Wealth Builder/Partners in Growth Conference
April 9-12, 2017
La Cantera Resort and Spa, San Antonio, Texas

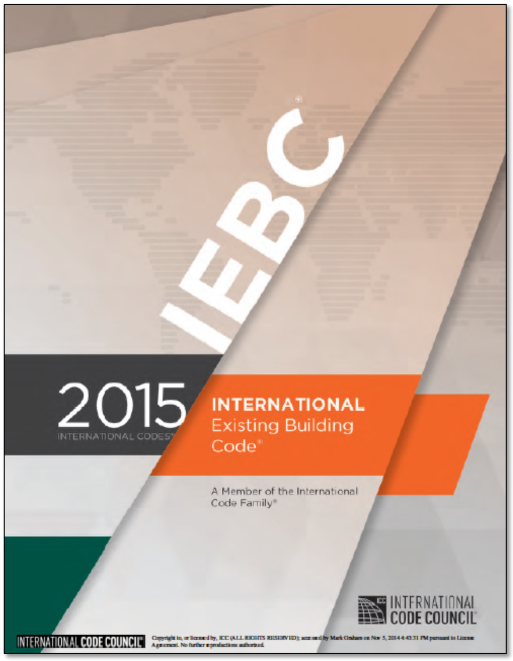
Technical issues: Challenges and opportunities

presented by

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

Topics

- *International Existing Building Code, 2015 Edition*
- Manufacturers' application instructions
- Wind warrantees
- Field uplift testing
- Moisture in concrete roof decks
- Steel roof deck uplift
- Insurance claim handling

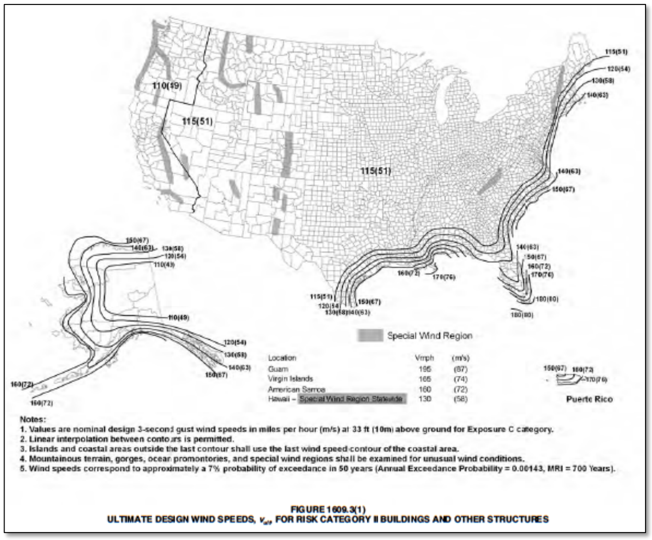


International Existing Building Code, 2015 Edition

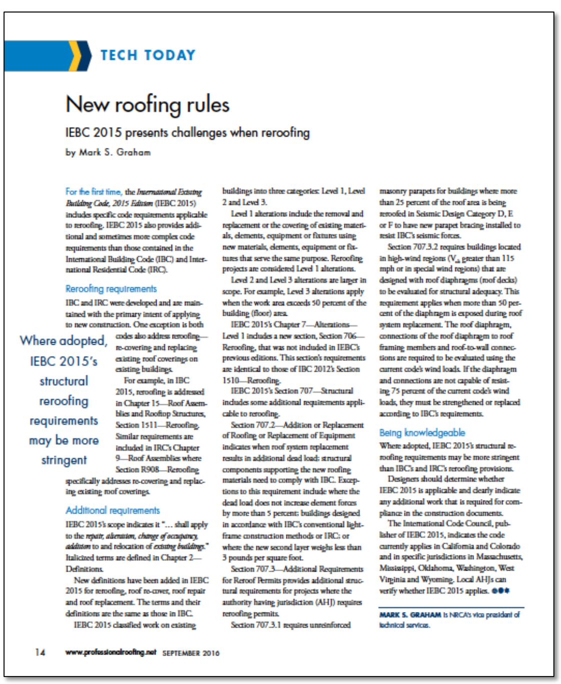
IEBC 2015's reroofing-related provisions

- Sec. 706: Reroofing provisions identical to IBC 2012
- Sec. 707.2: Additional gravity load triggers upgrade to IBC 2015's structural requirements
- In AHJ's that require reroofing permits:
  - Sec. 707.3.1: Reinforce unreinforced parapets in Seismic Design Category Regions D, E or F
  - Sec. 707.3.2: Roof diaphram load evaluation where $V_{ULT} > 115$ mph

Where is V_{ULT} > 115 mph?



- Atlantic and Gulf of Mexico coastlines
- Alaska coastline
- Hawaii and US territories
- "Special wind regions" (shaded)
- Also (except in CA, OR and WA):
  - Buildings that represent a substantial hazard to human life
  - Essential facilities (hospitals)



TECH TODAY

New roofing rules

IEBC 2015 presents challenges when reroofing

by Mark S. Graham

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

Reroofing requirements

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

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

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

Additional requirements

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

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

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

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

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

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

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

Section 707.2—Addition or Replacement of Roofing or Replacement of Equipment indicates when roof system replacement results in additional dead load: structural components supporting the new roofing materials need to comply with IBC. Exceptions to this requirement include where the dead load does not increase element forces by more than 5 percent; buildings designed in accordance with IBC's conventional light-frame construction methods or IRC; or where the new second layer weighs less than 3 pounds per square foot.

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

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

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

Being knowledgeable

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

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

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

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

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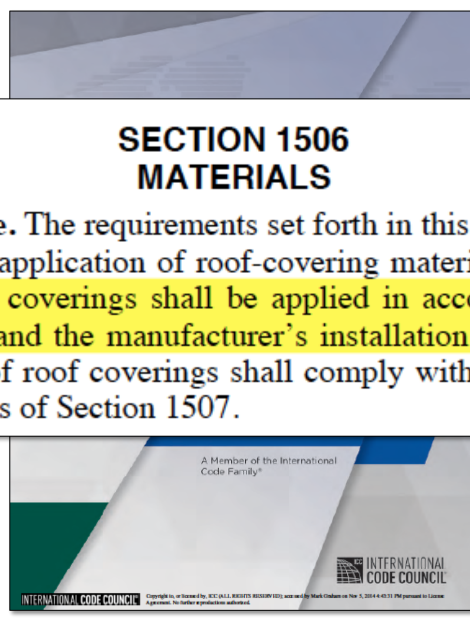
Manufacturers' application instructions

International Building Code



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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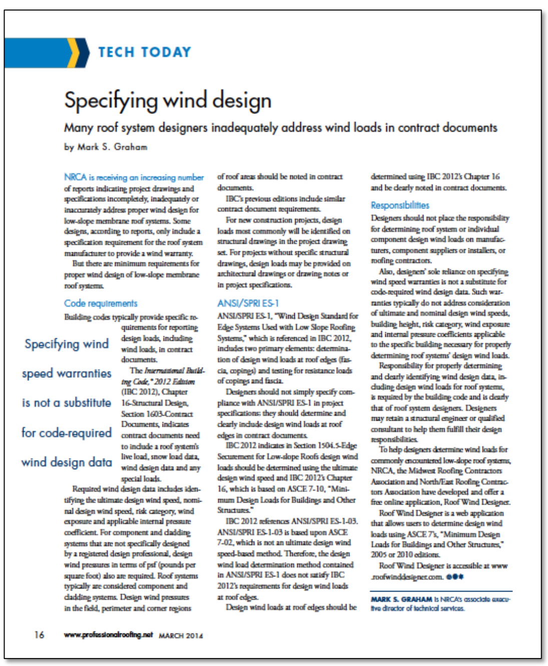
<u>**Wind warrantees**</u>

Wind warrantee concerns

- Typical evidence of inadequate wind design
  - Buildings are designed for pressure resistance, not wind speed
  - Design wind speeds are measured 10 m (33 ft.) above grade
- Code requires wind loads/conditions be indicated in construction documents (IBC Sec. 1603)
- Some manufacturers are more conservative than others in determining requirements



TECH TODAY

Specifying wind design

Many roof system designers inadequately address wind loads in contract documents

by Mark S. Graham

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.

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

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.

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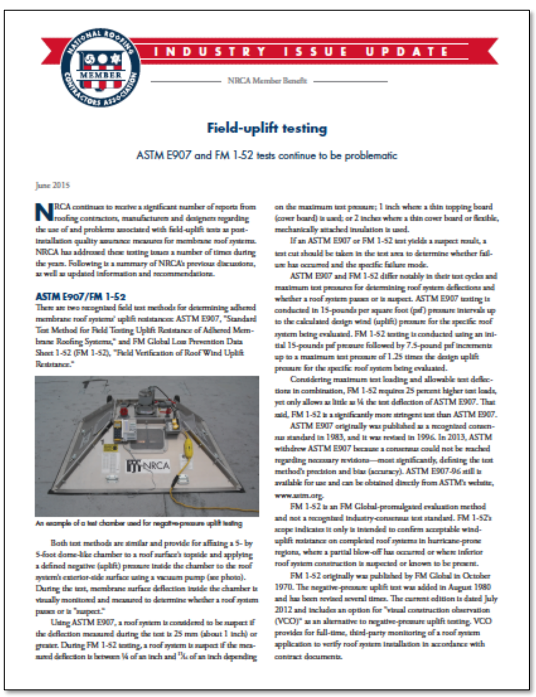
Field uplift testing

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



INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Field-uplift testing

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

June 2015

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

ASTM E907/FM 1-52

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

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

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

Using ASTM E907, a roof system is considered to be suspect if the deflection measured during the test is 25 mm (about 1 inch) or greater. During FM 1-52 testing, a roof system is suspect if the measured deflection is between ¼ of an inch and $^{11}/_{16}$ of an inch depending on the maximum test pressure; 1 inch where a thin topping board (cover board) is used; or 2 inches where a thin cover board or flexible, mechanically attached insulation is used.

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

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

Considering maximum test loading and allowable test deflections in combination, FM 1-52 requires 25 percent higher test loads, yet only allows as little as ¼ the test deflection of ASTM E907. That said, FM 1-52 is a significantly more stringent test than ASTM E907.

ASTM E907 originally was published as a recognized consensus standard in 1983, and it was revised in 1996. In 2013, ASTM withdrew ASTM E907 because a consensus could not be reached regarding necessary revisions—most significantly, defining the test method's precision and bias (accuracy). ASTM E907-96 still is available for use and can be obtained directly from ASTM's website, www.astm.org.

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

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

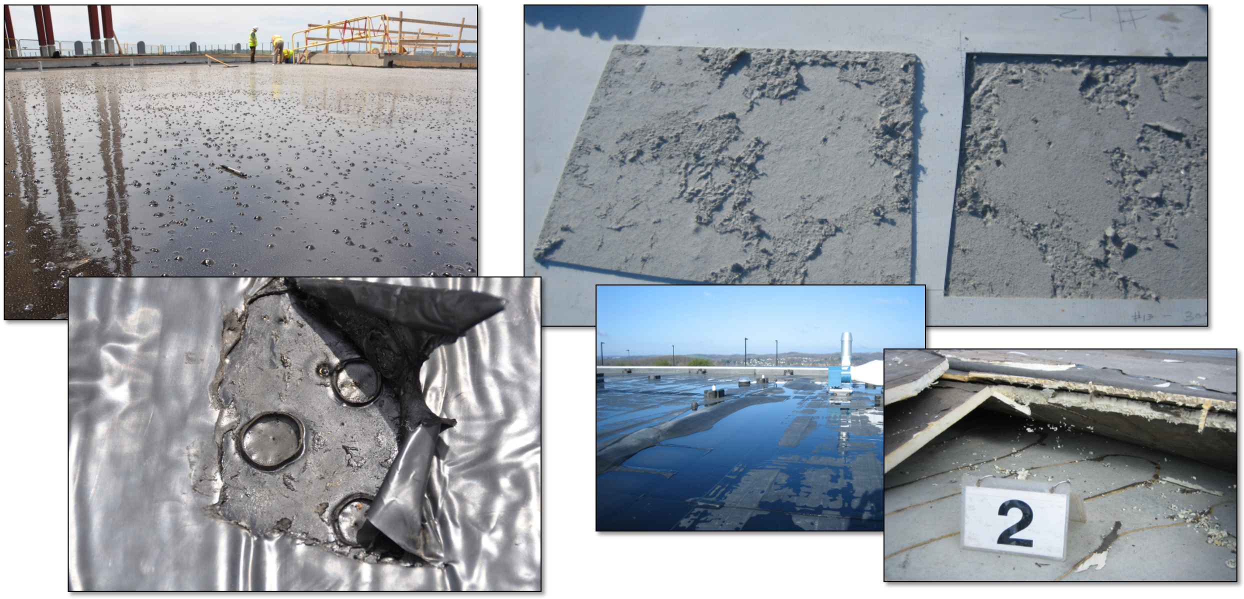
NRCA's experience:

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

NRCA's recommendations:

- Consider avoiding projects were ASTM E907/FM 1-52 is specified as acceptance (payment) criteria
- Use proposal and contract language (sample language provided)

Moisture in concrete roof decks

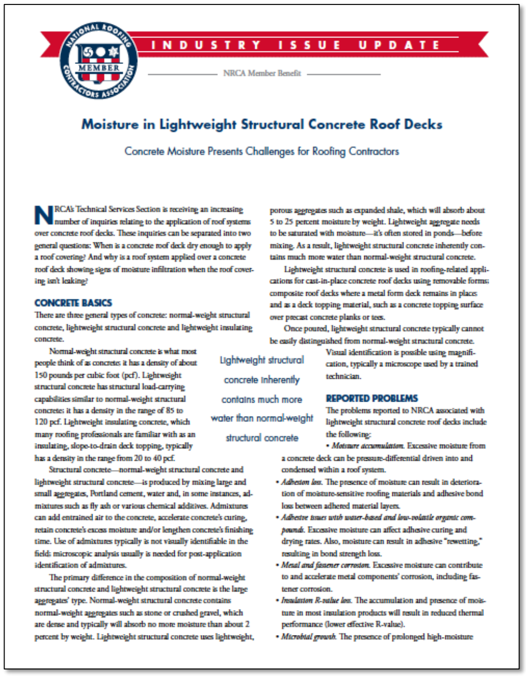


Concrete Floors and Moisture, 2nd Edition

Howard M. Kanare, CTL Group

75% internal RH can be achieved:

- Normal weight structural concrete
  - Less than 90 days
- Lightweight structural concrete
  - Almost 6 months



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.

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.

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

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

Key points:

- Concrete mix designs have become more complex
- Concrete deck dryness test methods can lead to false "dry" indications
- Roofing contractors should not make "went to roof" decisions

Recommendations:

- Consider avoiding lightweight structural concrete
- Remedial repairs

Concrete deck moisture research

Funded by NRCA, GAF and others

Steel roof deck uplift

Steel roof deck design

Steel Deck Institute

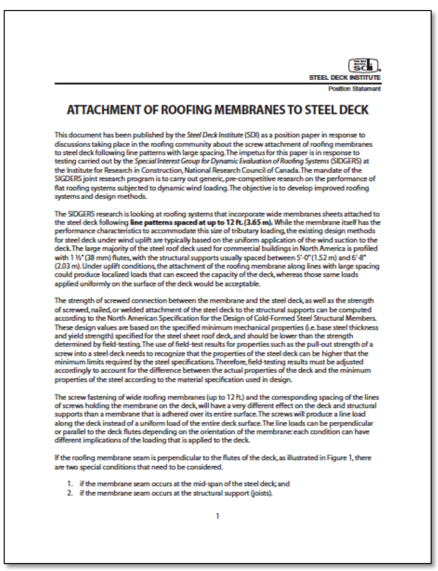
- SDI Design Manual
- AISI S100, "Specifications for the Design of Cold-formed Steel Structural Members"
- ANSI/SDI RD1.0-2006, "Standard for Steel Roof Deck"
- ANSI/SDI RD-2010, "Standard for Steel Roof Deck"
- SDI *Roof Deck Design Manual, First Edition* (Nov. 2012)

SDI methods – wind uplift resistance

- Minimum 30 psf uplift (uniform loading)
- Minimum 45 psf uplift (uniform loading) at roof overhangs

SDI bulletin

2009


STEEL DECK INSTITUTE

Position Statement

ATTACHMENT OF ROOFING MEMBRANES TO STEEL DECK

This document has been published by the *Steel Deck Institute* (SDI) as a position paper in response to discussions taking place in the roofing community about the screw attachment of roofing membranes to steel deck following line patterns with large spacing. The impetus for this paper is in response to testing carried out by the *Special Interest Group for Dynamic Evaluation of Roofing Systems* (SIDGERS) at the Institute for Research in Construction, National Research Council of Canada. The mandate of the SIGDERS joint research program is to carry out generic, pre-competitive research on the performance of flat roofing systems subjected to dynamic wind loading. The objective is to develop improved roofing systems and design methods.

The SIDGERS research is looking at roofing systems that incorporate wide membranes sheets attached to the steel deck following **line patterns spaced at up to 12 ft. (3.65 m).** While the membrane itself has the performance characteristics to accommodate this size of tributary loading, the existing design methods for steel deck under wind uplift are typically based on the uniform application of the wind suction to the deck. The large majority of the steel roof deck used for commercial buildings in North America is profiled with 1 ½" (38 mm) flutes, with the structural supports usually spaced between 5'-0" (1.52 m) and 6'-8" (2.03 m). Under uplift conditions, the attachment of the roofing membrane along lines with large spacing could produce localized loads that can exceed the capacity of the deck, whereas those same loads applied uniformly on the surface of the deck would be acceptable.

The strength of screwed connection between the membrane and the steel deck, as well as the strength of screwed, nailed, or welded attachment of the steel deck to the structural supports can be computed according to the North American Specification for the Design of Cold-Formed Steel Structural Members. These design values are based on the specified minimum mechanical properties (i.e. base steel thickness and yield strength) specified for the steel sheet roof deck, and should be lower than the strength determined by field-testing. The use of field-test results for properties such as the pull-out strength of a screw into a steel deck needs to recognize that the properties of the steel deck can be higher that the minimum limits required by the steel specifications. Therefore, field-testing results must be adjusted accordingly to account for the difference between the actual properties of the deck and the minimum properties of the steel according to the material specification used in design.

The screw fastening of wide roofing membranes (up to 12 ft.) and the corresponding spacing of the lines of screws holding the membrane on the deck, will have a very different effect on the deck and structural supports than a membrane that is adhered over its entire surface. The screws will produce a line load along the deck instead of a uniform load of the entire deck surface. The line loads can be perpendicular or parallel to the deck flutes depending on the orientation of the membrane: each condition can have different implications of the loading that is applied to the deck.

If the roofing membrane seam is perpendicular to the flutes of the deck, as illustrated in Figure 1, there are two special conditions that need to be considered.

1. if the membrane seam occurs at the mid-span of the steel deck; and
2. if the membrane seam occurs at the structural support (joists).

1

- Decks designed for joist spacing between 5' and 6' 8" o.c.
- Deck designed for uniform loading
- Seam-fastened single-ply membranes are a concern

Steel roof deck design

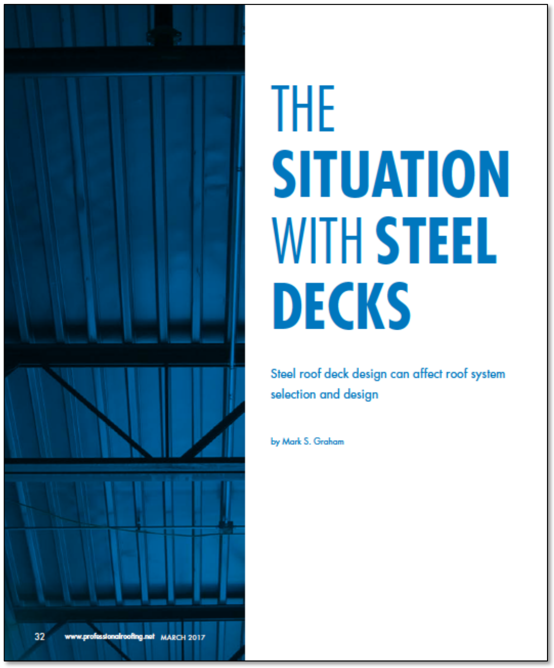
FM Global and FM Approvals

- FM 4451 (1978 and June 2012)
- FM 4470 (prior editions and June 2012)
- FM 1-29 (prior editions and April 2016)

FM 1-29 April 2016 is the first useable design guidance for steel roof decks when using seam-fastened mechanically-attached single-ply membrane roof systems

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



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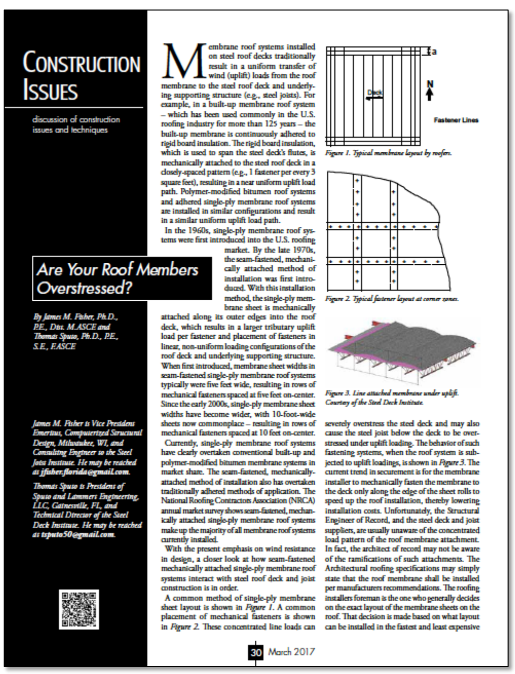
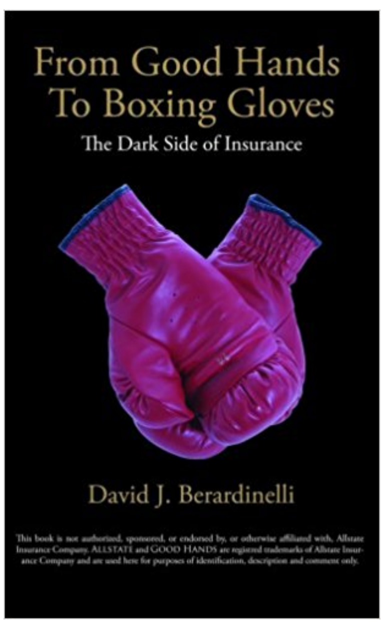


***Structure* magazine**
March 2017
www.structuremag.org

Insurance claim handling

- Insurance regulations vary state-to-state
- Insurance policies vary between companies and customers
  - Actual cash value (ACV) vs. replacement cost
- "Code upgrade" coverage is dictated policy language
- Repairs are required to comply with the current code
  - Manufacturer's installation instructions apply
- Match rules vary by state
- Discontinued products



- How insurance companies have changed their insurance claim handling procedures
- Home repair estimating systems: Xactimate and IntegriClaim
- Presented from the property owners' perspective

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