Denver, Colorado – Wednesday, December 14, 2016

Pinpoint Seminar: Technical Update

presented by

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

Topics

- Manufacturers' installation instructions
- IEBC 2015
- Polyiso. insulation update
- Asphalt shingle testing
- ASCE 7-16 in IBC 2018
- Other topics

Manufacturers' installation instructions

International Building Code, 2015 Edition

Section 1506-Materials

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 manufacturer's installation instructions. Installation of roof coverings shall comply with the applicable provisions of Section 1507.

TECH TODAY

A quest for clarity

A new NRCA task force is reviewing manufacturers' installation instructions

by Mark S. Graham

As roofing products and roof systems become increasingly proprietary and complex, proper installation instructions are an important consideration. Roofing product and roof system manufacturers generally are responsible for providing users with instructions explaining how to properly install their products.

Instructions for some products are not written at a level appropriate for intended users

Instructional variance

Although some manufacturers make their product-specific installation instructions readily accessible to users, instructions for some products are difficult to locate and not written at a level appropriate for the intended users—field applicators.

Most asphalt shingle manufacturers, for example, imprint product-specific installation instructions on shingle bundle wrappers. Some manufacturers print instructions in multiple languages in recognition some installers may not speak or read English.

Installation instructions for other products and systems, such as single-ply membranes, generally are not included with the product or product packaging. For these products, users need to rely on manufacturers' printed literature or websites for system-specific installation instructions. Some website-housed application instructions are difficult or nearly impossible to locate on manufacturers' websites. In addition, some online formats are not compatible with mobile devices, which a field applicator likely would use for access.

Also, the intended users and amount of information included in manufacturers' installation instructions vary significantly.

I recently downloaded installation instructions from several manufacturers for a conventional built-up membrane roof system specification. One manufacturer has a single-page instruction sheet indicating the intended components, application rates, cautions and limitations, as well as a graphic illustration of ply-line layout.

Another manufacturer's instructions for a similar built-up membrane specification consists of a 37-page, text-only document that includes minimal installation-specific instruction but detailed structural roof deck, wind-uplift resistance and fire-rating design information. Such an installation instruction document is of little use to field applicators and appears to be an attempt to shift some design responsibility to roofing contractors and field applicators.

Code requirements

Most building codes include specific provisions requiring roofing products and roof systems to be installed according to manufacturers' installation instructions.

For example, in Chapter 15—Roof Assemblies and Rooftop Structures of the *International Building Code, 2015 Edition* (IBC), Section 1506—Materials includes the following statement: "... Roof coverings shall be applied in accordance with this chapter and the manufacturer's installation instructions ...." Section 1507—Requirements for Roof Coverings includes similar requirements.

Chapter 9—Roof Assemblies of the *International Residential Code, 2015 Edition* (IRC) includes similar provisions in Section R904—Materials and Section R905—Requirements for Roof Coverings.

Previous editions of IBC and IRC contained similar provisions.

Manufacturers' installation instructions specifically are required by building codes, which underscores the importance of the instructions being easily accessible, relevant and easily understandable to roofing contractors' field personnel.

NRCA review task force

This year, NRCA established a Manufacturers' Application Instruction Review Task Force to review manufacturers' installation instructions and provide manufacturers with input and suggestions for improvement. A specific objective of the task force is to make manufacturers' installation instructions more useful to field personnel.

It bears noting the concept of an NRCA installation instruction review task force is not new. NRCA had a similar task force during the late 1970s and early 1980s, and it was primarily focused on achieving consistency in manufacturers' application instructions for coal tar- and asphalt-based built-up systems. That effort eventually evolved into the development (with several manufacturers and, later, the Asphalt Roofing Manufacturers Association) of NRCA's application quality control document.

During NRCA's Fall Committee Meetings, which will be held Nov. 14-17 in Chicago, the task force will meet with several manufacturers to discuss and, NRCA hopes, improve installation instructions. Although this meeting is an initial step, the effort is intended to be an ongoing, long-term undertaking by NRCA addressing all common roofing products and roof systems. We look forward to working with manufacturers in this effort. ●●●

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

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Professional Roofing, October 2016

NRCA Manufacturers Spec Review Task Force

Malarkey Roofing Products

LOW SLOPE ROOFING SYSTEM SPECIFICATION
FOUR-PLY CONVENTIONAL 524 RCap™ Plus (Base, Ply & Cap)

System Configuration
R4-AHO (515, 2-500 Type IV, 524 RCap Plus)
R4-AIO (515, 2-506 Type VI, 524 RCap Plus)
R4-BHO (501, 2-500 Type IV, 524 RCap Plus)
R4-BIO (501, 2-506 Type VI, 524 RCap Plus)

Materials per 100 sq./ft. of Roof Area:

Base Sheet: (choose one of the following)

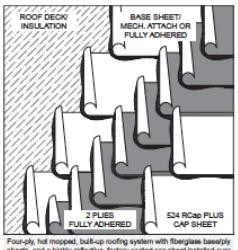
One (1) ply of **515**	25.0 lbs
-OR-	
One (1) ply of **501**	30.6 lbs

Ply Sheet Options: *(choose one of the following)*

Two (2) plies of **500**	7.2 lbs. per ply/14.4 lbs.
-OR-	
Two (2) plies of **506**	9.2 lbs. per ply/18.4 lbs.

Cap Sheet:

One (1) ply of **524 RCap Plus**	77 lbs.
Adhesive for Roofing Plies:	ASTM D 312 Type III, or IV 25.0 lbs. per ply/per sq.
Insulation:	*Specified*
Weight per Square: *(-Insulation)*	**192.4 lbs. to 199.4 lbs.**



Four-ply, hot mopped, built-up roofing system with fiberglass base/ply sheets, and a highly-reflective, factory coated cap sheet installed over an approved roof deck.

Roof deck and general information: Roof deck must be clean, dry, smooth, and structurally sound to receive the new roofing system. Drainage must be incorporated in the design to prevent ponding water. For more information, please refer to the current Malarkey Roofing Products (Malarkey) Specification Manual: General requirements and Commercial Installation Instructions.

Special requirements: This roofing system can be installed as illustrated on slopes up to 1" in 12". Slopes that are greater than 1" in 12" are to be installed in a strapped fashion using ASTM D 312 Type IV asphalt, and wood nailers/insulation stops to facilitate back nailing of the roofing system. For more information, please refer to the current Malarkey Specification Manual: General Requirements/Strapped Installations.

Application: *Hot Mopped* - Install all inter-plies so that the water runs over (shingle fashion) or parallel to (strapped), but never against the laps in a uniform mopping of hot asphalt at the nominal rate of 25 lbs. per ply, per square. Broom all plies to ensure contact between the asphalt and the bottom surface of the roofing felts. Cap sheet will be installed so that the water runs over (shingle fashion) or parallel to (strapped), but never against the laps. Cut cap to 1/3 of the total length (11') and allow to relax prior to installation. Position cap membrane for installation and embed into a uniform mopping of asphalt applied at the rate of 25 lbs. per square. Ensure contact between the asphalt and the bottom of the sheet. Stagger all end laps a minimum of 12".

Prior to the application of interply sheets, all valleys and waterways shall receive an extra layer of Malarkey ply sheet (or comparable product) which shall be at least a full width sheet and shall extend at least 12 inches (30 cm) up to the inclines out of the valleys.

Flashings: Install all primed flashings (lead, metal, scuppers, etc.) in a layer of plastic cement on top of the inter-ply and stripped off with Two (2) of reinforcement, feathering each ply 3" from the edge of the flange and corresponding ply. Install cap sheet after all flashings have been stripped in.

Base flashings: Base flashing stripping ply(s) are to be installed over the inter-ply before the installation of the field surfacing. Stripping ply(s) are to extend 3" beyond the toe of the cant and up the vertical surface of all flat to vertical transitions (curbs, walls, roof top equipment, etc). After the installation of the field surfacing, install the specified cap sheet base flashing extending 6" beyond the toe of the cant and up the vertical surface. Terminate the base flashing as shown in the commercial roofing details of the current Malarkey Specification Manual.

Fire Ratings: The specification carries a **Class 'A' rating** up to 1/2" in 12" over the following decks: Wood, Metal, Concrete, Lightweight Concrete, Structural Wood Fiber, and Gypsum. *For other ratings, contact the Malarkey Technical Services Department.*

Touch Up: Install 524 RCap Touch Up to dress out roof for a more pleasing appearance. Standing water locations must receive additional coatings of 524 RCap Touch Up.

Malarkey Roofing Products

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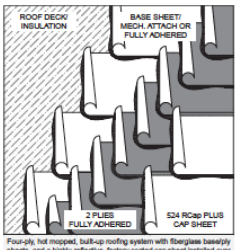

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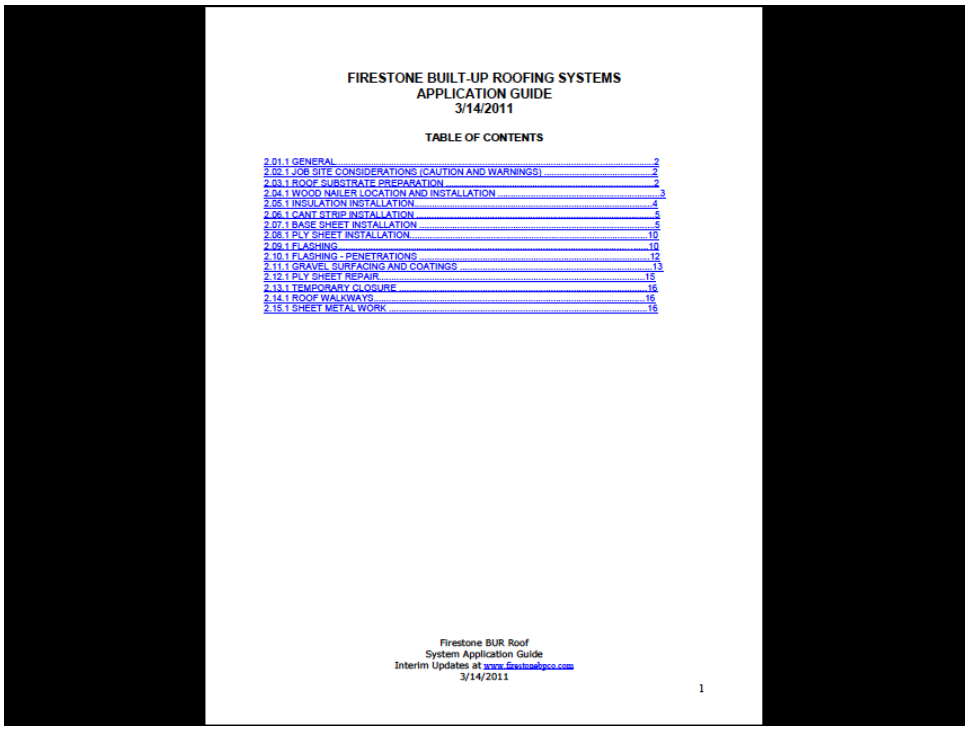
REV. 7/11 4-24 Specification Manual www.MalarkeyRoofing.com • 800-545-1191



FIRESTONE BUILT-UP ROOFING SYSTEMS
APPLICATION GUIDE
3/14/2011

TABLE OF CONTENTS

Firestone BUR Roof
System Application Guide
Interim Updates at www.firestonebpco.com
3/14/2011

1

NRCA's interim recommendations

Manufacturers installation instructions

- Access and file manufacturers' application instructions
- Review instructions
- Exclude not applicable information
- Should be the basis for QA/QC
- Contact NRCA with any questions

International Existing Building Code, 2015 Edition

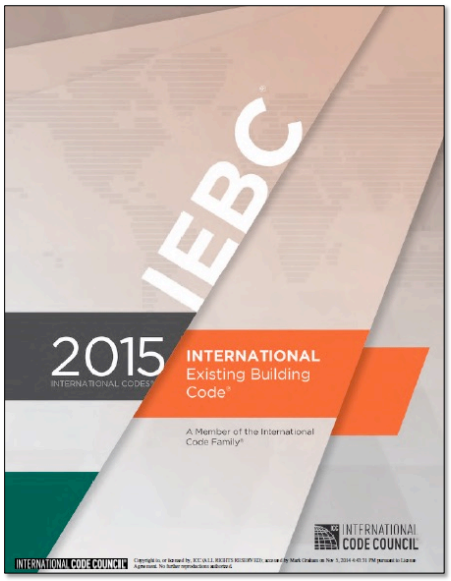
International Code Council (ICC)

Beginning in 2000 and currently

ICC INTERNATIONAL CODE COUNCIL
People Helping People Build a Safer World™

THE I-CODES

- ICC Performance Code (ICCPC)
- International Building Code (IBC)
- International Energy Conservation Code (IECC)
- International Existing Building Code (IEBC)
- International Fire Code (IFC)
- International Fuel Gas Code (IFGC)
- International Green Construction Code (IgCC)
- International Mechanical Code (IMC)
- International Plumbing Code (IPC)
- International Private Sewage Disposal Code (IPSDC)
- International Property Maintenance Code (IPMC)
- International Residential Code (IRC)
- International Swimming Pool and Spa Code (ISPSC)
- International Wildland-Urban Interface Code (IWUIC)
- International Zoning Code (IZC)



International Existing Building Code, 2015 Edition

IEBC 2015

Scope:

"…shall apply to the *repair, alteration, change of occupancy, addition* to and relocation of *existing buildings*."

Classifications:

- Level 1: Removal and replacement of materials
- Level 2: Reconfiguration or extension
- Level 3: Exceeds 50 percent of *building area*

International Existing Building Code, 2015 Edition

Chapter 7-Alterations-Level I

SECTION 706
REROOFING

[BS] 706.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 of the *International Building Code*.

Exception: Reroofing shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the *International Building Code* for roofs that provide positive roof drainage.

[BS] 706.2 Structural and construction loads. Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

[Continued…]

Similar to IBC 2012, Section 1510-Reroofing

International Existing Building Code, 2015 Edition

Chapter 7-Alterations-Level I

SECTION 707
STRUCTURAL

[BS] 707.1 General. Where *alteration* work includes replacement of equipment that is supported by the building or where a reroofing permit is required, the provisions of this section shall apply.

[BS] 707.2 Addition or replacement of roofing or replacement of equipment. Where addition or replacement of roofing or replacement of equipment results in additional dead loads, structural components supporting such reroofing or equipment shall comply with the gravity load requirements of the *International Building Code*.

Exceptions:

1. Structural elements where the additional dead load from the roofing or equipment does not increase the force in the element by more than 5 percent.
2. Buildings constructed in accordance with the *International Residential Code* or the conventional light-frame construction methods of the *International Building Code* and where the dead load from the roofing or equipment is not increased by more than 5 percent.
3. Addition of a second layer of roof covering weighing 3 pounds per square foot (0.1437 kN/m2) or less over an existing, single layer of roof covering.

International Existing Building Code, 2015 Edition

Chapter 7-Alterations-Level I

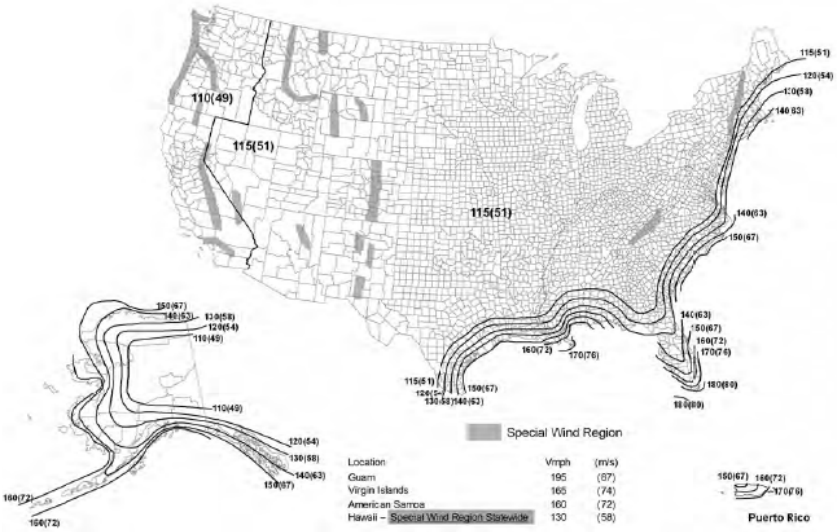
[BS] 707.3 Additional requirements for reroof permits. The requirements of this section shall apply to *alteration* work requiring reroof permits.

[BS] 707.3.1 Bracing for unreinforced masonry bearing wall parapets. Where a permit is issued for reroofing for more than 25 percent of the roof area of a building assigned to Seismic Design Category D, E or F that has parapets constructed of unreinforced masonry, the work shall include installation of parapet bracing to resist the reduced *International Building Code* level seismic forces as specified in Section 301.1.4.2 of this code, unless an evaluation demonstrates compliance of such items.

International Existing Building Code, 2015 Edition

Chapter 7-Alterations-Level I

[BS] 707.3.2 Roof diaphragms resisting wind loads in high-wind regions. Where roofing materials are removed from more than 50 percent of the roof diaphragm or section of a building located where the ultimate design wind speed, V_{ult}, determined in accordance with Figure 1609.3(1) of the *International Building Code,* is greater than 115 mph (51 m/s) or in a special wind region, as defined in Section 1609 of the *International Building Code*, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the *International Building Code*, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting at least 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the *International Building Code*.



Notes:
1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 Years).

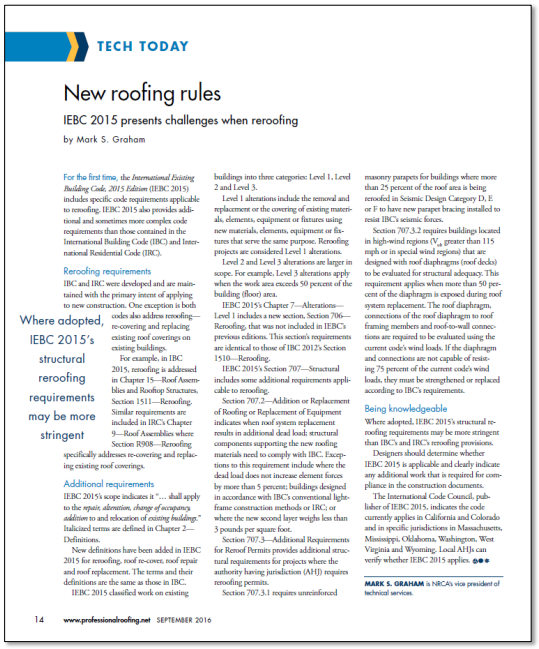
FIGURE 1609.3(1)
ULTIMATE DESIGN WIND SPEEDS, v_{ult}, FOR RISK CATEGORY II BUILDINGS AND OTHER STRUCTURES

International Existing Building Code, 2015 Edition

Chapter 7-Alterations-Level I

SECTION 708
ENERGY CONSERVATION

708.1 Minimum requirements. Level 1 *alterations* to *existing buildings* or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the *International Energy Conservation Code* or *International Residential Code*. The *alterations* shall conform to the energy requirements of the *International Energy Conservation Code* or *International Residential Code* as they relate to new construction only.



TECH TODAY

New roofing rules

IEBC 2015 presents challenges when reroofing

by Mark S. Graham

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

Reroofing requirements

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

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

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

Additional requirements

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

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

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

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

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

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

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

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

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

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

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

Being knowledgeable

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

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

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

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

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Professional Roofing, September 2016

Update on polyisocyanurate insulation issues

TECH TODAY

Testing R-values

Sample number	R-value, per inch thickness (2-inch specimens)			
	25 F	40 F	75 F	110 F
1	3.765	4.757	5.774	5.118
2	3.909	4.719	5.444	4.958
3	4.737	5.350	5.371	4.810
4	3.506	4.509	5.828	5.227
5	4.221	5.269	5.522	4.929
6	3.775	4.854	5.889	5.247
7	4.431	4.878	5.058	4.581
Average (mean)	4.049	4.905	5.555	4.981
Standard deviation	0.432	0.302	0.297	0.239

Data from NRCA's 2014 polyisocyanurate R-value testing

polyisocyanurate

executive director of technical services.

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Professional Roofing, March 2015

TECH TODAY

PIMA disagrees

PIMA's performance bulletin disputes NRCA's design R-value recommendation

by Mark S. Graham

In April, the Polyisocyanurate Insulation Manufacturers Association (PIMA) issued a performance bulletin titled "Measuring the R-value of Polyiso Roof Insulation," which attempts to refute NRCA's recommendation that designers use an in-service R-value of 5.0 per inch when specifying polyisocyanurate insulation.

NRCA stands by its current R-value recommendation

PIMA's position

PIMA's performance bulletin refers to NRCA's recommendation as "... an arbitrary unit R-value of 5.0. ..." The bulletin goes on to briefly explain long-term thermal resistance (LTTR) testing, PIMA's QualityMark™ LTTR certification program and the results of recent QualityMark verification testing. The bulletin reports results of PIMA's 2015 QualityMark verification testing as an average LTTR per inch of 5.78 for 1-inch-thick product, 5.74 for 2-inch-thick product, 5.85 for 3-inch-thick product and 5.95 for 4-inch-thick product.

The PIMA bulletin also indicates: "... It should be noted the LTTR testing conducted under the QualityMark program uses a more severe conditioning procedure than the standard R-value test used by NRCA as a basis for its recommendation. ... Given the difference in NRCA's recommendation and PIMA's QualityMark program testing results, PIMA suggests that this difference may be attributed to a smaller testing sample size used by NRCA to support its recommendation and a possible lack of experimental controls regarding how NRCA insulation samples were procured and selected. ..."

ON the WEB

For links to PIMA's performance bulletin and NRCA's Industry Issue Update, log on to www.professionalroofing.net

NRCA's recommendation

With the January publication of an interim update to *The NRCA Roofing Manual: Membrane Roof Systems—2015*, NRCA revised its design in-service R-value recommendation to 5.0 per inch thickness for polyisocyanurate insulation used in roof systems.

NRCA explained the rationale for this change in an Industry Issue Update, "New polyisocyanurate R-values," that was distributed to NRCA members in January.

Although PIMA's bulletin appears to dispute only NRCA's R-value testing, it is important to note NRCA's R-value test results have been replicated by research published in a 2013 report by Building Science Corp., Westford, Mass., and research published in a 2014 report by RDH Building Engineering Ltd., Vancouver, British Columbia. Also, since NRCA announced its revised R-value recommendation in January, the association has learned of an insulation manufacturer that has replicated NRCA's R-value test results.

When reviewing the results of PIMA's 2015 QualityMark verification testing, it should be noted the reported LTTR values are average values, not the minimum or lowest of the values tested. These average results range from only 0.04 to 0.08 greater than manufacturers' minimum published LTTR values. Unless the range of verification testing data is extremely narrow, which is unlikely, QualityMark's data likely show some tested LTTR values less than the manufacturers' minimum published LTTR values.

The distinction

When considering the variations between the QualityMark LTTR values and NRCA's tested R-values, it is important to understand the concepts themselves are somewhat different.

LTTR is an accelerated thermal resistance conditioning and testing method conducted under controlled laboratory conditions intended to provide an estimate of a product's R-value at an age of five years; this value corresponds closely to an estimate of the product's average R-value during its first 15 years of service life.

Conversely, NRCA's R-value test results are representative of products' R-values at the time of testing. The products tested were new (stored, uninstalled) at the time of testing, but NRCA's tests also take into account real-world conditioning the tested products experienced during shipment and storage, such as changing ambient temperature and humidity exposure conditions.

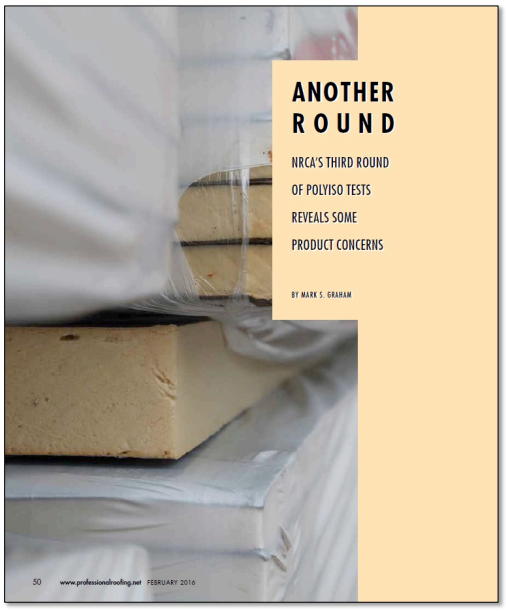
Although PIMA's bulletin suggests the differences among PIMA's QualityMark's values and NRCA's test results may be attributable to NRCA's limited test sample size, sample procurement and selection, it is far more logical and likely the laboratory conditioning contained in the QualityMark procedure is not truly representative of the actual exposure conditions polyisocyanurate insulation typically experiences.

After reviewing PIMA's performance bulletin and the additional R-value test data made available, NRCA stands by its results and current R-value recommendation for polyisocyanurate insulation. ●●●

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

14 www.professionalroofing.net JUNE 2016

Professional Roofing, June 2016



Professional Roofing,
February 2016

Sample	Facer type	Density (lb/ft³)	
		Apparent overall density	Apparent foam core density
1-A	Cellulosic (Class 1)	2.16	1.57
1-B	Coated fiberglass (Class 2)	3.80	1.68
2	Cellulosic (Class 1)	2.25	1.56
3	Cellulosic (Class 1)	2.26	1.65
4	Cellulosic (Class 1)	2.25	1.64
5	Coated fiberglass (Class 2)	3.16	1.79
6	Cellulosic (Class 1)	2.39	1.68

Sample	Compressive strength (psi)		
	With facers	Machine direction	Cross-machine direction
1-A	22.3	16.1	26.5
1-B	28.4	21.2	29.8
2	24.4	16.7	22.0
3	24.5	17.5	19.4
4	23.5	18.5	21.0
5	24.4	20.6	19.8
6	24.5	18.9	21.1
ASTM C1289, Type II requirement	Grade 1: 16 (minimum) Grade 2: 20 (minimum) Grade 3: 25 (minimum)	No requirement	

Sample	Dimensional stability (Percent linear change after seven days at 158 F and 97 percent relative humidity)		
	Machine direction	Cross-machine direction	Thickness
1-A	1.22	1.27	1.77
1-B	0.54	1.31	5.88
2	3.35	2.91	-1.11
3	2.42	1.53	3.19
4	2.14	2.24	1.21
5	0.56	0.75	3.74
6	2.52	1.96	1.68
ASTM C1289, Type II requirement	2.0 (maximum)		4.0 (maximum)

Sample	Flexural strength		Tensile strength perpendicular to surface (lbf/ft³)
	Modulus of rupture (psi)	Break strength (lbf)	
1-A	MD: 79.6 XMD: 61.2	MD: 64.8 XMD: 49.3	3259
1-B	MD: 127.9 XMD: 135.5	MD: 102.4 XMD: 108.2	2590
2	MD: 93.0 XMD: 64.1	MD: 75.4 XMD: 51.1	3080
3	MD: 98.4 XMD: 59.5	MD: 75.8 XMD: 47.2	3083
4	MD: 73.0 XMD: 52.6	MD: 58.1 XMD: 42.2	2904
5	MD: 121.1 XMD: 93.6	MD: 92.9 XMD: 76.9	3668
6	MD: 96.3 XMD: 55.8	MD: 71.3 XMD: 41.7	2657
ASTM C1289, Type II requirement	40	17	500

PIMA/NRCA TOC meeting

July 12, 2016

Outcomes:

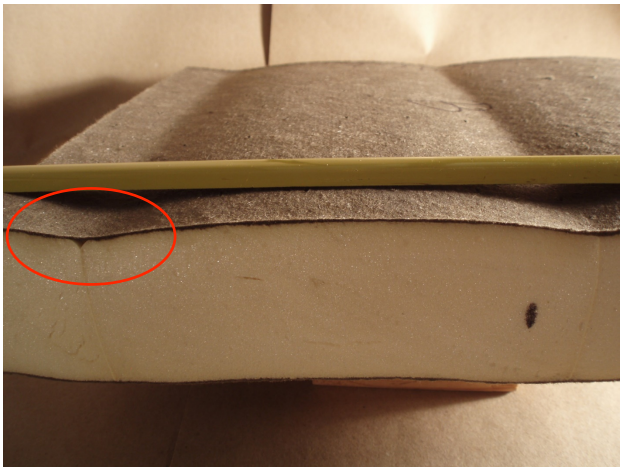
- PIMA R-value research
  - Results to NRCA by the end of the year
- Facer sheet descriptions
- Knit line criteria
- Review storage/covering criteria

Knit lines

Knit lines -- continued

As delivered by manufacturer.

Knit lines -- continued



After conditioning

Knit lines -- continued

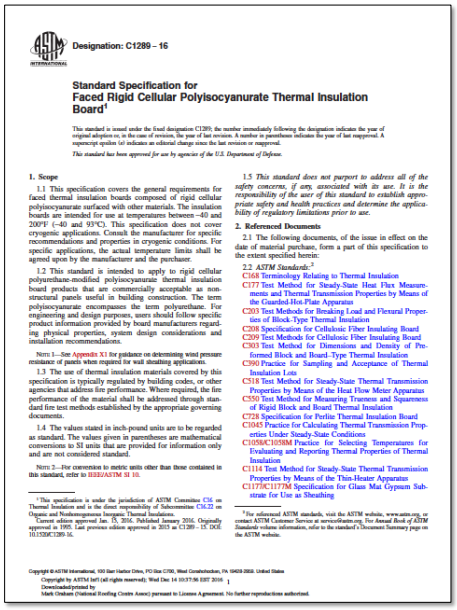
Knit line and V-groove close-up (after conditioning)

NRCA's interim recommendations

Polyiso. knit line, thickness and dimensional stability concerns

- Measure polyiso. thickness upon delivery
- Look for knit lines and board unevenness
- Contact manufacturer and NRCA if you see any issues

Polyiso facer sheets



Designation: C1289 – 16

Standard Specification for
Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board[1]

This standard is issued under the fixed designation C1289; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers the general requirements for faced thermal insulation boards composed of rigid cellular polyisocyanurate surfaced with other materials. The insulation boards are intended for use at temperatures between –40 and 200°F (–40 and 93°C). This specification does not cover cryogenic applications. Consult the manufacturer for specific recommendations and properties in cryogenic conditions. For specific applications, the actual temperature limits shall be agreed upon by the manufacturer and the purchaser.

1.2 This standard is intended to apply to rigid cellular polyurethane-modified polyisocyanurate thermal insulation board products that are commercially acceptable as non-structural panels useful in building construction. The term polyisocyanurate encompasses the term polyurethane. For engineering and design purposes, users should follow specific product information provided by board manufacturers regarding physical properties, system design considerations and installation recommendations.

Note 1—See Appendix X1 for guidance on determining wind pressure resistance of panels when required for wall sheathing applications.

1.3 The use of thermal insulation materials covered by this specification is typically regulated by building codes, or other agencies that address fire performance. Where required, the fire performance of the material shall be addressed through standard fire test methods established by the appropriate governing documents.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

Note 2—For conversion to metric units other than those contained in this standard, refer to IEEE/ASTM SI 10.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 The following documents, of the issue in effect on the date of material purchase, form a part of this specification to the extent specified herein:

2.2 *ASTM Standards:*[2]

C168 Terminology Relating to Thermal Insulation
C177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
C203 Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
C208 Specification for Cellulosic Fiber Insulating Board
C209 Test Methods for Cellulosic Fiber Insulating Board
C303 Test Method for Dimensions and Density of Preformed Block and Board–Type Thermal Insulation
C390 Practice for Sampling and Acceptance of Thermal Insulation Lots
C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
C550 Test Method for Measuring Trueness and Squareness of Rigid Block and Board Thermal Insulation
C728 Specification for Perlite Thermal Insulation Board
C1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions
C1058/C1058M Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation
C1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus
C1177/C1177M Specification for Glass Mat Gypsum Substrate for Use as Sheathing

[1] This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.22 on Organic and Nonhomogeneous Inorganic Thermal Insulations.
Current edition approved Jan. 15, 2016. Published January 2016. Originally approved in 1995. Last previous edition approved in 2015 as C1289 – 15. DOI: 10.1520/C1289-16.

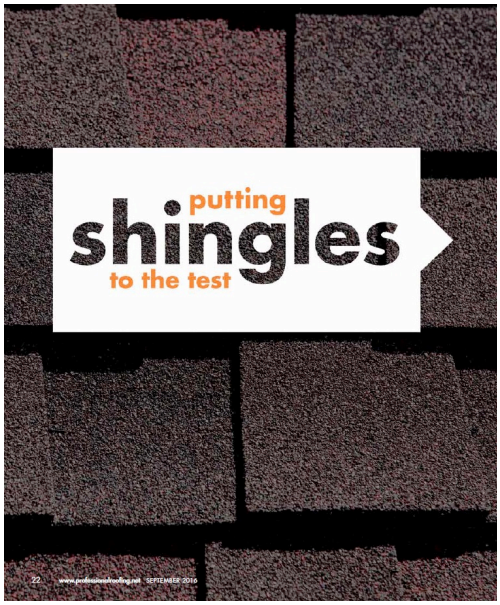
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

ASTM C1289, Type II:

- Class 1: Recycled cellulose with fiberglass
- Class 2: Coated fiberglass
- Class 3: Uncoated fiberglass

Also "Grades":

- Grade 1: 16 psi
- Grade 2: 20 psi
- Grade 3: 25 psi



Professional Roofing, September 2016

Test results for three-tab asphalt strip shingles

Sample	Tear strength (g)	Weight of displaced granules (g)	Fastener pull-through resistance (lbf)		Pliability	
			73 F	32 F	Top	Bottom
T-1	797	0.71	24.6	30.2	Pass	Pass
T-2	855	0.40	28.1	31.3	Pass	Pass
T-3	1,654	0.31	33.4	44.2	Pass	Pass
T-4	958	0.63	35.5	40.4	Pass	Pass
T-5	1,755	0.08	37.0	51.4	Pass	Pass
T-6	1,682	0.25	36.7	44.4	Pass	Pass
T-7	1,488	0.29	30.0	41.3	Pass	Pass
T-8	1,502	0.73	30.1	41.1	Pass	Pass
ASTM D3462 requirement	1,700 (minimum)	1.0 (maximum)	20 (minimum)	23 (minimum)	4 of 5 pass (minimum)	

Test results for architectural laminated shingles

Sample	Tear strength (g)	Fastener pull-through resistance (lbf)		Pliability	
		73 F	32 F	Top	Bottom
L-1	1,208	53.7	79.3	Pass	Pass
L-2	1,333	57.0	64.4	Pass	Pass
L-3	1,235	58.7	67.8	Pass	Pass
L-4	1,549	52.7	62.8	Pass	Pass
L-5	1,299	53.7	64.6	Pass	Pass
L-6	1,210	51.5	68.0	Pass	Pass
L-7	1,678	58.7	69.6	Pass	Pass
L-8	1,667	58.1	71.8	Pass	Pass
L-9	1,797	63.2	71.5	Pass	Pass
ASTM D3462 requirement	1,700 (minimum)	30 (minimum)	40 (minimum)	4 of 5 pass (minimum)	

WHO COMPLIED?

Only two of the 17 products evaluated in NRCA's most recent round of testing complied with the physical property requirements of ASTM D3462, "Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules."

Four other asphalt shingle products had tear strength values slightly below ASTM D3462's 1700-g minimum requirement. Based upon the known variability in the tear strength test method's results, these four products can be considered as complying with ASTM D3462's tear strength minimum requirement and, therefore, as complying with ASTM D3462's physical property requirements evaluated in NRCA's test program.

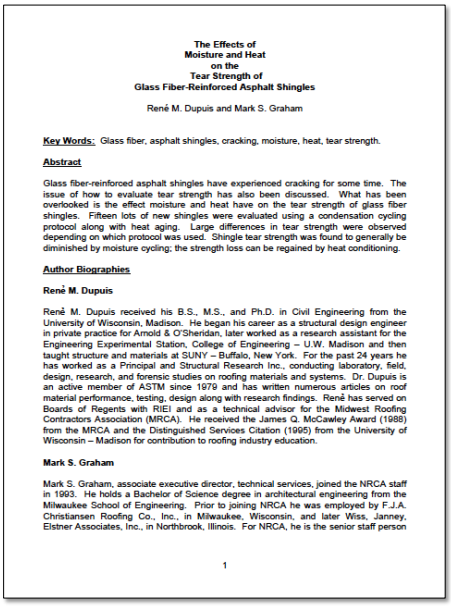
The six products (listed alphabetically) are:

- GAF Royal Sovereign®
- Malarkey Roofing Products Dura-Seal™ AR
- Owens Corning Classic® (Midwest)
- Owens Corning Oakridge® (Midwest)
- Pabco Roofing Products Premier®
- Tamko Building Products Inc. Heritage®

When considering the results of NRCA's asphalt shingle testing, understand the values and conclusions from the testing only apply to the specific product sample specimens evaluated and the specific values only may apply at the time of testing. These results may not represent all the manufacturers' products. Asphalt shingle products from different production lots and products of the same brand names manufactured in different manufacturing plants may have differing values and compliances with ASTM D3462.

Users of asphalt shingles should consult with manufacturers and suppliers regarding specific products' compliance with ASTM D3462.

Previous asphalt shingle testing…



The Effects of
Moisture and Heat
on the
Tear Strength of
Glass Fiber-Reinforced Asphalt Shingles

René M. Dupuis and Mark S. Graham

Key Words: Glass fiber, asphalt shingles, cracking, moisture, heat, tear strength.

Abstract

Glass fiber-reinforced asphalt shingles have experienced cracking for some time. The issue of how to evaluate tear strength has also been discussed. What has been overlooked is the effect moisture and heat have on the tear strength of glass fiber shingles. Fifteen lots of new shingles were evaluated using a condensation cycling protocol along with heat aging. Large differences in tear strength were observed depending on which protocol was used. Shingle tear strength was found to generally be diminished by moisture cycling; the strength loss can be regained by heat conditioning.

Author Biographies

Renè M. Dupuis

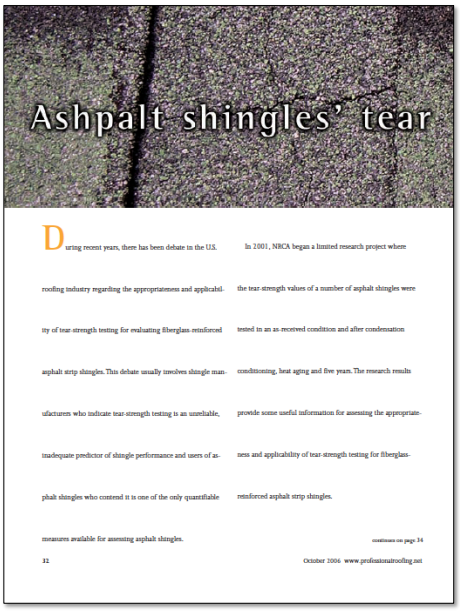
Renè M. Dupuis received his B.S., M.S., and Ph.D. in Civil Engineering from the University of Wisconsin, Madison. He began his career as a structural design engineer in private practice for Arnold & O'Sheridan, later worked as a research assistant for the Engineering Experimental Station, College of Engineering – U.W. Madison and then taught structure and materials at SUNY – Buffalo, New York. For the past 24 years he has worked as a Principal and Structural Research Inc., conducting laboratory, field, design, research, and forensic studies on roofing materials and systems. Dr. Dupuis is an active member of ASTM since 1979 and has written numerous articles on roof material performance, testing, design along with research findings. Renè has served on Boards of Regents with RIEI and as a technical advisor for the Midwest Roofing Contractors Association (MRCA). He received the James Q. McCawley Award (1988) from the MRCA and the Distinguished Services Citation (1995) from the University of Wisconsin – Madison for contribution to roofing industry education.

Mark S. Graham

Mark S. Graham, associate executive director, technical services, joined the NRCA staff in 1993. He holds a Bachelor of Science degree in architectural engineering from the Milwaukee School of Engineering. Prior to joining NRCA he was employed by F.J.A. Christiansen Roofing Co., Inc., in Milwaukee, Wisconsin, and later Wiss, Janney, Elstner Associates, Inc., in Northbrook, Illinois. For NRCA, he is the senior staff person

1

12th International Roofing & Waterproofing Conference,
"The effects of moisture and heat on the tear strength of glass fiber reinforced asphalt shingles"



Ashpalt shingles' tear

During recent years, there has been debate in the U.S. roofing industry regarding the appropriateness and applicability of tear-strength testing for evaluating fiberglass-reinforced asphalt strip shingles. This debate usually involves shingle manufacturers who indicate tear-strength testing is an unreliable, inadequate predictor of shingle performance and users of asphalt shingles who contend it is one of the only quantifiable measures available for assessing asphalt shingles.

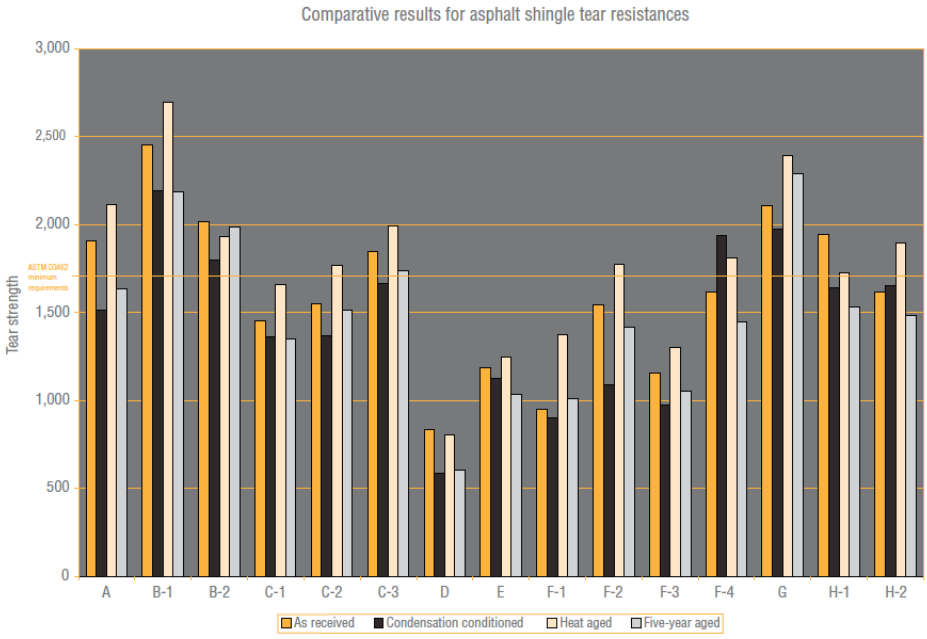
In 2001, NRCA began a limited research project where the tear-strength values of a number of asphalt shingles were tested in an as-received condition and after condensation conditioning, heat aging and five years. The research results provide some useful information for assessing the appropriateness and applicability of tear-strength testing for fiberglass-reinforced asphalt strip shingles.

continues on page 34

Professional Roofing,
October 2006

Tear-strength results for tested asphalt shingles				
Sample	Tear strength (g)[1]			
	As received (minimum of 24 hours at 73 F and 50 percent relative humidity)	Condensation conditioned (90 cycles of four hours of condensation at 122 F and four hours dry at 73 F)	Heat aged (30 days at 158 F)	Five-year aged (73 F and 50 percent relative humidity)
A	1,909	1,512	2,114	1,634
B-1	2,451	2,189	2,691	2,184
B-2	2,019	1,800	1,930	1,986
C-1	1,451	1,362	1,658	1,346
C-2	1,547	1,370	1,766	1,514
C-3	1,846	1,664	1,992	1,736
D	835	586	805	606
E	1,186	1,123	1,245	1,034
F-1	952	899	1,371	1,008
F-2	1,542	1,090	1,774	1,418
F-3	1,157	974	1,302	1,051
F-4	1,614	1,936	1,810	1,443
G	2,107	1,974	2,392	2,288
H-1	1,946	1,638	1,728	1,533
H-2	1,619	1,653	1,896	1,486
ASTM D3462	1,700	No values included in ASTM D3462		

[1] Tear-strength testing in accordance with ASTM D3462, Section 8.1.2–Tear Strength. Results are the mean values from 10 specimens tested.



TECH TODAY

Understanding underlayments

Roof system type	IBC 2015			IRC 2015		
	Section	V_{asd} < 120 mph	V_{asd} ≥ 120 mph	Section	V_{asd} < 140 mph	V_{asd} ≥ 140 mph
Asphalt shingles	1507.2	ASTM D226, Type I ASTM D4869, Type I ASTM D6757	ASTM D226, Type II ASTM D4869, Type IV ASTM D6757 ASTM D1970	R905.2	ASTM D226, Type I ASTM D4869, Type I, II, III or IV ASTM D6757	ASTM D226, Type II ASTM D4869, Type IV ASTM D6757 ASTM D1970
Clay and concrete tile	1507.3	ASTM D226, Type II ASTM D2626 ASTM D6380, Class M	ASTM D226, Type II ASTM D2626 ASTM D6380, Class M ASTM D1970	R905.3	ASTM D226, Type II ASTM D2626, Type I ASTM D6380, Class M	ASTM D226, Type II ASTM D2626, Type I ASTM D6380, Class M ASTM D1970
Metal panels	1507.4	Not applicable	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.10	Manufacturer's instructions	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Metal shingles	1507.5	ASTM D226, Type I ASTM D4869	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.4	ASTM D226, Type I or II ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Mineral-surfaced roll roofing	1507.6	ASTM D226, Type I ASTM D4869	ASTM D226, Type II ASTM D1970	R905.5	ASTM D226, Type I or II ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Slate shingles	1507.7	ASTM D226, Type II ASTM D4869, Type III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.6	ASTM D226, Type I ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Wood shingles	1507.8	ASTM D226, Type I ASTM D4869	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.7	ASTM D226, Type I or II ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Wood shakes	1507.9	ASTM D226, Type I ASTM D4869	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.8	ASTM D226, Type I or II ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970

Professional Roofing, December 2016

ASCE 7-16 adoption into IBC 2018

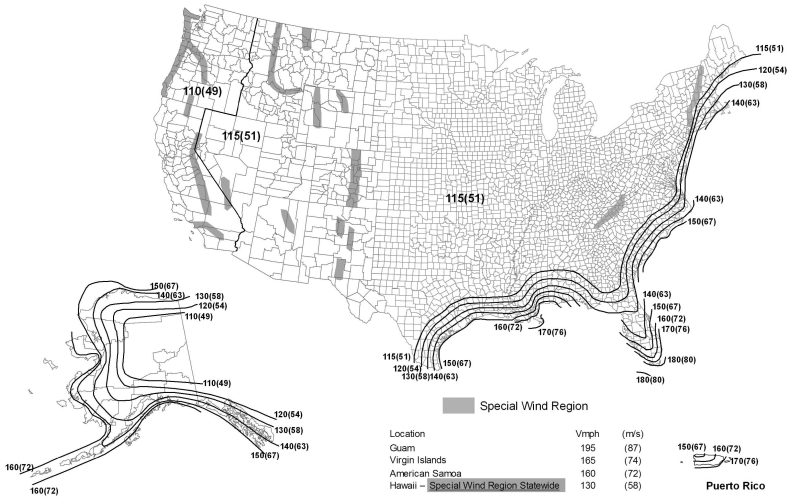
ASCE 7-16 (public review draft)

- Revised basic wind speed map
- Changes (and new) pressure coefficients
- Revised perimeter and corner zones

Expect higher field, perimeter and corner uplift pressures

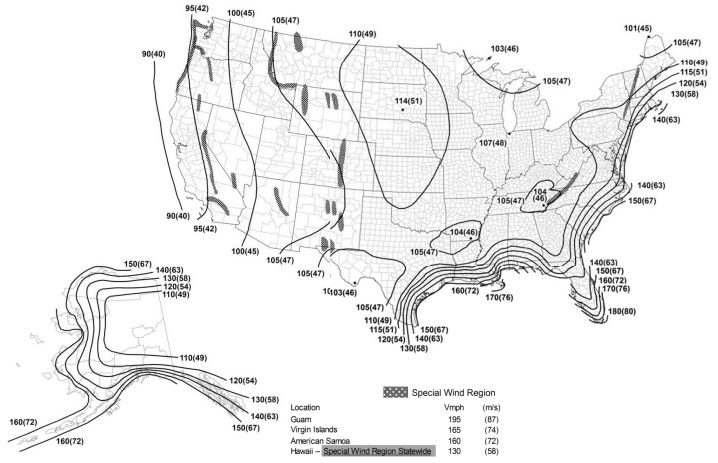
ASCE 7-10 basic wind speed map

Fig. 1607A--V_{ult} for Risk Category II Buildings



ASCE 7-16 (draft) basic wind speed map

Risk Category II Buildings



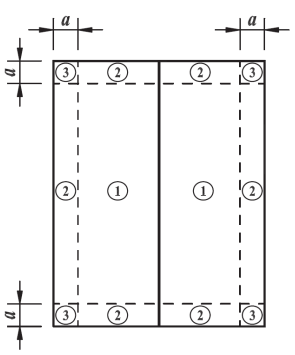
GC_p pressure coefficients

h ≤ 60 ft., gable roofs ≤ 7 degrees

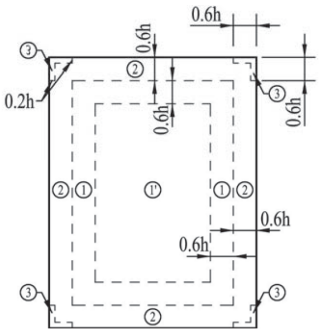
Zone	ASCE 7-10	ASCE 7-16 (draft)
1 (field)	-1.0	-1.7
1’	--	-0.9
2 (perimeter)	-1.8	-2.3
3 (corners)	-2.8	-3.2

Zones

h ≤ 60 ft., gable roofs ≤ 7 degrees



ASCE 7-10

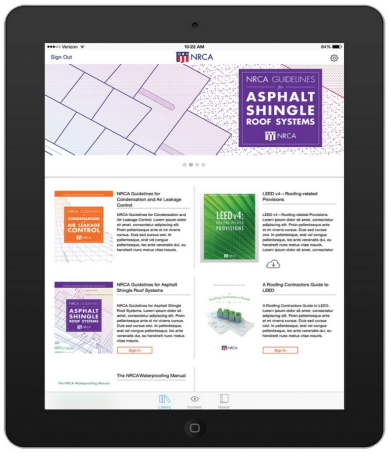


ASCE 7-16 (draft)

Proper wind design (which is oftentimes avoided) is getting even more complicated…

The NRCA Roofing Manual

NRCA App



- NRCA App available on the Apple Store and Google Play Store for tablets
- iPhone App also available
- Register within App as being an NRCA member
- The NRCA Roofing Manual is viewable to NRCA members
- Favorite and send pages features

Manual online

www.nrca.net

- Available to all NRCA member registered users (multiple users per member company)
- "Members only" section, click on "My account", the "Electronic file"
- View, download and print

Other topics…?

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