



**Fall Education Conference**  
September 21, 2017

**Covering the codes (and technical update)**

presented by

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



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**2012 I-codes**



**Fall Education Seminar**  
September 4, 2014

**Covering the codes**

presented by


**Mark S. Graham**  
Associate Executive Director, Technical Services  
National Roofing Contractors Association (NRCA)

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<http://www.marksgraham.com/presentations.html>

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## 2015 I-codes




**KANSAS ROOFING ASSOCIATION**

**Fall Education Seminar**  
September 24, 2015

**Code and technical update**

presented by

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

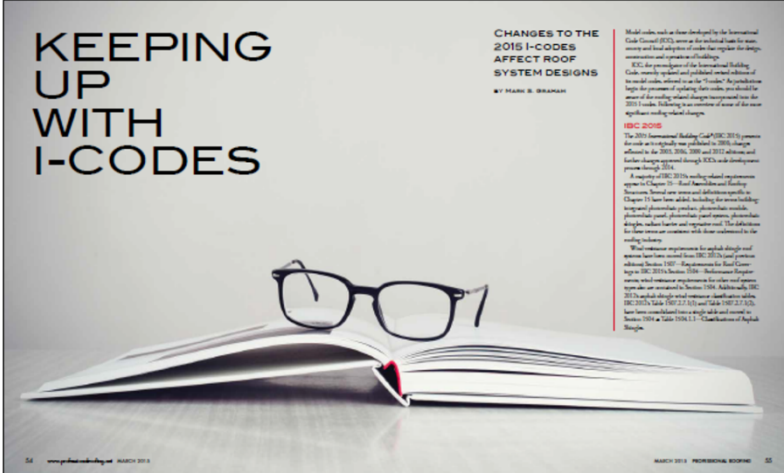


<http://www.marksgraham.com/presentations.html>

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## Significant roofing-related changes

2015 I-codes



**KEEPING UP WITH I-CODES**

**CHANGES TO THE 2015 I-CODES AFFECT ROOF SYSTEM DESIGNS**

BY MARK S. GRAHAM

Model codes such as those developed by the International Code Council (ICC) serve as the building code framework and local adoption of codes that require the design, construction and operation of buildings.

ICC, the publisher of the International Building Code, recently published its 2015 International Building Code, which is the first code to be published in the 100th anniversary year of the publication of the code. The code is the result of the roofing-related changes made for the 2015 code, including a number of new and significant roofing-related changes.

**IBC 2015**

The 2015 International Building Code (IBC 2015) covers the code as it originally was published in 2003, change editions in the 2003, 2006, 2009 and 2012 editions and further changes approved through ICC's code development process through 2014.

A majority of IBC 2015 roofing-related amendments appear in Chapter 15, "Roof Membrane Roofing Systems." Several new areas and definitions apply to Chapter 15 items that include, but are not limited to, temporary placement, protection, placement, installation, removal, placement, protection, placement, placement, placement and repair work. The definition of "low-slope membrane" has also been updated for the roofing industry.

Other notable amendments to the code include and apply to new areas such as IBC 2015, "roof protection" definition, Section 1507, "Requirements for Fall Protection" in IBC 2015, Section 1508, "Maintenance Support" and other related requirements. In addition, new items are contained in Section 1504, "Additional IBC 2015" and other related requirements. Additional items include IBC 2015, Table 1507.2.1.1.1 and Table 1507.2.1.1.2, "Low-slope membrane" and Table 1508.1.1, "Classification of Asphalt Shingles."

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## New model building code

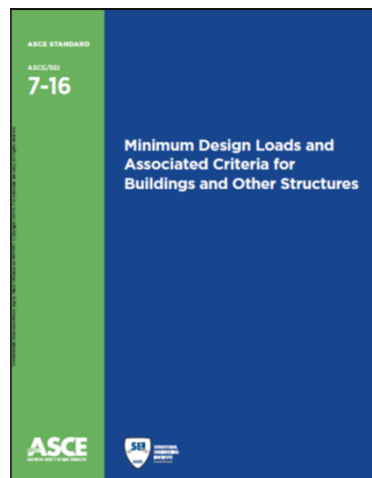
2018 I-codes



New I-codes is now available

## New wind design method

ASCE 7-16



- Published in June
- Referenced in IBC 2018

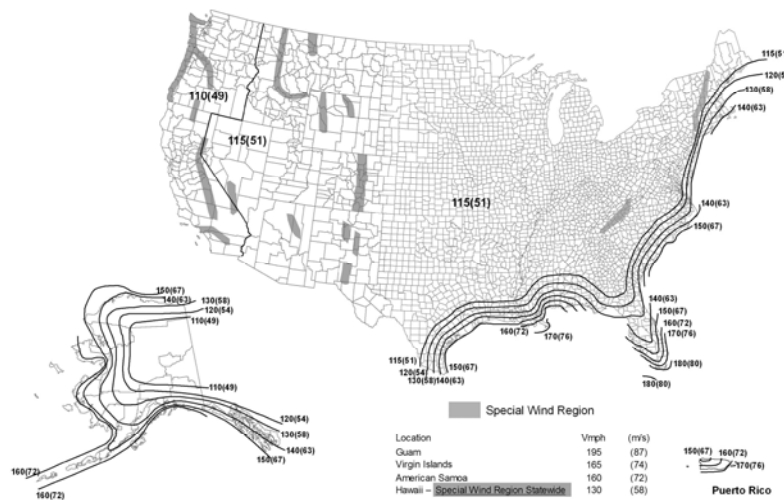
## ASCE 7-16's major revisions

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

*Expect higher field, perimeter and corner uplift pressures*

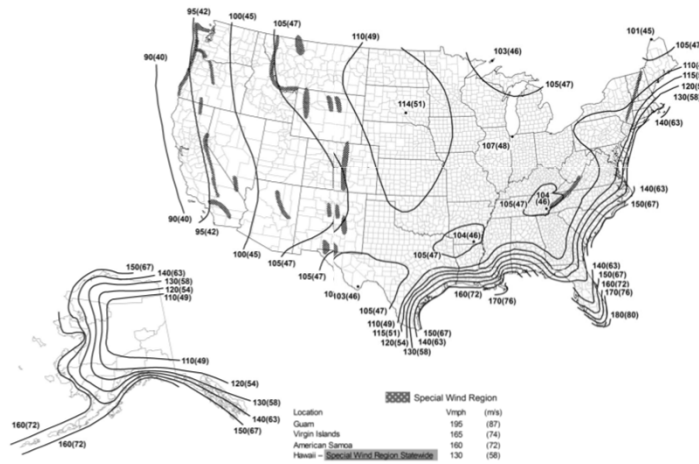
## ASCE 7-10 basic wind speed map

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



## ASCE 7-16 basic wind speed map

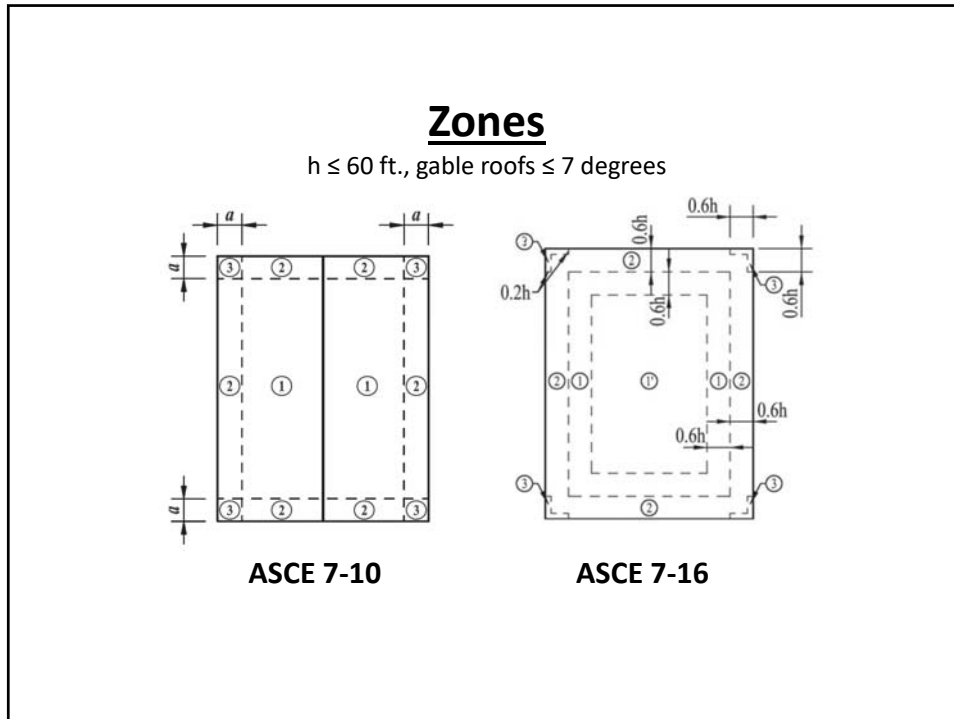
Risk Category II Buildings



## GC<sub>p</sub> pressure coefficients

h ≤ 60 ft., gable roofs ≤ 7 degrees

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



**Comparing FM 1-28, ASCE 7-05, ASCE 7-10  
 and ASCE 7-16**

Example: A manufacturing building located in New Orleans, LA. The building is an enclosed structure with a low-slope roof system and a roof height of 33 ft. The building is located in an area that is categorized as Exposure Category C.

**Comparing FM 1-28, ASCE 7-05, ASCE 7-10  
and ASCE 7-16**

Document	Basic wind speed (mph)	Design wind pressure (psf)		
		Zone 1 (Field)	Zone 2 (Perimeter)	Zone 3 (Corner)
FM 1-28 (without SF)	v = 120	43	72	108
ASCE 7-05	v = 120	38	63	95
ASCE 7-10 Strength design	v <sub>ULT</sub> = 150	59	99	148
ASCE 7-10 ASD	v <sub>ASD</sub> = 116	35	59	89
ASCE 7-16 Strength Design	v <sub>ULT</sub> = 160 mph	1' = 60.2 1 = 105	138.1	188.6
ASCE 7-16 ASD		1' = 36.1 1 = 63.0	83.1	113.2

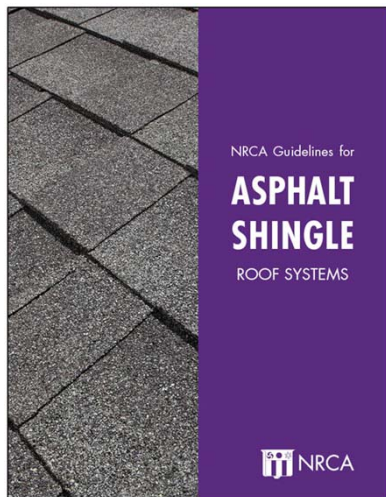
*Proper wind design (which is oftentimes avoided) is getting even more complicated...*

## Moisture on concrete roof decks



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Sept. 2017


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[Link](#)

**NRCA Guidelines for  
Asphalt Shingle Roof  
Systems**






### Understanding underlayments

Roof system type	IBC 2015		IRC 2015			
	Section	$V_{w} < 120$ mph	$V_{w} \geq 120$ mph	Section	$V_{w} < 140$ mph	$V_{w} \geq 140$ 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
Non-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

## “Fully” adhered



**The fully adhered misnomer**  
Terminology can create unrealistic expectations within the roofing industry

by Mark S. Graham

The term “fully adhered” is used by some manufacturers and specifiers to identify...  
Although not specifically defined, the...  
Realistic expectations...  
In practice...  
As a specifier...  
On the basis...  
MARK S. GRAHAM is NRCA's vice president of technical services.

Professional Roofing,  
January 2017

## Polyisocyanurate insulation

Knit line, thickness and dimensional stability concerns



**Professional Roofing**

February 2016

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**Knit lines**



**Knit lines -- continued**





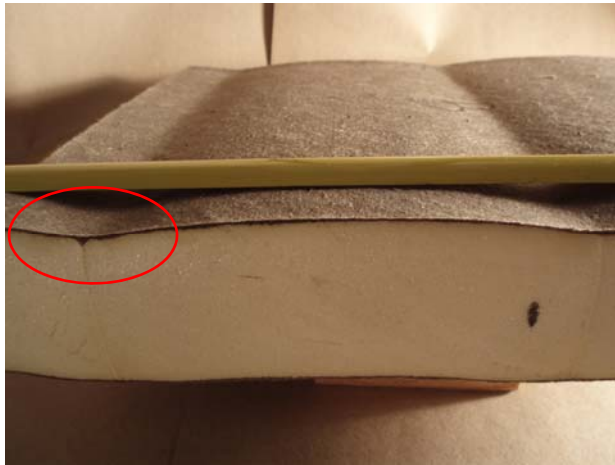
Photo from manufacturer's product literature

### **Thickness and knit lines**



As delivered by manufacturer.

**Knit lines -- continued**



After conditioning:  $158 \pm 4$  F and  $97 \pm 3\%$  RH for 7 days

**Knit lines -- continued**



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

“NRCA recommends the use of a suitable cover board layer over polyisocyanurate insulation before the installation of roof membrane.”

*-The NRCA Roofing Manual: Membrane Roof Systems-2015*

### **Additional 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

## Thickness variations in polyio. insulation

RESEARCH+TECH



**Not quite measuring up**  
Polyisocyanurate insulation thicknesses seem to vary

by Mark S. Graham

**N**IRCA has received a limited number of reports of forced, right-hand polyisocyanurate insulation with thicknesses less than what was specified and indicated on the manufacturer's package labeling being delivered from manufacturers to distributors and job sites. Following an investigation about these reports, as well as other studies about recognized allowable thickness tolerances and NIRCA's recommendations to roofing contractors for resolving this situation.

**Reports**

NIRCA has received reports of non-specified polyisocyanurate insulation being received directly from polyisocyanurate insulation manufacturers with thicknesses notably less than nominal dimensions. Reports have been received from the East Coast to the Rocky Mountains and as far north as Wisconsin and south to Texas.

Reports have been received about various specified nominal thicknesses of polyisocyanurate insulation. However, the problem appears to be more common with thicker polyisocyanurate insulation products than thinner ones. For example, NIRCA has received multiple reports of 3½ inch nominal thickness polyisocyanurate insulation measuring

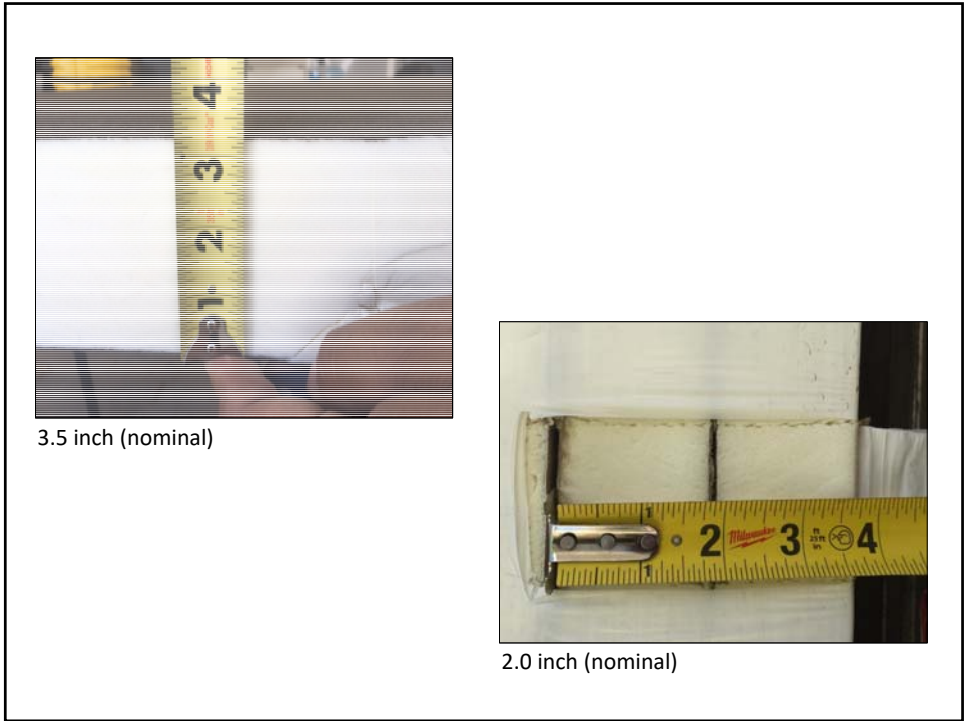
24 www.professionalroofing.net JULY 2017

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July 2017

## Thickness variations

Polysiocyanurate insulation

- Measured thicknesses notably less than nominal
- Reports from throughout the U.S.
- More common with thicker product
  - For example, 3.5 inch (nominal) measures less than 3¼-inch thick
- Most reports specific to one manufacturer
  - Multiple plants from the one manufacturer
  - Limited reports from other manufacturers



## Allowable tolerances

ASTM C1289 (Polyisocyanurate insulation)

### 8. Dimensions

**8.1 Dimensional Tolerances**—The length and width tolerances shall not exceed  $\pm 1/4$  in. (6.4 mm), the thickness tolerance shall not exceed  $1/8$  in. (3.2 mm), and the thickness of any two boards shall not differ more than  $1/8$  in. (3.2 mm) when measured in accordance with Test Method C303.

<p><b>1. Scope</b></p> <p>1.1 This specification covers thermal insulation boards of polyisocyanurate, polyurethane, and polyisocyanurate/polyurethane blends.</p> <p>1.2 This specification covers structural panels of polyisocyanurate.</p>	<p><b>8.3 Edge Trueness in the <i>xy</i> Direction</b>—Unless otherwise specified, the thermal insulation board shall be furnished with straight edges and edges shall not deviate more than <math>1/16</math> in./ft (2.6 mm/m) when examined in accordance with Practice C550.</p> <p><b>8.4 Shiplap Edges</b>—When specified, the insulation board shall be fabricated with shiplap edges along its longest dimensions.</p> <p>8.4.1 The nominal depth of each shiplap shall be the sum of its thickest facer dimension plus one half the thickness of its core foam dimension.</p> <p>8.4.2 For boards 2 in. (50.8 mm) or greater in nominal thickness, the width of the shiplap shall be 1 in. (25.4 mm). For boards less than 2 in. (50.8 mm) in thickness, the nominal width of the shiplap shall be one half the thickness of the faced board product.</p>	<p>1.3 This specification covers thermal insulation boards of polyisocyanurate, polyurethane, and polyisocyanurate/polyurethane blends.</p> <p>1.4 The values in this specification are in inches and millimeters. The values in parentheses are the equivalent values in millimeters and inches, respectively.</p>
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**8.5 Face Trueness**—The thermal insulation boards shall not depart from absolute flatness more than  $1/8$  in./ft (10 mm/m) of length or width when examined in accordance with Practice C550.

<p>1.5 This specification covers thermal insulation boards of polyisocyanurate, polyurethane, and polyisocyanurate/polyurethane blends.</p>	<p><b>8.6 Available Sizes</b>—The thermal insulation boards are normally supplied in sizes of 4 by 4 ft (1.22 by 1.22 m), and 4 by 8 ft (1.22 by 2.44 m) for use in roofing applications. For sheathing applications the thermal insulation boards are normally supplied in sizes of 4 by 8 ft (1.22 by 2.44 m), 4 by 9 ft</p>	<p>1.6 This specification covers thermal insulation boards of polyisocyanurate, polyurethane, and polyisocyanurate/polyurethane blends.</p>
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**8.7 Crushings and Depressions**—The thermal insulation boards shall have no crushed or depressed areas on any surface exceeding  $1/8$  in. (3.2 mm) in depth on more than 10 % of the total surface area.



### **The issues...**

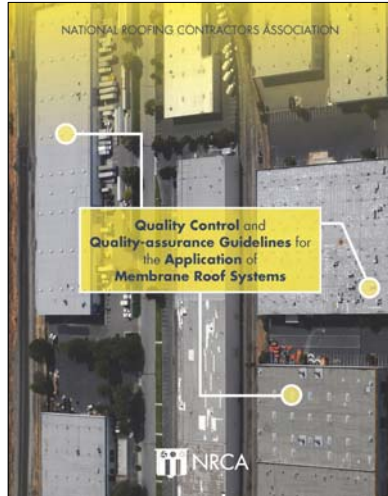
Thickness variations in polyiso. insulation

- Most physical properties are thickness related
- R-value loss:
  - R-value decreases about 0.7 per 1/8-inch thickness loss (assuming an LTTR of 5.6 per inch)
- Insulation thickness does not match established wood blocking heights

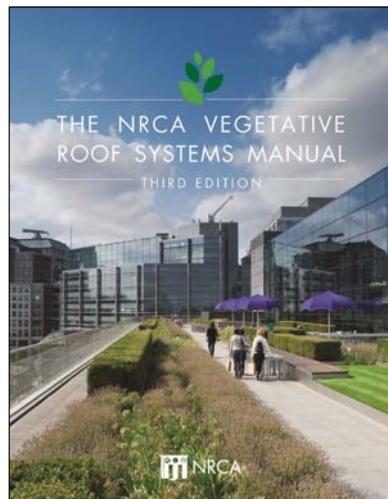
### **NRCA's recommendations**

Thickness variations in polyiso. insulation

- Distributors and contractors should measure board edge thicknesses upon delivery, preferably while the insulation still is on the truck
- Contact the manufacturer or distributor if thicknesses are less (or more) than specified
- Also contact NRCA Technical Services



***Quality Control and  
Quality-assurance  
Guidelines for the  
Application of  
Membrane Roof  
Systems***



***The NRCA Vegetative  
Roof Systems Manual***



**Mark S. Graham**

Vice President, Technical Services  
National Roofing Contractors Association  
10255 West Higgins Road, 600  
Rosemont, Illinois 60018-5607

(847) 299-9070  
mgraham@nrca.net  
www.nrca.net

Twitter: @MarkGrahamNRCA  
Personal website: [www.MarkGrahamNRCA.com](http://www.MarkGrahamNRCA.com)