International Roofing Expo
February 27, 2014
Las Vegas, NV

NRCA Technical Operations Committee: Technical Programs and Issues

presented by

National Roofing Contractors Association

NRCA

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NRCA Technical Operations Committee: Technical Programs and Issues

Dave Tilsen
Chairman, NRCA Technical Operations Committee
President
Tilsen Roof Co.
Madison, WI

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NRCA Technical Operations Committee

Dane Bradford	Bradford Roof Management, Billings, MT
Dave Karel	Garlock-French Corporation, Minneapolis, MN
Rod Petrick	Ridgeworth Roofing Co., Inc., Frankfurt, IL
John Plescia	Star Roofing, Inc.
Kyle Thomas	Thomas Roofing Co., Mobile, AL
Rob Therrien	The Melanson Co., Inc., Keene, NH
Dave Tilsen	Tilsen Roofing Co., Madison, WI

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Technical Services section staff

Mark S. Graham	Associate Executive Director, Technical Services
Tom Bollnow	Senior Director, Technical Services
Joan Crowe, AIA	Director, Technical Services
Maciek Rupar	Director, Technical Services
Jason Wilen, AIA	Director, Technical Services
Nick Gallagher	Project Manager, Technical Services

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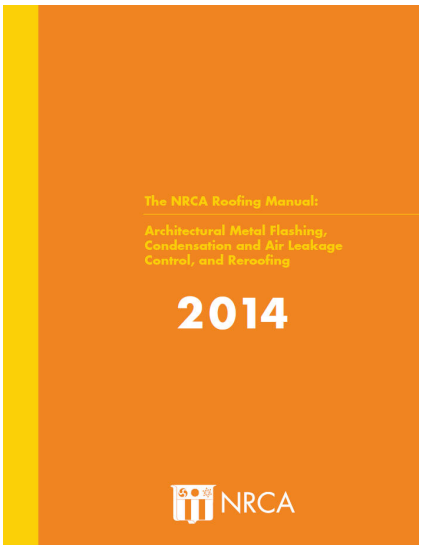
Updated Manual



- Architectural Metal Flashing, Condensation and Air-Leakage Control, and Reroofing—2014:
  - Expanded metal flashing section
    - 137 figures
    - 59 details
  - Added air leakage control section
  - Reroofing reformatted
- The NRCA Roofing Manual:
  - 2011: Membrane Roof Systems
  - 2012: Metal Panels and SPF Roof Systems
  - 2013: Steep-slope Roof Systems
  - 2014: Architectural Metal Flashing, Condensation and Air-Leakage Control, and Reroofing

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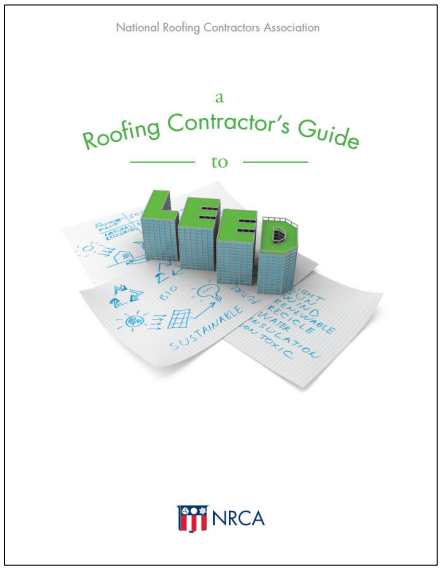
New LEED Guide



A Roofing Contractor's Guide to LEED:

- Based upon LEED 2009 (Version 3)
- Roofing-specific guidelines

An additional publication based upon the new LEED v4 will be available later in mid-2014.

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CERTA

- Established by MRCA in 1986
- Joint agreement with NRCA beginning in 2003
- 1,600+ trainers
- 21,000+ applicators
- Substantially improved fire safety record

NRCA ANSI/SPRI ES-1 certifications

- In response to manufacturers' development of ANSI/SPRI ES-1 and code requirements
- NRCA has been testing since 1999
- Two certifications:
  - Intertek Testing Services, N.A.
  - Underwriters Laboratories, Inc. (UL)
- 181 companies participating
- Open to all NRCA members

Roof Wind Designer

www.roofwinddesigner.com

- Developed jointly by NRCA, MRCA and NERCA
- No cost to users
- Determine building-specific wind loads:
  - ASCE 7-05
  - ASCE 7-10
- Determine required wind resistances
- 14,827 projects

EnergyWise

energywise.nrca.net

- Developed by NRCA in cooperation with the Roofing Industry Alliance for Progress
- Determine R-value requirements:
  - IECC 2006 and 2012
  - IgCC 2012
  - ASHRAE 90.1-99, -04, -07, -10 and -13
  - ASHRAE 189.1-09
- Calculates heating/cooling costs
- Verifies proper vapor retarder placement
- 7,457 projects

NRCA online library

http://www.nrca.net/rp/technical/search/default.aspx

- Search by author, publisher, title or keyword
- NRCA-owned and non-copyright documents are downloadable
- 9,966 documents accessible

Requests for technical assistance

1-800-323-9545 or www.nrca.net/contact.aspx

- Access to Technical Services section staff
- Used by NRCA members, building owners, A/E/Cs, code officials, media, etc.
- Questions range from simple to complex
- 3,000+ calls per year

NRCA Technical Operations Committee: Technical Programs and Issues

Rene Dupuis
President
SRI Engineering, Inc.
Middleton, WI

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Water Based Adhesive Study

1. Determine basic dry down properties with temperatures and humidity ranges seen in the field.
2. Study the effects of moisture on the cured products.
3. Evaluate peel strengths.

Water Based Bonding Adhesives Properties

- Low VOC
- Low odor
- Easy to apply
- Get more coverage

But there are some drawbacks...

- Application temperature has to be 40° F and rising
- Storage, shipping and handling must be done within specified temperature ranges, generally 50° F to 95° F range, although some manufactures have slight variations to this
- Longer drying time is needed than with solvent based bonding adhesives (such as neoprene based material)

Drawbacks continue...

- The material cannot be allowed to freeze in the pail awaiting use or in shipping and storage
- Some water based bonding adhesives will revert in the presence of high heat and humidity
- The material has a shelf life

TOC research found that…….

- No data exists in the public domain on basic dry down properties of water based bonding adhesives in a neat condition
- No public data exist on water soak properties of water based bonding adhesives
- No public data exist on time-to-dry for a membrane/insulation assembly
- No public data exists on time to reversion or "re-wetting" if high humidity exists in the roof assembly

Testing Methodology

- Obtain 3 – 5 gallon pails of 2013 material from different sources around the country.
- Each pail to have a different date of manufacture
- Each pail to be unopened prior to reaching the SRI Lab.
- Tests will be run on material from each pail for dry down time in neat condition at different temperatures and humidity's
- Water soak test will be run at 73° F and 90° F to check weight gain
- Reversion tests will be run at different temperatures and humidity's

Water Based Bonding Adhesives selected for test consideration

- Carlisle Aqua Base 120
- Firestone Water Based Bonding Adhesive P
- GAF WB 181
- JM water based PVC adhesive
- JM water based TPO adhesive
- JM water based EPDM adhesive
- Sarnafil – Sarnacol 2121

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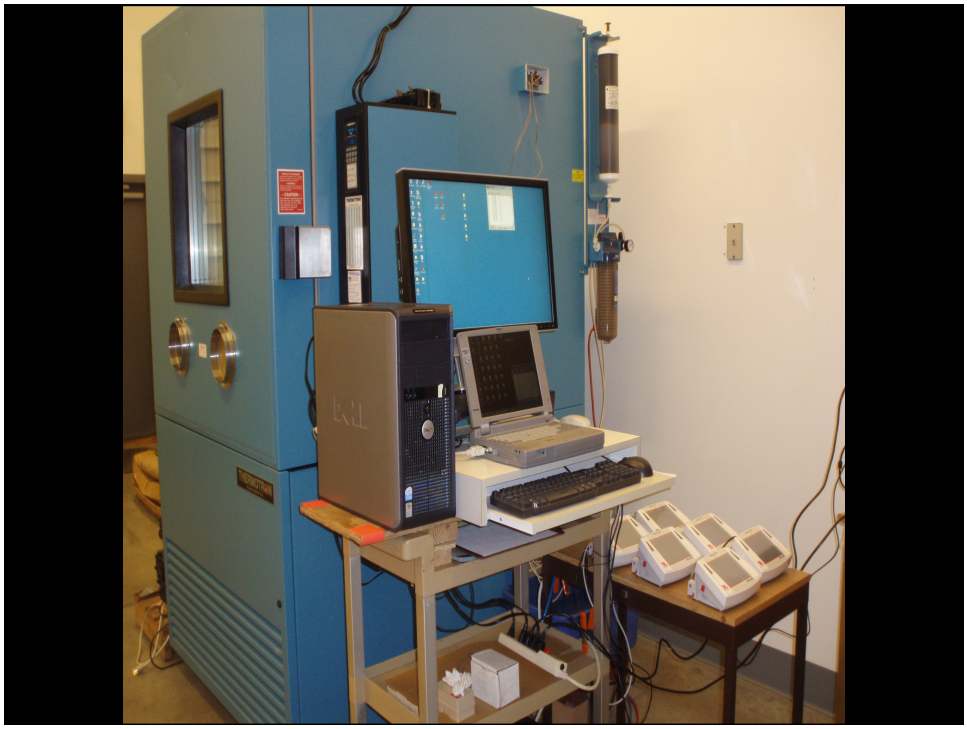
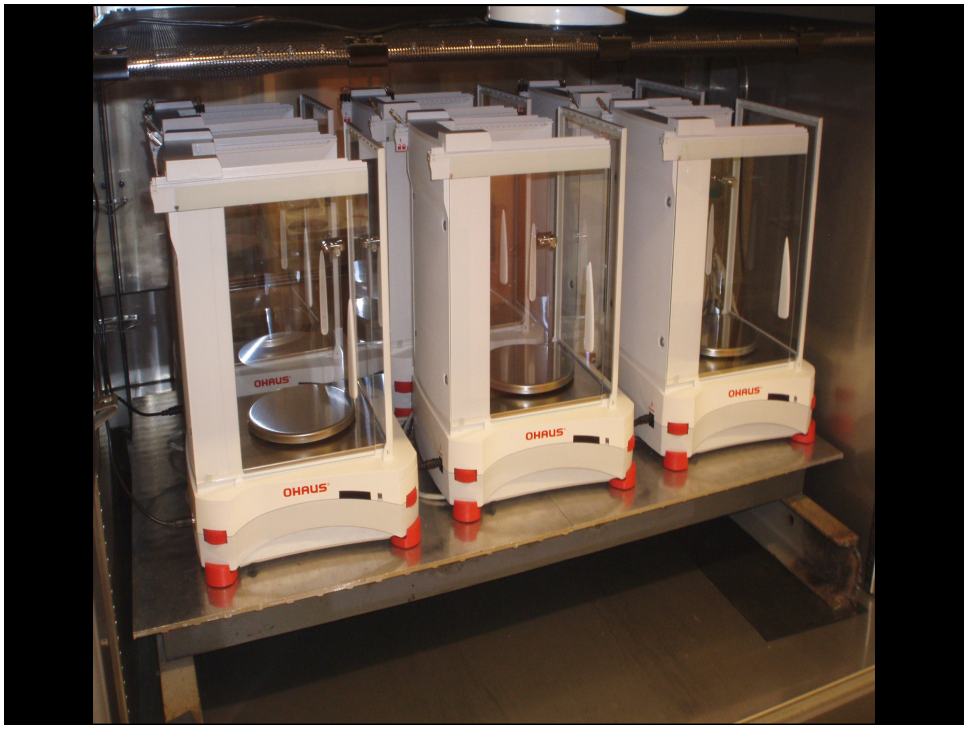


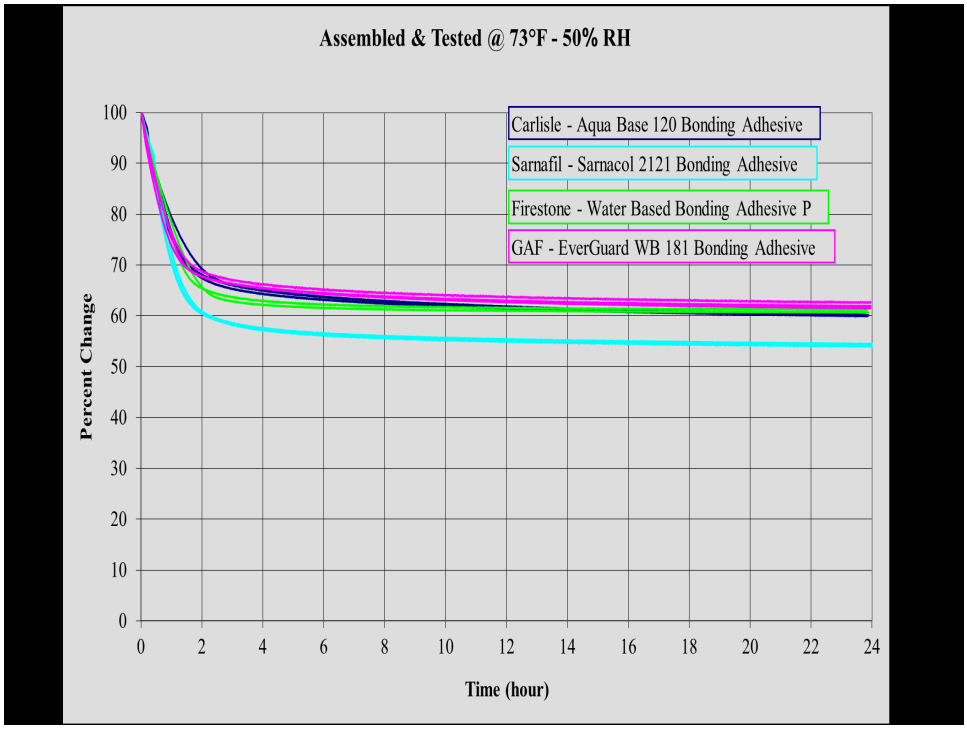


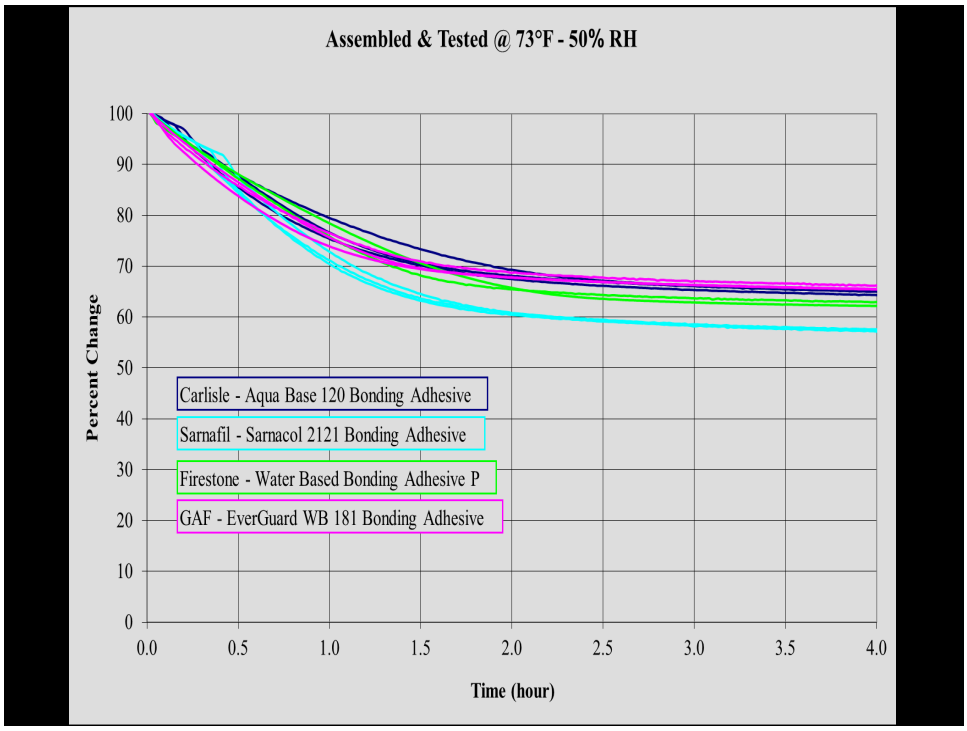
Test Results to Date

- Time to dry down in neat condition
- Water gain during immersion
- Reversion Testing (In Progress)
- Peel Strength (In Progress)

First check pail-to-pail and product-to-product for similar behavior on dry down

1. Pail-to-Pail was found to be consistent for all products
2. All products behave asymptotically as they lose water and volatiles during dry down
3. This is as it should be….

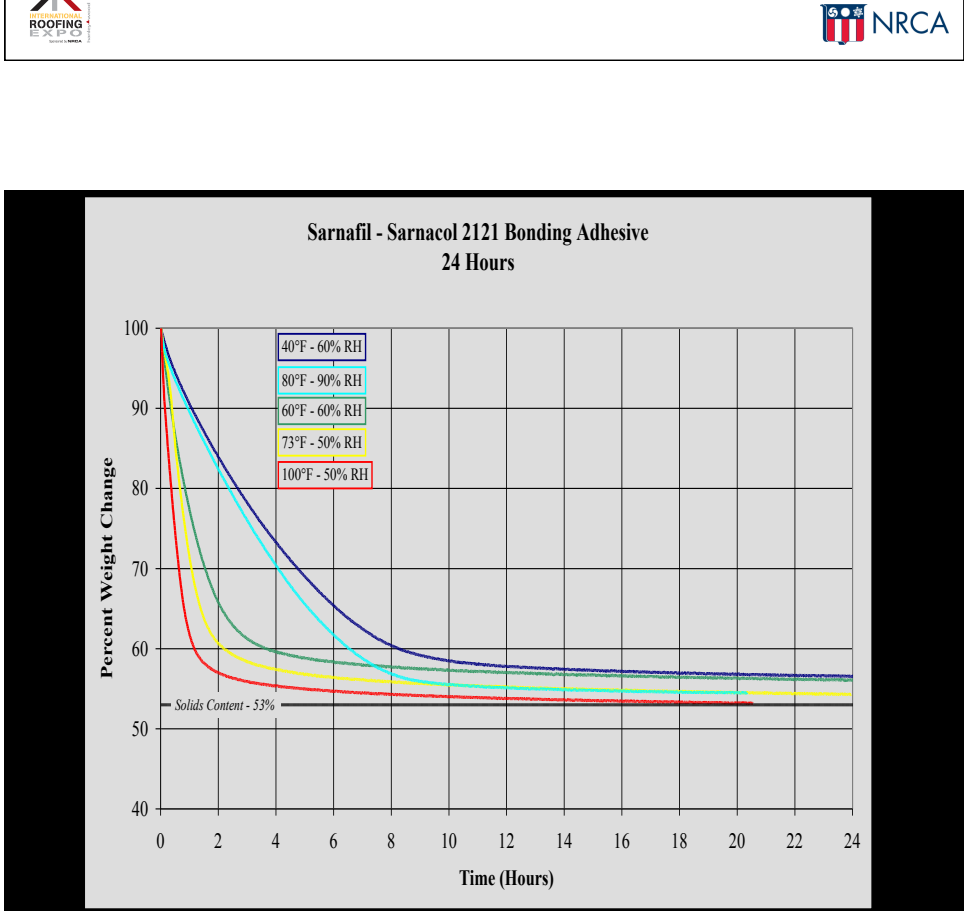


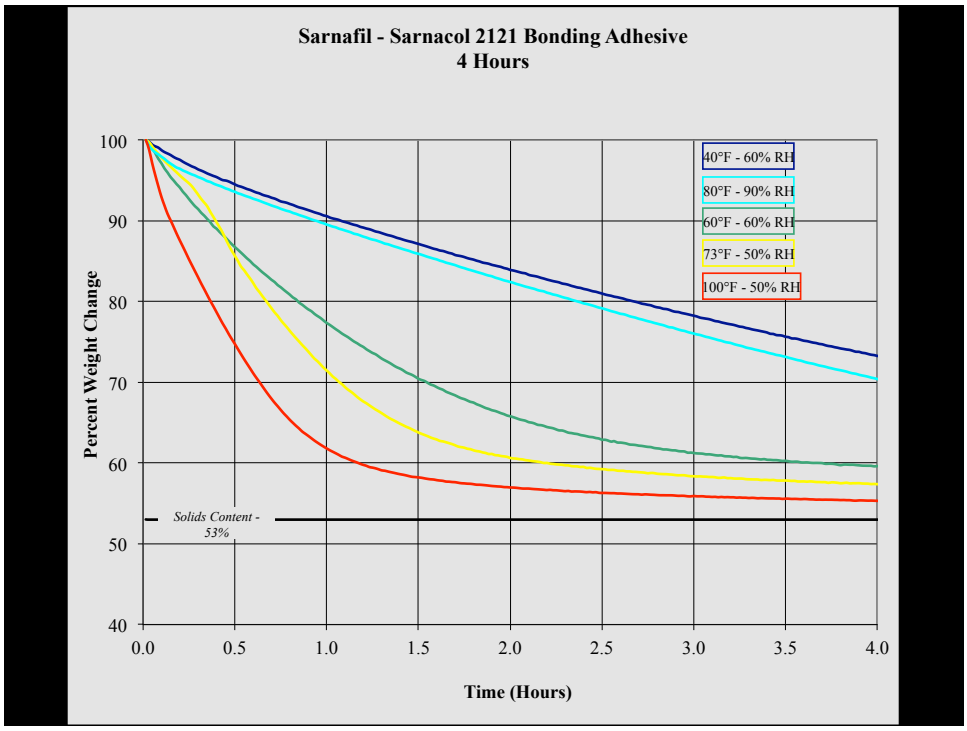


Time to Dry Down in Neat Condition

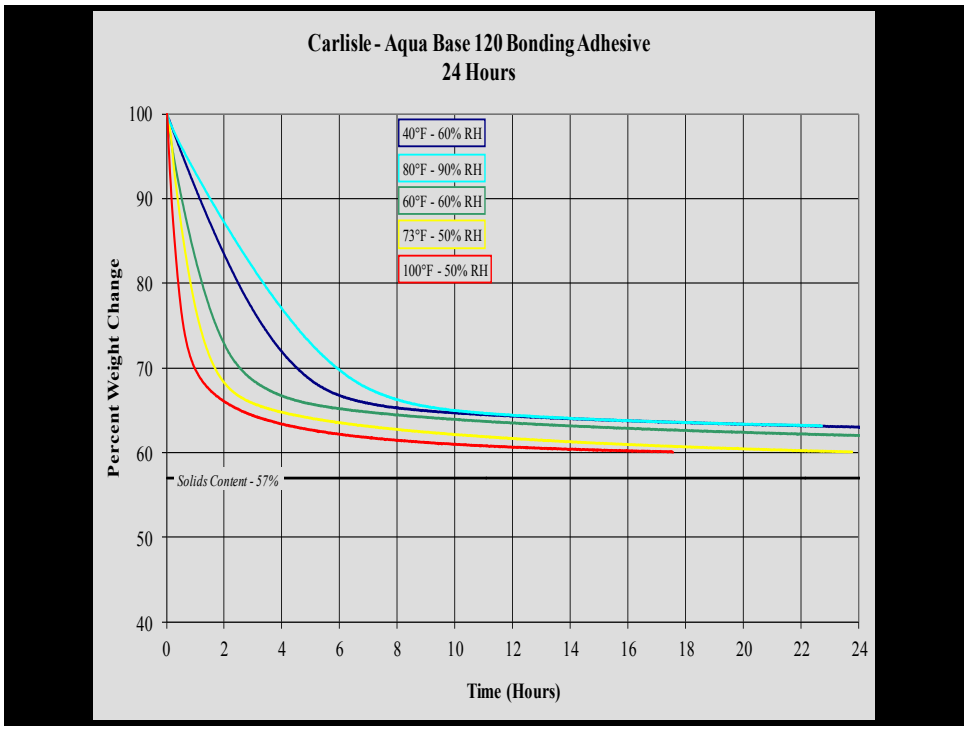
- Sarnafil – Sarnacol 2121
  - 24 and 4 hour graphs
- Carlisle Aqua Base 120
  - 24 and 4 hour graphs
- Firestone Water Based Bonding Adhesive P
  - 24 and 4 hour graphs
- GAF WB 181
  - 24 and 4 hour graphs
- All Products plotted together

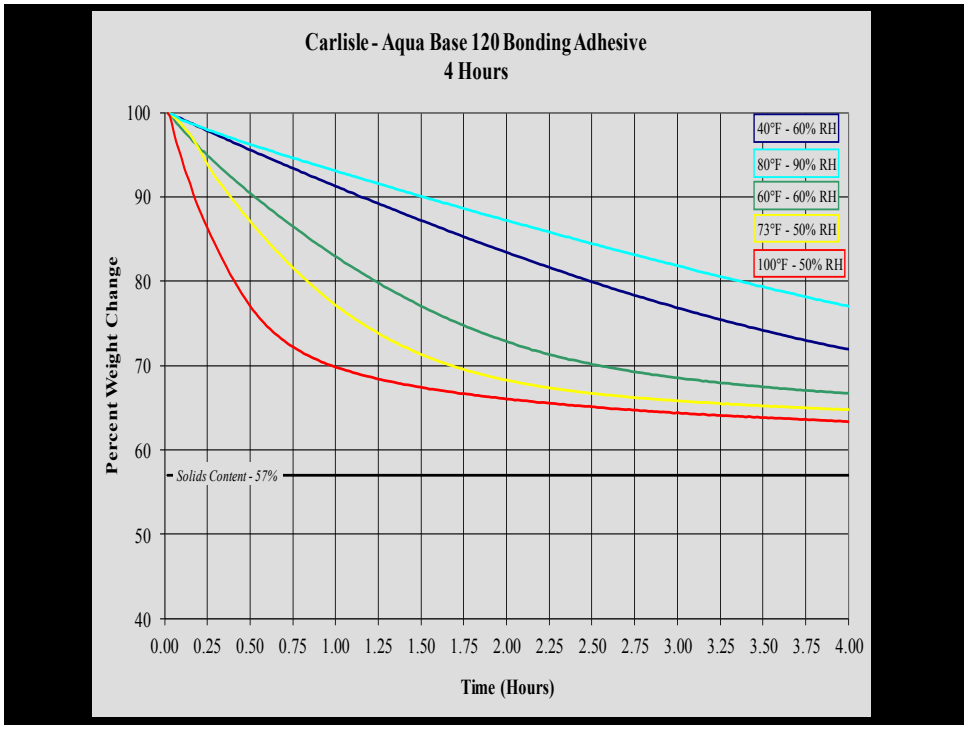
Sarnafil – Sarnacol 2121



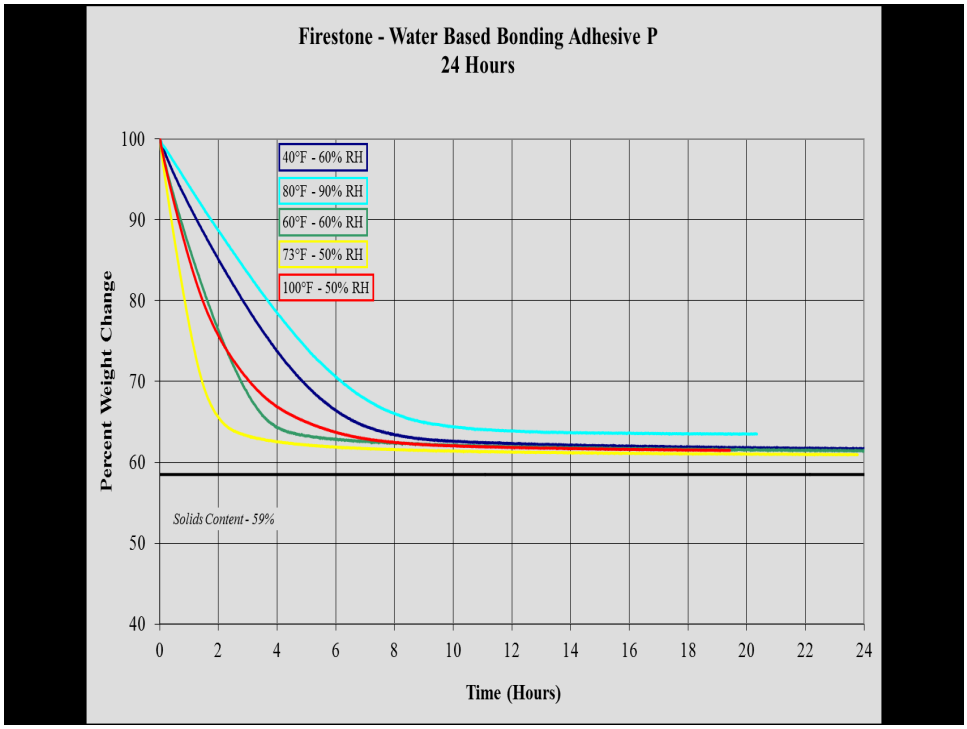


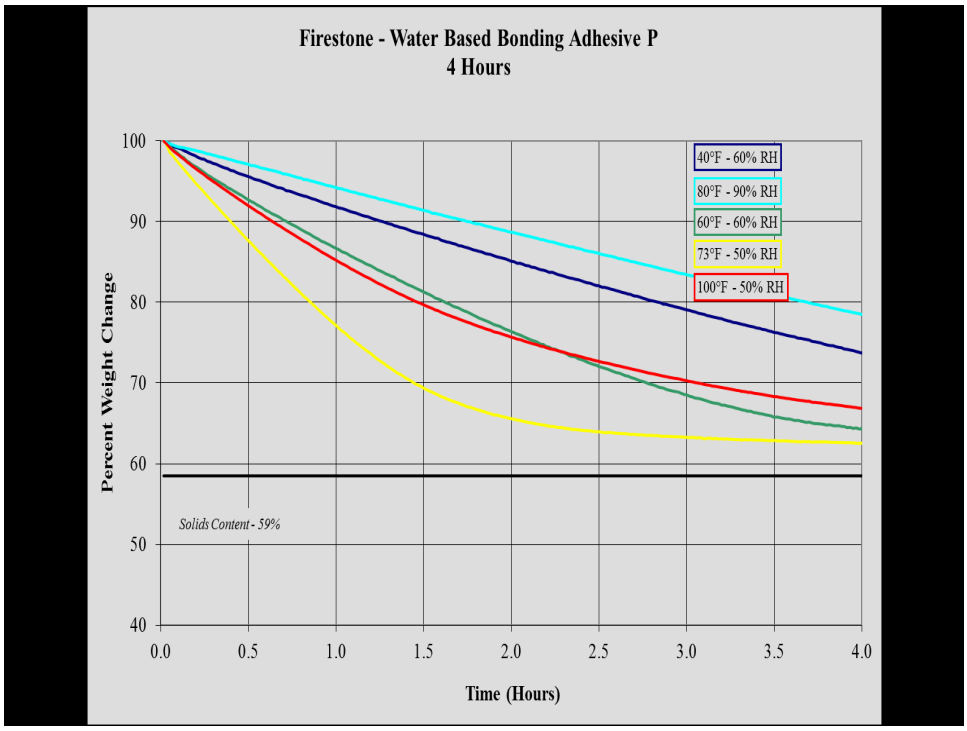
Carlisle Aqua Base 120


Carlisle - Aqua Base 120 Bonding Adhesive
24 Hours
Percent Weight Change
Time (Hours)
40°F - 60% RH
80°F - 90% RH
60°F - 60% RH
73°F - 50% RH
100°F - 50% RH
Solids Content - 57%
100
90
80
70
60
50
40
0
2
4
6
8
10
12
14
16
18
20
22
24

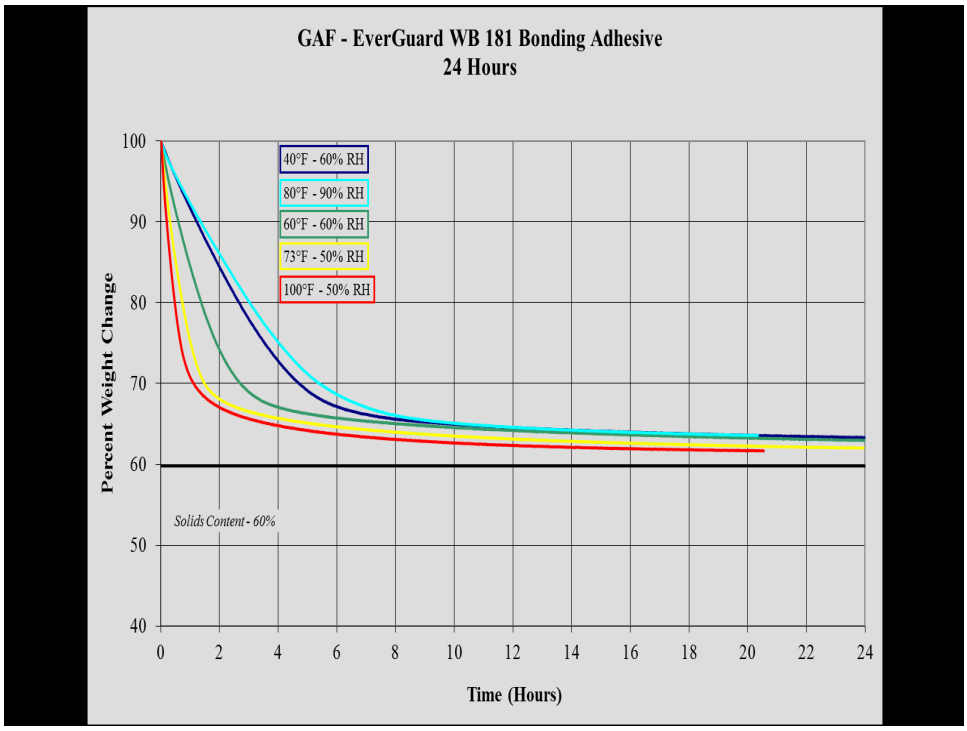

Carlisle - Aqua Base 120 Bonding Adhesive
4 Hours
Percent Weight Change
Time (Hours)
40°F - 60% RH
80°F - 90% RH
60°F - 60% RH
73°F - 50% RH
100°F - 50% RH
Solids Content - 57%
100
90
80
70
60
50
40
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00

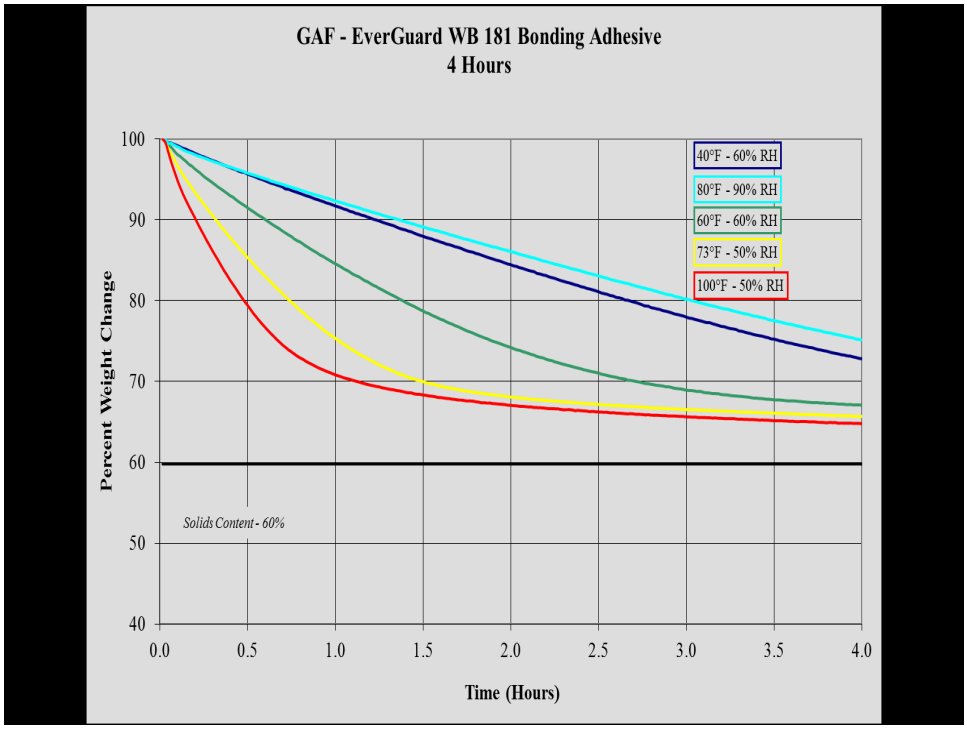
Firestone Water Based Bonding Adhesive P



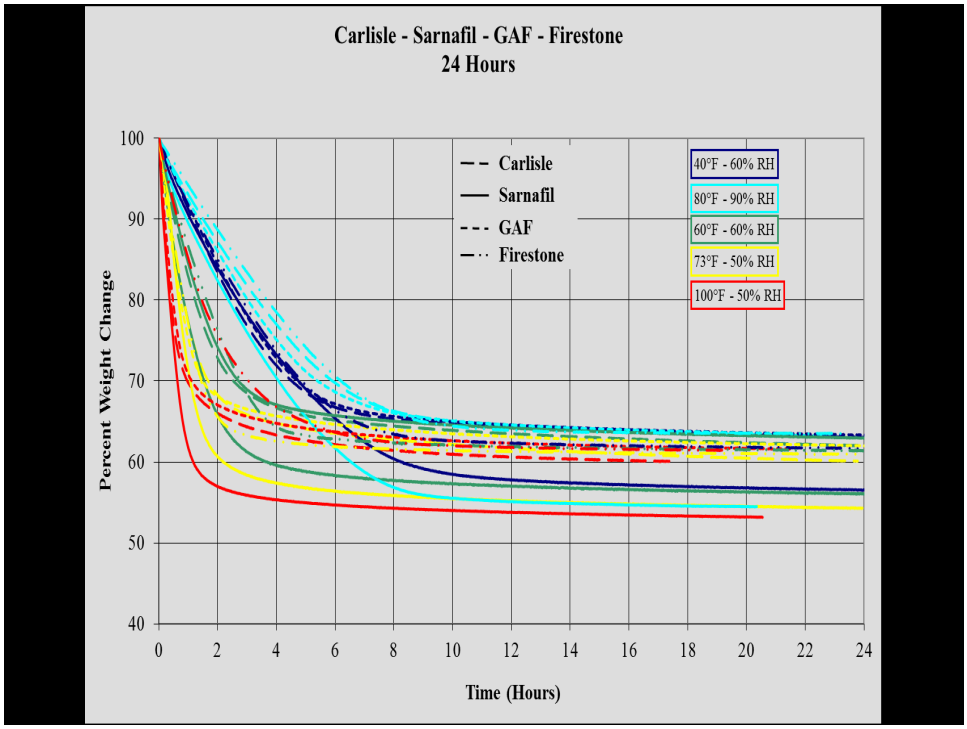

Firestone - Water Based Bonding Adhesive P
4 Hours
Percent Weight Change
100
90
80
70
60
50
40
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Time (Hours)
40°F - 60% RH
80°F - 90% RH
60°F - 60% RH
73°F - 50% RH
100°F - 50% RH
Solids Content - 59%

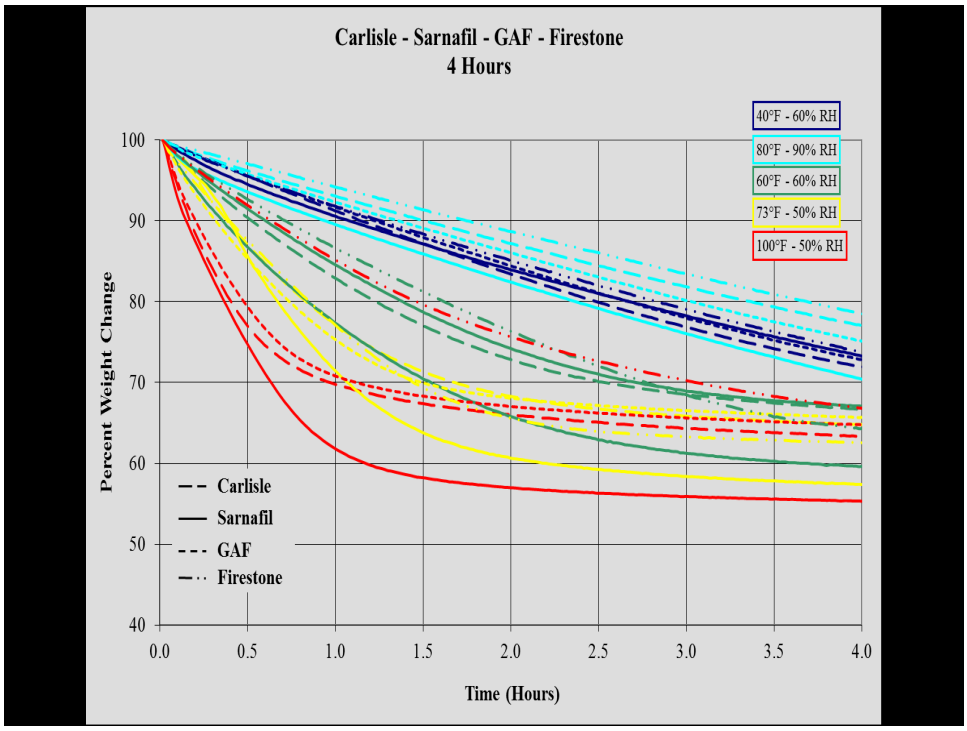
GAF WB 181


GAF - EverGuard WB 181 Bonding Adhesive
24 Hours
Percent Weight Change
Time (Hours)
40°F - 60% RH
80°F - 90% RH
60°F - 60% RH
73°F - 50% RH
100°F - 50% RH
Solids Content - 60%
100
90
80
70
60
50
40
0
2
4
6
8
10
12
14
16
18
20
22
24

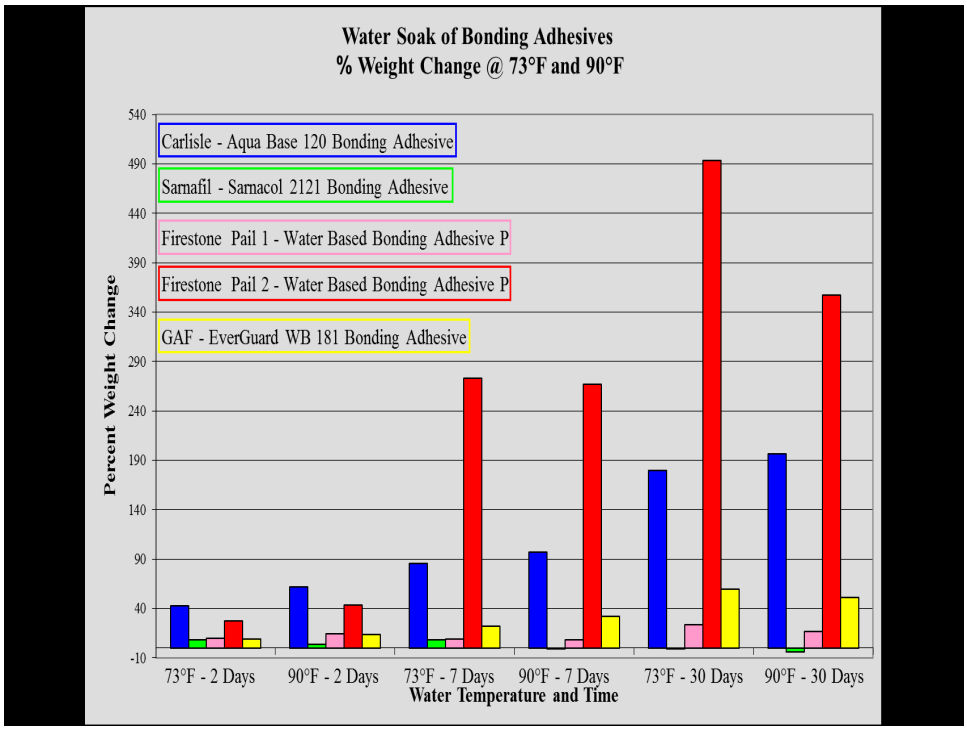

GAF - EverGuard WB 181 Bonding Adhesive
4 Hours
Percent Weight Change
Time (Hours)
40°F - 60% RH
80°F - 90% RH
60°F - 60% RH
73°F - 50% RH
100°F - 50% RH
Solids Content - 60%
100
90
80
70
60
50
40
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0

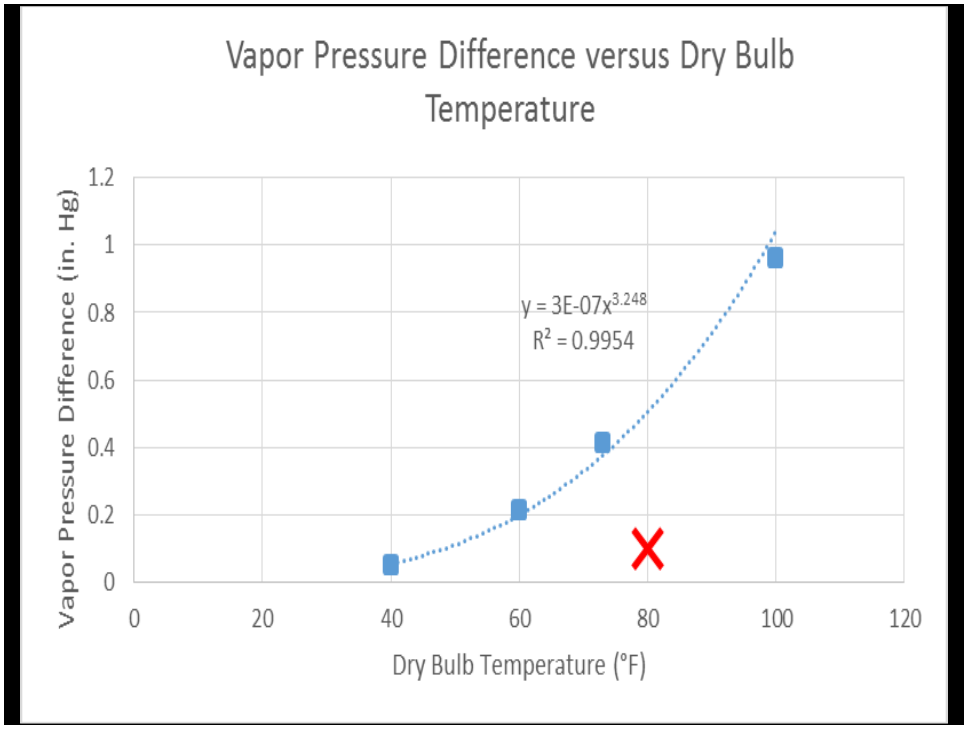
All Products Plotted Together





Water Gain During Immersion


Water Soak of Bonding Adhesives
% Weight Change @ 73°F and 90°F
Carlisle - Aqua Base 120 Bonding Adhesive
Sarnafil - Sarnacol 2121 Bonding Adhesive
Firestone Pail 1 - Water Based Bonding Adhesive P
Firestone Pail 2 - Water Based Bonding Adhesive P
GAF - EverGuard WB 181 Bonding Adhesive
Percent Weight Change
540
490
440
390
340
290
240
190
140
90
40
-10
73°F - 2 Days
90°F - 2 Days
73°F - 7 Days
90°F - 7 Days
73°F - 30 Days
90°F - 30 Days
Water Temperature and Time


Vapor Pressure Difference versus Dry Bulb Temperature
Vapor Pressure Difference (in. Hg)
1.2
1
0.8
0.6
0.4
0.2
0
y = 3E-07x^3.248
R² = 0.9954
0
20
40
60
80
100
120
Dry Bulb Temperature (°F)

NRCA Technical Operations Committee: Technical Programs and Issues

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

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Topics

- Steel roof deck concerns
- Lightweight structural concrete roof decks
- Asphalt
  - IARC
  - EVT and FP testing
- 2012 IECC
  - Increasing R-values
  - Payback?

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Steel roof decks

We now know the rationale for FM Approval's 2013 classification changes

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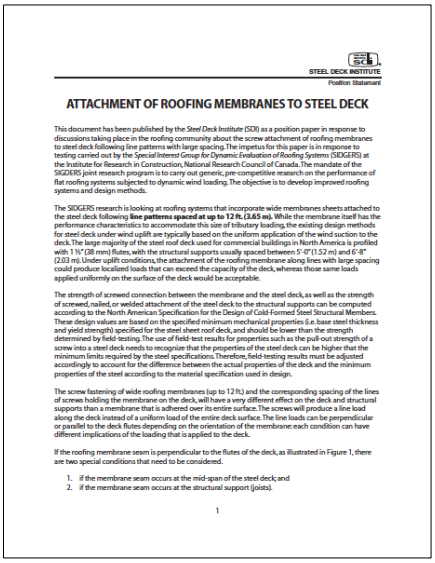
SDI bulletin



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 SIDGERS 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

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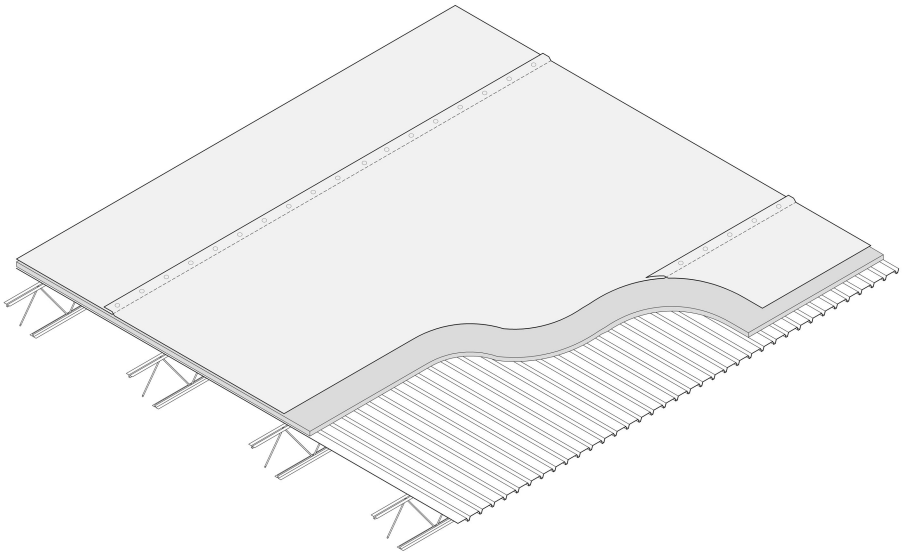
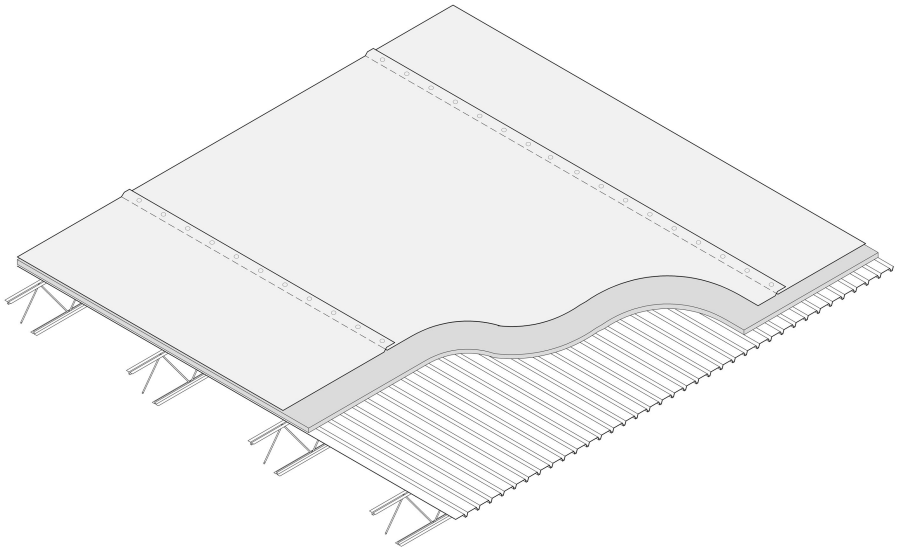
Membrane seams across deck flutes



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

Membrane seams in deck flute direction



SDI: 12 X bending moment and shear (deck)

SDI bulletin -- Conclusion

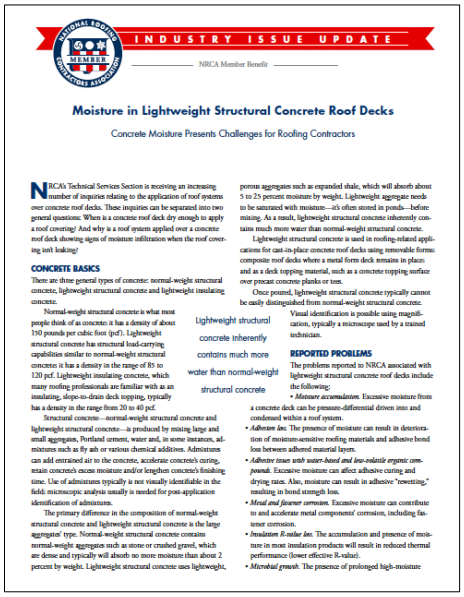
"…SDI does not recommend the use of roofing membranes attached to the steel deck using line patterns with large spacing unless a structural engineer has reviewed the adequacy of the steel deck and the structural supports to resist to wind uplift loads transmitted along the lines of attachment. Those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

NRCA interim recommendations

- Beware of the situation
- NRCA is investigating further…

Moisture-related concerns with lightweight structural concrete roof decks

NRCA Industry Issue Update, August 2013



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.

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

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.

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

Conclusions

- Concrete roof decks – normal weight and light-weight structural – present challenging moisture-related considerations.
- Further complicated by the use of admixtures and method of finishing.
- NRCA does not support the 28-day drying period or the plastic sheet test

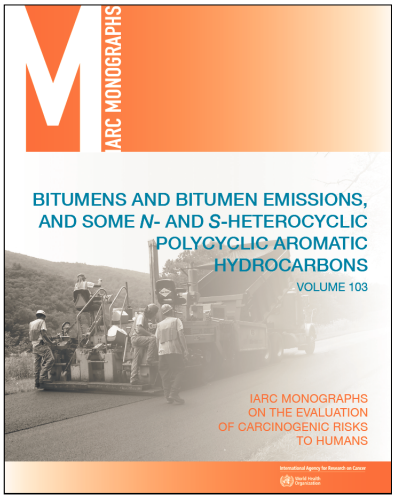
Conclusions - continued

- Roofing contractors can only visually assess the dryness of the concrete's top surface
- Roofing contractors cannot readily assess any remaining free moisture within concrete or its likely release

Roofing contractors are not privy to and may not be knowledgeable about the information necessary to make "…when to roof…" decisions

Asphalt

Asphalt



IARC Monograph – 103:

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

No new regulation (yet)

Some terminology…

Flash point (FP): the lowest temperature at which asphalt vapors above a volatile combustible substance can ignite in air when exposed to an ignition source; tested using ASTM D92.

Equiviscous temperature (EVT): the temperature at which asphalt attains proper viscosity (flow rate) for built-up membrane application; tested using ASTM D4402 – 125 cP (mop application) and 75 cP (mechanical spreader application).

Some more terminology…

EVT application range: the recommended bitumen application range. The range is approximately 25 F above or below the EVT, thus giving a range of approximately 50 F. The EVT is measured in the mop cart pr mechanical spreader just prior to application of bitumen to the substrate.

NRCA recommends…

"…NRCA recommends designers specify asphalt with a sufficiently high enough FP temperature top provide a minimum 125-degree differential between an asphalt's EVT and FP temperature to allow for proper application of built-up membranes."

NRCA asphalt testing -- 1989

- 26 asphalt samples
- EVTs:
  - Type III (mop) 375 – 450 F
  - Type III (spreader) 400 – 500 F
  - Type IV (mop) 395 – 475 F
  - Type IV (spreader) 425 – 505 F
- FPs:
  - Not reported

NRCA asphalt testing -- 2000

- 19 asphalt lots sampled
- EVTs:
  - Type III (mop) 390 – 440 F
  - Type III (spreader) 415 – 470 F
- FPs: 585 – 640 F
- ASTM D312 compliance:
  - 10 of 19 did not comply

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NRCA asphalt testing – 2014 (to date)

- 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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Proposed revision to ASTM D312

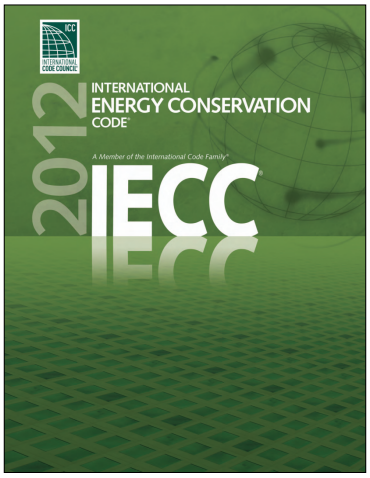
- Maximum heating temp.: 550 F (575 F min. FP)
- Maximum EVTs:
  - Type III (mop) 430 F
  - Type III (spreader) 455 F
  - Type IV (mop) 470 F
  - Type IV (spreader) 485 F
- Lot-specific package labeling of EVT

NRCA's interim recommendations

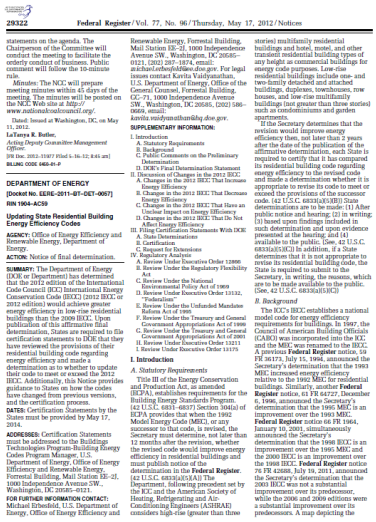
- Consult manufacturers' installation requirements and MSDS.
- Carefully select asphalt
- Beware of actual FPs; max. heating temp. should be FP – 25 F
- Beware of actual EVTs
- Make field crews aware

International Energy Conservation Code, 2012 Edition

International Energy Conservation Code, 2012 Edition (IECC 2012)



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. 2012-11977 Filed 5–16–12; 8:45 am]

BILLING CODE 0450–01–P

DEPARTMENT OF ENERGY

[Docket No. EERE–2011–BT–DET–0067]

RIN 1904–AC59

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–2J, 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–2J, 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
D. DOE's Final Determination Statement
II. 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
III. Filing Certification Statements With DOE
A. Certification Statements
B. Certification
C. Request for Extensions
IV. Regulatory Analysis
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 2005
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 stories) 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 not 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 increased energy efficiency 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 42688, 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 has determined IECC 2012 will achieve greater energy efficiency in low-rise residential buildings than IECC 2009
- States must certify by May 17, 2014 their energy code meets or exceeds the levels of IECC 2012

This triggers most states to update their state energy code

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Roofing-related changes

International Energy Conservation Code, 2012 Edition

- R-value increases
- Mandatory roof reflectivity requirements in Climate Zones 1-3
- Mandatory air barrier requirements in Climate Zones 4-8

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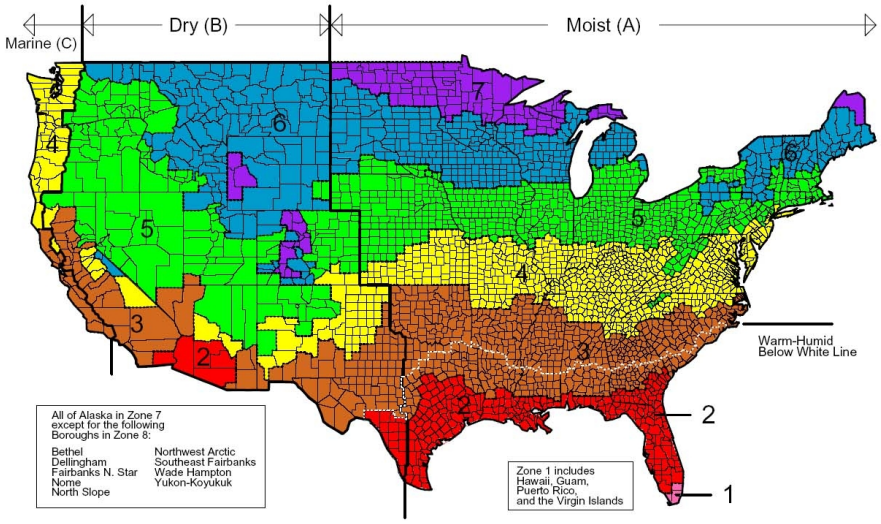
Climate zones

IECC 2012, Section C301 and Sec. R301—Climate Zones



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Roofing-specific adaptation of Table R402.1

International Energy Conservation Code, 2012 Edition

Insulation and Fenestration Requirements by Component[a]	
Climate zone	**Ceiling R-value**
1	30
2	38
3	
4	49
5	
6	
7	
8	
[a] R-values are minimums. … [Other footnotes omitted for clarity]	

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Roofing-specific adaptation of Table C402.2

International Energy Conservation Code, 2012 Edition

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-25 ci		
5			
6	R-30ci	R-25 + R-11 LS	R-49
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)

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International Energy Conservation Code, 2012 Edition

Status of states' adoptions

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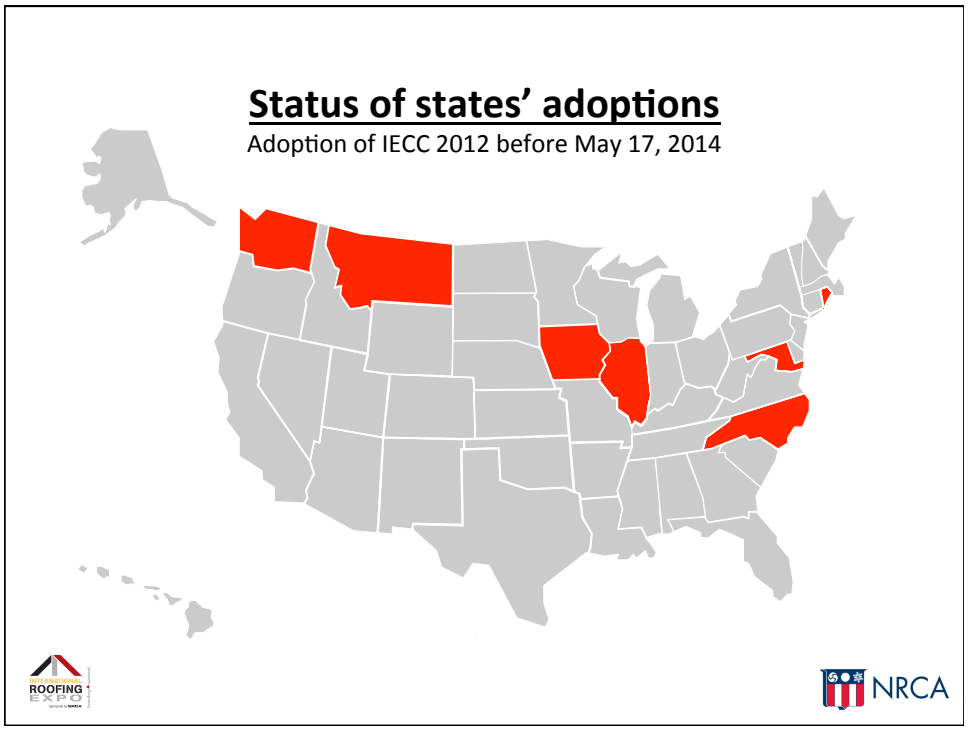
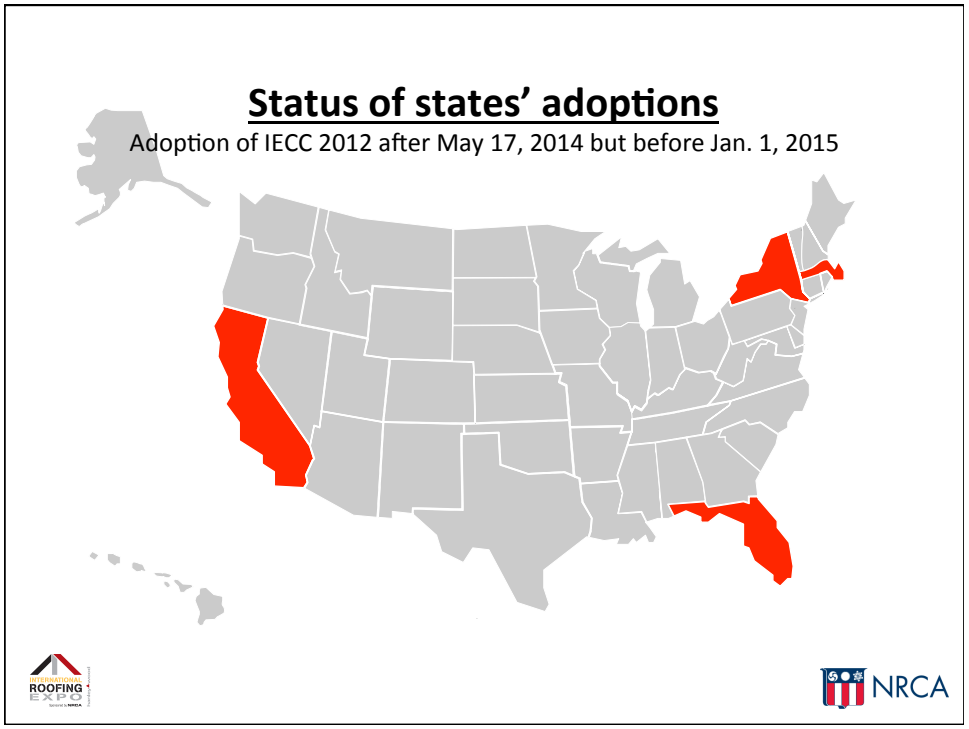
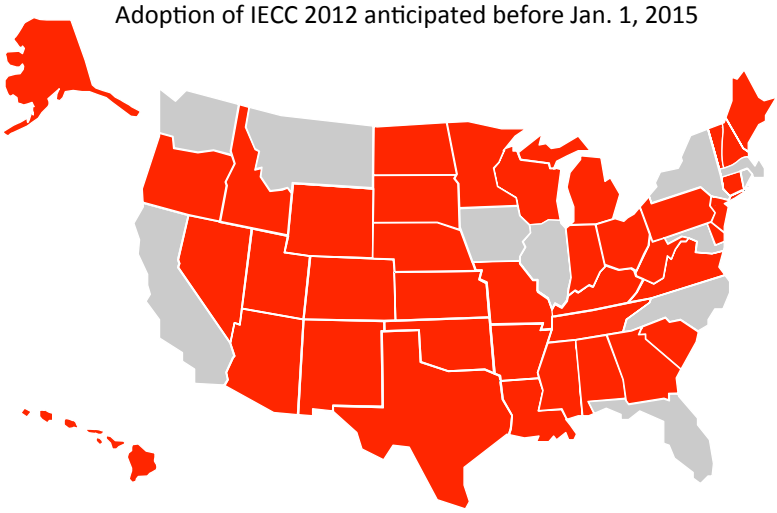

Status of states' adoptions
Adoption of IECC 2012 before May 17, 2014
NRCA


Status of states' adoptions
Adoption of IECC 2012 after May 17, 2014 but before Jan. 1, 2015
NRCA

Status of states' adoptions

Adoption of IECC 2012 anticipated before Jan. 1, 2015



So….

- Do increased R-values make sense?
- Is there a realistic payback?

…we've done some calculations

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In a heating climate

10,000 sq. ft. building in Minneapolis, MN

R-value increase	Annual Btu savings	Payback time
R-10 to R-15	68,995,466 Btu	9.4 years
R-15 to R-20	38,033,780 Btu	15.8 years
R-20 to R-25	21,876,909 Btu	29.1 years
R-25 to R-30	15,415,978 Btu	63.5 years

In a cooling climate

10,000 sq. ft. building in Miami, FL

R-value increase	Annual Btu savings	Payback time
R-10 to R-15	14,094,020 Btu	15.0 years
R-15 to R-20	7,870,571 Btu	30.7 years
R-20 to R-25	4,561,644 Btu	49.3 years
R-25 to R-30	3,232,756 Btu	106.7 years

Questions?

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