2015 CRCA Tradeshow & Seminars
January 23, 2015

What issues cost you money?

presented by

Mark S. Graham
Associate Executive Director, Technical Services
National Roofing Contractors Association

Today's topics

- Energy code adoption status…payback
- Polyisocyanurate insulation update
- Asphalt update and developments
- Concerns with steel roof decks
- Water-based bonding adhesives
- Questions (other topics)

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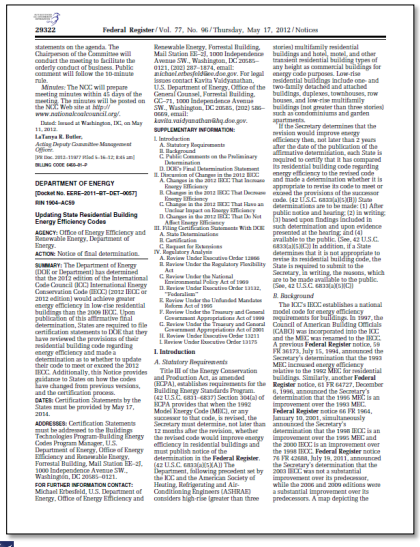
Energy code adoption status

Federal Register, May 17, 2012



29322 Federal Register / Vol. 77, No. 96 / Thursday, May 17, 2012 / Notices

statements on the agenda. The Chairperson of the Committee will conduct the meeting to facilitate the orderly conduct of business. Public comment will follow the 10-minute rule.

Minutes: The NCC will prepare meeting minutes within 45 days of the meeting. The minutes will be posted on the NCC Web site at *http://www.nationalcouncil.org/*.

Dated: Issued at Washington, DC, on May 11, 2012.

LaTanya R. Butler,

Acting Deputy Committee Management Officer.

[FR Doc. 2012-11927 Filed 5-16-12; 8:45 am]

BILLING CODE 0450-01-P

DEPARTMENT OF ENERGY

[Docket No. EERE–2011–BT–DET–0057]

RIN 1904-AC39

Updating State Residential Building Energy Efficiency Codes

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Notice of final determination.

SUMMARY: The Department of Energy (DOE or Department) has determined that the 2012 edition of the International Code Council (ICC) International Energy Conservation Code (IECC) (2012 IECC or 2012 edition) would achieve greater energy efficiency in low-rise residential buildings than the 2009 IECC. Upon publication of this affirmative final determination, States are required to file certification statements to DOE that they have reviewed the provisions of their residential building code regarding energy efficiency and made a determination as to whether to update their code to meet or exceed the 2012 IECC. Additionally, this Notice provides guidance to States on how the codes have changed from previous versions, and the certification process.

DATES: Certification Statements by the States must be provided by May 17, 2014.

ADDRESSES: Certification Statements must be addressed to the Buildings Technologies Program-Building Energy Codes Program Manager, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Forrestal Building, Mail Station EE–2L, 1000 Independence Avenue SW., Washington, DC 20585–0121.

FOR FURTHER INFORMATION CONTACT: Michael Erbesfeld, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Forrestal Building, Mail Station EE–2L, 1000 Independence Avenue SW., Washington, DC 20585–0121, (202) 287–1874, email: *michael.erbesfeld@ee.doe.gov*. For legal issues contact Kavita Vaidyanathan, U.S. Department of Energy, Office of the General Counsel, Forrestal Building, GC–71, 1000 Independence Avenue SW., Washington, DC 20585, (202) 586–0669, email: *kavita.vaidyanathan@hq.doe.gov*.

SUPPLEMENTARY INFORMATION:

I. Introduction
- A. Statutory Requirements
- B. Background
- C. Public Comments on the Preliminary Determination

II. Final Determination Statement

III. Discussion of Changes in the 2012 IECC
- A. Changes in the 2012 IECC That Increase Energy Efficiency
- B. Changes in the 2012 IECC That Decrease Energy Efficiency
- C. Changes in the 2012 IECC That Have an Unclear Impact on Energy Efficiency
- D. Changes in the 2012 IECC That Do Not Affect Energy Efficiency

IV. Filing Certification Statements With DOE
- A. State Determinations
- B. Certification
- C. Request for Extensions

V. Procedural Issues
- A. Review Under Executive Order 12866
- B. Review Under the Regulatory Flexibility Act
- C. Review Under the National Environmental Policy Act of 1969
- D. Review Under Executive Order 13132, Federalism
- E. Review Under the Unfunded Mandates Reform Act of 1995
- F. Review Under the Treasury and General Government Appropriations Act of 1999
- G. Review Under the Treasury and General Government Appropriations Act of 2001
- H. Review Under Executive Order 13211
- I. Review Under Executive Order 13175

I. Introduction

A. Statutory Requirements

Title III of the Energy Conservation and Production Act, as amended (ECPA), establishes requirements for the Building Energy Standards Program. (42 U.S.C. 6831–6837) Section 304(a) of ECPA provides that when the 1992 Model Energy Code (MEC), or any successor to that code, is revised, the Secretary must determine, not later than 12 months after the revision, whether the revised code would improve energy efficiency in residential buildings and must publish notice of the determination in the **Federal Register**. (42 U.S.C. 6833(a)(5)(A)) The Department, following precedent set by the ICC and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) considers high-rise (greater than three storied multifamily residential buildings and hotel, motel, and other transient residential building types of any height as commercial buildings for energy code purposes. Low-rise residential buildings include one- and two-family detached and attached buildings, duplexes, townhouses, row houses, and low-rise multifamily buildings (not greater than three stories) such as condominiums and garden apartments.

If the Secretary determines that the revision would improve energy efficiency then, not later than 2 years after the date of the publication of the affirmative determination, each State is required to certify that it has compared its residential building code regarding energy efficiency to the revised code and made a determination whether it is appropriate to revise its code to meet or exceed the provisions of the successor code. (42 U.S.C. 6833(a)(5)(B)) State determinations are to be made: (1) After public notice and hearing; (2) in writing; (3) based upon findings included in such determination and upon evidence presented at the hearing; and (4) available to the public. (See, 42 U.S.C. 6833(a)(5)(C)) In addition, if a State determines that it is appropriate to revise its residential building code, the State is required to submit to the Secretary, in writing, the reasons, which are to be made available to the public. (See, 42 U.S.C. 6833(a)(5)(C))

B. Background

The ICC's IECC establishes a national model code for energy efficiency requirements for buildings. In 1997, the Council of American Building Officials (CABO) was incorporated into the ICC and the MEC was renamed to the IECC. A previous **Federal Register** notice, 59 FR 36173, July 15, 1994, announced the Secretary's determination that the 1993 MEC was not a substantial improvement relative to the 1992 MEC for residential buildings. Similarly, another **Federal Register** notice, 61 FR 64727, December 6, 1996, announced the Secretary's determination that the 1995 MEC is an improvement over the 1993 MEC. **Federal Register** notice 66 FR 1964, January 10, 2001, simultaneously announced the Secretary's determination that the 1998 IECC is an improvement over the 1995 MEC and the 2000 IECC is an improvement over the 1998 IECC. **Federal Register** notice 76 FR 42868, July 19, 2011, announced the Secretary's determination that the 2003 IECC was not a substantial improvement over its predecessor, while the 2006 and 2009 editions were a substantial improvement over its predecessors. A map depicting the

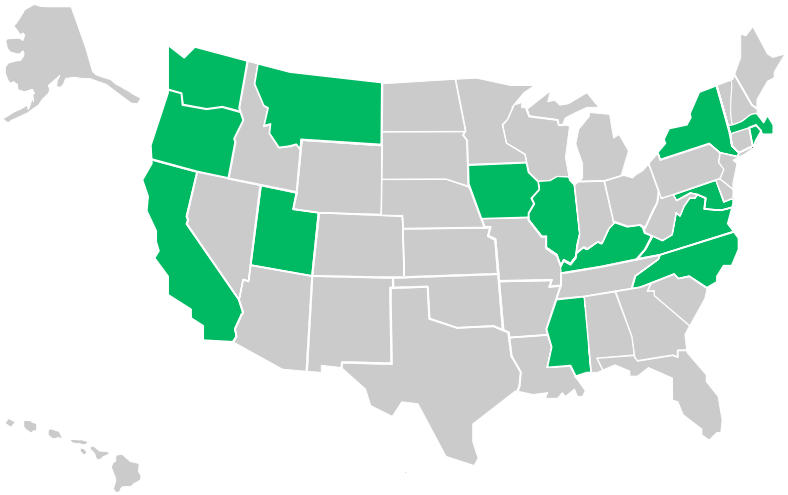
Key points:

- US DOE determined IECC 2012 will achieve greater energy efficiency in low-rise residential buildings than IECC 2009
- States must certify by 5/17/14 their energy code meets or exceeds the levels of IECC 2012

This triggers most states to update their state energy code

Status of states' adoptions

Adoption of IECC 2012 before Jan. 1, 2015



NRCA

Is there payback…?

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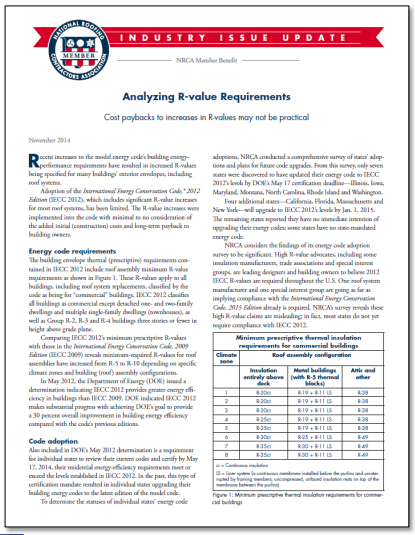
NRCA

NRCA "Industry Issue Update"

November 2014



INDUSTRY ISSUE UPDATE

NRCA Member Benefit

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,® 2012 Edition* (IECC 2012), which includes significant R-value increases for most roof systems, has been limited. The R-value increases were implemented into the code with minimal to no consideration of the added initial (construction) costs and long-term payback to building owners.

Energy code requirements

The building envelope thermal (prescriptive) requirements contained in IECC 2012 include roof assembly minimum R-value requirements as shown in Figure 1. These R-values apply to all buildings, including roof system replacements, classified by the code as being for "commercial" buildings. IECC 2012 classifies all buildings as commercial except detached one- and two-family dwellings and multiple single-family dwellings (townhouses), as well as Group R-2, R-3 and R-4 buildings three stories or fewer in height above grade plane.

Comparing IECC 2012's 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 zones and building (roof) assembly configurations.

In May 2012, the Department of Energy (DOE) issued a determination indicating IECC 2012 provides greater energy efficiency in 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 editions.

Code adoption

Also included in DOE's May 2012 determination is a requirement for individual states to review their current codes and certify by May 17, 2014, their residential energy-efficiency requirements meet or exceed the levels established in IECC 2012. In the past, this type of certification mandate resulted in individual states upgrading their building energy codes to the latest edition of the model code.

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

Four additional states—California, Florida, Massachusetts and New York—will upgrade to IECC 2012's levels by Jan. 1, 2015. The remaining states reported they have no immediate intention of upgrading their energy codes; some states have no state-mandated energy code.

NRCA considers the findings of its energy code adoption survey to be significant. High R-value advocates, including some insulation manufacturers, trade associations and special interest groups, are leading designers and building owners to believe 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, 2015 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.

Minimum prescriptive thermal insulation requirements for commercial buildings

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	R-20ci	R-19 + R-11 LS	R-38
3	R-20ci	R-19 + R-11 LS	R-38
4	R-25ci	R-19 + R-11 LS	R-38
5	R-25ci	R-19 + R-11 LS	R-38
6	R-30ci	R-25 + R-11 LS	R-49
7	R-35ci	R-30 + R-11 LS	R-49
8	R-35ci	R-30 + R-11 LS	R-49

ci = Continuous insulation

LS = Liner system for continuous membranes installed below the purlins and secured by framing members; uncompressed, unfaced insulation rests on top of the membranes between the purlins.

Figure 1: Minimum prescriptive thermal insulation requirements for commercial buildings

Payback analysis:

- 100 sq. single story building
- Costs per R+5 increases
- Energy savings per R+5 increases
- Local energy costs
- Cost ÷ Savings = Payback
- 16 cities in 8 climate zones

Payback results:

- R-10 to R-15: 7 to 19 yrs.
- R-15 to R-20: 14 to 38 yrs.
- R-20 to R-25: 22 to 61 yrs.
- R-25 to R-30: 49 to 133 yrs.

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In a heating climate

10,000 sq. ft. single-story building in Chicago, IL

R-value increase	Annual Btu savings	Payback time
R-10 to R-15	58,340,933Btu	7.5 years
R-15 to R-20	32,175,508 Btu	15.6 years
R-20 to R-25	18,512,379 Btu	25.2 years
R-25 to R-30	13,047,818 Btu	54.7 years

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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)

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/purchasing polyiso.

Use ASTM C1289 and the specific

Type, Class and Grade for the desired product

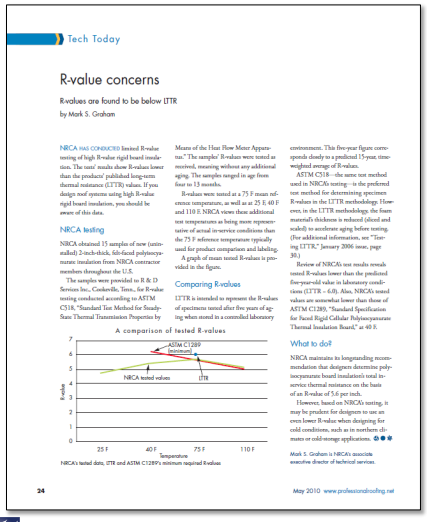
Polyisocyanurate insulation

- 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.

Polyisocyanurate insulation



Tech Today

R-value concerns

R-values are found to be below LTTR

by Mark S. Graham

NRCA has conducted limited R-value testing of high R-value rigid board insulation. The tests' results show R-values lower than the products' published long-term thermal resistance (LTTR) values. If you design roof systems using high R-value rigid board insulations, you should be aware of this data.

NRCA testing

NRCA obtained 15 samples of new (uninstalled) 2-inch-thick, felt-faced polyisocyanurate insulation from NRCA contractor members throughout the U.S.

The samples were provided to R & D Services Inc., Cookeville, Tenn., for R-value testing conducted according to ASTM C518, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus." The samples' R-values were tested as received, meaning without any additional aging. The samples ranged in age from four to 12 months.

R-values were tested at a 75 F mean reference temperature, as well as at 25 F, 40 F and 110 F. NRCA views these additional test temperatures as being more representative of actual in-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-values of specimens tested after five years of aging when stored in a controlled laboratory environment. This 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's 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 (sliced and scaled) to accelerate aging before testing. (For additional information, see "Testing LTTR," January 2006 issue, page 20.)

Review of NRCA's test results reveals tested R-values lower than the predicted five-year-old value in laboratory conditions (LTTR – 6.0). Also, NRCA's tested values are somewhat lower than those of ASTM C1289, "Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board," at 40 F.

What to do?

NRCA maintains its longstanding recommendation 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 associate executive director of technical services.

A comparison of tested R-values

NRCA's tested data, LTTR and ASTM C1289's minimum required R-values

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May 2010 www.professionalroofing.net

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/inch (heating)
  - R_{Aged} = 5.6/inch (cooling)

When specifying insulation…

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

Asphalt update and developments

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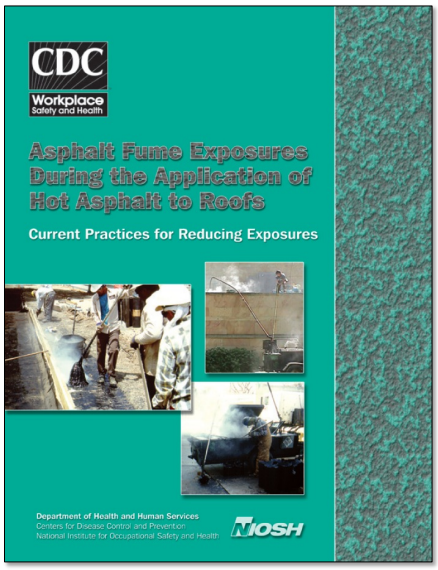
NRCA

Asphalt

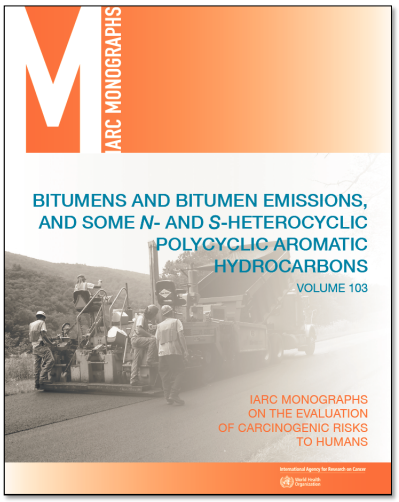
June 2003



NRCA

Asphalt

May 2013



IARC Monograph – 103:

- Group 2A –Probably carcinogenic to humans
- Pgs. 160 – 165 specific to "Roofing workers exposed to bitumens"

No new regulation (yet)

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NRCA asphalt testing -- 1989

- 26 asphalt samples
- EVTs:
  - Type III (125 cps) 400 – 430 F
  - Type III (75 cps) 420 – 470 F
  - Type IV (125 cps) 420 – 455 F
  - Type IV (75 cps) 445 – 485 F
- FPs:
  - Not reported

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NRCA asphalt testing -- 2000

- 19 asphalt lots sampled
- EVTs:
  - Type III (mop) 390 – 440 F
  - Type III (spreader) 415 – 475 F
- FPs: 585 – 640 F
- ASTM D312 compliance:
  - 10 of 19 did not comply

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NRCA asphalt testing – 2014

- 14 asphalt lots (7 suppliers) sampled
- EVTs:
  - Type III (mop) 424 – 462 F
  - Type III (spreader) 452 – 486 F
  - Type IV (mop) 455 – 482 F
  - Type IV (spreader) 480 – 506 F
- FPs: 615 – 660 F
- 10 of 14 do not comply with ASTM D312's physical property requirements

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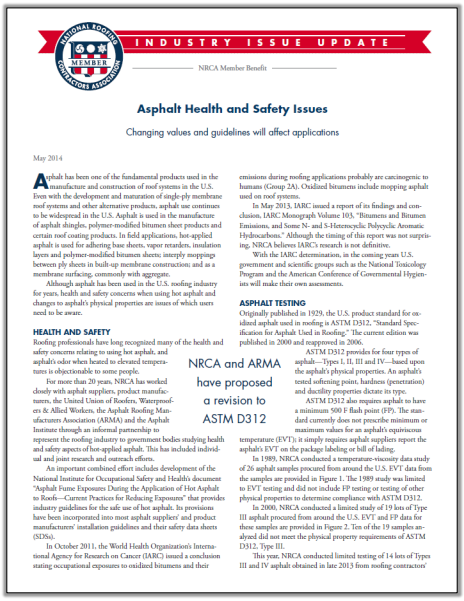
Industry Issue Update, May 2014



INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Asphalt Health and Safety Issues

Changing values and guidelines will affect applications

May 2014

Asphalt has been one of the fundamental products used in the manufacture and construction of roof systems in the U.S. Even with the development and maturation of single-ply membrane roof systems and other alternative products, asphalt use continues to be widespread in the U.S. Asphalt is used in the manufacture of asphalt shingles, polymer-modified bitumen sheet products and certain roof coating products. In field applications, hot-applied asphalt is used for adhering base sheets, vapor retarders, insulation layers and polymer-modified bitumen sheets; interply moppings between ply sheets in built-up membrane construction; and as a membrane surfacing, commonly with aggregate.

Although asphalt has been used in the U.S. roofing industry for years, health and safety concerns when using hot asphalt and changes to asphalt's physical properties are issues of which users need to be aware.

HEALTH AND SAFETY

Roofing professionals have long recognized many of the health and safety concerns relating to using hot asphalt, and asphalt's odor when heated to elevated temperatures is objectionable to some people.

For more than 20 years, NRCA has worked closely with asphalt suppliers, product manufacturers, the United Union of Roofers, Waterproofers & Allied Workers, the Asphalt Roofing Manufacturers Association (ARMA) and the Asphalt Institute through an informal partnership to represent the roofing industry to government bodies studying health and safety aspects of hot-applied asphalt. This has included individual and joint research and outreach efforts.

An important combined effort includes development of the National Institute for Occupational Safety and Health's document "Asphalt Fume Exposures During the Application of Hot Asphalt to Roofs—Current Practices for Reducing Exposures" that provides industry guidelines for the safe use of hot asphalt. Its provisions have been incorporated into most asphalt suppliers' and product manufacturers' installation guidelines and their safety data sheets (SDSs).

In October 2011, the World Health Organization's International Agency for Research on Cancer (IARC) issued a conclusion stating occupational exposures to oxidized bitumens and their emissions during roofing applications probably are carcinogenic to humans (Group 2A). Oxidized bitumens include mopping asphalt used on roof systems.

In May 2013, IARC issued a report of its findings and conclusion, IARC Monograph Volume 103, "Bitumens and Bitumen Emissions, and Some N- and S-Heterocyclic Polycyclic Aromatic Hydrocarbons." Although the timing of this report was not surprising, NRCA believes IARC's research is not definitive.

With the IARC determination, in the coming years U.S. government and scientific groups such as the National Toxicology Program and the American Conference of Governmental Hygienists will make their own assessments.

ASPHALT TESTING

Originally published in 1929, the U.S. product standard for oxidized asphalt used in roofing is ASTM D312, "Standard Specification for Asphalt Used in Roofing." The current edition was published in 2000 and reapproved in 2006.

NRCA and ARMA have proposed a revision to ASTM D312

ASTM D312 provides for four types of asphalt—Types I, II, III and IV—based upon the asphalt's physical properties. An asphalt's tested softening point, hardness (penetration) and ductility properties dictate its type.

ASTM D312 also requires asphalt to have a minimum 500 F flash point (FP). The standard currently does not prescribe minimum or maximum values for an asphalt's equiviscous temperature (EVT); it simply requires asphalt suppliers report the asphalt's EVT on the package labeling or bill of lading.

In 1989, NRCA conducted a temperature-viscosity data study of 26 asphalt samples procured from around the U.S. EVT data from the samples are provided in Figure 1. The 1989 study was limited to EVT testing and did not include FP testing or testing of other physical properties to determine compliance with ASTM D312.

In 2000, NRCA conducted a limited study of 19 lots of Type III asphalt procured from around the U.S. EVT and FP data for these samples are provided in Figure 2. Ten of the 19 samples analyzed did not meet the physical property requirements of ASTM D312, Type III.

This year, NRCA conducted limited testing of 14 lots of Types III and IV asphalt obtained in late 2013 from roofing contractors'

Revision to ASTM D312

Will be published as ASTM D312-15

- Maximum heating temp.: 550 F (575 F min. FP)
- Maximum EVTs:
  - Type III (mop) 430 F
  - Type III (spreader) 455 F
  - Type IV (mop) 470 F
  - Type IV (spreader) 485 F
- Lot-specific package labeling of EVT

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NRCA's recommendations

Asphalt

- Seek out asphalt complying with ASTM D312-15
- Consider asking for certificates of compliance
- Do not overheat asphalt
  - 550 F maximum kettle/tanker temperature
- Apply at EVT (BUR application)
- Make field crews aware
- Contact NRCA with any questions or issues

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Issues with steel roof decks

- Probable under-design for wind uplift
- Deck overstress:
  - Seam-fastened mechanically-attached single–plies
- Possible structural overload:
  - Seam-fastened mechanically-attached single–plies

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Steel deck design

Prior to 2010:

- SDI's *Design Manual for Composite Decks, Form Decks and Roof Decks*
- ANSI/SDI RD1.0-2006, "Standard for Steel Roof Deck" (referenced in IBC 2009)

30-pound-per-square-foot (psf) uplift
and 45-psf uplift at roof overhangs

25

Steel deck design

Since 2010:

- ANSI/SDI RD1.0-2010, "Standard for Steel Roof Deck" (referenced in IBC 2012 and IBC 2015)

"… be anchored to resist the required net uplift forces, <u>but not less than</u>…"
30 psf and 45 psf for eave overhangs

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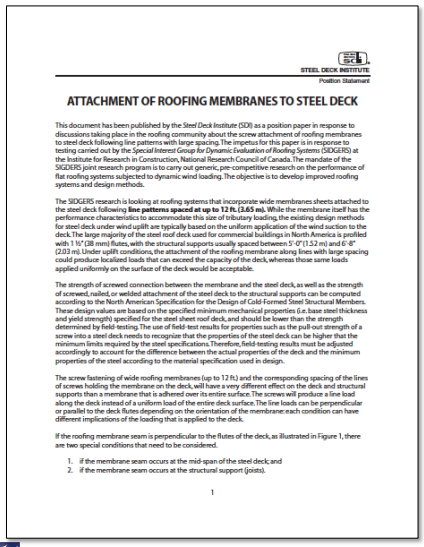
SDI bulletin



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.
- Steel decks designed for uniform loading
- Seam-fastened single-ply membranes are a concern

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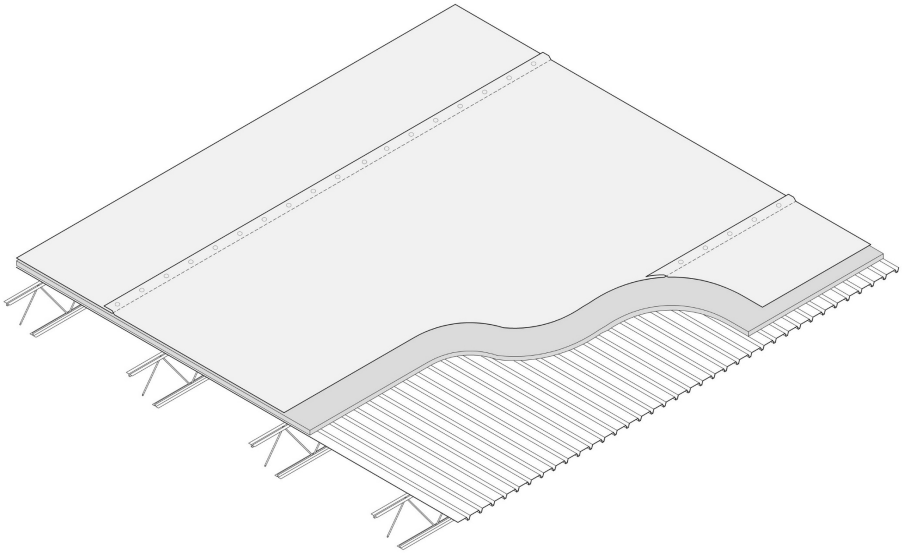
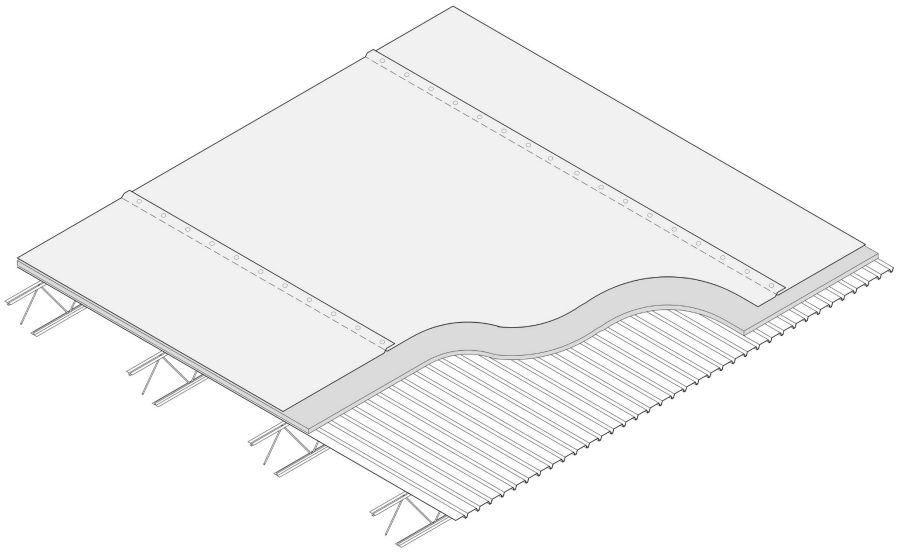
Membrane seams across deck flutes



SDI: 3.8 X moment (deck); 2 X load (joists)

28

Membrane seams in deck flute direction



SDI: 12 X bending moment and shear (deck)

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SDI bulletin -- Conclusion

"…SDI does not recommend the use of roofing membranes attached to the steel deck using line patterns with large spacing unless a structural engineer has reviewed the adequacy of the steel deck and the structural supports to resist to wind uplift loads transmitted along the lines of attachment. Those lines of attachment shall only be perpendicular to the flutes of the deck."

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NRCA's recommendations

- Beware of the situation
- Roof system designers should not rely on "excess capacity" in steel roof decks
- Be cautious of "accepting" responsibility for the roof deck; use NRLRC recommended proposal/ contract language
- Better communication is needed between Roof system designers and roof deck designers

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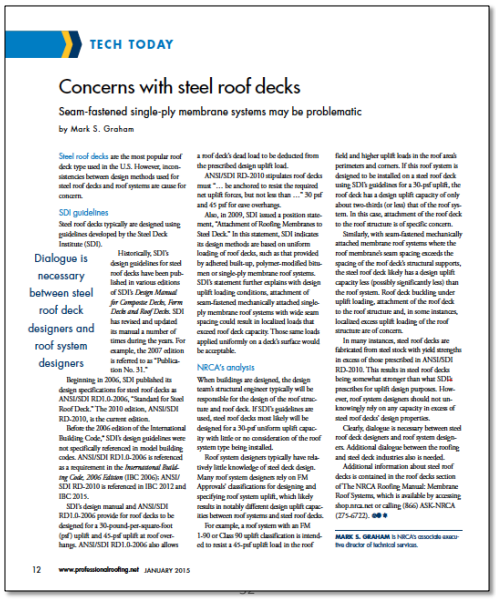
NRCA

Professional Roofing "Tech today"

January 2015



TECH TODAY

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, inconsistencies between design methods used for steel 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).

Historically, SDI's design guidelines for steel roof decks have been published in various editions of SDI's *Design Manual for Composite Decks, Form Decks and Roof Decks*. 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. 31."

Dialogue is necessary between steel roof deck designers and roof system designers

Beginning in 2006, SDI published its design specifications for steel roof decks as ANSI/SDI RDI.0-2006, "Standard for Steel Roof Deck." The 2010 edition, ANSI/SDI RD-2010, is the current edition.

Before the 2006 edition of the International Building Code," SDI's design guidelines were not specifically referenced in model building codes. ANSI/SDI RDI.0-2006 is referenced as a requirement in the *International Building Code, 2006 Edition* (IBC 2006); ANSI/SDI RD-2010 is referenced in IBC 2012 and IBC 2015.

SDI's design manual and ANSI/SDI RDI.0-2006 provide for roof decks to be designed for a 30-pound-per-square-foot (psf) uplift and 45-psf uplift at roof overhangs. ANSI/SDI RDI.0-2006 also allows a roof deck's dead load to be deducted from the prescribed design uplift load.

ANSI/SDI RD-2010 stipulates roof decks must "… be anchored to resist the required net uplift forces, but not less than …" 30 psf and 45 psf for eave overhangs.

Also, in 2009, SDI issued a position statement, "Attachment of Roofing Membranes to Steel Deck." In this statement, SDI indicates its design methods are based on uniform loading of roof decks, such as that provided by adhered built-up, polymer-modified bitumen or single-ply membrane roof systems. SDI's statement further explains with design uplift loading conditions, attachment of seam-fastened mechanically attached single-ply membrane roof systems with wide seam spacing could result in localized loads that exceed roof deck capacity. Those same loads applied uniformly on a deck's surface would be acceptable.

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. If 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 FM Approvals' classifications for designing and specifying roof system uplift, which likely results in notably different design uplift capacities between roof systems and steel roof decks.

For example, a roof system with an FM 1-90 or Class 90 uplift classification is intended to resist a 45-psf uplift load in the roof field and higher uplift loads in the roof area's perimeters and corners. If this roof system is designed to be installed on a steel roof deck using SDI's guidelines for a 30-psf uplift, the roof deck has a design uplift capacity of only about two-thirds (or less) that of the roof system. In this case, attachment of the roof deck to the roof structure is of specific concern.

Similarly, with seam-fastened mechanically attached membrane roof systems where the roof membrane's seam spacing exceeds the spacing of the roof deck's structural supports, the steel roof deck likely has a design uplift capacity less (possibly significantly less) than the roof system. Roof deck buckling under uplift loading, attachment of the roof deck to the roof structure and, in some instances, localized excess uplift loading of the roof structure are of concern.

In many instances, steel roof decks are fabricated from steel stock with yield strengths in excess of those prescribed in ANSI/SDI RD-2010. This results in steel roof decks being somewhat stronger than what SDI's prescribes for uplift design purposes. However, roof system designers should not unknowingly rely on any capacity in excess of steel roof decks' design properties.

Clearly, dialogue is necessary between steel roof deck designers and roof system designers. Additional dialogue between the roofing and steel deck industries also is needed.

Additional information about steel roof decks is contained in the roof decks section of The NRCA Roofing Manual: Membrane Roof Systems, which is available by accessing shop.nrca.net or calling (866) ASK-NRCA (275-6722).

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

12 www.professionalroofing.net JANUARY 2015

Continuing concerns with water-based bonding adhesives

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Professional Roofing, Aug. 2012

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***Professional Roofing*, "Tech today," Dec. 2013**

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 rooftop temperatures and increased moisture, contractors face working with roofing products that are temperature- and moisture-sensitive.

This year, NRCA established a Cold Weather Application Task Force to review manufacturers' recommendations for roofing product and roof system application during cold weather.

Certain roofing products and roof system types are temperature-sensitive

Temperature limitations

Roofing contractors have long recognized certain roofing products and roof system types are temperature-sensitive. For example, with hot-applied bituminous roof systems, when ambient temperatures are less than 40 F, shortening the distances between bitumen heating equipment and the point of application and using insulated rooftop bitumen transport and dispensing equipment is recommended by NRCA and most manufacturers to make sure bitumen is at its equiviscous temperature at the point of application.

For self-sealing asphalt shingles, it is recognized shingles' sealing strips may not immediately activate if installed in cold weather. However, some manufacturers provide asphalt shingles with sealant strips that will activate at lower temperatures. Also, in some cold-weather application situations, manufacturers suggest hand-rubbing shingle tabs during installation to prevent shingle tab uplift until the shingles' self-seal strips activate.

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, presents 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 adhesives use when rooftop temperatures are 40 F and rising. This is in recognition that installed adhesives should not freeze during drying and initial curing after application. Adhesive cure times necessary to reach adequate initial "green" strength are based on temperature and humidity conditions and vary among adhesive products. It generally is recognized newly applied adhesives 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 surfaces' temperatures. If this lower temperature results in the substrate being at or below the surrounding air'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's task force suggests water-based and low-VOC adhesive application be limited to when the dew-point temperature is at least five degrees Fahrenheit (preferably 10 degrees Fahrenheit or more) from the ambient temperature. This suggested differential is in recognition that rooftop temperatures vary, such as from the sun side to shade side of penthouses. Dew point and ambient temperatures typically are closest during early morning and sundown. Also, this condition is more common in northern climates during periods of cold temperatures.

For water-based and low-VOC adhesives, when the minimum-recommended ambient temperature or dew-point temperature cannot be met, adhesive application should be suspended.

Being aware

You need to be aware of the temperature- and moisture-related limitations of the products and systems you use and install. Product-specific limitations typically are provided in manufacturers' printed installation instructions.

Building owners, designers, general contractors, construction managers and roofing construction observers also need to be aware of the limitations of roofing products and roof systems installed in colder temperatures. They also need to acknowledge in some weather conditions, roofing work will need to be suspended until more favorable conditions exist.

In situations where roofing work must take place during periods of unfavorable weather, such as when construction project sequencing requires roofing work be conducted in late fall and winter, building owners and designers should consider specifying roofing products and/or roof system types that are not as sensitive. Roofing product manufacturers and roofing contractors should be consulted for specific recommendations.

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

12 www.professionalroofing.net 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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MRCA/NRCA testing

Water-based bonding adhesives

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

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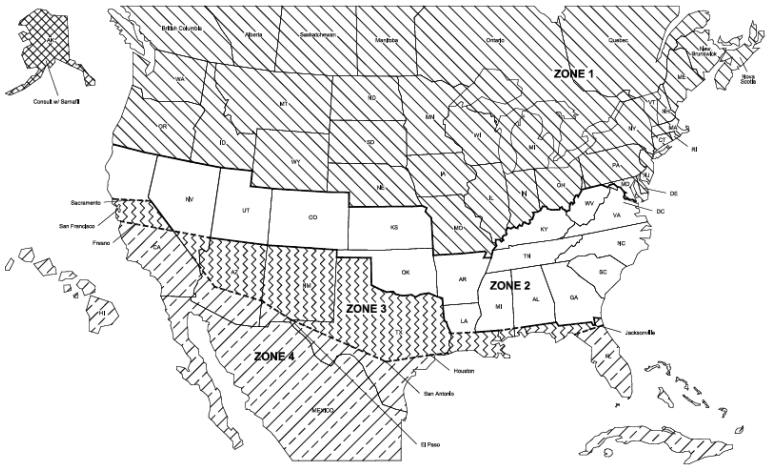
Sika/Sarnafil



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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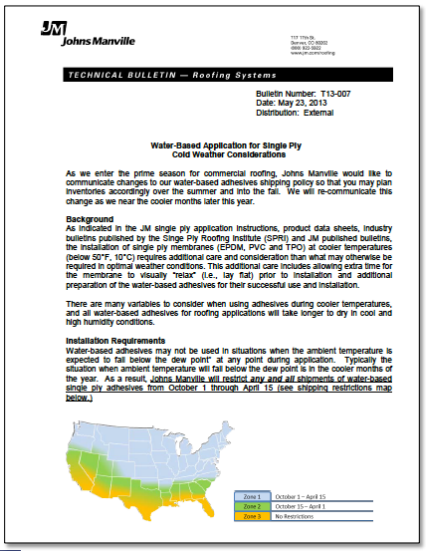
JM technical bulletin



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 than what may otherwise be required in optimal weather conditions. This additional care includes allowing extra time for the membrane to visually "relax" (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 (see shipping restrictions map below.)

- 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.

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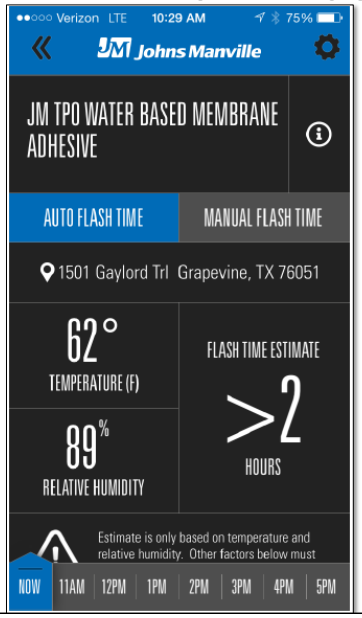
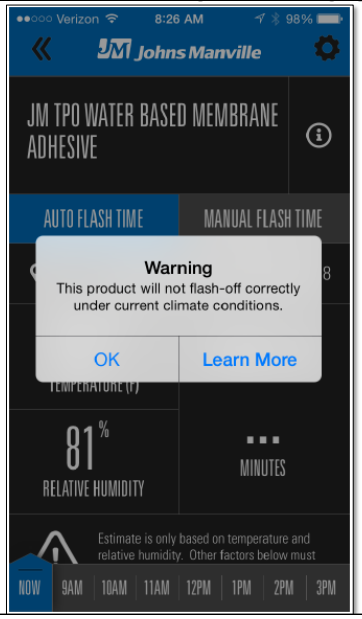
JM TechXpert app



NRCA

JM TechXpert app



NRCA

NRCA's interim recommendations

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

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Questions

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