several times. The current edition is dated July 2012 and includes an option for "visual construction observation (VCO)" as an alternative to negative-pressure uplift testing. VCO provides for full-time, third-party monitoring of a roof system application to verify roof system installation in accordance with contract documents.

NRCA "Industry Issue Update," June 2015

NRCA members' experience:

- Most tests not conducted in accordance with ASTM E907 or FM 1-52.
- No correlation between field test vs. lab. results/classifications
- NRCA survey: 55% passing

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RESEARCH+TECH

Revisiting field uplift testing

NRCA's long-standing concerns continue with this issue

by Mark S. Graham

It has been a while since I have written about NRCA's concerns with field uplift testing, which sometimes is inappropriately used as a way to assess the quality of an adhered membrane roof system installation. Despite the time that has passed, NRCA continues to have reservations about field uplift testing, and the test procedure has not yet been revised to address NRCA's concerns.

ASTM E907

In 2013, ASTM International withdrew its consensus-based test method for field uplift testing, ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems."

ASTM International requires its test method standards to include a precision statement addressing two things:

- Known within-laboratory variability, referred to as "repeatability"
- Relative variability of test results obtained from different laboratories, referred to as "reproducibility"

Test methods also are required to include an estimate of bias in test results.

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ASTM Interlaboratory study (ILS)

"Testing the test"

- Built three identical test decks allowing for 24 tests total
- FM Class 90 roof system (FM tested to 90 psf)
- 8 testing entities conducted 3 test each
- Each test run at 15 psf increments up to 90 psf classification
- Membrane deflection is measured
- ASTM ILS staff planned the study and analyzed the test results
- At FM Global's research center in Glocester, RI

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ILS results

"Testing the test"

- Statistical outliers 15-, 30-, 45-, 60- and 90-psf test increments
- Outlier data excluded at 30-, 45- and 90-psf test increments
- 16 of the 24 specimens exhibited failure before completing the 90-psf test increment.
- 5 results at the 45-psf increment and all the tests' results at 60, 75- and 90-psf test increments exceeded FM 1-52's maximum allowable deflection.

All specimens should have exceeded 90 psf

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RESEARCH+TECH

Putting the test to the test

Substantial variability has been found in field-uplift testing

by Mark S. Graham

NRCA participated in an ASTM International interlaboratory study to evaluate the accuracy and precision of the field-uplift test method. The study provides some useful data and information for evaluating the appropriateness and effectiveness of field-uplift testing.

Field-uplift testing

There are two recognized field test methods for determining adhered membrane roof systems' uplift resistances: ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems," and FM Global Loss Prevention Data Sheet 1-52 (FM 1-52), "Field Verification of Roof Wind Uplift Resistance." In each of these test methods, a vacuum is created inside a test chamber mounted on a roof surface and membrane deflections resulting from the induced negative (uplift) pressures inside the chamber are measured.

ASTM E907 has been a consensus-based standard since it was originally published in 1983. ASTM International withdrew the standard in 2013 because it lacked a precision statement, which is required for all ASTM International test methods.

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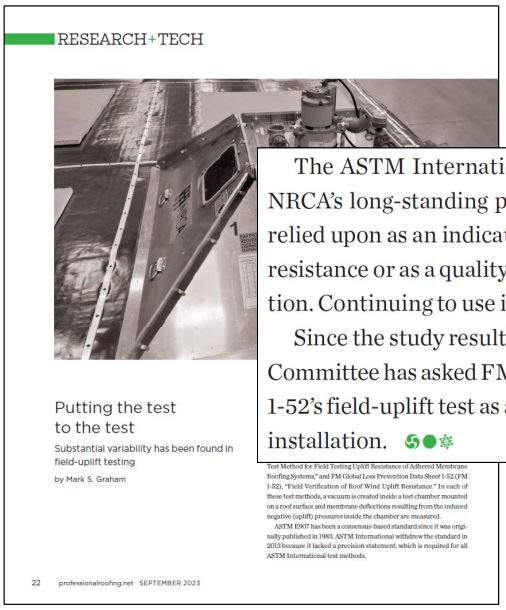

RESEARCH+TECH

Putting the test to the test

Substantial variability has been found in field-uplift testing

by Mark S. Graham

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The ASTM International interlaboratory study clearly illustrates NRCA's long-standing position that field-uplift testing should not be relied upon as an indicator of an adhered roof assembly's in situ uplift resistance or as a quality-assurance measure of roof assembly installation. Continuing to use it as such is irresponsible.

Since the study results were released, NRCA's Technical Operations Committee has asked FM Global to immediately discontinue use of FM 1-52's field-uplift test as a quality-assurance measure for roof assembly installation.

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Vapor retarder adhesion testing

Moisture-related issues with concrete roof decks

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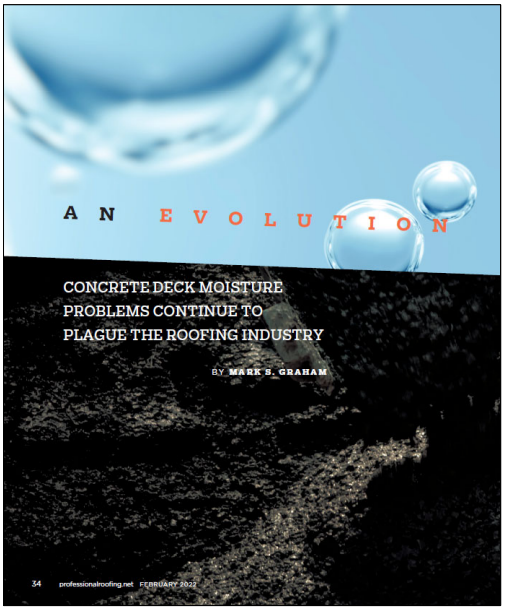

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NRCA recommends designers specify and adhered vapor retarder… but isn't adhesion of the vapor retarder still a concern?

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What we tested…

Vapor retarder adhesion testing

- 2-ply asphalt BUR membrane
- Manufacturer A-SA vapor retarder
- Manufacturer B-SA vapor retarder
- Manufacturer C-SA vapor retarder
- Manufacturer D-SA vapor retarder

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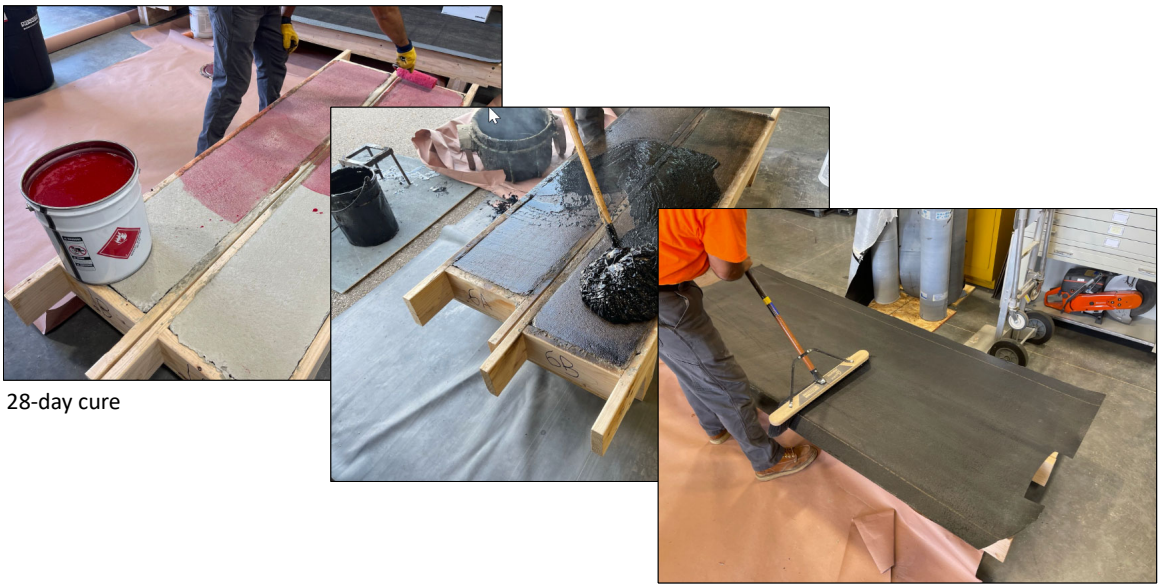

28-day cure

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Sample conditioning

After vapor retarder application; 28 days after concrete placement

- Conditioned for 60-days
- One set of each at standard laboratory conditions
- Other set of each at a 30 F temperature differential
  - The temperature differential creates an upward vapor pressure drive

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Test results

Vapor retarder adhesion

Sample	Tested pull resistance		Difference	
	Lab. conditions 60-day conditioning (Average of 5 specimens)	Vapor drive 60-day conditioning (Average of 5 specimens)	Differential	Percent differential
2-ply built-up membrane	1,421 psf	833 psf	-588 psf	-41%

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Conclusions

Vapor retarder adhesion

- Results vary
- For 4 of 5 samples, vapor drive conditioning resulted in lower values, but Manufacture 3-SA VR is higher
- All results greater than 90 psf (i.e., FM 1-90)

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Recommendations

Vapor retarder adhesion

- Designers should specify vapor retarders after considering vapor retarder adhesion both at the time of application and in-service.
- Manufacturers should incorporate some form of vapor drive conditioning assessment in their product development and assessment, and make that information available to specifiers.
- The vapor drive conditioning used in this testing is one possible assessment method.

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RESEARCH+TECH

Better understanding of adhesion

Recent research shows vapor retarder adhesion to new concrete roof decks varies

by Mark S. Graham

In "An evolution of knowledge," February 2022 issue, I discussed NRCA's research examining roofing-related problems with moisture in concrete roof decks. One area where NRCA considered additional research to be necessary was addressing the adequacy of vapor retarder adhesion to newly placed concrete roof decks.

NRCA has since undertaken this research, which provides designers with some guidance for proper vapor retarder selection.

Adhesion research

NRCA contracted with SRI Consultants Inc., Waunakee, Wis., to oversee test specimen preparation and conduct vapor retarder adhesion testing.

Ten 6-inch-thick concrete roof deck specimen sets were poured using normal-weight structural concrete. The top surfaces of the concrete specimens were float-finished.

After 28 days of curing at standard laboratory conditions, a two-ply built-up membrane was applied to two of the concrete roof deck specimens and four different manufacturers' self-adhering vapor retarder products were applied to the remaining concrete roof deck specimens in two specimens sets. For each of the self-adhering vapor retarder types, the manufacturer's recommended primer was used, and installations

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Other topics and your questions

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