



Aurora, CO – Wednesday, December 16, 2015

Pinpoint Seminar: Technical Update

presented by

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Energy code update

International Energy Conservation Code, 2015 Edition



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Federal Register

June 11, 2015

32250 Federal Register / Vol. 80, No. 112 / Thursday, June 11, 2015 / Notice

32250 **Federal Register / Vol. 80, No. 112 / Thursday, June 11, 2015 / Notice**

• Presentation by DOE:
Public Comment Period:
• Action:
 Public Participation: The NRC/CAR Committee welcomes the submission of comments on the proposed energy efficiency and will make every effort to accommodate persons with physical disabilities or special needs. If you require special accommodations due to a disability, please contact Michael Antonovich at least seven days in advance of the meeting at the telephone number listed above. Written statements may be filed with the Committee either before or after the meeting. Individuals who wish to make oral statements pertaining to specific items should contact Michael Antonovich at the address or telephone number listed above. Individuals wishing to make oral statements will be provided a maximum of five minutes to present their comments. Written statements will be accepted by the address or phone number listed above. Minutes and other Board documents are on the Internet at <http://www.nrcra.org>.
• Action:
 Agency: Energy Efficiency and Renewable Energy, Department of Energy.
• Summary: The U.S. Department of Energy (DOE) is announcing the 2015 update of the International Energy Conservation Code (IECC). Improve energy efficiency in buildings that buildings meeting the 2015 IECC compared with buildings meeting the

States must certify whether their residential energy code complies with IECC 2015 levels by June 12, 2017.

This typically causes states to update their Energy Code



Status of states' adoptions

<http://www.nrcra.net/Technical/EnergyCodes>

The screenshot shows the NRCA website's 'Energy codes' page. It features a navigation bar with 'Members only', 'Bookstore', 'Technical', 'Education', 'Member directory', 'Government advocacy', 'Safety and insurance', and 'About'. The main content area includes a 'Home > Technical' breadcrumb, a 'Renew your membership' button, and a 'Roofing industry news' section with an advertisement for 'ALPINE SNOWGUARDS'. A 'with YOUR Pricing' banner is also visible at the bottom of the page.



Energy codes by state

To see the energy codes from a particular state, please select the state from the dropdown list.

Details for Colorado

State-mandated code:
 IECC 2003 for jurisdictions that adopt and enforce codes. Many jurisdictions have voluntarily adopted IECC 2009

IECC 2012 (with reference to ASHRAE 90.1-2010) for all Factory Built and Multi Family structures in areas of Colorado that do not adopt or enforce building codes.

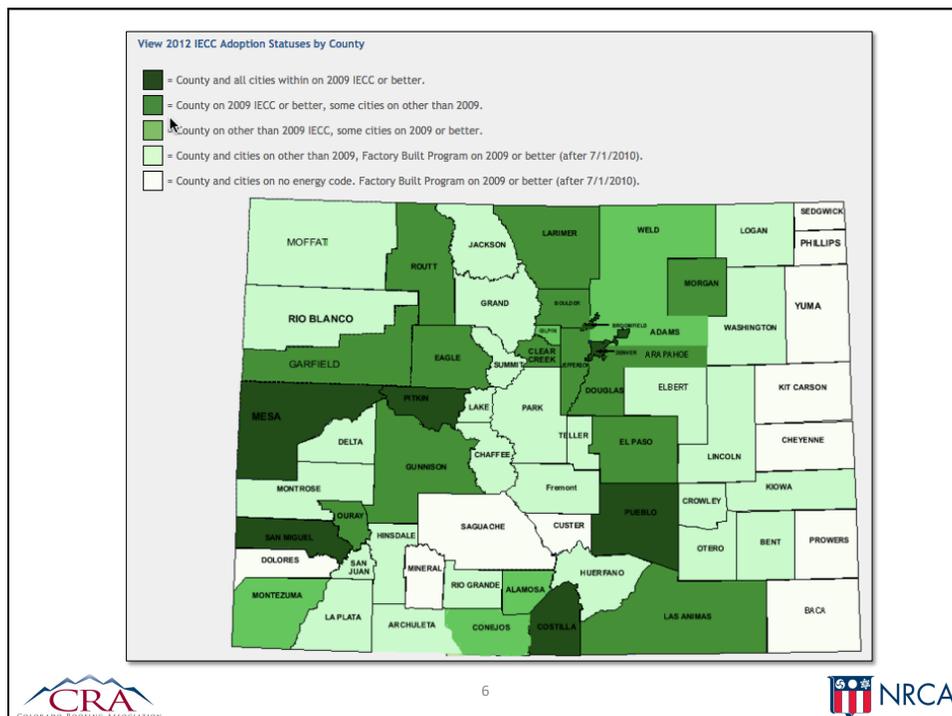
Click the following link for the status of Colorado energy codes by jurisdiction (link maintained by the State of Colorado Department of Local Affairs): <https://dola.colorado.gov/geo/ecMap2009.jsf>

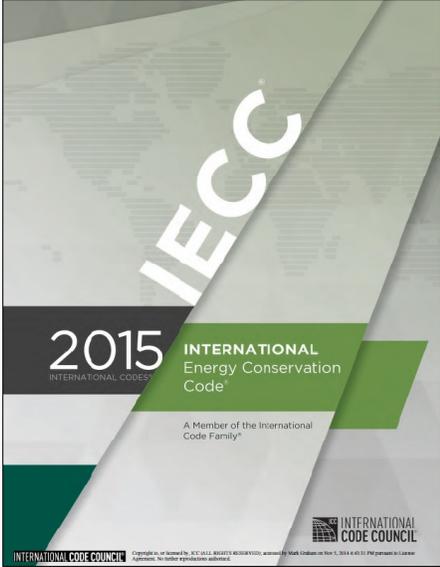
Code administration agency:
 Colorado Dept. of Local Affairs
 Division of Housing
 1313 Sherman St.
 Room 500
 Denver, CO 80203
 (303) 866-2033
www.colorado.gov/cs/Satellite/DOLA-Main/CBON/1251591390175

Applicability:
 Local

Technical basis:
 IECC 2003, IECC 2012, ASHRAE 90.1-2010


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IECC 2015:
Commercial buildings:

- All except “Residential Buildings”

Residential buildings:

- One- and two-family dwellings, multiple single-family dwellings and Group R-2, R-3 and R-4 buildings three stories or less

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Format of IECC 2015

<p><u>Commercial (CE):</u></p> <ul style="list-style-type: none">• Ch. 1-Scope• Ch. 2-Definitions• Ch. 3-General requirements• Ch. 4-Commercial energy efficiency• Ch. 5-Existing buildings• Ch. 6-Reference standards	<p><u>Residential (RE):</u></p> <ul style="list-style-type: none">• Ch. 1-Scope• Ch. 2-Definitions• Ch. 3-General requirements• Ch. 4-Residential energy efficiency• Ch. 5-Existing buildings• Ch. 6-Reference standards• Appendix RA-Atmospheric venting• Appendix RB-Solar-ready provisions
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Residential provisions are not addressed in this presentation

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IECC 2015 – Commercial (CE)

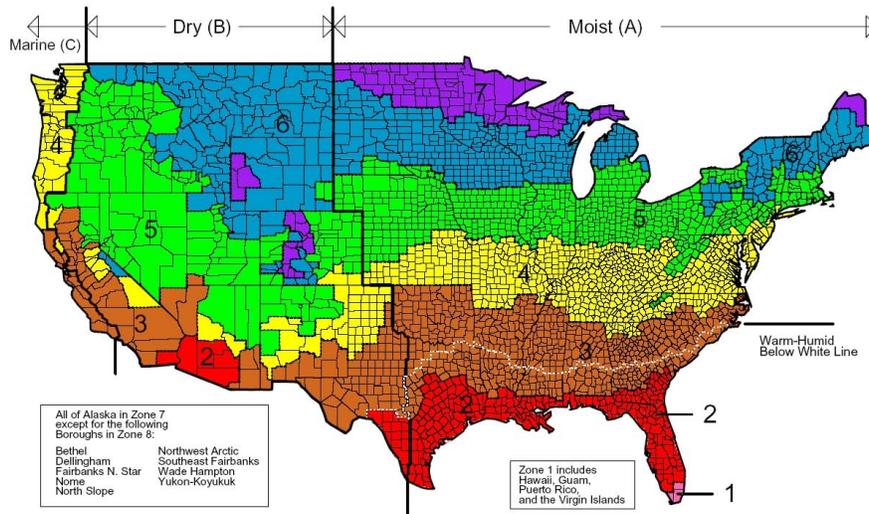


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IECC 2015, Fig. C301.1-Climature zones

Fig. R301.1 (residential climate zones) is similar



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Ch. 4[CE]-Commercial energy efficiency

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C404, C405.2, C405.3, C405.4, C405.6 and C407. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.



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Ch. 4[CE]-Commercial energy efficiency

C402.1.1 Low-energy buildings. The following low energy buildings, or portions thereof separated from the remainder of the building by building thermal envelope assemblies complying with this section, shall be exempt from the building thermal envelope provisions of Section C402.

1. Those with a peak design rate of energy usage less than $3.4 \text{ Btu/h} \cdot \text{ft}^2$ (10.7 W/m^2) or 1.0 watt per square foot (10.7 W/m^2) of floor area for space conditioning purposes.
2. Those that do not contain conditioned space.
3. Greenhouses.



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Ch. 4[CE]-Commercial energy efficiency

C402.2.2 Roof assembly. The minimum thermal resistance (*R*-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table C402.1.3, based on construction materials used in the roof assembly. Skylight curbs shall be insulated to the level of roofs with insulation entirely above deck or R-5, whichever is less.

Exceptions: [next slide]

Insulation installed on a suspended ceiling with removable ceiling tiles shall not be considered part of the minimum thermal resistance of the roof insulation.



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Ch. 4[CE]-Commercial energy efficiency

Exceptions:

1. Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25 mm) or less and where the area-weighted U-factor is equivalent to the same assembly with the R-value specified in Table C402.1.3.
2. Where tapered insulation is used with insulation entirely above deck, the R-value where the insulation thickness varies 1 inch (25 mm) or less from the minimum thickness of tapered insulation shall comply with the R-value specified in Table C402.1.3.
3. Unit skylight curbs included as a component of a skylight listed and labeled in accordance with NFRC 100 shall not be required to be insulated.



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Roofing-specific adaptation of Table C402.1.3

Commercial Buildings (Insulation component R-value-based method)

Climate zone	Assembly description		
	Insulation entirely above deck	Metal buildings	Attic and other
1	R-20ci (all other) R-25ci (Group R)	R-19 + R-11 LS	R-38
2	R-25ci		
3			
4	R-30ci	R-19 + R-11 LS	R-38 (except Marine 4)
5			R-38 (all other) R-49 (Group R, Marine 4)
6		R-25 + R-11 LS	R-49
7	R-35ci	R-30 + R-11 LS	
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ci = Continuous insulation; LS = Liner system

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Ch. 4[CE]-Commercial energy efficiency

C402.3 Roof solar reflectance and thermal emittance. Low-sloped roofs directly above cooled conditioned spaces in Climate Zones 1, 2 and 3 shall comply with one or more of the options in Table C402.3.

Exceptions: [next slide]

**TABLE C402.2
MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS**

Three-year solar reflectance of 0.55 and 3-year aged thermal emittance of 0.75
Three-year-aged solar reflectance index of 64

[Footnotes omitted for clarity]



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Ch. 4[CE]-Commercial energy efficiency

Exceptions: The following roofs and portions of roofs are exempt from the requirements of Table C402.3:

1. Portions of the roof that include or are covered by the following:
 - 1.1. Photovoltaic systems or components.
 - 1.2. Solar air or water-heating systems or components.
 - 1.3. Roof gardens or landscaped roofs.
 - 1.4. Above-roof decks or walkways.
 - 1.5. Skylights.
 - 1.6. HVAC systems and components, and other opaque objects mounted above the roof.
2. Portions of the roof shaded during the peak sun angle on the summer solstice by permanent features of the building or by permanent features of adjacent buildings. [Continued...]



Ch. 4[CE]-Commercial energy efficiency

3. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot [74 kg/m²] or 23 psf [117 kg/m²] pavers.
4. Roofs where not less than 75 percent of the roof area complies with one or more of the exceptions to this section.

C402.3.1 Aged roof solar reflectance. Where an aged solar reflectance required by Section C402.3 is not available, it shall be determined in accordance with Equation 4-3.

$$R_{aged} = [0.2 + 0.7(R_{initial} - 0.2)] \quad \text{(Equation 4-3)}$$

where:

R_{aged} = The aged solar reflectance.

$R_{initial}$ = The initial solar reflectance determined in accordance with CRRC-1.



Ch. 4[CE]-Commercial energy efficiency

C402.5 Air leakage—thermal envelope (Mandatory). The thermal envelope of buildings shall comply with Sections C402.5.1 through C402.5.8, or the building thermal envelope shall be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge (75 Pa) or an equivalent method approved by the code official and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/ft² (0.2 L/s · m²). Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.



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Ch. 4[CE]-Commercial energy efficiency

C402.5.1 Air barriers. A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof. The air barrier shall comply with Sections C402.5.1.1 and C402.5.1.2.

Exception: Air barriers are not required in buildings located in Climate Zone 2B.



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Ch. 4[CE]-Commercial energy efficiency

C402.5.1.2 Air barrier compliance options. A continuous air barrier for the opaque building envelope shall comply with Section C402.5.1.2.1 or C402.5.1.2.2.

C402.5.1.2.1 Materials. Materials with an air permeability not greater than 0.004 cfm/ft² (0.02 L/s · m²) under a pressure differential of 0.3 inch water gauge (75 Pa) when tested in accordance with ASTM E 2178 shall comply with this section. Materials in Items 1 through 16 shall be deemed to comply with this section, provided joints are sealed and materials are installed as air barriers in accordance with the manufacturer's instructions.

[Continued...]



Ch. 4[CE]-Commercial energy efficiency

- 1.-4. ...
- 5. Closed-cell spray foam a minimum density of 1.5 pcf (2.4 kg/m³) having a thickness of not less than 1½ inches (38 mm)
- 6.-8. ...
- 9. Built-up roofing membrane.
- 10. Modified bituminous roof membrane.
- 11. Fully adhered single-ply roof membrane.
- 12.-16. ...



Ch. 4[CE]-Commercial energy efficiency

C402.5.1.2.2 Assemblies. Assemblies of materials and components with an average air leakage not greater than 0.04 cfm/ft² (0.2 L/s · m²) under a pressure differential of 0.3 inch of water gauge (w.g.) (75 Pa) when tested in accordance with ASTM E 2357, ASTM E 1677 or ASTM E 283 shall comply with this section. Assemblies listed in Items 1 through 3 shall be deemed to comply, provided joints are sealed and the requirements of Section C402.5.1.1 are met.

1. Concrete masonry walls coated with either one application of block filler or two applications of a paint or sealer coating.
2. Masonry walls constructed of clay or shale masonry units with a nominal width of 4 inches (102 mm) or more.
3. A Portland cement/sand parge, stucco or plaster not less than 1/2 inch (12.7 mm) in thickness.

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Ch. 5[CE]-Commercial energy efficiency

Sec. C503-Alterations:

C503.3 Building envelope. New building envelope assemblies that are part of the alteration shall comply with Sections C402.1 through C402.5.

C503.3.1 Roof replacement. Roof replacements shall comply with Table C402.1.3 or C402.1.4 where the existing roof assembly is part of the building thermal envelope and contains insulation entirely above the roof deck.

Roof replacements shall comply to the same IECC 2015 requirements as new construction



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Ch. 5[CE]-Commercial energy efficiency

SECTION C504

REPAIRS

C504.1 General. Buildings and structures, and parts thereof, shall be repaired in compliance with Section C501.3 and this section. Work on nondamaged components that is necessary for the required repair of damaged components shall be considered part of the repair and shall not be subject to the requirements for alterations in this chapter. Routine maintenance required by Section C501.3, ordinary repairs exempt from permit and abatement of wear due to normal service conditions shall not be subject to the requirements for repairs in this section.

Where a building was constructed to comply with ANSI/ASHRAE/IESNA 90.1, repairs shall comply with the standard and need not comply with Sections C402, C403, C404 and C405.



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Ch. 5[CE]-Commercial energy efficiency

C504.2 Application. For the purposes of this code, the following shall be considered repairs:

1. ...
2. *Roof repairs.*
3. Air barriers shall not be required for *roof repair* where the repairs to the building do not include *alterations*, renovations or *repairs* to the remainder of the building envelope.
4. ...
5. ...



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In summary: IECC 2015 – Commercial (CE)

- R-value
- Roof reflectivity (Climate Zones 1-3 only)
- Air retarders (All Climate Zones except 2B)
- Roof replacement:
 - R-value requirements to IECC 2015 levels
 - Roof reflectivity per IECC 2015
 - Air retarder per IECC 2105 (whole building envelope replacement only)



INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Analyzing R-value Requirements

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

November 2014

Roof 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.

Compared to IECC 2009's minimum prescriptive R-values with those in the *International Energy Conservation Code, 2009 Edition* (IECC 2009) result 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 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 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, that 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 updating their building energy codes to the latest edition of the model code.

To determine the statuses of individual states' energy code

adoption, NRCA conducted a comprehensive survey of states' adoption and plans for future code upgrades. From this survey, only seven states were discovered to have updated their energy code to IECC 2012 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 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, 2009 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 assembly above	Roof buildings with R-3 thermal blanket	Attic and other
1	R-20ci	R-10 + R-11.15	R-20
2	R-20ci	R-10 + R-11.15	R-20
3	R-20ci	R-10 + R-11.15	R-20
4	R-25ci	R-10 + R-11.15	R-20
5	R-25ci	R-10 + R-11.15	R-20
6	R-20ci	R-20 + R-11.15	R-40
7	R-25ci	R-20 + R-11.15	R-40
8	R-25ci	R-20 + R-11.15	R-40

ci = Gypsum Insulation
 R-3 = Low-slope (a continuous membrane installed below the surface and attached to the roof structure, membrane, reinforcement, without insulation over or the insulation under the panel)
 *Figure 1. Minimum prescriptive thermal insulation requirements for commercial buildings



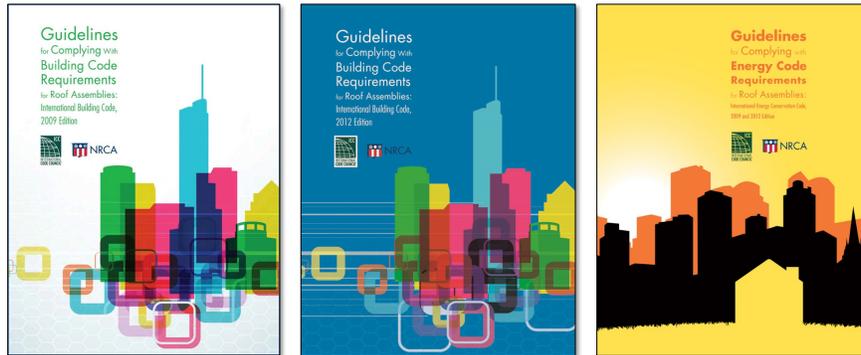
NRCA "Industry Issue Update," November 2014

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 (Denver, CO):
- R-10 to R-15: 12.1 yrs.
 - R-15 to R-20: 25.1 yrs.
 - R-20 to R-25: 40.4 yrs.
 - R-25 to R-30: 88.2 yrs.

NRCA code manuals

shop.nrca.net or (866) ASK-NRCA



Consider joining ICC



Membership categories:

- Corporate member: \$400 (complete collection)
- Building safety professional member: \$150 (1 code)

<http://www.iccsafe.org/Membership/Pages/join.aspx>





INDUSTRY ISSUE UPDATE

NRCA Member Benefit

NRCA "Industry Issue Update," August 2013:

- Reported problems
- Deck dryness tests:
 - Conventional dryness tests are no longer reliable
 - Suggested using ASTM F2170
- NRCA recommendations:
 - Contractors should not determine deck dryness
 - Don't use lightweight structural concrete
 - Remedial repair suggestions

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 a concrete roof deck dry enough to apply a roof covering?" And why is a roof system applied over a concrete roof deck showing signs of moisture infiltration when the roof covering isn't leaking?

CONCRETE BASICS
There are three general types of concrete: normal-weight structural concrete, lightweight structural concrete and lightweight insulating concrete.

Normal-weight structural concrete is what most people think of as concrete. It has a density of about 150 pounds per cubic foot (pcf). Lightweight structural concrete has structural load-carrying capabilities similar to normal-weight structural concrete. It has a density in the range of 85 to 120 pcf. Lightweight insulating concrete, which many roofing professionals are familiar with as an insulating, slope-to-drain deck topping, typically has a density in the range from 20 to 40 pcf.

Structural concrete—normal-weight structural concrete and lightweight structural concrete—is produced by mixing large and small aggregates, Portland cement, water and, in some instances, admixtures such as fly ash or various chemical additives. Admixtures can add entrained air to the concrete, accelerate concrete's curing, retain moisture to cure 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 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—its 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 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.
- **Adhesive 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-solids organic compounds.** Excessive moisture can affect adhesive curing and drying rates. Also, moisture can result in adhesive "swelling," resulting in bond strength loss.
- **Steel and faster corrosion.** Excessive moisture can contribute to and accelerate metal component corrosion, including faster 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).
- **Mold and green growth.** The presence of prolonged high-moisture

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

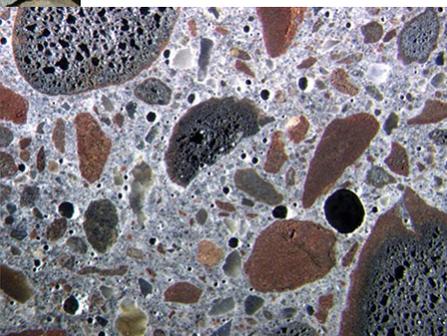


COLOrado ROOFING ASSOCIATION

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An up-close look



COLOrado ROOFING ASSOCIATION

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Concrete Floors and Moisture, 2nd Edition

Howard M. Kanare, CTL Group

75% internal RH can be achieved:

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



Barrier One

BARRIER ONE INTERNATIONAL MOISTURE VAPOR REDUCTION ADMIXTURE	<p style="font-size: small;">Phone: 877.234.5550 Fax: 352.348.2400 522 S. West Clark Blvd., #303 Apopka, Florida 32703</p> <p style="font-size: x-small;">Email: info@barrieroone.com Website: www.barrieroone.com</p> <p style="text-align: right; font-size: x-small;">Effective Date</p>
--	--

General Contractor
 Attn: Project Manager
info@barrieroone.com
 P. XX, XX XXXX
 123 Main Street
 Any Town, USA 12345

Subject: BARRIER ONE PROJECT MOISTURE LETTER
 Re: Project Name, address, city, state, zip

PM,
 Our Barrier One Concrete Admixture was used in the above named project. We obtained cylinders of the Barrier One closed concrete throughout the project for our quality control and warranty processes and have completed the hydraulic conductivity testing on those samples using ASTM D 5084. The test results reveal the concrete of your project to be non-hygroscopic and virtually impervious to moisture vapor emission from the concrete slab. No further field moisture testing is required by Barrier One prior to flooring installation, but if conducted, Barrier One warrants up to 100% moisture humidity (per ASTM C1715) within 28 pounds of moisture per ASTM F1545.

When our admixture is used, the associated warranty against moisture related flooring failure far exceeds that which is offered with the adhesive and flooring manufacturer. Barrier One warrants and completely removes the liability for moisture vapor emission from every one involved. Installation of the flooring can begin upon receipt assuming the site conditions are suitable and being sure to follow the flooring manufacturer's installation guidelines with the exception of field moisture and pH testing. Should the installed flooring later fail due to moisture vapor emission from the slab, the responsibility to address would rest with Barrier One, and not with flooring contractor, adhesive manufacturer, flooring manufacturer, your firm or the project's owner. This warranty is in effect for the life of the concrete and covers identification of failed areas/floor topical remediation of the corresponding slab and new material and labor for the installation of the same flooring material.

Please refer any questions you might have directly to your Barrier One Regional Manager or me at info@barrieroone.com.
 Sincerely,
 Principal
 Barrier One, Inc.

Copyright 2013 by Barrier One Inc. All Rights Reserved. Duplication without permission is prohibited.

“...moisture vapor reduction admixture (water-based concrete admixture). A nano scale, chemical formation of micro calcium silicate hydrate molecules that blocks moisture vapor transmission through the capillary system of cementitious structural concrete.”



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



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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



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Recommendations

Normal weight structural concrete

In new construction:

- Designer should specify “...when to roof...” criteria
 - Consult with CM/GC, concrete supplier and placement contractor, and roof system manufacturer

In reroofing:

- If evidence of moisture-related problems associated with the deck, treat the deck as lightweight structural concrete



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Recommendations – cont.

Lightweight structural concrete

In new construction:

- NRCA recommends lightweight structural concrete not be used for roof deck construction.
- If lightweight structural concrete is used, the Designer should specifically identify concrete drying parameters/when to apply roofing



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Recommendations – cont.

Existing concrete roof decks (known to be lightweight structural concrete or where moisture-related problems are evident):

- Above-deck venting design (e.g., venting base sheet)
- Adhered vapor retarder (e.g., two-part epoxy 12-15 mils)

Adhered or loosely-laid, ballasted roof systems



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NRLRC's Contract Provisions, Vol. III

“Roofing Contractor’s commencement of the roof installation indicates only that the Roofing Contractor has visually inspected the surface of the roof deck for visible defects and has accepted the surface of the roof deck. Roofing Contractor is not responsible for the construction, structural sufficiency, durability, fastening, moisture content, suitability, or physical properties of the roof deck or other trades’ work or design. Roofing Contractor is not responsible to test or assess moisture content of the deck or substrate.”



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Insulation R-values



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Insulation R-values

International Energy Conservation Code, 2015 Edition

C303.1.4 Insulation product rating. The thermal resistance (R-value) of insulation shall be determined in accordance with the U.S. Federal Trade Commission R-value rule (CFR Title 16, Part 460) in units of $h \cdot ft^2 \cdot ^\circ F/Btu$ at a mean temperature of 75°F (24°C).



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Long-term thermal resistance (LTTR)

- ASTM C1303
- ULC-S 770

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.



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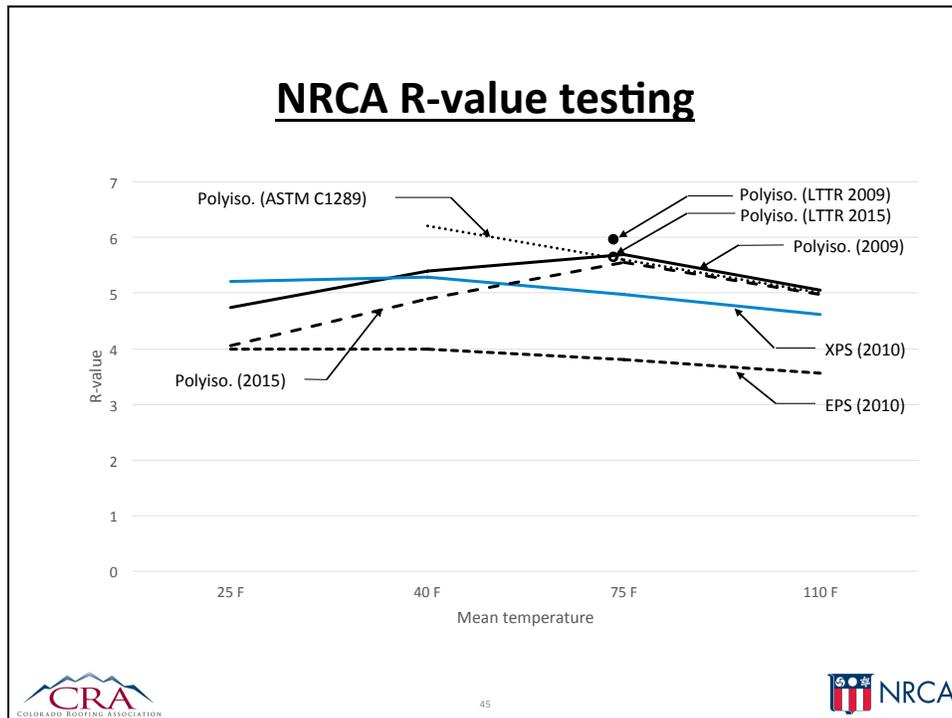
NRCA R-values testing

- Polyisocyanurate (2009 and previous)
- Expanded polystyrene (2010)
- Extruded polystyrene (2010)
- Polyisocyanurate (2015)



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NRCA’s design, in-service R-value recommendation

Polyisocyanurate insulation

1986-2011:

- R = 5.6 per inch thickness

2012-2015:

- R = 5.6 per inch thickness (cooling climates)
- R = 5.0 per inch thickness (heating climates)

Beginning in 2016:

- R = 5.0 per inch thickness

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NRCA recommendation

In contract documents, identify insulation by its thickness, not its LTTR or R-value.



High-density polyiso. coverboard

Professional Roofing, "Tech today," December 2015



Manufacturer	ASTM C1289, Type II, Class 4		
	Grade 1 (80 psi)	Grade 2 (110 psi)	Grade 3 (140 psi)
Atlas Roofing Corp.	ACFOAM®-HS Coverboard	—	—
	ACFOAM-III HD Coverboard		
Firestone Building Products Co.	—	ISOGARD HD Cover Board	—
GAF	EnergyGuard® HD Cover Board	EnergyGuard HD Plus Cover Board	—
Hunter Panels	H-Shield HD	—	—
Johns Manville	—	—	Invinsa Roof Board
			Invinsa FR
Rmax	—	—	—

Johns Manville — — Invinsa Roof Board —
 Invinsa FR — —
 Invinsa FR — —
 Invinsa FR — —

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Additional issues...

High-density polyiso coverboards

- Facer sheet delamination
- Boards being shipped wet
 - Manufacturer recommending boards be laid-out to air dry



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Proper wind design

- Determine wind loads
 - IBC Ch. 16-Structural Design
 - ASCE 7-10, “Minimum Design Loads for Buildings and Other Structures”
- Design for resistance
 - FM 4474
 - UL 580 or UL 1897

IBC requires (Sec. 1603) design wind loads to be shown in the Contract Documents



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*Specifying a wind warrantee,
in itself, is not proper wind design*



Design wind load determination

www.roofwinddesigner.com

$q_{10} = 0.00256 K_{zt} K_{d} K_{e} K_{g} K_{f} V^2 Z^2$

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Roof Wind Designer is intended to provide users with an easy-to-use means for determining roof systems' design wind loads for many commonly encountered building types that are subject to building code compliance.

Design wind loads are derived using the American Society of Civil Engineers (ASCE) Standard ASCE 7, "Minimum Design Loads for Buildings and Other Structures." This standard is a widely recognized consensus standard and is referenced in and serves as the technical basis for wind load determination in the International Building Code and NFPA 5000: Building Construction and Safety Code. Roof Wind Designer allows users to choose between the 2005 or 2010 editions of ASCE 7. Roof Wind Designer uses Method 1—Simplified Method, 2005 edition, and the Envelope Procedure, Part 2: Low-rise Buildings (Simplified) of Chapter 30, 2010 edition. For a more detailed explanation of the two editions, please [click here](#).

Also, Roof Wind Designer determines roof systems' minimum recommended design wind-resistance loads, which are derived from the building's design wind loads, taking into consideration a safety factor in reliance of ASTM D6630, "Standard Guide for Low Slope Insulated Roof Membrane Assembly Performance." Using these minimum recommended design wind-resistance loads, users can select appropriate wind resistance classified roof systems.

Roof Wind Designer has been developed and is maintained by the National Roofing Contractors Association (NRCA), with the support of the Midwest Roofing Contractors Association (MRCA) and the North/East Roofing Contractors Association (NERCA). Currently, this application is available at no cost.

Questions regarding Roof Wind Designer can be directed to the [Contact Us](#) page.

To register for a new account [click here](#). If you already have an account, [click here](#) to login.



FM 1-28 has been updated

www.fmglobalsdatasheets.com

FM Global
Property Loss Prevention Data Sheets 1-28
October 2015
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WIND DESIGN
MEMBERS OF FM GLOBAL SHOULD CONSULT THEIR LOCAL FM GLOBAL OFFICE BEFORE BEGINNING ANY ROOFING WORKS

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- October 2015 update
- Based upon ASCE 7-05 with enhancements
- Reformatted
- Be cautious of FM-insured projects
- NRCA will review and publish a summary of changes

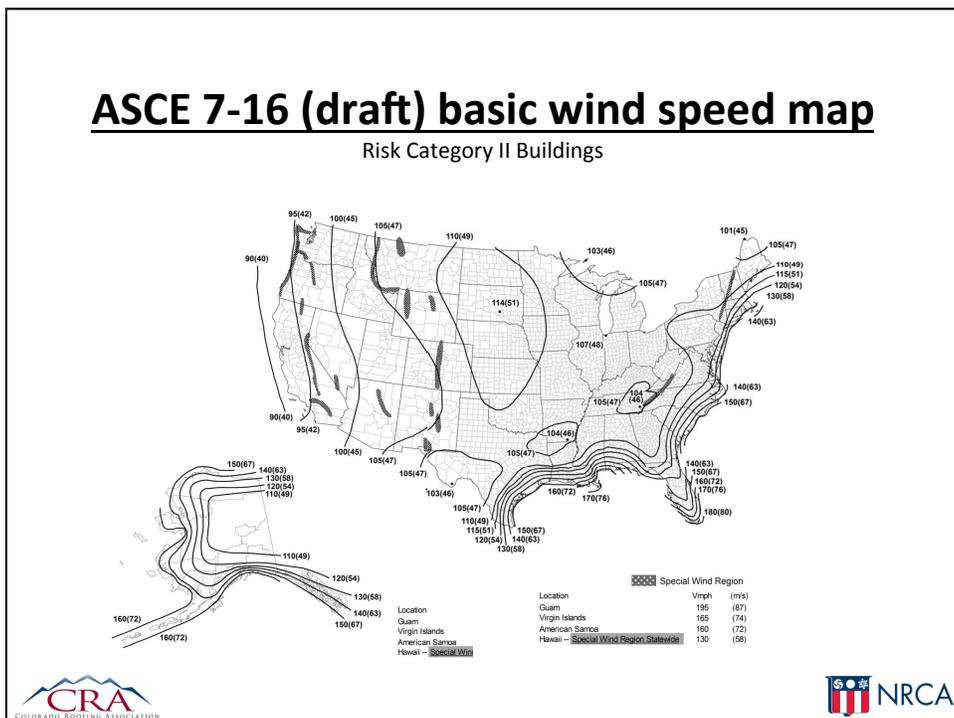
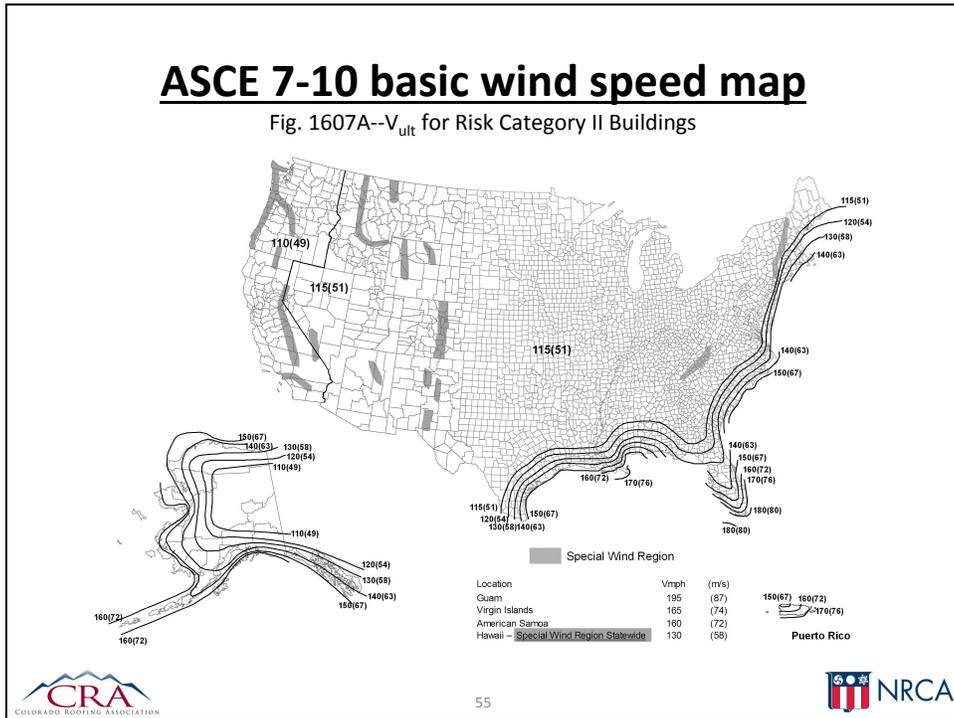


ASCE 7-16 (public review draft)

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

Expect higher field, perimeter and corner uplift pressures





GC_p pressure coefficients

$h \leq 60$ ft., gable roofs ≤ 7 degrees

Zone	ASCE 7-10	ASCE 7-16 (draft)
1 (field)	-1.0	-1.7
1'	--	-0.9
2 (perimeter)	-1.8	-2.3
3 (corners)	-2.8	-3.2

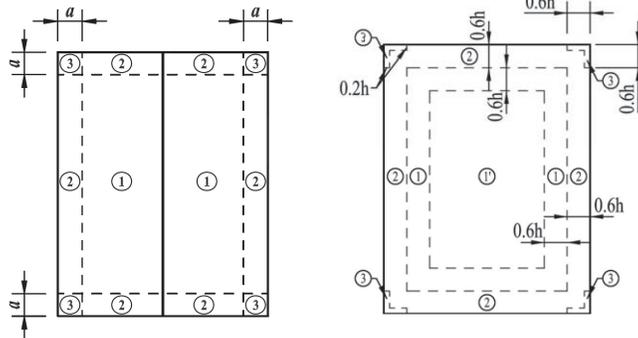


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Zones

$h \leq 60$ ft., gable roofs ≤ 7 degrees



ASCE 7-10

ASCE 7-16 (draft)



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*Proper wind design is oftentimes avoided...
and it is getting more complicated*



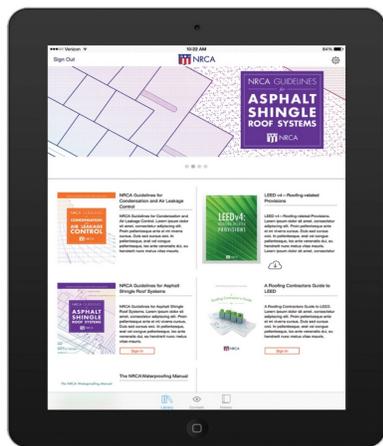
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The NRCA Roofing Manual



NRCA App

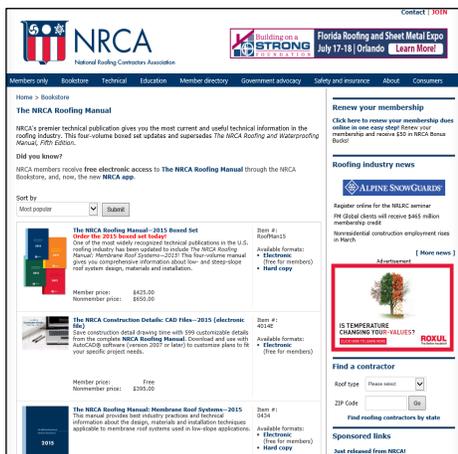


- NRCA App available on the Apple Store and Google Play Store for tablets
- iPhone App also available
- Register within App as being an NRCA member
- The NRCA Roofing Manual is viewable to NRCA members
- Favorite and send pages features



Manual online

www.nrca.net



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





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