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CAROLINAS ROOFING AND SHEET METAL CONTRACTORS ASSOCIATION, INC.
PROFESSIONAL ROOFING CONTRACTORS COVERING THE CAROLINAS

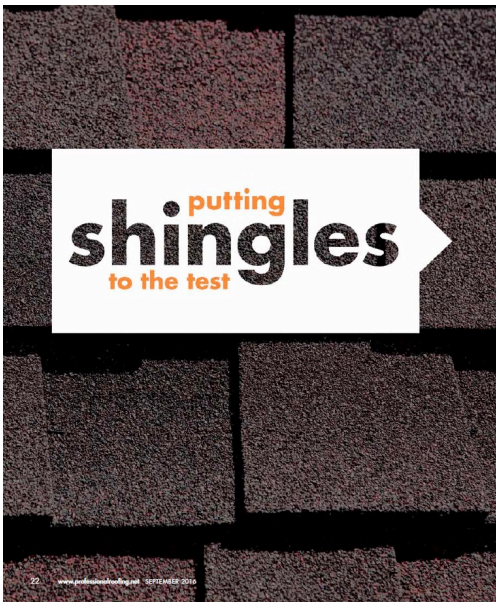
2017 Carolinas Mid-winter Roofing Expo
Greenville, SC – January 31–February 2, 2017

Technical issue update

presented by

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

NRCA



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.

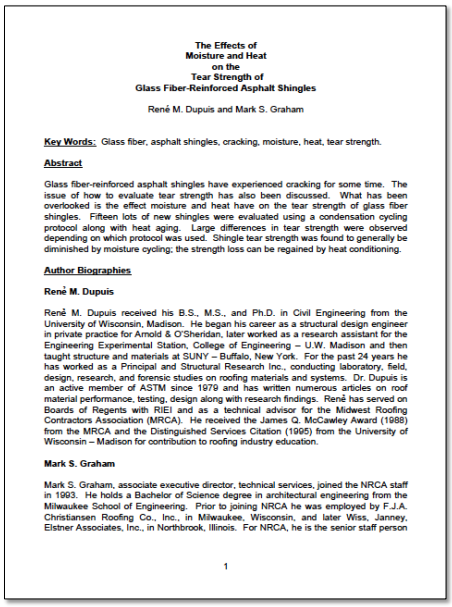
The six products (listed alphabetically) are:

- 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

René M. Dupuis

René 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. René 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

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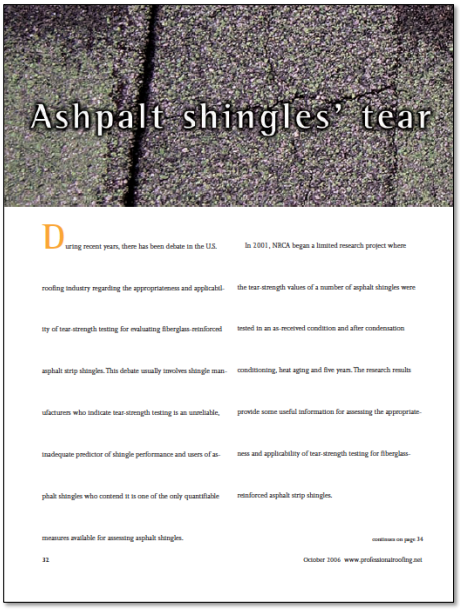
12th International Roofing & Waterproofing Conference,
"The effects of moisture and heat on the tear strength of glass fiber reinforced asphalt shingles"



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

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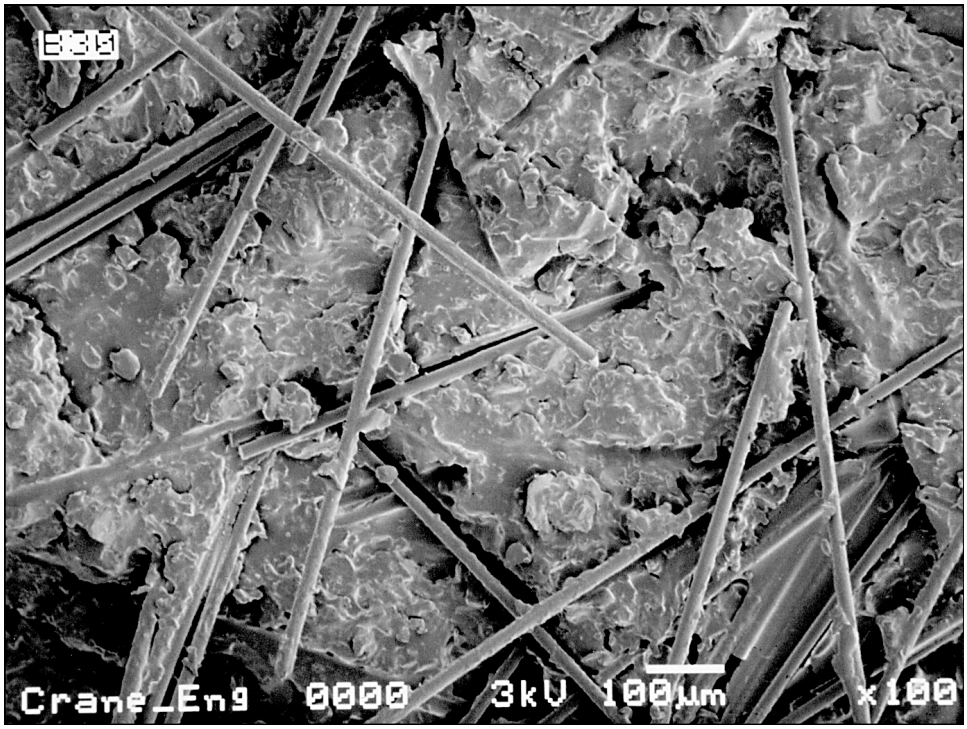
October 2006

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.



Mat weight and tear strength, in themselves,
may not be true performance indicators…
other factors need to be considered/developed.

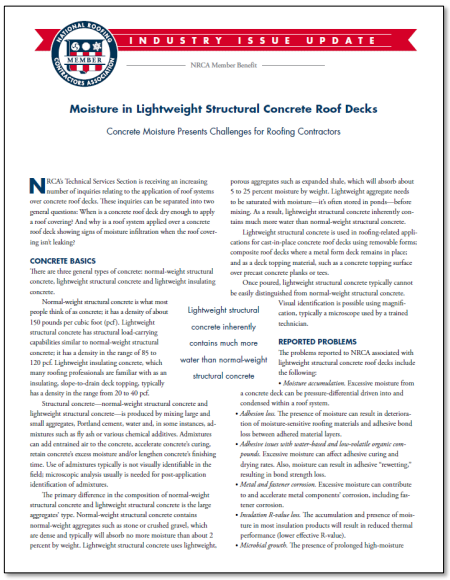
TECH TODAY

Understanding underlayments

Roof system type	IBC 2015			IRC 2015		
	Section	V_{asd} < 120 mph	V_{asd} ≥ 120 mph	Section	V_{ult} < 140 mph	V_{ult} ≥ 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

Moisture in concrete roof decks



INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Moisture in Lightweight Structural Concrete Roof Decks

Concrete Moisture Presents Challenges for Roofing Contractors

NRCA's Technical Services Section is receiving an increasing number of inquiries relating to the application of roof systems over concrete roof decks. These inquiries can be separated into two general questions: When is a concrete roof deck dry enough to apply a roof covering? And why is a roof system applied over a concrete roof deck showing signs of moisture infiltration when the roof covering isn't leaking?

CONCRETE BASICS

There are three general types of concrete: normal-weight structural concrete, lightweight structural concrete and lightweight insulating concrete.

Normal-weight structural concrete is what most people think of as concrete; it has a density of about 150 pounds per cubic foot (pcf). Lightweight structural concrete has structural load-carrying capabilities similar to normal-weight structural concrete; it has a density in the range of 85 to 120 pcf. Lightweight insulating concrete, which many roofing professionals are familiar with as an insulating, slope-to-drain deck topping, typically has a density in the range from 20 to 40 pcf.

Lightweight structural concrete inherently contains much more water than normal-weight structural concrete

Structural concrete—normal-weight structural concrete and lightweight structural concrete—is produced by mixing large and small aggregates, Portland cement, water and, in some instances, admixtures such as fly ash or various chemical additives. Admixtures can add entrained air to the concrete, accelerate concrete's curing, retain concrete's excess moisture and/or lengthen concrete's finishing time. Use of admixtures typically is not visually identifiable in the field; microscopic analysis usually is needed for post-application identification of admixtures.

The primary difference in the composition of normal-weight structural concrete and lightweight structural concrete is the large aggregates' type. Normal-weight structural concrete contains normal-weight aggregates such as stone or crushed gravel, which are dense and typically will absorb no more moisture than about 2 percent by weight. Lightweight structural concrete uses lightweight, porous aggregates such as expanded shale, which will absorb about 5 to 25 percent moisture by weight. Lightweight aggregate needs to be saturated with moisture—it's often stored in ponds—before mixing. As a result, lightweight structural concrete inherently contains much more water than normal-weight structural concrete.

Lightweight structural concrete is used in roofing-related applications for cast-in-place concrete roof decks using removable forms; composite roof decks where a metal form deck remains in place; and as a deck topping material, such as a concrete topping surface over precast concrete planks or tees.

Once poured, lightweight structural concrete typically cannot be easily distinguished from normal-weight structural concrete. Visual identification is possible using magnification, typically a microscope used by a trained technician.

REPORTED PROBLEMS

The problems reported to NRCA associated with lightweight structural concrete roof decks include the following:

- *Moisture accumulation.* Excessive moisture from a concrete deck can be pressure-differential driven into and condensed within a roof system.
- *Adhesion loss.* The presence of moisture can result in deterioration of moisture-sensitive roofing materials and adhesive bond loss between adhered material layers.
- *Adhesive issues with water-based and low-volatile organic compounds.* Excessive moisture can affect adhesive curing and drying rates. Also, moisture can result in adhesive "rewetting," resulting in bond strength loss.
- *Metal and fastener corrosion.* Excessive moisture can contribute to and accelerate metal components' corrosion, including fastener corrosion.
- *Insulation R-value loss.* The accumulation and presence of moisture in most insulation products will result in reduced thermal performance (lower effective R-value).
- *Microbial growth.* The presence of prolonged high-moisture

NRCA "Industry Issue Update," August 2013:

- Reported problems
- Deck dryness tests:
  - Conventional dryness tests are no longer reliable
  - Suggested using ASTM F2170
- NRCA recommendations:
  - Contractors should <u>not</u> determine deck dryness
  - Don't use lightweight structural concrete
  - Remedial repair suggestions

Concrete roof deck moisture research

- NRCA
- Chicago Roofing Contractors Association
- Chicagoland Roofing Council
- Several manufacturers

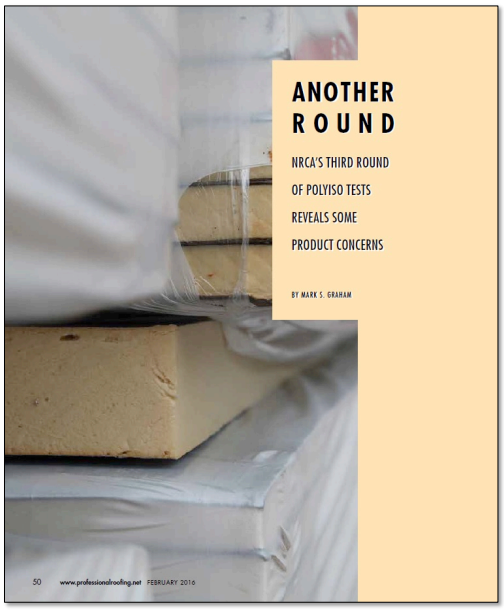
Concrete deck moisture research

Concrete pour: Monday, July 11, 2016

Preliminary results will be reported
at the 2017 International Roofing Expo

Polyisocyanurate insulation

Knit line, thickness and dimensional stability concerns



Professional Roofing,
February 2016

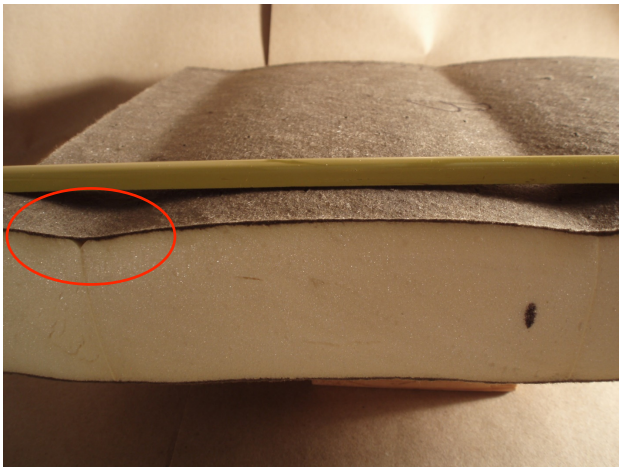
Knit lines

Knit lines -- continued

Thickness and knit lines

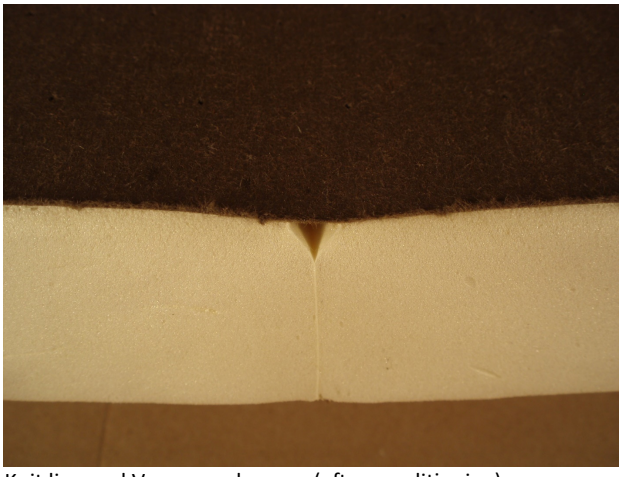
As delivered by manufacturer.

Knit lines -- continued



After conditioning: 158 ± 4 F and 97 ± 3% RH for 7 days

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

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

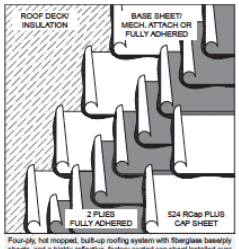
LOW SLOPE ROOFING SYSTEM SPECIFICATION
FOUR-PLY CONVENTIONAL 524 RCap™ Plus (Base, Ply & Cap)

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.

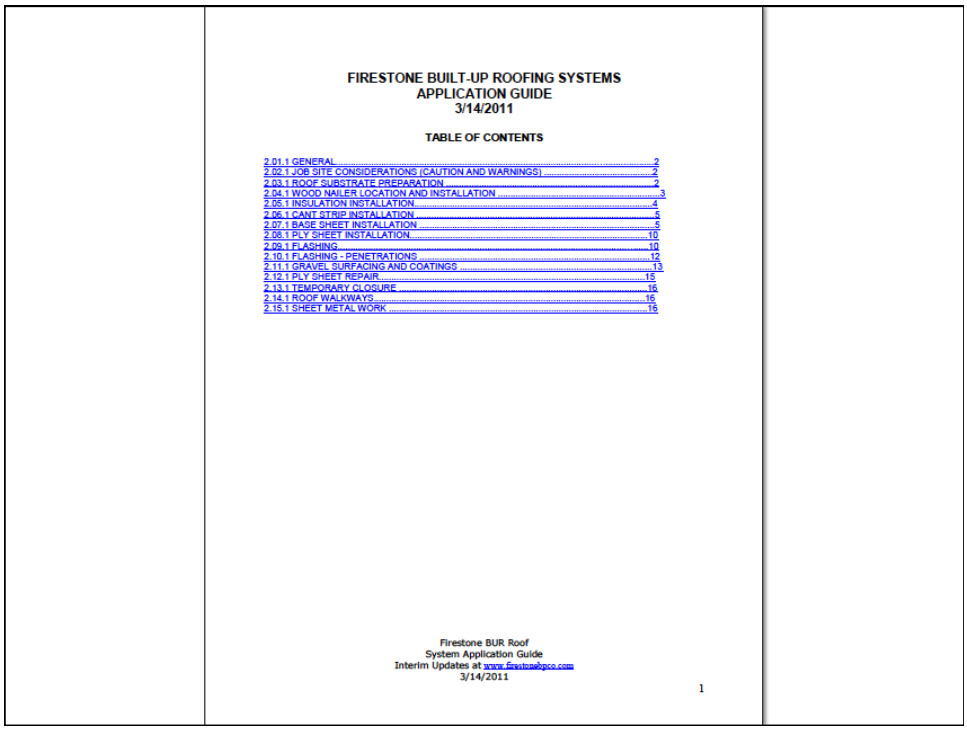
Flashings: Install all primed flashings (lead, metal, scuppers, etc.) in a layer of plastic cement on top of the inter-ply and stripped off with Two (2) of reinforcement, feathering each ply 3" from the edge of the flange and corresponding ply. Install cap sheet after all flashings have been stripped 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 824 RCap Touch Up to dress out roof for a more pleasing appearance. Standing water locations must receive additional coatings of 824 RCap Touch Up.

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



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

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

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NRCA's interim recommendations

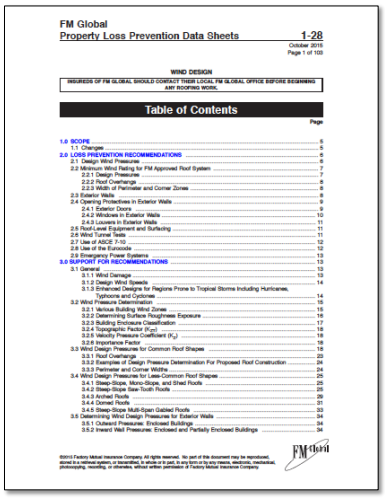
Manufacturers installation instructions

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

FM document updates

FM 1-28 has been updated

www.fmglobaldatasheets.com



FM Global
Property Loss Prevention Data Sheets 1-28

October 2015
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WIND DESIGN

INSUREDS OF FM GLOBAL SHOULD CONTACT THEIR LOCAL FM GLOBAL OFFICE BEFORE BEGINNING ANY ROOFING WORK.

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- Use RoofNav's ratings calculator
- Apply a 2.0 safety factor
- Roof overhang factors (Table 7)
- Windborne debris separation distances
- Roof-mounted equipment (ASCE 7-10)
- Tornado-resistant design (Appendix)

TECH TODAY

A new consideration

FM 1-28 has been updated, further complicating wind designs

by Mark S. Graham

FM Global recently updated its Property Loss Prevention Data Sheet 1-28, "Wind Design" (FM 1-28). The data sheet provides general guidance to building designers regarding wind considerations for highly protected buildings insured by FM Global.

FM 1-28's revisions

The new edition of FM 1-28 is dated October 2015 and was first publicly distributed in late November 2015. The document's previous edition was published in April 2011.

FM 1-28 typically results in higher design wind pressures and recommended resistance ratings

FM 1-28 has been completely revised and reformatted and expanded. The current edition consists of 103 pages; the previous edition had 72 pages.

FM 1-28's wind design guidance continues to be based on ASCE 7-05, "Minimum Design Loads for Buildings and Other Structures," though FM 1-28 contains some enhancements that typically result in higher design wind pressures and recommended resistance ratings. Conversely, the 2012 and 2015 editions of the International Building Code® (IBC) reference ASCE 7's 2010 edition, which can result in notably different design wind loads from those derived using FM 1-28.

ON the WEB

For a link to download FM 1-28 and example calculations comparing the differences between FM 1-28 and ASCE 7-10, log on to www.professionalroofing.net.

FM 1-28 recommends roof field, perimeter and corner design wind pressures be determined using the ratings calculator in FM Approvals' RoofNav™ online application (www.RoofNav.com). FM 1-28's previous editions included specific calculation procedures and tables for determining design wind pressures.

Not included in FM 1-28's new edition is Table 8 from FM 1-28's previous edition, which provided FM Global's recommended resistance ratings based on design wind pressures. When determining recommended resistance ratings, FM 1-28 now directs users to multiply basic uplift pressures by the applicable pressure coefficients, apply a 2.0 safety factor and round up the resulting values to the next highest 15-pound-per-square-foot increment. This procedure likely will cause some user confusion. The RoofNav ratings calculator already includes the recommended safety factor and rounding.

FM 1-28's recommendations for roof overhangs have been reworked, and some roof overhang factors (Table 7) have been increased, which will result in higher design wind pressures at roof overhangs with roof slopes of 1.5:12 and greater.

FM 1-28's Section 3.7-Designing for Windborne Debris includes a specific calculation procedure for determining separation distances between buildings in locations prone to tropical storms where aggregate roof surfacings are used.

FM 1-28's Section 3.8-Roof-mounted Equipment adds guidance to determine resistance to uplift, sliding and overturning in high winds for rooftop equipment. The guidelines for roof-mounted equipment generally are consistent with ASCE 7-10.

FM 1-28's Appendix D-Optional Guidance for Tornado-resistant Design and Construction provides optional guidance for important facilities that may warrant additional property protection in locations subject to tornadoes.

FM 1-28 and ASCE 7-10

FM 1-28 includes a discussion and example comparisons of the differences in design wind pressures using FM 1-28 and ASCE 7-10 (as well as IBC 2012 and IBC 2015).

FM 1-28 uses basic wind speeds based on a 50-year mean recurrence interval (MRI) and approaching a 100-year MRI along coastal areas, as well as an importance factor of 1.15 and recommended safety factor of 2.0. Conversely, ASCE 7-10's strength design method for components and claddings uses ultimate wind speeds based on 300-, 700- and 1,700-year MRIs.

ASCE 7-10 also provides a method for converting strength design method results to allowable stress design (ASD) method values, which are more comparable to FM 1-28's results.

FM 1-28 typically results in higher—sometimes notably higher—design wind pressures and recommended resistance ratings than those derived using ASCE 7-10's strength design or ASD methods.

Closing thoughts

The revision of FM 1-28 has resulted in changes to FM Global's recommendations to designers of highly protected buildings insured by FM Global.

Designers using FM 1-28 need to realize it typically results in higher design wind pressures and recommended resistance ratings than when using ASCE 7-10, IBC 2012 and IBC 2015.

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

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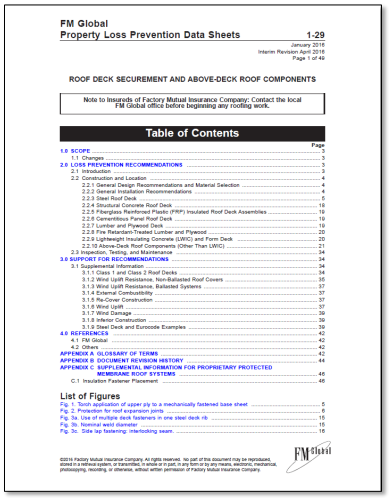
Professional Roofing, March 2016

FM 1-29 has been updated

dwww.fmglobaldatasheets.com



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ROOF DECK SECUREMENT AND ABOVE-DECK ROOF COMPONENTS

Note to Insureds of Factory Mutual Insurance Company: Contact the local FM Global office before beginning any roofing work.

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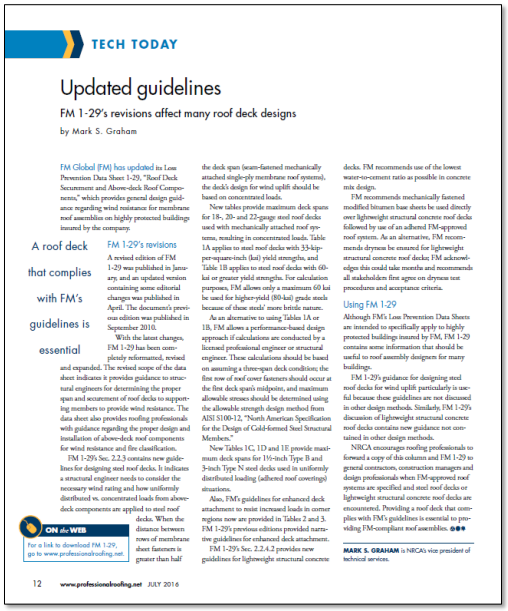
FM Global

Revised/now criteria:

- Steel roof decks:
  - Uniformly-distributed loading
  - Concentrated loading
- Lightweight structural concrete



TECH TODAY

Updated guidelines

FM 1-29's revisions affect many roof deck designs

by Mark S. Graham

FM Global (FM) has updated its Loss Prevention Data Sheet 1-29, "Roof Deck Securement and Above-deck Roof Components," which provides general design guidance regarding wind resistance for membrane roof assemblies on highly protected buildings insured by the company.

A roof deck that complies with FM's guidelines is essential

FM 1-29's revisions

A revised edition of FM 1-29 was published in January, and an updated version containing some editorial changes was published in April. The document's previous edition was published in September 2010.

With the latest changes, FM 1-29 has been completely reformatted, revised and expanded. The revised scope of the data sheet indicates it provides guidance to structural engineers for determining the proper span and securement of roof decks to supporting members to provide wind resistance. The data sheet also provides roofing professionals with guidance regarding the proper design and installation of above-deck roof components for wind resistance and fire classification.

FM 1-29's Sec. 2.2.3 contains new guidelines for designing steel roof decks. It indicates a structural engineer needs to consider the necessary wind rating and how uniformly distributed vs. concentrated loads from above-deck components are applied to steel roof decks. When the distance between rows of membrane sheet fasteners is greater than half the deck span (seam-fastened mechanically attached single-ply membrane roof systems), the deck's design for wind uplift should be based on concentrated loads.

New tables provide maximum deck spans for 18-, 20- and 22-gauge steel roof decks used with mechanically attached roof systems, resulting in concentrated loads. Table 1A applies to steel roof decks with 33-kip-per-square-inch (ksi) yield strengths, and Table 1B applies to steel roof decks with 60-ksi or greater yield strengths. For calculation purposes, FM allows only a maximum 60 ksi be used for higher-yield (80-ksi) grade steels because of these steels' more brittle nature.

As an alternative to using Tables 1A or 1B, FM allows a performance-based design approach if calculations are conducted by a licensed professional engineer or structural engineer. These calculations should be based on assuming a three-span deck condition; the first row of roof cover fasteners should occur at the first deck span's midpoint, and maximum allowable stresses should be determined using the allowable strength design method from AISI S100-12, "North American Specification for the Design of Cold-formed Steel Structural Members."

New Tables 1C, 1D and 1E provide maximum deck spans for 1½-inch Type B and 3-inch Type N steel decks used in uniformly distributed loading (adhered roof coverings) situations.

Also, FM's guidelines for enhanced deck attachment to resist increased loads in corner regions now are provided in Tables 2 and 3. FM 1-29's previous editions provided narrative guidelines for enhanced deck attachment.

FM 1-29's Sec. 2.2.4.2 provides new guidelines for lightweight structural concrete decks. FM recommends use of the lowest water-to-cement ratio as possible in concrete mix designs.

FM recommends mechanically fastened modified bitumen base sheets be used directly over lightweight structural concrete roof decks followed by use of an adhered FM-approved roof system. As an alternative, FM recommends dryness be ensured for lightweight structural concrete roof decks. FM acknowledges this could take months and recommends all stakeholders first agree on dryness test procedures and acceptance criteria.

Using FM 1-29

Although FM's Loss Prevention Data Sheets are intended to specifically apply to highly protected buildings insured by FM, FM 1-29 contains some information that should be useful to roof assembly designers for many buildings.

FM 1-29's guidance for designing steel roof decks for wind uplift particularly is useful because these guidelines are not discussed in other design methods. Similarly, FM 1-29's discussion of lightweight structural concrete roof decks contains new guidance not contained in other design methods.

NRCA encourages roofing professionals to forward a copy of this column and FM 1-29 to general contractors, construction managers and design professionals when FM-approved roof systems are specified and steel roof decks or lightweight structural concrete roof decks are encountered. Providing a roof deck that complies with FM's guidelines is essential to providing FM-compliant roof assemblies.

ON the WEB

For a link to download FM 1-29, go to www.professionalroofing.net

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

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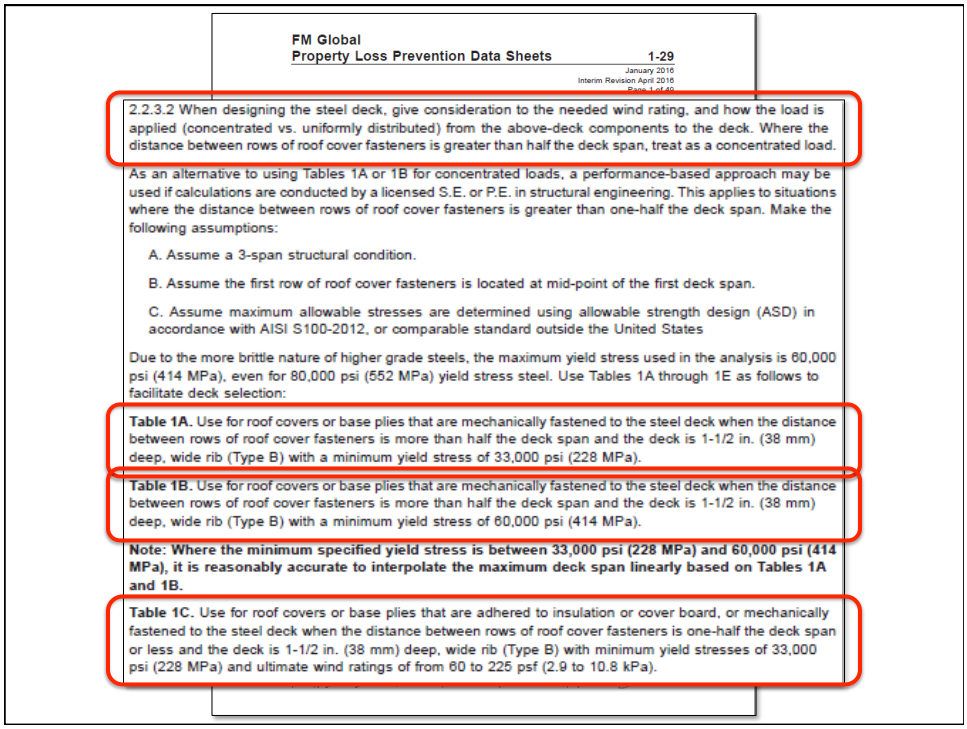
Professional Roofing, July 2016



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2.2.3.2 When designing the steel deck, give consideration to the needed wind rating, and how the load is applied (concentrated vs. uniformly distributed) from the above-deck components to the deck. Where the distance between rows of roof cover fasteners is greater than half the deck span, treat as a concentrated load.

As an alternative to using Tables 1A or 1B for concentrated loads, a performance-based approach may be used if calculations are conducted by a licensed S.E. or P.E. in structural engineering. This applies to situations where the distance between rows of roof cover fasteners is greater than one-half the deck span. Make the following assumptions:

A. Assume a 3-span structural condition.

B. Assume the first row of roof cover fasteners is located at mid-point of the first deck span.

C. Assume maximum allowable stresses are determined using allowable strength design (ASD) in accordance with AISI S100-2012, or comparable standard outside the United States

Due to the more brittle nature of higher grade steels, the maximum yield stress used in the analysis is 60,000 psi (414 MPa), even for 80,000 psi (552 MPa) yield stress steel. Use Tables 1A through 1E as follows to facilitate deck selection:

Table 1A. Use for roof covers or base plies that are mechanically fastened to the steel deck when the distance between rows of roof cover fasteners is more than half the deck span and the deck is 1-1/2 in. (38 mm) deep, wide rib (Type B) with a minimum yield stress of 33,000 psi (228 MPa).

Table 1B. Use for roof covers or base plies that are mechanically fastened to the steel deck when the distance between rows of roof cover fasteners is more than half the deck span and the deck is 1-1/2 in. (38 mm) deep, wide rib (Type B) with a minimum yield stress of 60,000 psi (414 MPa).

Note: Where the minimum specified yield stress is between 33,000 psi (228 MPa) and 60,000 psi (414 MPa), it is reasonably accurate to interpolate the maximum deck span linearly based on Tables 1A and 1B.

Table 1C. Use for roof covers or base plies that are adhered to insulation or cover board, or mechanically fastened to the steel deck when the distance between rows of roof cover fasteners is one-half the deck span or less and the deck is 1-1/2 in. (38 mm) deep, wide rib (Type B) with minimum yield stresses of 33,000 psi (228 MPa) and ultimate wind ratings of from 60 to 225 psf (2.9 to 10.8 kPa).

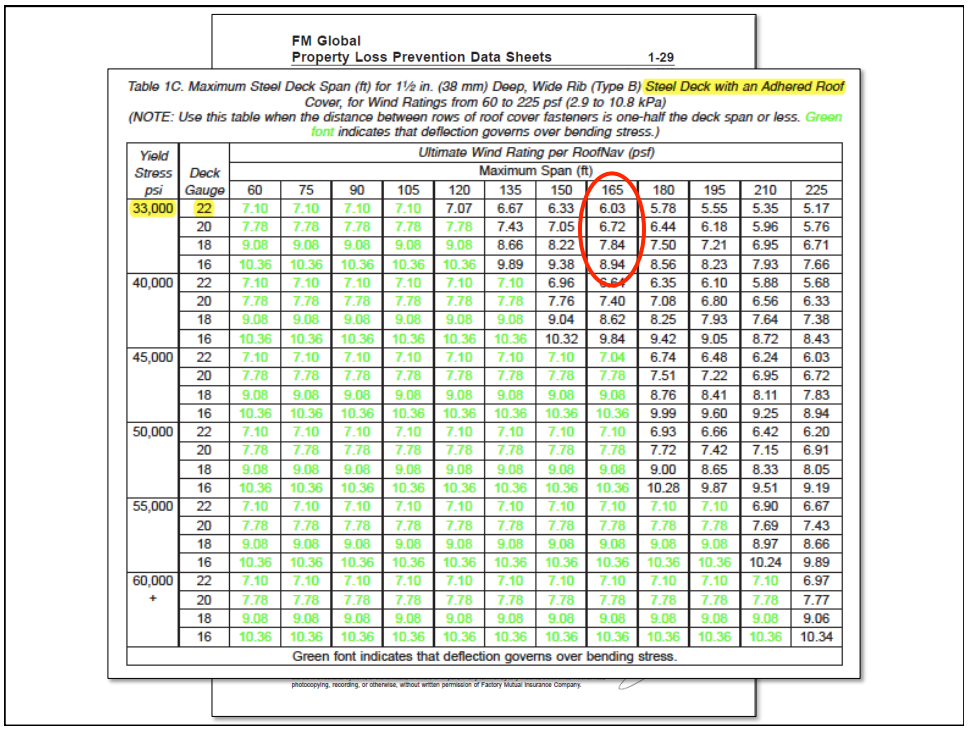

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Table 1C. Maximum Steel Deck Span (ft) for 1½ in. (38 mm) Deep, Wide Rib (Type B) Steel Deck with an Adhered Roof Cover, for Wind Ratings from 60 to 225 psf (2.9 to 10.8 kPa)
(NOTE: Use this table when the distance between rows of roof cover fasteners is one-half the deck span or less. Green font indicates that deflection governs over bending stress.)

Yield Stress psi	Deck Gauge	Ultimate Wind Rating per RoofNav (psf) Maximum Span (ft)											
		60	75	90	105	120	135	150	165	180	195	210	225
33,000	22	7.10	7.10	7.10	7.10	7.07	6.67	6.33	6.03	5.78	5.55	5.35	5.17
	20	7.78	7.78	7.78	7.78	7.78	7.43	7.05	6.72	6.44	6.18	5.96	5.76
	18	9.08	9.08	9.08	9.08	9.08	8.66	8.22	7.84	7.50	7.21	6.95	6.71
	16	10.36	10.36	10.36	10.36	10.36	9.89	9.38	8.94	8.56	8.23	7.93	7.66
40,000	22	7.10	7.10	7.10	7.10	7.10	7.10	6.96	6.64	6.35	6.10	5.88	5.68
	20	7.78	7.78	7.78	7.78	7.78	7.78	7.76	7.40	7.08	6.80	6.56	6.33
	18	9.08	9.08	9.08	9.08	9.08	9.08	9.04	8.62	8.25	7.93	7.64	7.38
	16	10.36	10.36	10.36	10.36	10.36	10.36	10.32	9.84	9.42	9.05	8.72	8.43
45,000	22	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.04	6.74	6.48	6.24	6.03
	20	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.51	7.22	6.95	6.72
	18	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	8.76	8.41	8.11	7.83
	16	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	9.99	9.60	9.25	8.94
50,000	22	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	6.93	6.66	6.42	6.20
	20	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.72	7.42	7.15	6.91
	18	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.00	8.65	8.33	8.05
	16	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.28	9.87	9.51	9.19
55,000	22	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	6.90	6.67
	20	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.69	7.43
	18	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	8.97	8.66
	16	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.24	9.89
60,000 +	22	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	6.97
	20	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.78	7.77
	18	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.08	9.06
	16	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.34

Green font indicates that deflection governs over bending stress.

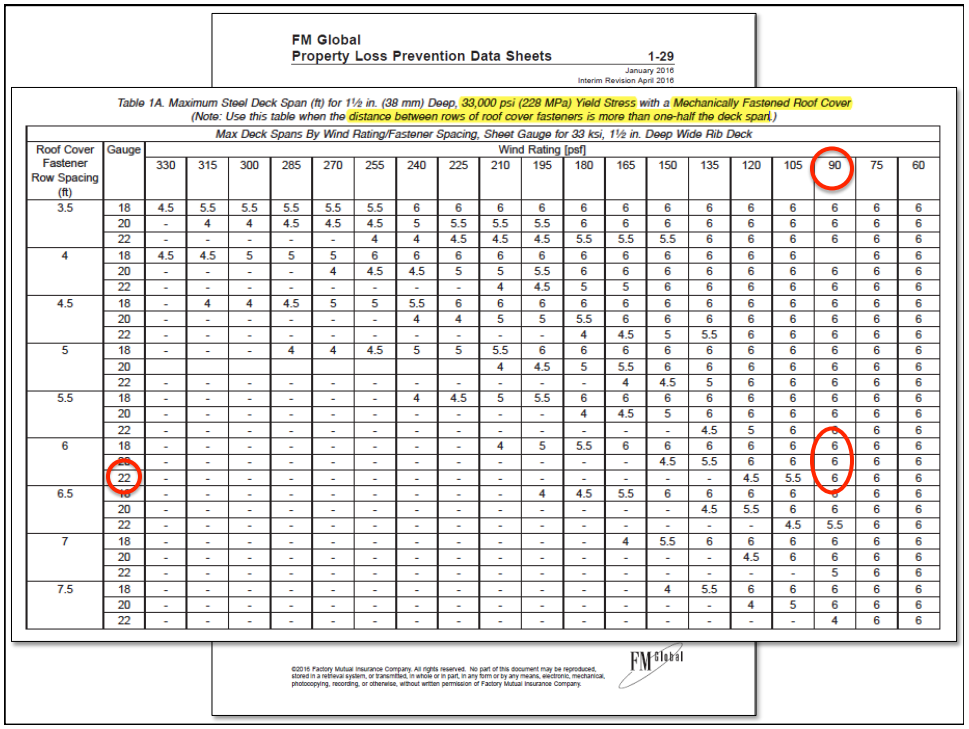

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Table 1A. Maximum Steel Deck Span (ft) for 1½ in. (38 mm) Deep, 33,000 psi (228 MPa) Yield Stress with a Mechanically Fastened Roof Cover
(Note: Use this table when the distance between rows of roof cover fasteners is more than one-half the deck span.)

Roof Cover Fastener Row Spacing (ft)	Gauge	Max Deck Spans By Wind Rating/Fastener Spacing, Sheet Gauge for 33 ksi, 1½ in. Deep Wide Rib Deck Wind Rating [psf]																		
		330	315	300	285	270	255	240	225	210	195	180	165	150	135	120	105	90	75	60
3.5	18	4.5	5.5	5.5	5.5	5.5	5.5	6	6	6	6	6	6	6	6	6	6	6	6	6
	20	-	4	4	4.5	4.5	4.5	5	5.5	5.5	5.5	6	6	6	6	6	6	6	6	6
	22	-	-	-	-	-	4	4	4.5	4.5	4.5	5.5	5.5	5.5	6	6	6	6	6	6
4	18	4.5	4.5	5	5	5	6	6	6	6	6	6	6	6	6	6	6		6	6
	20	-	-	-	-	4	4.5	4.5	5	5	5.5	6	6	6	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	4	4.5	5	5	6	6	6	6	6	6	6
4.5	18	-	4	4	4.5	5	5	5.5	6	6	6	6	6	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	4	4	5	5	5.5	6	6	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	4	4.5	5	5.5	6	6	6	6	6
5	18	-	-	-	4	4	4.5	5	5	5.5	6	6	6	6	6	6	6	6	6	6
	20									4	4.5	5	5.5	6	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5	6	6	6	6	6
5.5	18	-	-	-	-	-	-	4	4.5	5	5.5	6	6	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	4	4.5	5	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	5	6	6	6	6
6	18	-	-	-	-	-	-	-	-	4	5	5.5	6	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	-	-	4.5	5.5	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	5.5	6	6	6
6.5	18	-	-	-	-	-	-	-	-	-	4	4.5	5.5	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	5.5	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	5.5	6	6
7	18	-	-	-	-	-	-	-	-	-	-	-	4	5.5	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	6	6
7.5	18	-	-	-	-	-	-	-	-	-	-	-	-	4	5.5	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5	6	6	6
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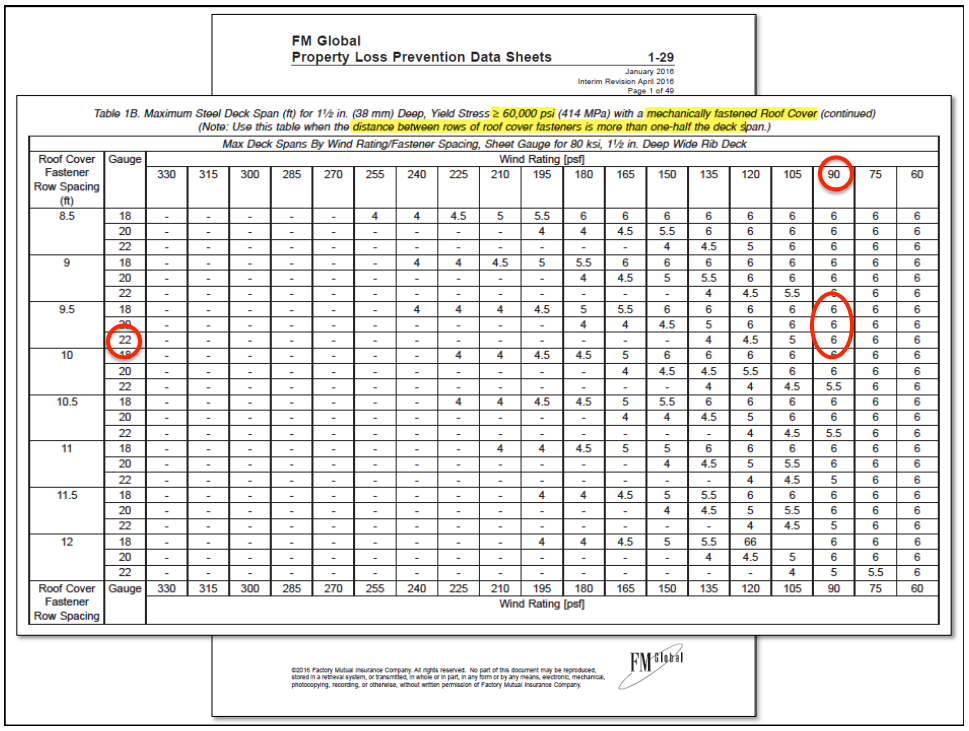

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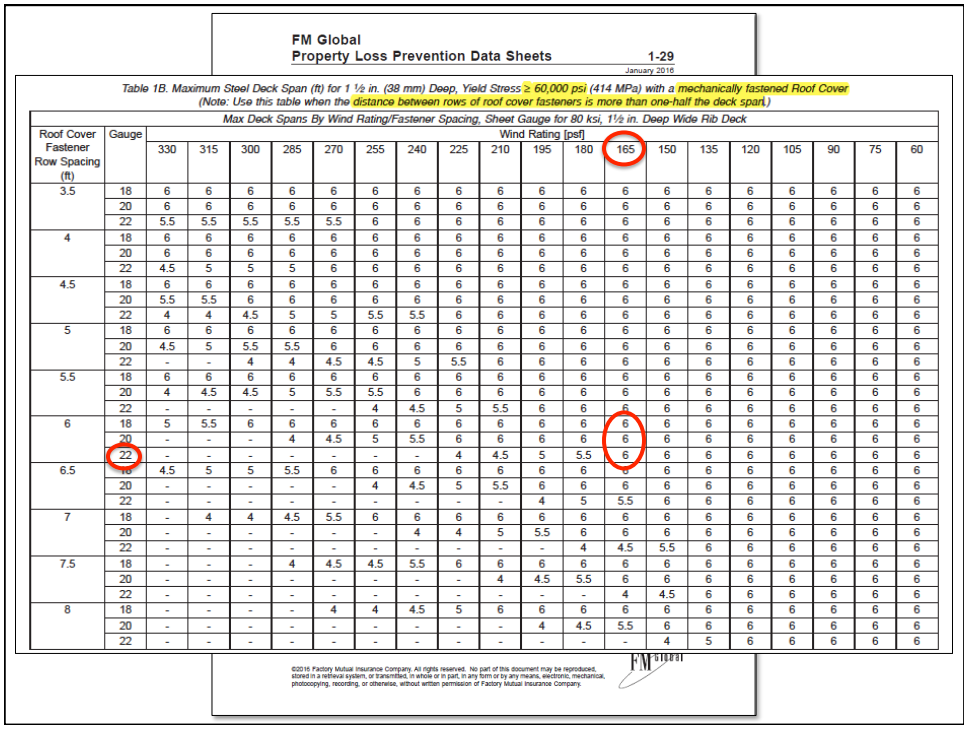
Table 1B. Maximum Steel Deck Span (ft) for 1½ in. (38 mm) Deep, Yield Stress ≥ 60,000 psi (414 MPa) with a mechanically fastened Roof Cover (continued)
(Note: Use this table when the distance between rows of roof cover fasteners is more than one-half the deck span.)

Max Deck Spans By Wind Rating/Fastener Spacing, Sheet Gauge for 80 ksi, 1½ in. Deep Wide Rib Deck

Roof Cover Fastener Row Spacing (ft)	Gauge	Wind Rating [psf]																		
		330	315	300	285	270	255	240	225	210	195	180	165	150	135	120	105	90	75	60
8.5	18	-	-	-	-	-	4	4	4.5	5	5.5	6	6	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	4	4	4.5	5.5	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5	6	6	6	6
9	18	-	-	-	-	-	-	4	4	4.5	5	5.5	6	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	4	4.5	5	5.5	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5.5	6	6	6
9.5	18	-	-	-	-	-	-	4	4	4	4.5	5	5.5	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	4	4	4.5	5	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5	6	6	6
10	18	-	-	-	-	-	-	-	4	4	4.5	4.5	5	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	-	4	4.5	4.5	5.5	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4.5	5.5	6	6
10.5	18	-	-	-	-	-	-	-	4	4	4.5	4.5	5	5.5	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	-	4	4	4.5	5	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5.5	6	6
11	18	-	-	-	-	-	-	-	-	4	4	4.5	5	5	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5	5.5	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5	6	6
11.5	18	-	-	-	-	-	-	-	-	-	4	4	4.5	5	5.5	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5	5.5	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5	6	6
12	18	-	-	-	-	-	-	-	-	-	4	4	4.5	5	5.5	66		6	6	6
	20	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.5	5	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5	5.5	6
Roof Cover Fastener Row Spacing	Gauge	330	315	300	285	270	255	240	225	210	195	180	165	150	135	120	105	90	75	60
		Wind Rating [psf]																		



FM Global
Property Loss Prevention Data Sheets 1-29
January 2016

Table 1B. Maximum Steel Deck Span (ft) for 1 ½ in. (38 mm) Deep, Yield Stress ≥ 60,000 psi (414 MPa) with a mechanically fastened Roof Cover
(Note: Use this table when the distance between rows of roof cover fasteners is more than one-half the deck span.)

Max Deck Spans By Wind Rating/Fastener Spacing, Sheet Gauge for 80 ksi, 1½ in. Deep Wide Rib Deck

Roof Cover Fastener Row Spacing (ft)	Gauge	Wind Rating [psf]																		
		330	315	300	285	270	255	240	225	210	195	180	165	150	135	120	105	90	75	60
3.5	18	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	20	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	22	5.5	5.5	5.5	5.5	5.5	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4	18	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	20	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	22	4.5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4.5	18	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	20	5.5	5.5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	22	4	4	4.5	5	5	5.5	5.5	6	6	6	6	6	6	6	6	6	6	6	6
5	18	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	20	4.5	5	5.5	5.5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	22	-	-	4	4	4.5	4.5	5	5.5	6	6	6	6	6	6	6	6	6	6	6
5.5	18	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	20	4	4.5	4.5	5	5.5	5.5	6	6	6	6	6	6	6	6	6	6	6	6	6
	22	-	-	-	-	-	4	4.5	5	5.5	6	6	6	6	6	6	6	6	6	6
6	18	5	5.5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	20	-	-	-	4	4.5	5	5.5	6	6	6	6	6	6	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	4	4.5	5	5.5	6	6	6	6	6	6	6	6
6.5	18	4.5	5	5	5.5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	20	-	-	-	-	-	4	4.5	5	5.5	6	6	6	6	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	4	5	5.5	6	6	6	6	6	6	6
7	18	-	4	4	4.5	5.5	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	4	4	5	5.5	6	6	6	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	4	4.5	5.5	6	6	6	6	6	6
7.5	18	-	-	-	4	4.5	4.5	5.5	6	6	6	6	6	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	4	4.5	5.5	6	6	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	4	4.5	6	6	6	6	6	6
8	18	-	-	-	-	4	4	4.5	5	6	6	6	6	6	6	6	6	6	6	6
	20	-	-	-	-	-	-	-	-	-	4	4.5	5.5	6	6	6	6	6	6	6
	22	-	-	-	-	-	-	-	-	-	-	-	-	4	5	6	6	6	6	6

Recommendations

Uniformly-loaded vs. non-uniform, linear pattern loaded steel roof decks

New construction:

- Structural engineer awareness of roof system design
  - Note load pattern and steel's yield strength on structural drawings and shop drawings
- Roof system designer awareness of steel roof deck design

Recommendations – cont.

Uniformly-loaded vs. non-uniform, linear pattern loaded steel roof decks

Reroofing:

- Realize steel roof decks are not likely designed to current SDI, FM Global and FM Approvals' standards
- If steel deck design cannot be verified:
  - Use narrow fastener row/seam spacing (rows/seams ≤ joist spacing)
  - Use a uniform uplift loading roof system (BUR, MB, adhered single ply)

Fastener pull-out tests…

There is little correlation between fastener pull-out resistance and a steel roof deck's yield strength and uplift (bending) strength

Although roofing contractors sometimes are given the responsibility of inspecting and accepting steel roof decks to receive a new roof system, determining a roof deck's design adequacy is beyond the expertise of most roofing contractors.

This determination is best made during a project's design phase.

New I-codes and SC/NC adoptions

South Carolina code adoptions

On August 26, 2014 the Council updated the mandatory building codes to be used within South Carolina. The Council established the implementation date for local jurisdictions as July 1, 2016 for all of the following codes. All local jurisdictions must enforce the mandatory codes, and may adopt and enforce the permissive codes.

Mandatory Building Codes adopted for current use in South Carolina and which must be enforced by all municipalities and counties, beginning July 1, 2016, include the:
2015 South Carolina Building Code or the 2015 International Building Code with SC modifications;
2015 South Carolina Residential Code or the 2015 International Residential Code with SC modifications;
2015 South Carolina Fire Code or the 2015 International Fire Code with SC modifications;
2015 South Carolina Plumbing Code or the 2015 International Plumbing Code.
2015 South Carolina Mechanical Code or the 2015 International Mechanical Code.
2015 South Carolina Fuel Gas Code or the 2015 International Fuel Gas Code with SC modifications
2009 South Carolina Energy Conservation Code; and,
2014 National Electrical Code (NFPA 70).

North Carolina code adoptions

2018 NC/ICC 2015 NC State Building Codes

The Base Documents for the 2018 NC Codes are the 2015 International Codes. The 2018 NC Ad-Hoc Committee amendments below are replacements to the Sections printed in the Base Documents. The 2015 International Codes are available at www.iccsafe.org for purchase or at http://codes.iccsafe.org/I-Codes.html#2015 for public access. A printed copy is available for review only at the following location.

NC Department of Insurance, 116 West Jones Street, Room B135, Raleigh, NC 27603
919-647-0019

ICC's code development cycle

2018 I-codes

- 2015 Group A (IBC-FS, IBC-G, IEBC, IPC, IMC):
  - Memphis, TN -- April 2015
  - Long Beach, CA -- September 2015
  - Online vote
- 2016 Group B (IECC, IBC-S, IRC, IFC):
  - Louisville, KY -- April 2016
  - Kansas City, MO -- October 2016
  - Online vote
- Publication estimated late-Spring 2017
- Adoptions effective beginning in 2018

IECC 2018 (tentative)

Roofing-related changes:

- Some editorial/format changes
- No changes in R-values requirements
- No changes in roof reflectivity requirements
- No changes in air barrier requirements

ASHRAE 90.1-13 to ASHRAE 90.1-16:

- Single-ply membrane roof systems will be a deemed-to-comply air retarder

ASCE 7-16 adoption into IBC 2018

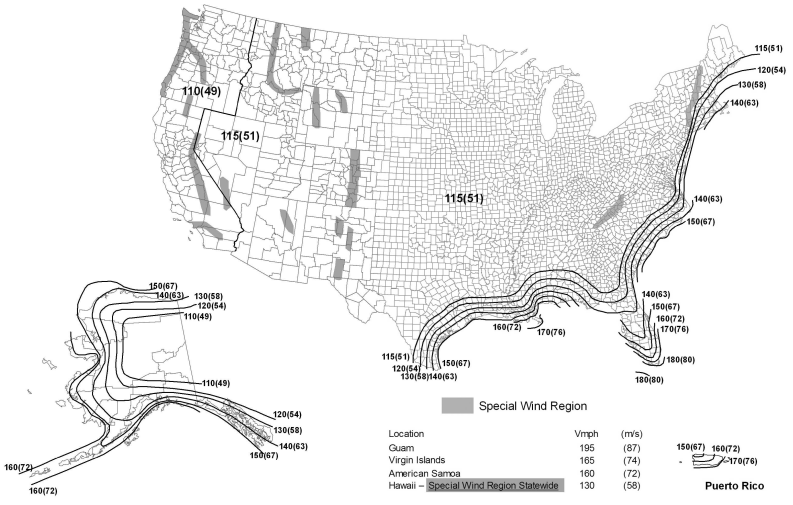
ASCE 7-16 (public review draft)

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

Expect higher field, perimeter and corner uplift pressures

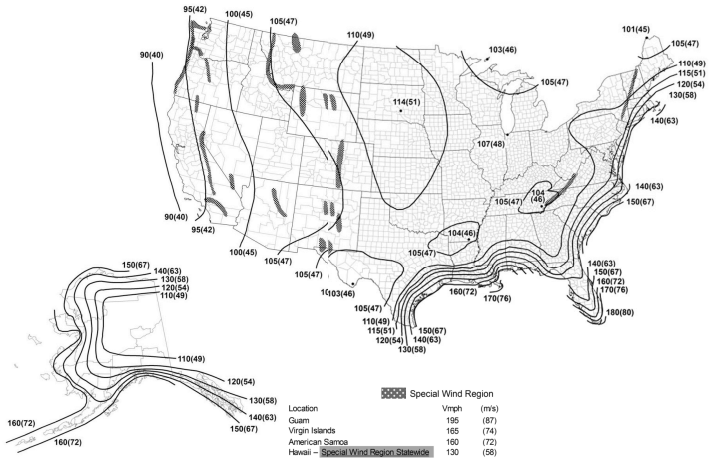
ASCE 7-10 basic wind speed map

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



ASCE 7-16 (draft) basic wind speed map

Risk Category II Buildings



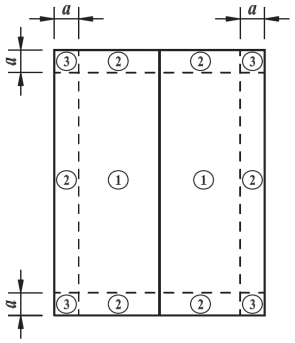
GC_p pressure coefficients

h ≤ 60 ft., gable roofs ≤ 7 degrees

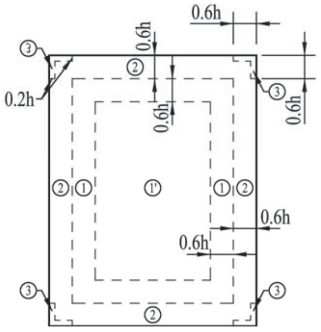
Zone	ASCE 7-10	ASCE 7-16 (draft)
1 (field)	-1.0	-1.7
1’	--	-0.9
2 (perimeter)	-1.8	-2.3
3 (corners)	-2.8	-3.2

Zones

h ≤ 60 ft., gable roofs ≤ 7 degrees



ASCE 7-10

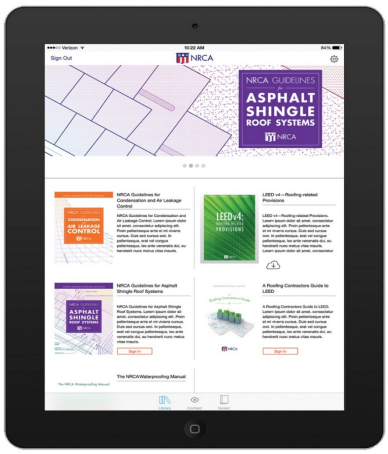


ASCE 7-16 (draft)

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

The NRCA Roofing Manual - 2017

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

Questions… and other topics

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