

CSI Master Specifiers Retreat

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Roof Systems: Choices, Decisions and Performance Implications

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About NRCA

- National trade association of roofing contractors
- Founded in 1886
- Based in Rosemont, IL (suburban Chicago)
- 3,500+ members, all 50 states and 53 countries
- Member company volume varies from <\$1 million to \$435 million
- Residential and commercial contractors; more than 50% do both
- More than 1/3 have been in business 25+ years
- Many multi-generation family businesses



Roof Systems: Choices, Decisions and Performance Implications

About me

- Grew up in a family-run construction business
- Degree in architectural engineering
- Roofing contracting business
- Consulting engineering business
- Last 21 years with NRCA
- Industry involvement includes ASHRAE, ASTM, ICC, NFPA, UL
- Personal web site: www.MarkGrahamNRCA.com
- Twitter: @MarkGrahamNRCA



Roof Systems: Choices, Decisions and Performance Implications

Topics

- FM, UL and ASTM classifications
- Energy code requirements
- Polyisocyanurate insulation
- Asphalt
- Roof decks
- Water-based bonding adhesives
- Wind design and wind warranties
- Questions (other topics)



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FM classifications

FM Global is an insurance company, with a wholly-owned subsidiary, FM Approvals, that is a code-approved testing agency.

“FM 1-60A” classification:

- The “1” designates Class 1 (internal fire) construction
- The “-60” designates 30 psf allowable uplift in the field of the roof
- “A” designates ASTM E108 external fire classification



UL classifications

Fire classifications (UL 790/ASTM E108 external fire):

- Class A: “Severe” fire test exposure
- Class B: “Moderate” fire test exposure
- Class C: “Light” fire test exposure

What fire class is required? (IBC Sec. 1505):

TABLE 1505.1 ^{a, b} MINIMUM ROOF COVERING CLASSIFICATION FOR TYPES OF CONSTRUCTION								
IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
B	B	B	C ^c	B	C ^c	B	B	C ^c



UL classifications – cont.

Wind uplift classifications (UL 580, UL 1897)

- Class 30: 30 psf uplift (no safety factor)
- Class 60: 60 psf uplift (no safety factor)
- Class 90: 90 psf uplift (no safety factor)

Be careful no to confuse FM's uplift classifications
with UL's classifications



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Wind uplift – Steep-slope products

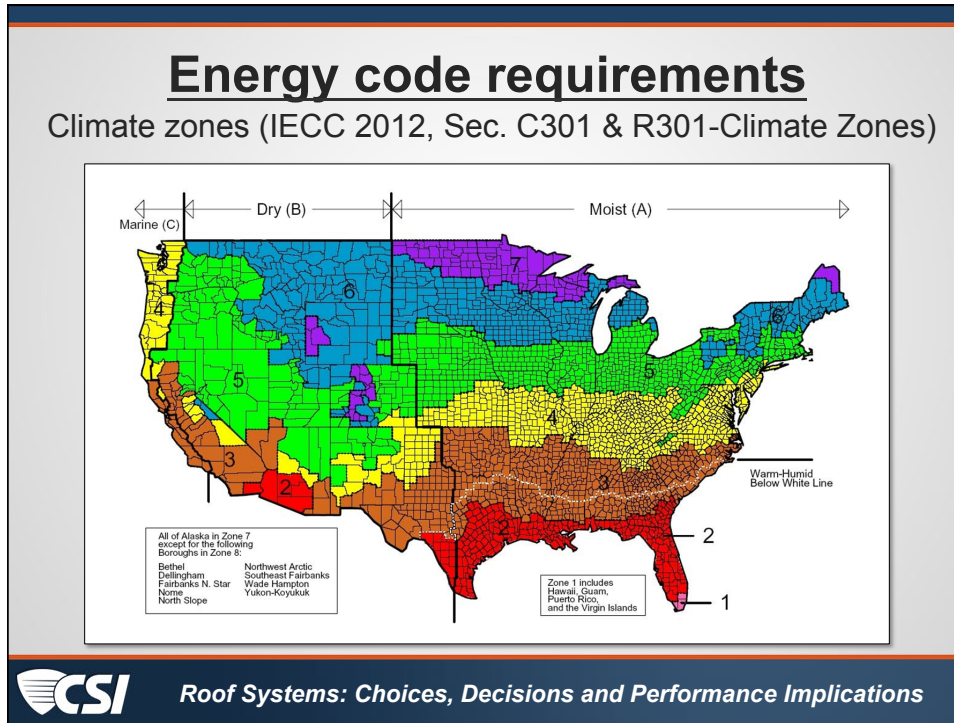
ASTM D3161/ASTM D7158 testing:

- Class A: 60 mph
- Class D: 90 mph
- Class F: 110 mph
- Class G: 120 mph
- Class H: 150 mph

Note these classification designations are reversed
from those used in fire testing...don't get confused.



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Roofing-specific adaptation of Table 502.2(1)

International Energy Conservation Code, 2009 Edition (Commercial buildings)

Opaque Thermal Envelope Assembly Requirements			
Climate zone	Roof assembly configuration		
	Insulation entirely above deck	Metal buildings (with R-5 thermal blocks)	Attic and other
1	R-15ci	R-19	R-30
2	R-20ci	R-13 + R-13	R-38
3			
4			
5			
6	R-25ci	R-13 + R-19	R-49
7			
8			

ci = Continuous insulation
 LS = Liner system (a continuous membrane installed below the purlins and uninterrupted by framing members; uncompressed, faced insulation rests on top of the membrane between the purlins)

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Roofing-specific adaptation of Table C402.2

International Energy Conservation Code, 2012 Edition (Commercial buildings)

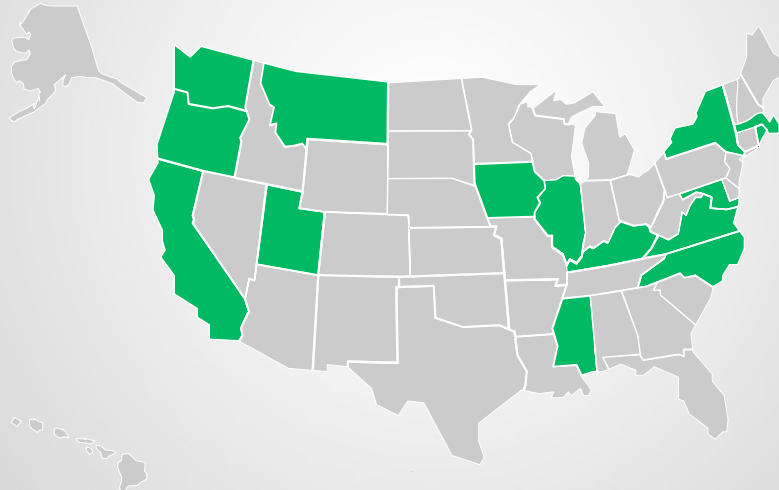
Opaque Thermal Envelope Assembly Requirements			
Climate zone	Roof assembly configuration		
	Insulation entirely above deck	Metal buildings (with R-5 thermal blocks)	Attic and other
1	R-20ci	R-19 + R-11 LS	R-38
2			
3			
4	R-25ci	R-25 + R-11 LS	R-49
5			
6	R-30ci	R-30 + R-11 LS	
7	R-35ci	R-30 + R-11 LS	
8			

ci = Continuous insulation
 LS = Liner system (a continuous membrane installed below the purlins and uninterrupted by framing members; uncompressed, faced insulation rests on top of the membrane between the purlins)

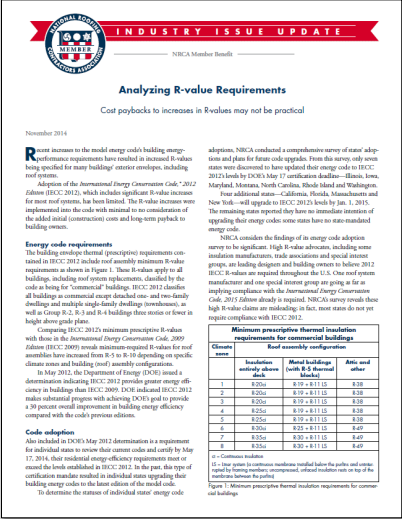


Status of states' adoptions

Adoption of IECC 2012 before Jan. 1, 2015



Is there a realistic payback?



Analyzing R-value Requirements
Cost paybacks to increases in R-values may not be practical

November 2014

Recent increases to the model energy code's building energy performance requirements have resulted in increased R-values being specified for many buildings' exterior envelopes, including roof systems.

Adoption of the International Energy Conservation Code (IECC) 2012, which includes significant R-value increases for most systems, has been limited. Most R-value increases were implemented into the code with intent to no consideration of the added initial (construction) costs and long-term payback to building owners.

Energy code requirements

The building envelope thermal (specifies) requirements contained in IECC 2012 include roof assemblies minimum R-value requirements as shown in Figure 1. These R-values apply to all buildings, including roof system typologies, classified by the code as being for "commercial" buildings. IECC 2012 classifies all buildings as commercial energy classifications, and new-family dwellings and multiple single-family dwellings (condominiums), as well as Group B-2, B-3 and C-4 buildings, then states or lists to high above grade plans.

Comparing IECC 2012 minimum prescriptive R-values with those in the International Energy Conservation Code, 2009 Edition (IECC 2009) reveals minimum required R-values for roof assemblies have increased from R-5 to R-10 depending on specific climate zone and building level assembly configurations.

In May 2014, the Department of Energy (DOE) issued a determination indicating IECC 2012 provide greater energy efficiency to buildings than IECC 2009. DOE indicated IECC 2012 makes substantial progress with achieving DOE's goal to provide a 30 percent overall improvement in building energy efficiency compared with the code's previous edition.

Code adoption

Also included in ENR's May 2012 determination is a requirement for individual states to review their current codes and certify by May 17, 2014, that national energy efficiency requirements meet or exceed the levels established in IECC 2012. In the past, this type of certification has been provided in individual states regarding their building energy codes to the best of their ability.

To determine the status of individual state energy code adoption, NRCA conducted a comprehensive survey of state adoption and plans for future code upgrades. From this survey only seven states were determined to have updated their energy code to IECC 2012 levels by DOE's May 17 certification deadline—Illinois, Iowa, Maryland, Missouri, North Carolina, Rhode Island and Washington.

Four additional states—California, Florida, Massachusetts and New York—will upgrade to IECC 2012 levels by Jan. 1, 2015. The remaining states reported they have no intention of updating their energy codes since they have no state-standard energy code.

NRCA considers the findings of its energy code adoption survey to be significant. High R-value allowances, including area insulation manufacturers, trade associations and special interest groups, are building designers and building owners to follow 2012 IECC R-values are required throughout the U.S. One roof system manufacturer and one special interest group are going as far as implying compliance with the International Energy Conservation Code, 2012 Edition already is required. NRCA's survey reveals these high R-value claims are misleading. In fact, most states do not yet require compliance with IECC 2012.

Climate zone	Roof assembly configurations		
	Insulation solely above deck	Roof buildings with R & thermal breaks	Roofs and other
1	R-20 ¹	R-19 + R-11 ^{1,2}	R-18
2	R-20 ¹	R-19 + R-11 ^{1,2}	R-18
3	R-20 ¹	R-19 + R-11 ^{1,2}	R-18
4	R-20 ¹	R-19 + R-11 ^{1,2}	R-18
5	R-25 ¹	R-19 + R-11 ^{1,2}	R-18
6	R-30 ¹	R-23 + R-11 ^{1,2}	R-20
7	R-35 ¹	R-23 + R-11 ^{1,2}	R-20
8	R-35 ¹	R-23 + R-11 ^{1,2}	R-20

1 = 1/2" gaps in continuous insulation permitted below the purlins and rafters, except for trusses, where continuous insulation must be in or of the members between bays.
2 = 1/2" Maximum prescriptive thermal insulation requirements for commercial buildings.

NRCA "Industry Issue Update," Nov. 2014:


- R-15 to R-20: 14 to 24 yrs.
- R-20 to R-25: 26 to 63 yrs.
- R-25 to R-30: 48 to 133 yrs.

Average roof life is 17.4 yrs.

Polyisocyanurate insulation

ASTM C1289:

- Type I (wall sheathing)
- Type II (faced roof insulation)
- Type III (perlite board laminate)
- Type IV (wood-fiber board laminate)
- Type V (OSB/plywood laminate)
- Type VII (glass mat-faced gypsum board laminate)



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ASTM C1289, Type II:

- Class 1 (cellulose facers)
 - Grade 1: 16 psi compressive strength
 - Grade 2: 20 psi compressive strength
 - Grade 3: 25 psi compressive strength
- Class 2 (coated-glass facers)
- Class 3 (uncoated-glass facers)
- Class 4 (high-density product)
 - Grade 1: 80 psi compressive strength
 - Grade 2: 110 psi compressive strength
 - Grade 3: 140 psi compressive strength



When specifying polyiso.

Use ASTM C1289 and the specific Type, Class and Grade for the desired product



Polyisocyanurate insulation

- R-value versus LTTR

	ASTM C518	ASTM C1303
1 inch	6.2	5.6 / inch
2 inch	12.3	5.7 / inch
3 inch	--	5.8 / inch
4 inch	--	5.9 / inch

- LTTR represents a 15-year time-weighted-average of R-value; corresponds to the estimated R-value after 5-years of aging.

Roof Systems: Choices, Decisions and Performance Implications

Polyisocyanurate insulation

R-value concerns
R-values are found to be below LTTR
by Mark S. Graham

NRCA testing
NRCA obtained 15 samples of new (untested) 2-inch-thick, 4-ft-thick polyisocyanurate insulation from NRCA contractor members throughout the U.S. The samples were prepared in accordance with ASTM C1289, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus. The samples ranged in age from four to 13 months. R-values were tested at a 75 F mean reference temperature, as well as at 25 F, 40 F and 100 F. NRCA notes these additional test temperatures as being more representative of actual service conditions than the 75 F reference temperature typically used for product comparison and labeling. A graph of mean tested R-values is provided in the figure.

Comparing R-values
LTTR is intended to represent the R-value of specimens tested at the year of aging when used in a controlled laboratory environment. The five-year figure corresponds closely to a predicted 15-year time-weighted average of R-values. ASTM C518—the same test method used in NRCA testing—is the preferred test method for determining specimen R-values in the LTTR methodology. However, in the LTTR methodology, the foam material's thickness is reduced (flattened) and aged to simulate aging before testing. (For additional information, see "Testing LTTR," January 2010 issue, page 36.)

Because of NRCA's test results, mean tested R-values lower than the predicted five-year value in laboratory conditions (LTTR), NRCA also notes NRCA's test values are somewhat lower than those of ASTM C1303, Standard Specification for Rigid Cellular Polyisocyanurate Thermal Insulation Board, at 40 F.

What to do!
NRCA cautions in beginning recommendations that designers determine polyisocyanurate board insulation's total in-service thermal resistance on the basis of an R-value of 5.6 per inch. However, based on NRCA's testing, it may be prudent for designers to use an even lower R-value when designing for cold conditions, such as in northern climates or cold-storage applications.

Mark S. Graham is NRCA's executive vice president of technical services.

Professional Roofing, May 2010:

- Tested "aged" R-values are less than LTTR
- Polyiso's LTTR and R-values are temperature sensitive
- NRCA's recommendation:
 - $R_{Aged} = 5.0/\text{inch}$ (heating)
 - $R_{Aged} = 5.6/\text{inch}$ (cooling)

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When specifying insulation...

...NRCA recommends insulation be specified by its thickness (and ASTM designation), not by its R-value or LTTR...



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Asphalt

- IARC has classified oxidized asphalt as “Group 2A”, that is, “probably carcinogenic to humans”
- ASTM D312 has been revised:
 - Maximum kettle temperature of 550 F
 - Maximum EVT values (430 F to 485 F)
 - Lot-specific labeling of EVT
- NRCA recommends specifying “...ASTM D312-15...”



Roof Systems: Choices, Decisions and Performance Implications

Water-based bonding adhesives



THE BUT DIFFER!

In markets subject to volatile organic compound (VOC) regulations, single-ply roof membrane manufacturers apply alternative materials for water-based adhesives and primers. Among the VOC-regulation-compliant materials that have emerged, low-VOC solvent-based and water-based adhesives are marketed as direct replacements for VOC-solvent-based contact adhesives.


Although marketed as direct replacements, these materials should be considered apart from traditional solvent-based contact adhesives. For one thing, work and handling practices for low-VOC materials differ somewhat from those for traditional solvent-based materials, and water-based formulas present some challenges that are unique from both types of solvent-based materials. Additionally, depending on specific products and manufacturers, different recommendations for handling and use may apply for products within the same general category.

Where are VOC regulations?

The California Clean Air Act of 1988 established the framework for the state's air quality management efforts, including its requirements for controlling ground-level ozone. To meet the requirements, in 1990, the South Coast Air Quality Management District, which is the air pollution control agency for Orange County and urban portions of Los Angeles, Riverside and San Bernardino counties, adopted Rule 1108. Rule 1108 limits VOC content of adhesives and sealants, including single-ply roof membrane adhesives and primers. The VOC content limits introduced in Rule 1108 have since been included in similar regulations adopted by a number of other California air districts.

40 www.professionalroofing.net AUGUST 2012

Professional Roofing, August 2012



Temperature/humidity limitations

TECH TODAY

Cold weather application

Installing roofing products and roof systems in fall and winter can prove challenging

by Mark S. Graham

Roofing in cold weather, such as during late fall and winter in northern climates, presents roofing contractors with challenges. In addition to having to manage relatively cold roofing temperatures and increased moisture, contractors face working with roofing products that are temperature- and moisture-sensitive.

The new NRCA established a Cold Weather Application Task Force to review manufacturers' recommendations for roofing products and roof system applications during cold weather.

Certain roofing products and roof system types are temperature-sensitive

Temperature limitations for roofing contractors have long recognized certain roofing products and roof system types are temperature-sensitive. For example, with low-temperature limitations of roof systems, when ambient temperatures are less than 40 F, determining the distance between heating equipment and the point of application and using insulated roofing between equipment and decking equipment is recommended by NRCA and most manufacturers to make sure heat is at its maximum temperature at the point of application.

For all roofing asphalt shingles, it is important to ensure that asphalt is fully cured and ready to be applied during the installation process. However, some manufacturers provide guidelines along with certain shingles that will activate at low temperatures. Also, in cold weather applications situations, manufacturers suggest hand-applied asphalt during installation to prevent shingle tabs from lifting and the danger of wind-blown debris.

The relatively recent introduction of water-based and low-volatile organic compound (VOC) adhesives, such as those used with fully adhered single-ply membrane roof systems and membrane flashings, present contractors with unique challenges. Manufacturers generally recommend such adhesives be transported and stored at temperatures between 40 F and 90 F. Also, most manufacturers' application instructions limit adhesive use when roofing temperatures are 40 F and rising. This is a recognition that initial adhesive should not freeze during drying and initial curing after application. Adhesive cure times necessary to reach adequate bond "strength" are based on temperature and humidity conditions and vary among adhesive products. It is generally recommended newly applied adhesive should not freeze until at least two days after application.


Dew-point considerations

For water-based adhesives, the humidity at the time of adhesive application also is an important consideration. Adhesive application can cause evaporative cooling of a substrate to which an adhesive is applied, resulting in the adhesive substrate's temperature being slightly lower than the surrounding ambient temperature. If this lower temperature results in the substrate being at or below the surrounding ambient's dew-point temperature, condensation will occur within the applied adhesive. This condition is referred to as "adhesive blushing" and can significantly affect an adhesive's drying and cure times and strength.

To minimize the potential for adhesive blushing, based on input from manufacturers, NRCA asks that roofing contractors use low-VOC adhesive application be limited to when the low-temperature requirement is at least five degrees Fahrenheit (preferably 10 degrees Fahrenheit or more) from the ambient temperature. The suggested differential

Professional Roofing, December 2012:

- **Manufacturers:**
 - Store at 60F - 90F
 - Install at 40F and rising
 - Longer green time
- **NRCA:**
 - Don't freeze
 - Dew point differential of 5F or more



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Sika/Sarnafil

BLACKOUT DATES FOR SIKACOAT & WATER BASED PRODUCTS
 Zone 1: October 1st thru April 15th Zone 3: November 1st thru March 1st
 Zone 2: October 15th thru April 1st Zone 4: No Blackout Dates

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JM technical bulletin

JM Johns Manville

TECHNICAL BULLETIN — Roofing Systems

Bulletin Number: T13-007
 Date: May 23, 2013
 Distribution: External

Water Based Application for Single Ply Cold Weather Considerations

As we enter the prime season for commercial roofing, Johns Manville would like to communicate changes to our water-based adhesives shipping policy so that you may plan inventories accordingly over the summer and into the fall. We will re-communicate this change as we near the cooler months later this year.

Background
 As indicated in the JM single ply application instructions, product data sheets, industry bulletins published by the Single Ply Roofing Institute (SPRI) and JM published bulletins, the installation of single ply membranes (EPDM, PVC and TPO) at cooler temperatures (below 50°F, 10°C) requires additional care and consideration that what may otherwise be required in optimal weather conditions. This additional care includes allowing extra time for the membrane to visually "heat" (i.e., lay flat) prior to installation and additional preparation of the water-based adhesives for their successful use and installation.

There are many variables to consider when using adhesives during cooler temperatures, and all water-based adhesives for roofing applications will take longer to dry in cool and high humidity conditions.

Installation Requirements
 Water-based adhesives may not be used in situations when the ambient temperature is expected to fall below the "dew point" at any point during application. Typically the situation when ambient temperature will fall below the dew point is in the cooler months of the year. As a result, Johns Manville will restrict any and all shipments of water-based single ply adhesives from October 1 through April 15, using shipping restrictions, map below.

Zone 1: October 1 - April 15
 Zone 2: October 15 - April 1
 Zone 3: No Restrictions

- Shipment restrictions from 10/1 to 4/15
- Storage 60F – 80F
- Should not be applied:
 - Below 40F
 - RH 90%+
 - DP separation < 5F
 - Temp. = DP within 6 hrs.
 - Temp. < 32F within 48 hrs.

MRCA/NRCA testing

Water-based bonding adhesives

- Products vary
- Pail variability
- Long times to develop strengths
- Peel strengths are relatively low, particularly with paper-faced polyisocyanurate insulation



NRCA's interim recommendations

Water-based bonding adhesives

- Manufacturers need to take a more active role
- Designers should specify Class 2 (coated glass) facers when using water-based adhesives
 - Polyiso.: ASTM C1289, Type II, Class 2
- Designers need to consider/offer alternatives
- Make field crews aware of limitations
- Consider alternative products/systems



Lightweight structural concrete



Moisture in Lightweight Structural Concrete Roof Decks

Concrete Moisture Presents Challenges for Roofing Contractors

NRCA 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 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, drop-to-deck deck topping, typically has a density in the range from 30 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 are used to alter the properties of the concrete, accelerate concrete's curing, retain concrete's mass moisture and/or lighten 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 aggregate 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—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 formwork concrete roof decks where a metal form deck remains in place and is a deck topping material, such as a concrete topping over precast concrete planks or tiles.

Once poured, lightweight structural concrete typically cures to be only distinguished from normal-weight structural concrete. Visual identification is possible using magnifying glasses, typically in 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 present differential drains into and contained within a roof system.
- **Adhesive failure.** The presence of moisture can result in deterioration of moisture-sensitive roofing materials and adhesive bonds between adjacent material layers.
- **Adhesive issues with water-based and non-soluble organic compounds.** Excessive moisture can affect adhesive curing and drying rates. Also, moisture can result in adhesive "bleeding," resulting in bond strength loss.
- **Etched and flaking surfaces.** Excessive moisture can contribute to and accelerate metal component corrosion, including fastener corrosion.
- **Insulation failure due.** The accumulation and presence of moisture in most insulation products will result in reduced thermal performance (lower effective R-value).
- **Moisture-related.** The presence of prolonged high-moisture

NRCA "Industry Issue Update," August 2013:

- Reports of moisture-related roof problems
- "Dry times" far beyond practical
- Lightweight structural concrete should not be used for roof decks



Steel roof decks

Concerns with steel roof decks

Seam-fastened single-ply membrane systems may be problematic

by Mark S. Graham

Steel roof decks are the most popular roof deck type used in the U.S. However, moisture intrusion between design methods and for roof decks and roof systems are cause for concern.

SDI guidelines
Steel roof decks typically are designed using guidelines developed by the Steel Deck Institute (SDI).

Dialogue is necessary between steel roof deck designers and roof system designers
Historically, SDI's design guidelines for steel roof decks have been published in various editions: SDI Design Manual for Composite Deck, Form Deck and Roof Deck. SDI has revised and updated its manual a number of times during the years. For example, the 2007 edition is referred to as "Publication No. 312."

Beginning in 2006, SDI published its design specifications for steel roof decks as ANSISEE RD-10-2006. "Standard for Steel Roof Deck," the 2010 edition, ANSISEE RD-10-2010, is the current edition.

Below the 2006 edition of the International Building Code (IBC), SDI design guidelines were specifically referenced in model building codes. ANSISEE RD-10-2006 is referenced as a requirement in the International Building Code (ANSISEE RD-10-2006). ANSISEE RD-10-2010 is referenced in IBC 2012 and IBC 2015.

SDI design manual and ANSISEE RD-10-2006 provide for roof decks to be designed for a 30-psf uniform live load (uniformly applied and 45 psf applied as roof covering). ANSISEE RD-10-2006 also allows a roof deck's dead load to be defined from the prescribed design uplift load. ANSISEE RD-10-2010 replaces roof decks' "live load" with the upward snow uplift force, but not for decks "... 30 psf and 45 psf for snow overhangs."

Also, in 2009, SDI issued a position statement, "Attachment of Roofing Membranes to Steel Decks," in this connection. SDI advances its design methods are based on uniform loading of roof decks, such as that provided by a uniform dead-load, uniform live load, snow or single-ply membrane roof systems. SDI's connection details emphasize design uplift loading conditions, attachment of non-mechanically attached single-ply membrane roof systems with wide spans. Seams could result in localized loads that exceed roof deck capacity. These seams likely applied uniformly on a deck's surface would be unacceptable.

NRCA's analysis
When buildings are designed, the design team's structural engineer typically will be responsible for the design of the roof structure and roof deck. SDI's guidelines are used, steel roof decks most likely will be designed for a 30-psf uniform uplift capacity with little or no consideration of the roof system type being installed.

Roof system designers typically have relatively little knowledge of steel deck design. Many roof system designers rely on IMI Apparel's classification for designing and specifying roof systems, which usually results in variable design uplift capacities between roof systems and steel roof decks. For example, a roof system with an IMI 1.00 or Class 90 uplift classification is installed on a steel 45-psf uplift load in the roof field and higher uplift loads in the roof system perimeter and corners. If the roof system is designed to resist a steel roof deck using SDI guidelines for a 30-psf uplift, the steel roof deck has a design uplift capacity of only about one-third (or less) than of the roof system. In many instances, steel roof decks are fabricated from steel deck with single- or double-attached membrane roof systems where the roof membrane seams spanning across the purling of the roof deck's structural supports, the steel roof deck likely has a design uplift capacity less than the roof system. Roof deck building under uplift loading conditions of the roof deck to the roof structure and, in some instances, localized stress uplift loading of the roof structure are of concern.

In many instances, steel roof decks are fabricated from steel deck with single- or double-attached membrane roof systems where the roof membrane seams spanning across the purling of the roof deck's structural supports, the steel roof deck likely has a design uplift capacity less than the roof system. Roof deck building under uplift loading conditions of the roof deck to the roof structure and, in some instances, localized stress uplift loading of the roof structure are of concern.

Clearly, dialogue is necessary between steel roof deck designers and roof system designers. Additional dialogue between the roofing and steel deck industries is needed. Additional information about steel roof decks is contained in the roof deck section of the NRCA Roofing Manual: Membrane Roof Systems, which is available for downloading at no charge (866) ANS-NRCA (275-7222). ◆◆◆

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

Professional Roofing, Jan. 2015:

- SDI manual: 30 psf
- ANSI/SDI RD-2010: ≥ 30 psf
- Decks are designed for uniform loading
- Seam-fastened mechanically-attached single-ply membrane roof systems:
 - Possible deck overstress
 - Possible excess moment
 - Possible joist overload



Wind design and warranties

- Wind speed vs. wind uplift
- Proper wind design:
 - Wind load prediction by IBC Ch. 16 or ASCE 7
 - Wind-resistance testing by FM 4474, UL 580 or UL 1897
- A “wind warranty” or “wind rider” is not a substitute for proper wind design
- Pay-out on a wind warranty/rider is very unlikely



**Questions...
and additional topics**





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