International Roofing Expo
February 12, 2019
Nashville, TN

NRCA Technical Operations Committee: Technical programs and issues

Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association
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Today's topics

NRCA Technical Operations Committee: Technical programs and issues

- Staff and committee members
- New 2019 Manual
- CERTA torch safety program
- 2018 I-codes and ASCE 7-16
- Field uplift testing
- Synthetic underlayment
- Attic ventilation
- Concrete roof deck moisture
- Concrete moisture research (Matt Dupuis)

Technical Services section staff

Mark S. Graham	Vice President
Glen Clapper	Director
Maciek Rupar	Director
Nick Gallagher	Project Manager
Kurt Fester	Project Engineer
Andrea Khalil	Administrative Assistant

NRCA Technical Operations Committee

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Dryspace, Inc.
Cedar Rapids, IA

Jack Moore, Jr.
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LaGrange, OH

George Patterson
Bennett & Brosseau Roofing, Inc.
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Stephen Teal
Flynn Group of Companies,
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Dayton, OH

Scott Baxter
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Portland, OR

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Helen Hardy Pierce
GAF Materials Corp.
Parsippany, NJ

Dave Tilsen
Tilsen Roofing Co.,
Madison, WI

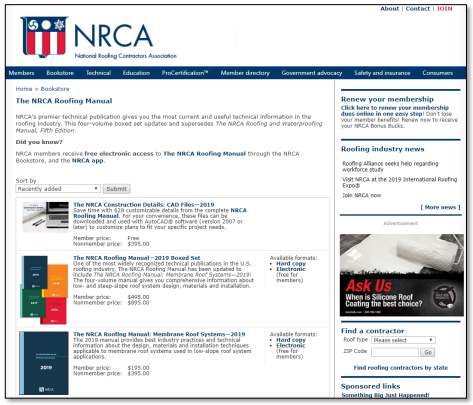
Scott Kawulok, Vice Chair Liaison
B & M Roofing of Colorado
Frederick, CO

Other technical committees & task forces

- Manual Update Committee
- SPF Task Force
- Waterproofing Manual Task Force
- Installation Instructions Review Task Force
- Metal Wall Panel Task Force

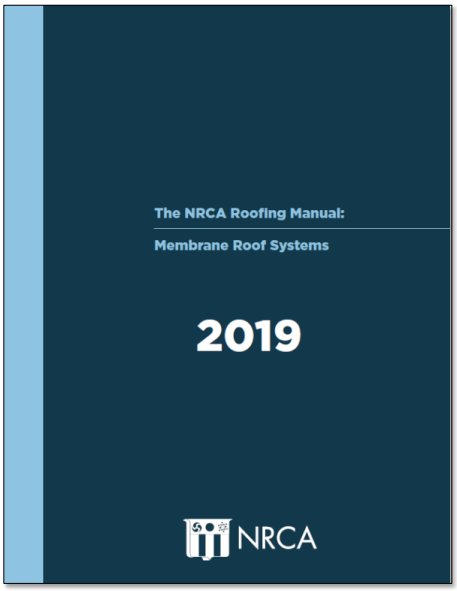
The NRCA Roofing Manual-2019

NRCA manual online

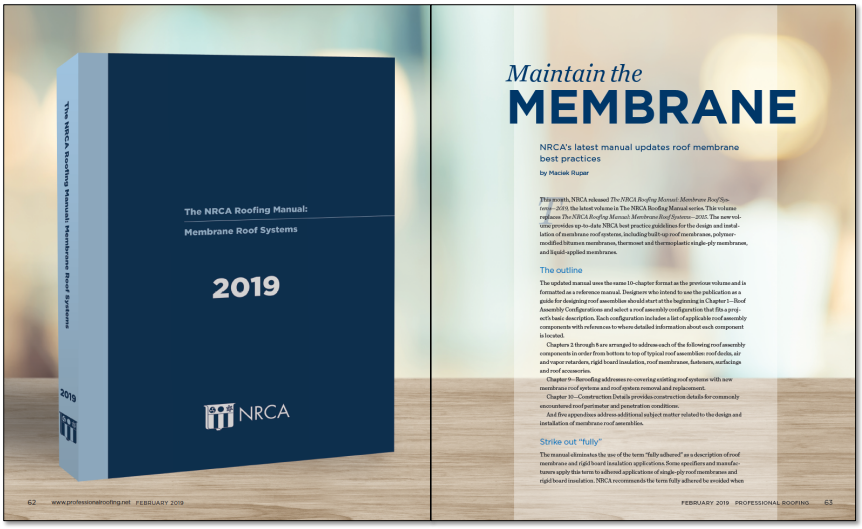


Link

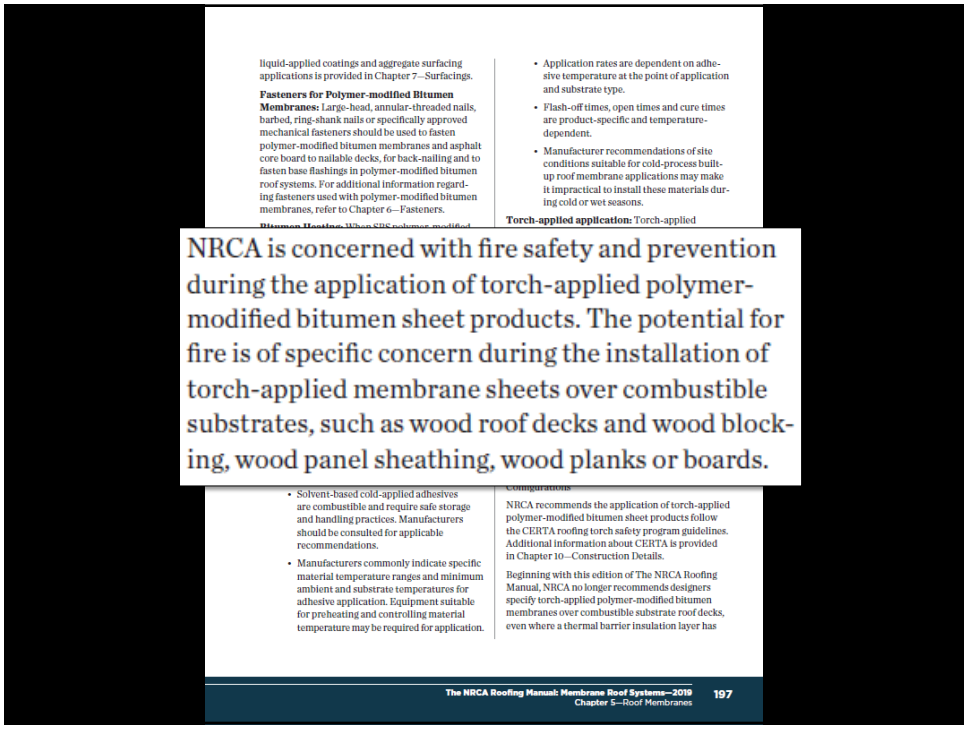
- Available to all NRCA member registered users (multiple users per member company)
- "Members only" section, click on "My account", the "Electronic file"
- View, download and print

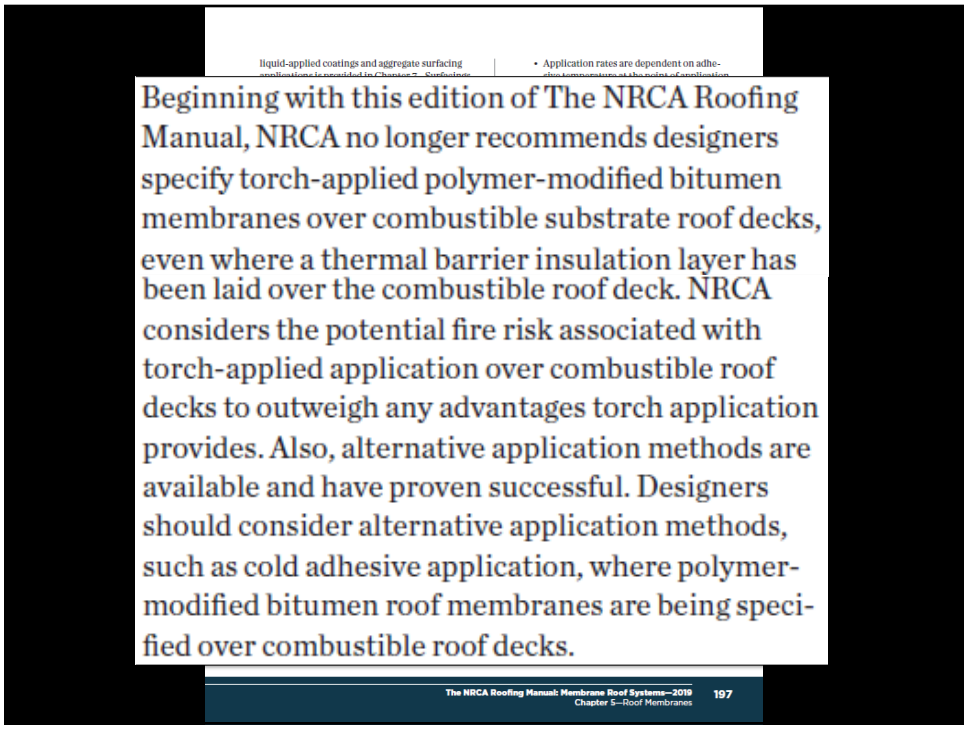


The NRCA Roofing Manual: Membrane Roof Systems-2019



Professional Roofing, February 2019 (Link)





CERTA

As of January 1, 2019, there are 2,069 CERTA trainers and 32,385 applicators

OIRCA

ontarioroofing.com

Members' Bulletin: 2018-12 *December 3, 2018*

To All OIRCA Members:

OIRCA Submits Ontario Fire Code Changes to the Office of the Ontario Fire Marshal

The OIRCA Board of Directors made a decision earlier this year that our Association would take an industry leadership position on addressing roofing fires that involve the torch application of modified bitumen roofing membranes.

This province, the entire country for that matter, has recently witnessed very serious fires that originated from re-roofing operations utilizing open flame torch applications. In Ontario the Lakeridge Health Port Perry Hospital had been closed for over a year as a result of a fire which took place on August 25, 2017. This past June a major rooftop fire at Dalhousie University's Faculty of Agriculture, Cox Institute in Bible Hill Nova Scotia is still closed and in July in Montreal two roofers ended up in hospital as a result of a rooftop fire that involved over 200 fire fighters fighting a blaze which shut down a skyscraper in the downtown core. 30 floors of businesses and hundreds of employees have yet to return to the building.

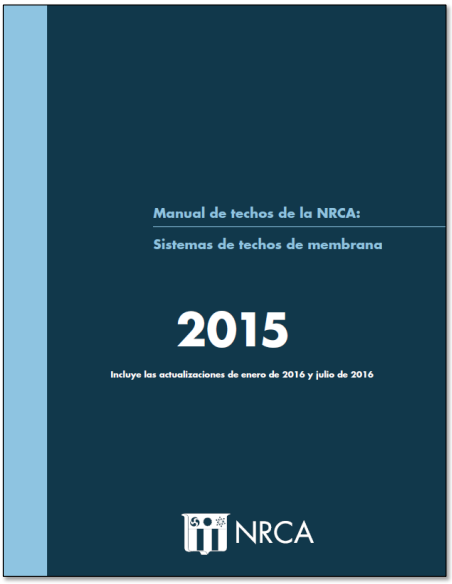
In 2012 through 2014 the OIRCA assisted the Office of the Ontario Fire Marshal with establishing changes to the Ontario Fire Code that ultimately became law in January 1, 2015. Those revisions were designed to help reduce rooftop fires utilizing open flame torches and kettles. This effort followed the death of two fire fighters in Listowel Ontario in 2011 resulting from a torch related fire.

Those changes to the Fire Code have had little impact on the number of roofing related fires. Fire Marshal complied statistics indicate no improvement in the number or severity of these fires. This fact has prompted the OIRCA to suggest further changes and to that end we made a submission to the Fire Marshal this fall. Those changes were endorsed by the Association's Technical and Risk Management Committees, the Board of Directors and the membership through this past summer's membership survey.

Those Committees became aware of torching policies being adopted by a few of our members. Specifically, they became mindful that most torch fires originate at flashings and roof penetrations. Much fewer start in the field of the roof. This fact alone encouraged us to consider recommending code language that would restrict where torching can be used on a roof.

1

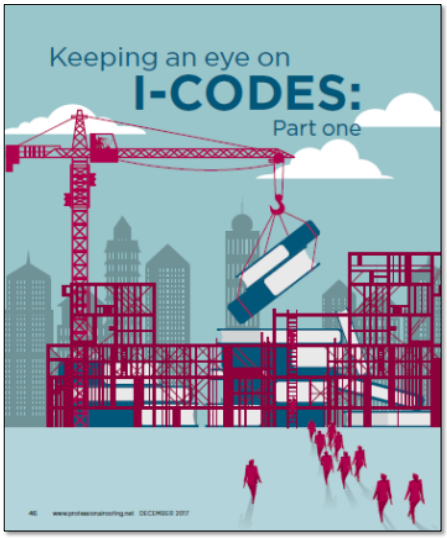
While NRCA and the CERTA program have not adopted OIRCA's recommendations, we are supportive of their efforts and the desire for the roofing industry (and not outside entities) to control our own solutions.



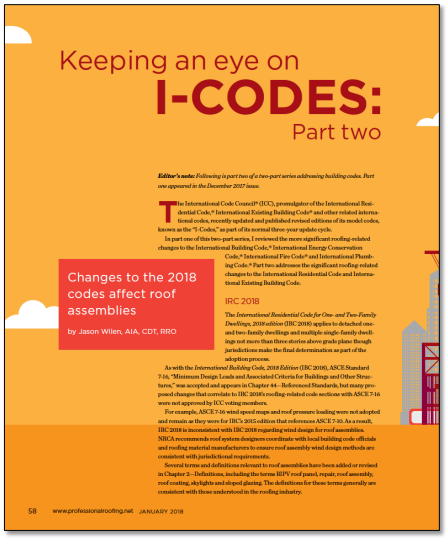
Spanish manual:

- 2015 online now; hardcopy to follow shortly
- 2016-2019 later this year

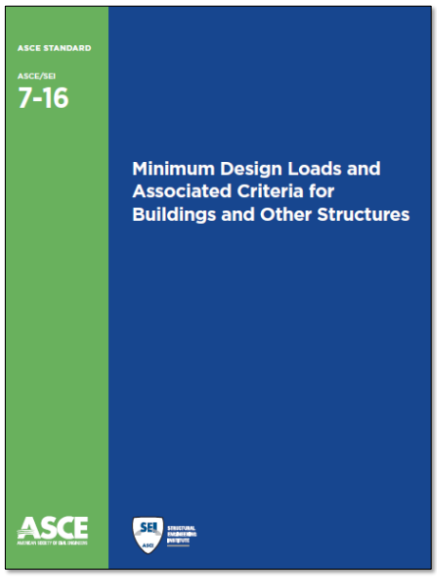
2018 I-codes and ASCE 7-16



Professional Roofing, December 2017
Link to access this article



Professional Roofing, January 2018
Link to access this article



American Society of Civil Engineers Standard 7, "Minimum Design Loads and Associated Criteria for Buildings and Other Structures" (ASCE 7-16)

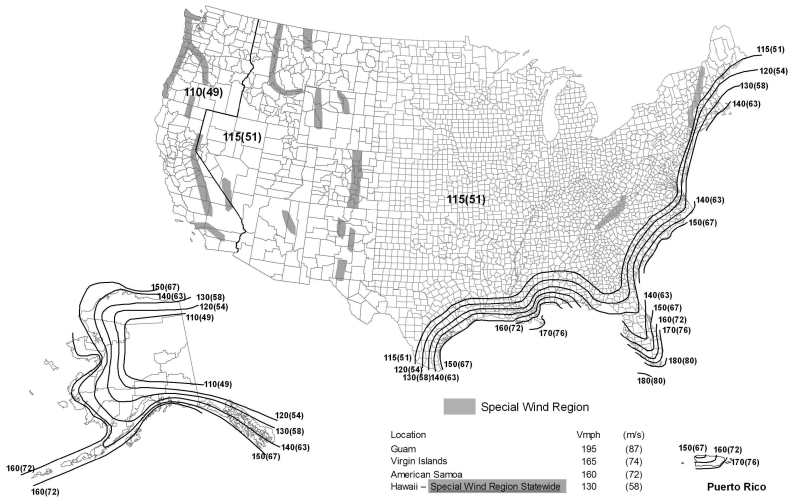
Noteworthy changes in ASCE 7-16

Compared to ASCE 7-10

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

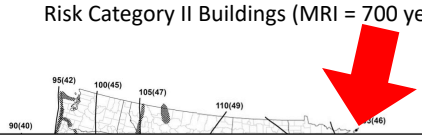
ASCE 7-10 basic wind speed map

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



ASCE 7-16 basic wind speed map

Risk Category II Buildings (MRI = 700 years)



MRI		
Risk Category	**ASCE 7-10**	**ASCE 7-16**
I (Low)	300 yrs.	300 yrs.
II (not I, II or IV)	700 yrs.	700 yrs.
Category III (High risk)	1,700 yrs.	1,700 yrs.
Category IV (Essential)	1,700 yrs.	3,000 yrs.

Selection of the correct Risk Category/map (i.e., wind speed) is essential

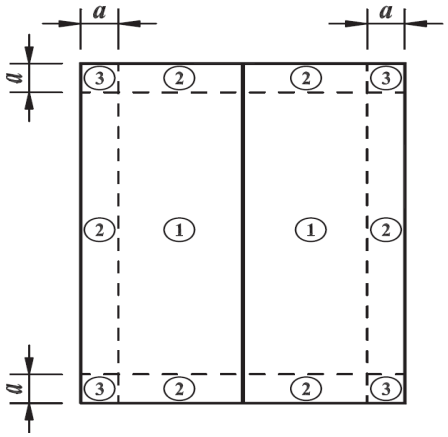
Comparing GC_p pressure coefficients

h ≤ 60 ft., gable roofs ≤ 7 degrees

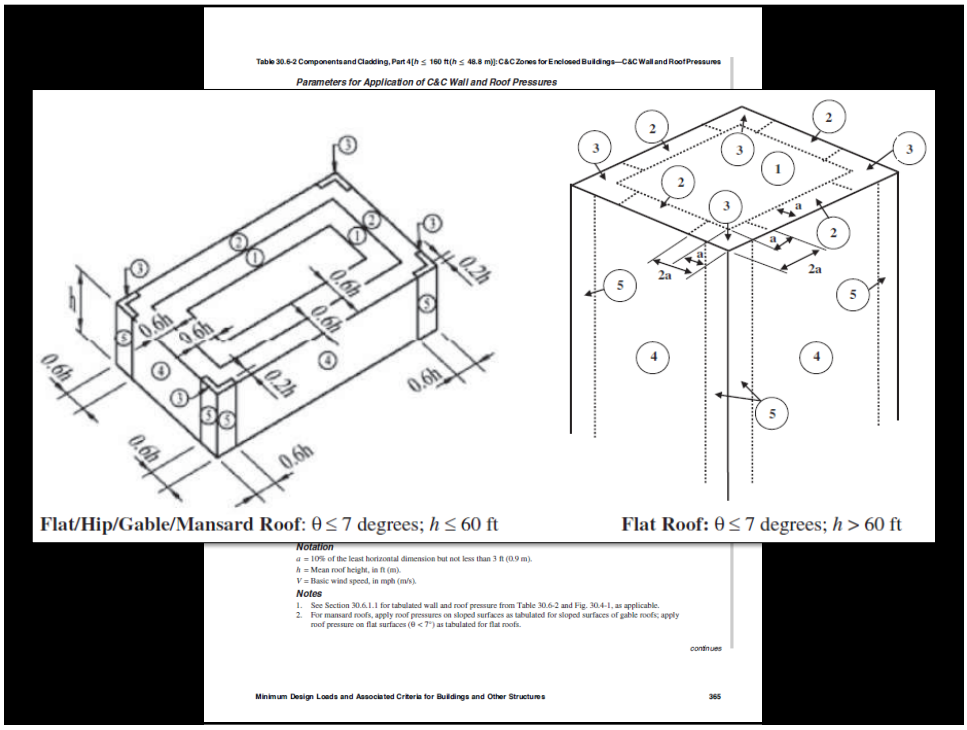
Zone	ASCE 7-10	ASCE 7-16	Change
1’	n/a	0.9	-10%
1 (field)	-1.0	-1.7	+70%
2 (perimeter)	-1.8	-2.3	+28%
3 (corners)	-2.8	-3.2	+14%

Zones

h ≤ 60 ft., gable roofs ≤ 7 degrees



ASCE 7-10



Noteworthy changes in ASCE 7-16

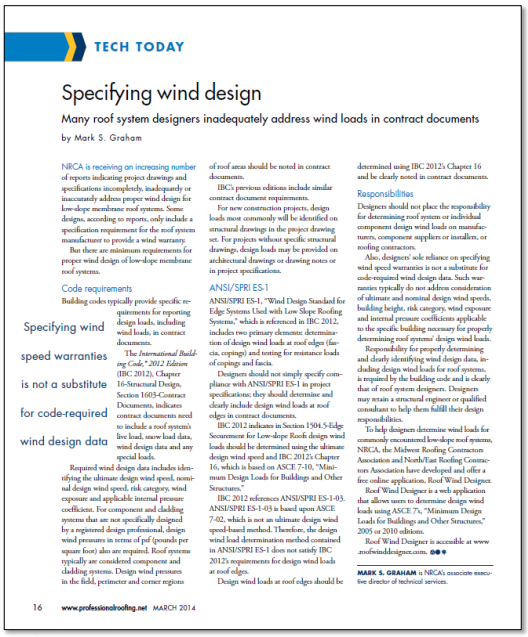
Compared to ASCE 7-10

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

While center field pressures may be slightly lower, field, perimeter and corner uplift pressures will generally be greater

How the roofing industry will adapt to ASCE 7-16 remains to be seen….

FM Global has indicated they will update their FM 1-28 to be based on ASCE 7-16 (with modifications) in mid-2019.



TECH TODAY

Specifying wind design

Many roof system designers inadequately address wind loads in contract documents

by Mark S. Graham

Specifying wind speed warranties is not a substitute for code-required wind design data

NRCA is receiving an increasing number of reports indicating project drawings and specifications incompletely, inadequately or inaccurately address proper wind design for low-slope membrane roof systems. Some designs, according to reports, only include a specification requirement for the roof system manufacturer to provide a wind warranty.

But there are minimum requirements for proper wind design of low-slope membrane roof systems.

Code requirements

Building codes typically provide specific requirements for reporting design loads, including wind loads, in contract documents.

The *International Building Code,® 2012 Edition* (IBC 2012), Chapter 16-Structural Design, Section 1603-Contract Documents, indicates contract documents need to include a roof system's live load, snow load data, wind design data and any special loads.

Required wind design data includes identifying the ultimate design wind speed, nominal design wind speed, risk category, wind exposure and applicable internal pressure coefficient. For component and cladding systems that are not specifically designed by a registered design professional, design wind pressures in terms of psf (pounds per square foot) also are required. Roof systems typically are considered component and cladding systems. Design wind pressures in the field, perimeter and corner regions of roof areas should be noted in contract documents.

IBC's previous editions include similar contract document requirements.

For new construction projects, design loads most commonly will be identified on structural drawings in the project drawing set. For projects without specific structural drawings, design loads may be provided on architectural drawings or drawing notes or in project specifications.

ANSI/SPRI ES-1

ANSI/SPRI ES-1, "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems," which is referenced in IBC 2012, includes two primary elements: determination of design wind loads at roof edges (fascia, copings) and testing for resistance loads of copings and fascia.

Designers should not simply specify compliance with ANSI/SPRI ES-1 in project specifications; they should determine and clearly include design wind loads at roof edges in contract documents.

IBC 2012 indicates in Section 1504.5 Edge Securement for Low-slope Roofs design wind loads should be determined using the ultimate design wind speed and IBC 2012's Chapter 16, which is based on ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures."

IBC 2012 references ANSI/SPRI ES-1-03. ANSI/SPRI ES-1-03 is based upon ASCE 7-02, which is not an ultimate design wind speed-based method. Therefore, the design wind load determination method contained in ANSI/SPRI ES-1 does not satisfy IBC 2012's requirements for design wind loads at roof edges.

Design wind loads at roof edges should be determined using IBC 2012's Chapter 16 and be clearly noted in contract documents.

Responsibilities

Designers should not place the responsibility for determining roof system or individual component design wind loads on manufacturers, component suppliers or installers, or roofing contractors.

Also, designers' sole reliance on specifying wind speed warranties is not a substitute for code-required wind design data. Such warranties typically do not address consideration of ultimate and nominal design wind speeds, building height, risk category, wind exposure and internal pressure coefficients applicable to the specific building necessary for properly determining roof systems' design wind loads.

Responsibility for properly determining and clearly identifying wind design data, including design wind loads for roof systems, is required by the building code and is clearly that of roof system designers. Designers may retain a structural engineer or qualified consultant to help them fulfill their design responsibilities.

To help designers determine wind loads for commonly encountered low-slope roof systems, NRCA, the Midwest Roofing Contractors Association and North/East Roofing Contractors Association have developed and offer a free online application, Roof Wind Designer.

Roof Wind Designer is a web application that allows users to determine design wind loads using ASCE 7's, "Minimum Design Loads for Buildings and Other Structures," 2005 or 2010 editions.

Roof Wind Designer is accessible at www.roofwinddesigner.com.

MARK S. GRAHAM is NRCA's associate executive director of technical services.

16 www.professionalroofing.net MARCH 2014

Link

Professional Roofing
March 2014

Field uplift testing

INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Field-uplift testing

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

Using ASTM E907, a roof system is considered to be suspect if the deflection measured during the test is 25 mm (about 1 inch) or greater. During FM 1-52 testing, a roof system is suspect if the measured deflection is between ¼ of an inch and $^{9}/_{16}$ of an inch depending

regions, where a partial blow-off has occurred or where inferior roof system construction is suspected or known to be present.

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

Link

Methods

FM Global
Property Loss Prevention Data Sheets 1-52
July 2012
Page 1 of 24

FIELD VERIFICATION OF ROOF WIND UPLIFT RESISTANCE

FM Global clients must contact the local FM Global office before beginning uplift testing or any roofing work.

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FM Global

FM procedure; non-consensus

FM 1-52

Designation: E 907 – 96

An American National Standard

Standard Test Method for
Field Testing Uplift Resistance of Adhered Membrane Roofing Systems[1]

This standard is issued under the fixed designation E 907; 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.

1. Scope

1.1 This test method covers the determination of the resistance of adhered membrane roofing systems to uplift pressure. It applies to roof systems with or without rigid board insulation or base ply, which are either adhered or mechanically fastened, and fully adhered membrane.

1.2 This test method is intended to be used as a measure of the uplift resistance of the roofing system. Systems containing cold adhesive shall be in place for the cure time specified by the adhesive manufacturer to obtain optimum adhesion before conducting the test. Motorized vacuum shall be operated to accomplish the test. Mechanical vacuum shall be operated to accomplish the test.

1.3 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 ASTM Standards:
E 375 Practice for Metric Practice[2]
Building

3. Summary of Test Method

3.1 A controlled negative pressure is created on top of the roof surface by means of a chamber fitted with a pressure measuring device and vacuum equipment.

3.2 For roofs containing surfacing such as gravel, slag, or granules, the loose surfacing shall be removed by sweeping a 300 mm (12 in.) wide path around the perimeter of the test area. Care shall be taken not to damage the test area. A heavy pouring of hot asphalt is applied over the swept area and allowed to cool. This provides a smooth surface and allows the edges of the chamber to be in complete contact with the roof surface so that a negative pressure is developed inside the chamber. Other methods are not to be used to prepare the test area unless the method used will produce a tight seal and is compatible so as not to damage the roof membrane. Examples are the use of wet sand, duct tape, water, or polythene film.

4. Significance and Use

4.1 This field test method is suitable for determining the uplift resistance of the roofing system as stated in applicable specifications, bid documents, or when required by other authorities having jurisdiction. This field test method is also intended to supplement measurement of the uplift resistance performance of roofing systems as determined under laboratory

5.2 *Pressure-Sensing Device*, for measuring the negative pressure inside the chamber. The manometer shall be calibrated to indicate negative pressures in increments of 360 ± 20 Pa (7.5 ± 0.5 lbf/ft²).

5.3 *Vacuum Equipment*, with sufficient capacity to create the negative pressures required in the test chamber (see 8.4). The chamber vacuum equipment shall also be equipped with controls to maintain the constant negative pressure at each test pressure increment as required in 8.4.

5.4 *Dial Indicator*, with a reset face graduated in at least 0.05 mm (0.002 in.) units and having at least a 50 mm (2 in.) range, mounted at the center of a 50 by 50 by 1500 mm (2 by 2 by 59 in.) long aluminum bar or number of equivalent stiffness. Feet on each end of the bar provide support and give a clear distance of 50 mm (2 in.) above the roof surface. This allows measurement of roof surface deflections in the test area (see Fig. 2).

5.4.1 All persons not involved in the test shall be kept far enough away from the test area to ensure that the dial gage

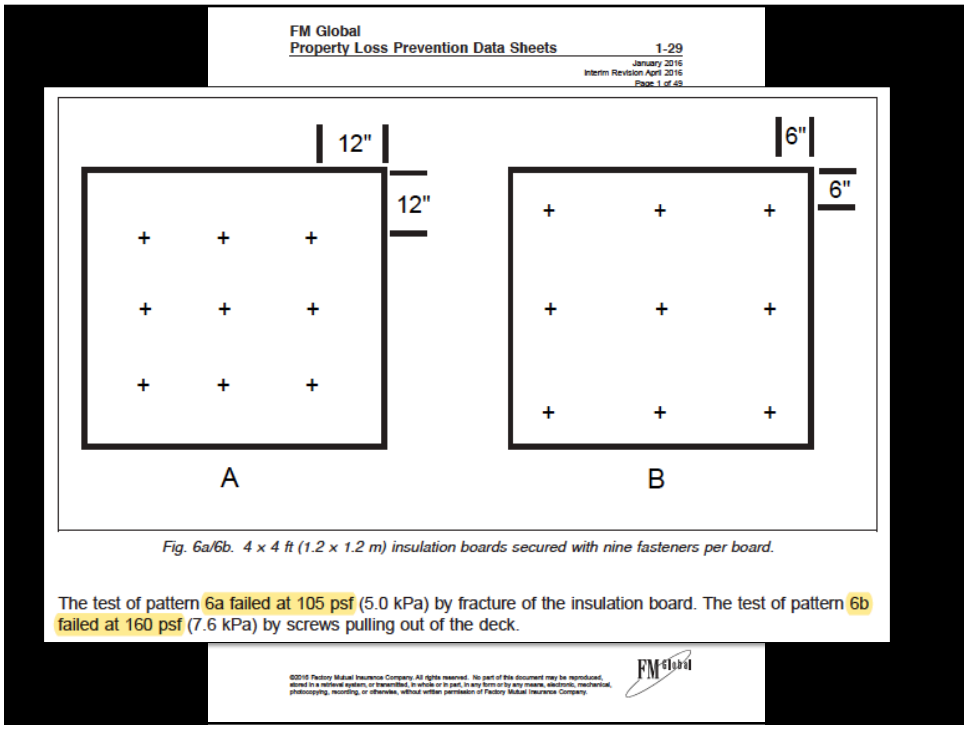
This test method is under the jurisdiction of ASTM Committee E-6 on Performance of Buildings and is the direct responsibility of Subcommittee E06.51 on Serviceability.

Current edition approved July 10, 1996. Published September 1996. Originally published as E 907 – 85. Last previous edition E 907 – 85 (1996)ε1.

[1] *1983 Annual Book of ASTM Standards*, Vol 04.11.

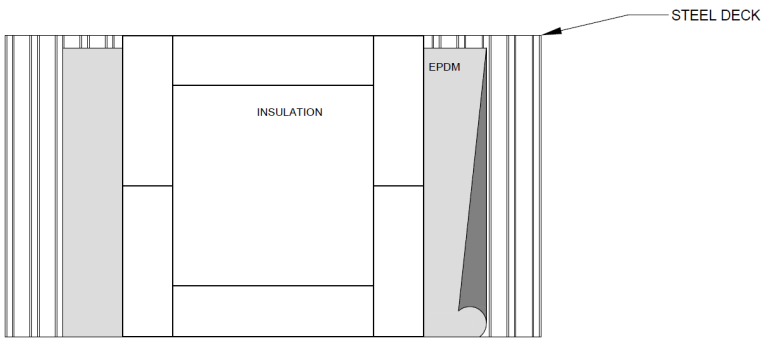
Was consensus; since withdrawn

ASTM E907



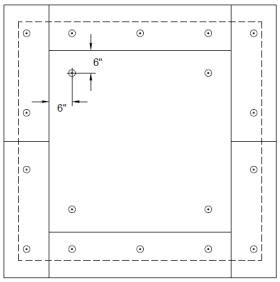
NRCA's laboratory testing

Controlled laboratory conditions

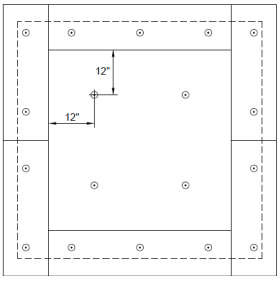


NRCA's laboratory testing

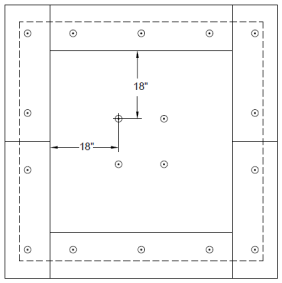
Controlled laboratory conditions



6" from edge



12" from edge

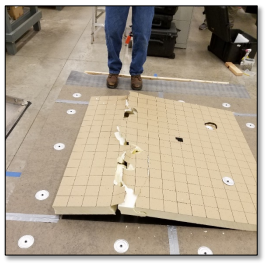


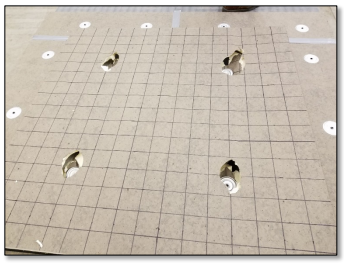
18" from edge

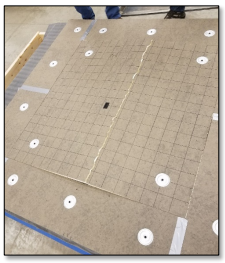
NRCA's laboratory testing -- Results

Controlled laboratory conditions

Condition	Fastener placement		
	6" from edge	**12" from edge**	**18" from edge**
Load a test failure	52.5 to 55 psf	60 to 75 psf	45 to 50 psf
Deflection at test failure	3¼" to 4"	2" to 5"	½" to 1"







NRCA's laboratory testing

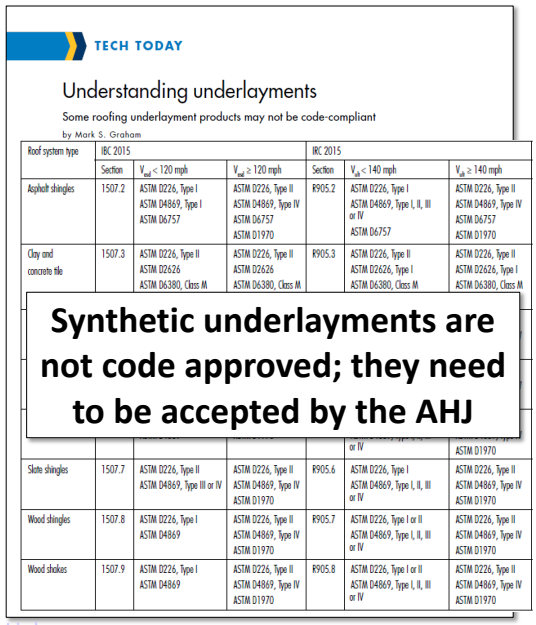
Controlled laboratory conditions

Interim findings:

- Results are variable/not repeatable
- Differences in failure loads between 6" and 12" fastener offsets are not as large as is indicated in FM 1-29
- FM 1-52's ¼" to 1"/ASTM E907's 1"maximum allowable deflections appear arbitrary/very conservative

NRCA will continue this testing…

Synthetic underlayment



TECH TODAY

Understanding underlayments

Some roofing underlayment products may not be code-compliant

by Mark S. Graham

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	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
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

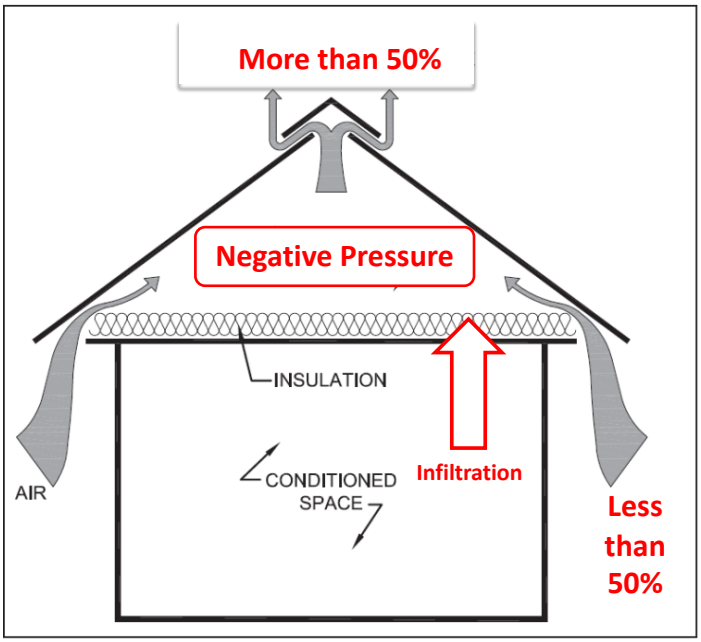
Synthetic underlayments are not code approved; they need to be accepted by the AHJ

Link

Professional Roofing
December 2016

Attic ventilation

What we (sometimes) do wrong?



Be careful not to install excess amounts of ridge vents…. It can have undesirable consequences.

If your company is selling ridge vents, you should also be selling soffit/eave vents.


RESEARCH+TECH

Clearing the air

Considerations for attic ventilation

by Mark S. Graham

Proper attic ventilation can be an important consideration when designing high-performing, steep-slope roof assemblies. For example, with some asphalt shingle products, proper attic ventilation may be a warranty requirement. Following is a review of code requirements and NRCA's guidelines for attic ventilation in steep-slope roof assemblies.

Code requirements

Code requirements for attic ventilation have varied between the International Building Code® (IBC) and International Residential Code® (IRC) and have changed with each edition up to the 2015 editions.

Beginning with the IBC's and IRC's 2015 editions, both codes require the net free ventilating area (NFVA) to be at least a 1:150 ratio of the space being vented. Any blocking or bridging in attics must not interfere with air movement, and an air space of at least 1 inch must be provided between the bottom of the roof deck and any attic insulation. Vent openings must protect against the entrance of rain and snow and be installed according to manufacturer's installation instructions.

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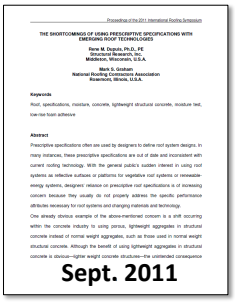
Moisture in concrete roof decks

Moisture in concrete roof decks


Moisture in concrete roof decks

Concrete's curing and drying rate can affect roof systems

Feb. 2010


THE SHORTCOMINGS OF USING PRESCRIPTIVE SPECIFICATIONS WITH EMERGING ROOF TECHNOLOGIES

Sept. 2011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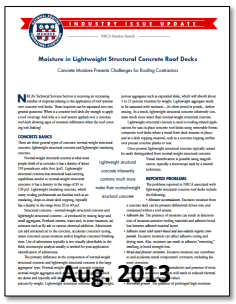
Concrete deck dryness

Alternative approaches are needed to determine when concrete decks are dry

Dec. 2012


INDUSTRY ISSUE UPDATE

Moisture in Lightweight Structural Concrete Roof Decks

Concrete Moisture Presents Challenges for Roofing Contractors

Aug. 2013


TECH TODAY

A troubling issue

Moisture in lightweight structural concrete presents concerns

Dec. 2013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Moisture in concrete roof decks

Sept. 2017

Moisture vapor reduction admixtures (MVRAs)


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Are admixtures the answer?

Moisture in concrete roof decks continues to be problematic

by Mark S. Graham

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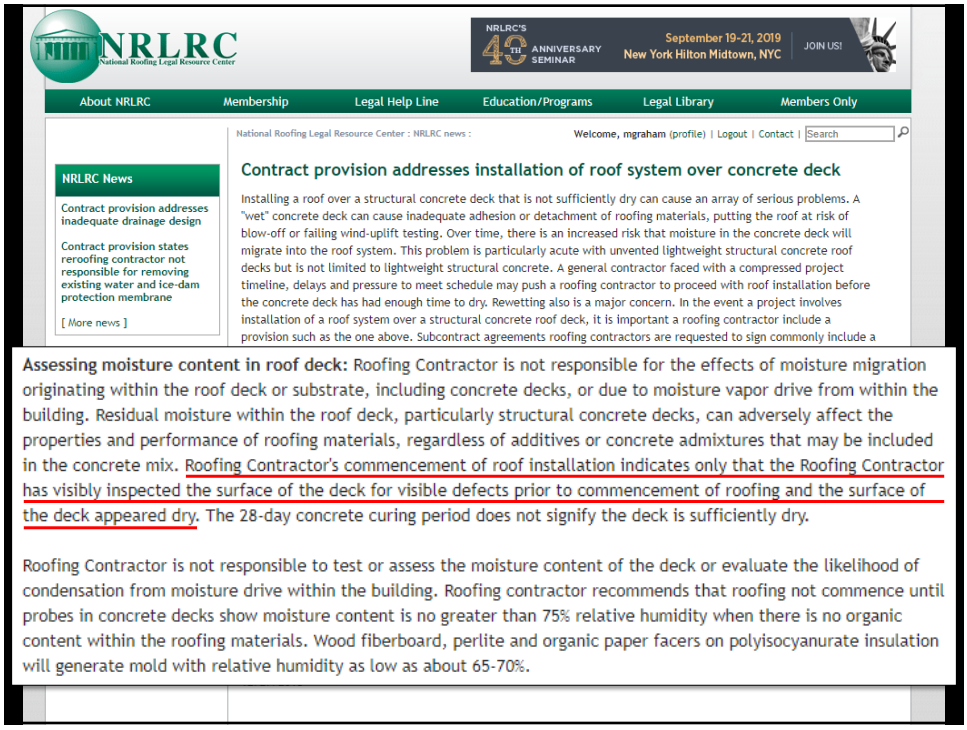
The roofing industry needs to re-think the concept of concrete roof deck "acceptance"

Who "owns" the moisture in concrete?

Why should we take responsibility (or incur liability) for someone else's moisture?



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NRLRC News

Contract provision addresses inadequate drainage design

Contract provision states reroofing contractor not responsible for removing existing water and ice-dam protection membrane

[More news]

Contract provision addresses installation of roof system over concrete deck

Installing a roof over a structural concrete deck that is not sufficiently dry can cause an array of serious problems. A "wet" concrete deck can cause inadequate adhesion or detachment of roofing materials, putting the roof at risk of blow-off or failing wind-uplift testing. Over time, there is an increased risk that moisture in the concrete deck will migrate into the roof system. This problem is particularly acute with unvented lightweight structural concrete roof decks but is not limited to lightweight structural concrete. A general contractor faced with a compressed project timeline, delays and pressure to meet schedule may push a roofing contractor to proceed with roof installation before the concrete deck has had enough time to dry. Rewetting also is a major concern. In the event a project involves installation of a roof system over a structural concrete roof deck, it is important a roofing contractor include a provision such as the one above. Subcontract agreements roofing contractors are requested to sign commonly include a

Assessing moisture content in roof deck: Roofing Contractor is not responsible for the effects of moisture migration originating within the roof deck or substrate, including concrete decks, or due to moisture vapor drive from within the building. Residual moisture within the roof deck, particularly structural concrete decks, can adversely affect the properties and performance of roofing materials, regardless of additives or concrete admixtures that may be included in the concrete mix. Roofing Contractor's commencement of roof installation indicates only that the Roofing Contractor has visibly inspected the surface of the deck for visible defects prior to commencement of roofing and the surface of the deck appeared dry. The 28-day concrete curing period does not signify the deck is sufficiently dry.

Roofing Contractor is not responsible to test or assess the moisture content of the deck or evaluate the likelihood of condensation from moisture drive within the building. Roofing contractor recommends that roofing not commence until probes in concrete decks show moisture content is no greater than 75% relative humidity when there is no organic content within the roofing materials. Wood fiberboard, perlite and organic paper facers on polyisocyanurate insulation will generate mold with relative humidity as low as about 65-70%.

Roofing industry-funded research

Moisture in concrete roof decks

Phase 1:

- Primary sponsors:
  - NRCA
  - Chicago Roofing Contractors Association
  - Chicagoland Roofing Council
- Additional sponsors:
  - GAF
  - Soprema
  - Canadian Roofing Contractors Association

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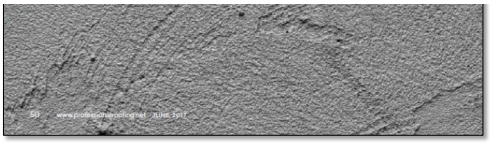
Phase 1 results -- June 2017

	ASTM E96 calculated perm			
	Lightweight structural concrete		Normal weight concrete	
Age	Wet cup	Dry cup	Wet cup	Dry cup
28 days	1.48	0.78	3.42	1.05
60 days	1.45	0.47	2.03	1.13

The figure shows results of ASTM E96 water vapor transmission testing. Note the lightweight structural concrete has about half of the permeability of regular weight concrete. Considering lightweight structural concrete arrives with more than twice the evaporable water of regular weight concrete, this explains why lightweight structural concrete retains moisture for so long.



Roofing industry-funded research

Moisture in concrete roof decks

Phase 2:

- Primary sponsors:
  - NRCA
  - Roofing Industry Alliance for Progress
  - Chicago Roofing Contractors Association
  - Chicagoland Roofing Council
- Additional sponsors:
  - GAF
  - JM

Matt Dupuis from SRI Consultants will present preliminary findings from the Phase 2 work

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