remodeling SHOW deck EXPO JLC LIVE RESIDENTIAL CONSTRUCTION SHOW
THE PREMIER TRADE SHOW FOR RESIDENTIAL BUILDERS AND REMODELERS

Roofing-related Design and installation Considerations When Remodeling

presented by

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National Roofing Contractors Association (NRCA)

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About NRCA

- Not-for-profit trade association founded in 1886
- Rosemont, IL and Washington , DC
- More than 3,500 members:
  - Roofing contractors and affiliate members
  - All 50 states and 53 counties
  - 97 local, state and regional affiliates organizations
  - Less than $1 M to large companies
  - Both residential and commercial work
  - One-third in business for more than 50 years
- Information, education, technology and advocacy

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About me

- Grew up in a three-generation family construction business
- Degree in Architectural Engineering
- Roof contracting business
- Consulting engineer
- NRCA…for the last 21 years

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Learning objectives

- Understand code requirements applicable to roof systems
- Understand roof slope and how roof configuration(s) can limit slope
- Become knowledgeable of basic attic ventilation concepts
- Become knowledgeable to basic material/product considerations
- Learn basic installation tips

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Some terminology

Roof assembly: an assembly of interacting roof components including the roof deck, air and vapor retarder (if present), insulation and membrane or primary roof covering designed to weatherproof a structure.

Roof system: A system of interacting roof components generally consisting of a membrane or primary roof covering and roof insulation (not including the roof deck) designed to weatherproof and sometimes improve the building's thermal resistance.

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Roof slope

"incline", not "pitch"

Low slope	Steep slope
At or less than 2:12	Greater than 4:12
Hydrostatic	Hydrokinetic
Waterproof	Water shedding
Membrane roof coverings	Shingle-type roof coverings

Roof slopes from 2:12 to 4:12 become somewhat of a "no person's land" and are best avoided

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Valleys

The slope along a valley between two 4:12 roof slopes is about 3:12

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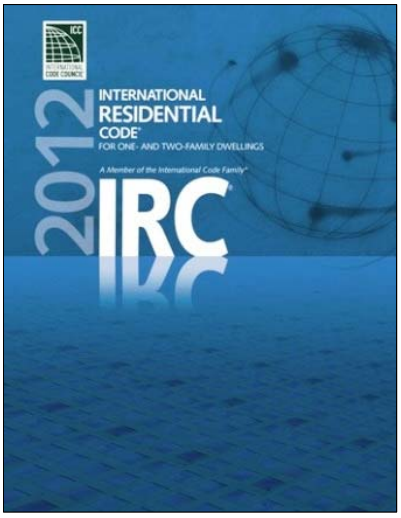
Building code



Applicable to:

- Detached one-and two family dwellings
- Townhouses not more than three-stories above grade

Roofing:

- Ch. 8-Roof-ceiling assemblies
  - Attic ventilation (Sec. R806)
- Ch. 9-Roof Assemblies

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Basic code requirements – Roof assemblies

- Fire resistant
  - Class A, B or C
- Wind resistant
  - Classified systems, or
  - Prescriptive requirements
- Product/material requirements
  - For example, ASTM D3462 asphalt shingles
  - Installed per manufacturer's installation instructions
- Prescriptive requirements
  - For example, metal drip edge
- Reroofing (Sec. R908)
  - Same requirements as for current new roof construction with exceptions

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Be careful of fire- vs. wind-classifications

Fire resistance:

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

Wind resistance

- Class A: 60 mph test exposure
- Class D: 90 mph test exposure
- Class F: 110 mph test exposure

The relative scale for wind resistance classifications is reversed from that of fire resistance classifications

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Impact resistance

Simulated hail impacts

UL 2218 (steel balls):

- Class 1 (minimal)
- Class 2
- Class 3
- Class 4 (highest)

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Attic ventilation

More isn't always better

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Attic ventilation

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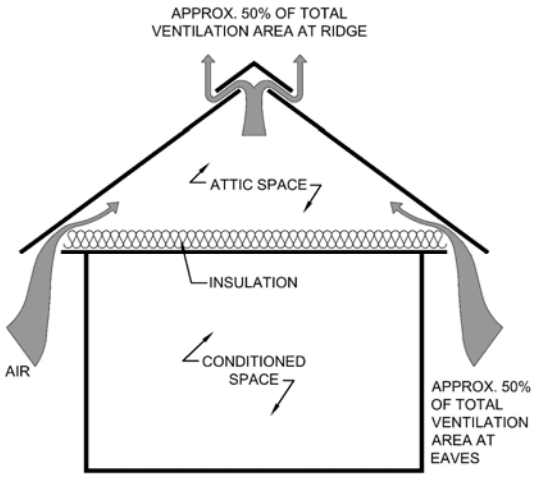
"Balanced" ventilation



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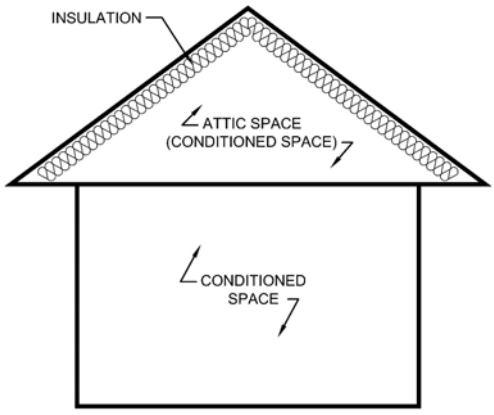
Unvented, conditioned attics



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International Residential Code, 2012 Edition

Chapter 8-Roof-Ceiling Construction; Section R806-Roof Ventilation

R806.5 Unvented attic and unvented enclosed rafter assemblies. Unvented attic assemblies (spaces between the ceiling joists of the top story and the roof rafters) and unvented enclosed rafter assemblies (spaces between ceilings that are applied directly to the underside of roof framing members/rafters and the structural roof sheathing at the top of the roof framing members/rafters) shall be permitted if all the following conditions are met:

1. The unvented attic space is completely contained within the building thermal envelope.
2. No interior Class I vapor retarders are installed on the ceiling side (attic floor) of the unvented attic assembly or on the ceiling side of the unvented enclosed rafter assembly.
3. Where wood shingles or shakes are used, a minimum 1/4- inch (6 mm) vented air space separates the shingles or shakes and the roofing underlayment above the structural sheathing.

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4. In Climate Zones 5, 6, 7 and 8, any air-impermeable insulation shall be a Class II vapor retarder, or shall have a Class III vapor retarder coating or covering in direct contact with the underside of the insulation.
5. Either Items 5.1, 5.2 or 5.3 shall be met, depending on the air permeability of the insulation directly under the structural roof sheathing.
   - 5.1 Air-impermeable insulation only. Insulation shall be applied in direct contact with the underside of the structural roof sheathing.
   - 5.2 Air-permeable insulation only. In addition to the air-permeable insulation installed directly below the structural sheathing, rigid board or sheet insulation shall be installed directly above the structural roof sheathing as specified in Table R806.5 for condensation control.
   - 5.3 Air-impermeable and air-permeable insulation. The air-impermeable insulation shall be applied in direct contact with the underside of the structural roof sheathing as specified in Table R806.5 for condensation control. The air-permeable insulation shall be installed directly under the air-impermeable insulation.

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5.4. Where preformed insulation board is used as the air-impermeable insulation layer, it shall be sealed at the perimeter of each individual sheet interior surface to form a continuous layer.

TABLE R806.5
INSULATION FOR CONDENSATION CONTROL

CLIMATE ZONE	MINIMUM RIGID BOARD ON AIR-IMPERMEABLE INSULATION R-VALUE[a]
2B and 3B tile roof only	0 (none required)
1, 2A, 2B, 3A, 3B, 3C	R-5
4C	R-10
4A, 4B	R-15
5	R-20
6	R-25
7	R-30
8	R-35

[a] Contributes to but does not supersede the requirements in Section N1103.2.1.

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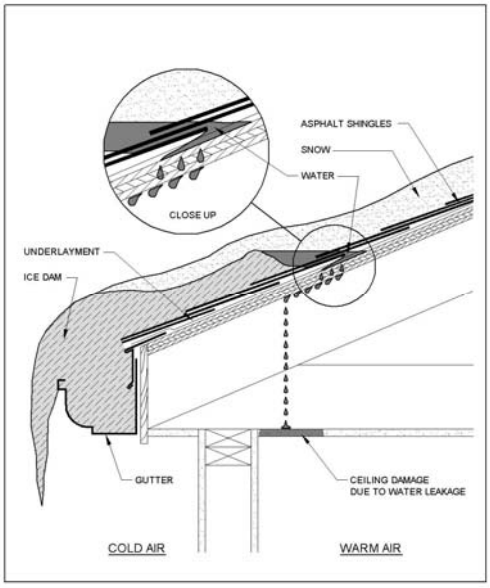
Ice damming



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Ice damming

The NRCA Roofing Manual

NRCA guidelines:

- For all steep-slope water-shedding roof systems (including tile and architectural metal panels)
- Include anytime "…the January mean temperature is 30 F or less…."
- ASTM D1970 self-adhering underlayment
- Extending upslope a minimum of 24 inches—measured in the horizontal plane—from the inside of a building's exterior wall line

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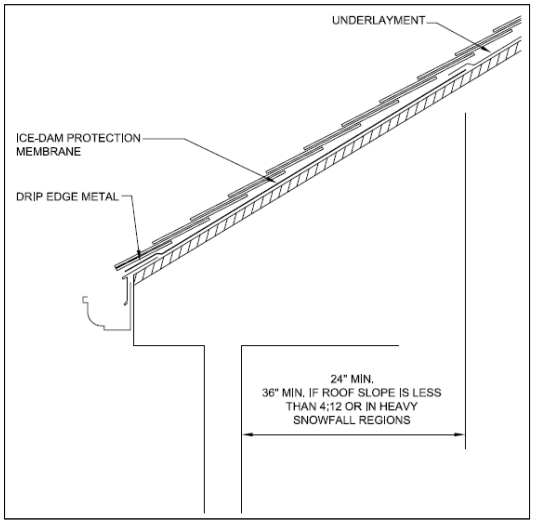
Ice dam membrane



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The NRCA Roofing Manual

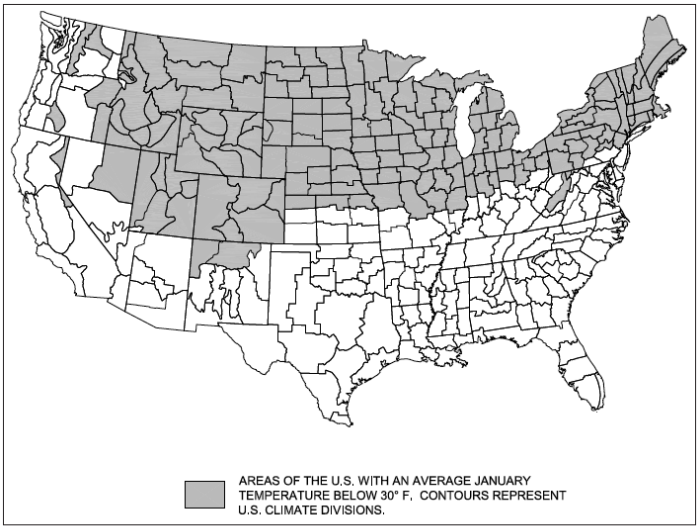

Figure 2-3: Areas of the U.S. with an average January temperature below 30 F, composite 1981-2012 data. Map is based on data provided by NOAA/ESRL Physical Sciences Division, Boulder, Colo., from its website, www.cdc.noaa.gov. Contours represent U.S. Climate Divisions.

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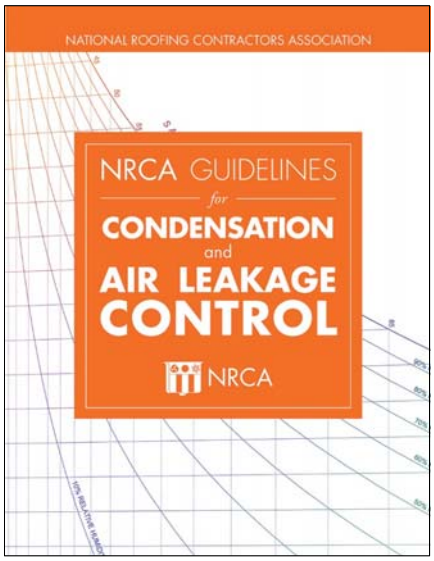
Vaulted (cathedral) ceilings



Wayne Tobiasson/CRREL research:

- Ventilation has a role in reducing ice-dam and icicle formation
- When it is warmer than 22 F, melted water seldom refreezes at eaves.
- Size ventilation to keep the bottomside of the roof deck below freezing when it is 22 F outside.
- When it is colder than 22 F, it is easier to ventilate with outside air

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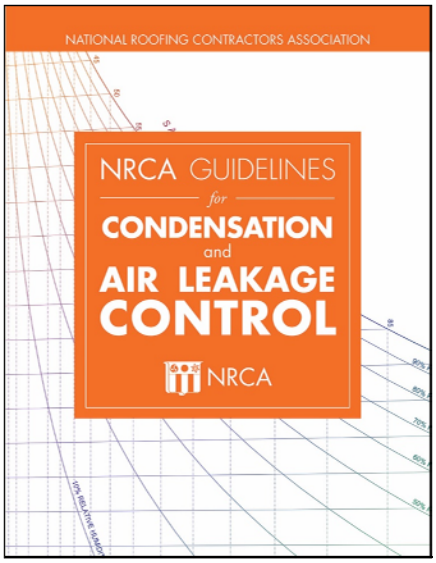
Vaulted (cathedral) ceilings



Pages 51-54:

- Further explanation of concept
- Graphs/curves:
  - Roof slope
  - Roof system R-value
  - Airway height (air space)
  - Inlet area (in^2)
  - Airway length (rafter length)

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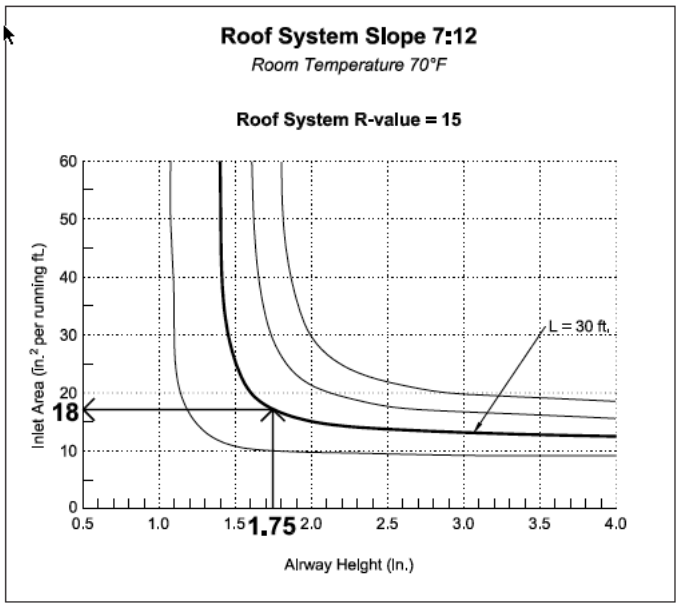

Figure 14: Example calculation for airways 1.75 inches in height with a rafter length of 30 feet and an R-value of 15, slope of 7:12

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Skylights

- IRC requires 4” curbs at slopes less than 3:12
- Cricket if 30” or wider
- AAMA/WDMA/CSA 101/I.S./A440
- Use pre-manufactured flashing kits

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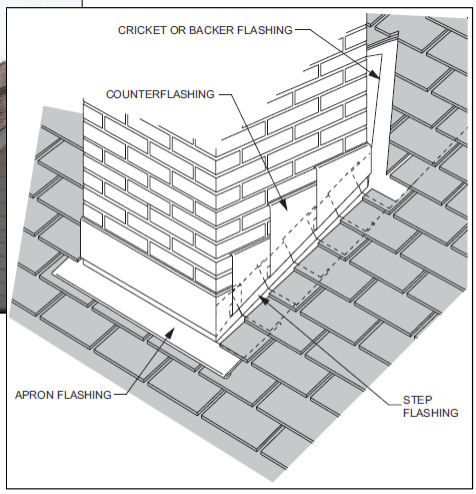
Chimney flashing



Roof product/system choices – Low slope

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Roof product/system choices – Steep slope



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Roof Warrantees

- Product/material warrantees
- Roof system warrantees
- Wind warrantees

Roof warrantees really serve as marketing tools and limitations of liability

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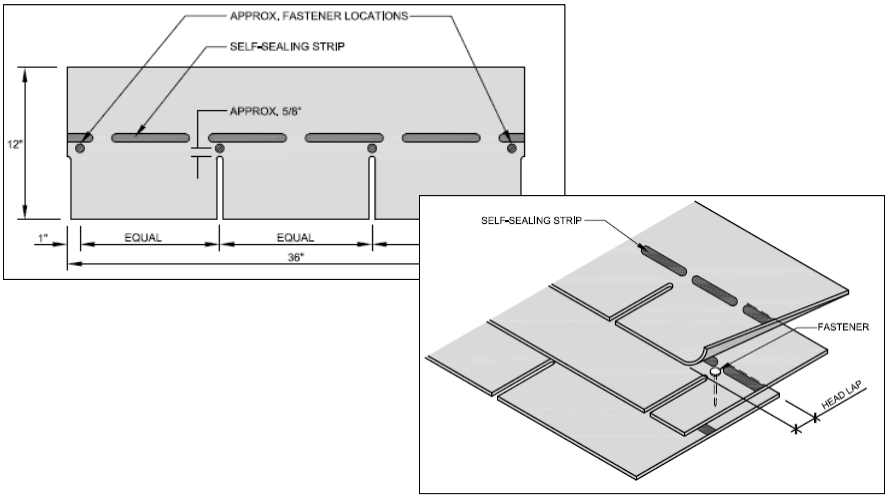
Asphalt shingles – Fastener placement

Three-tab shingles



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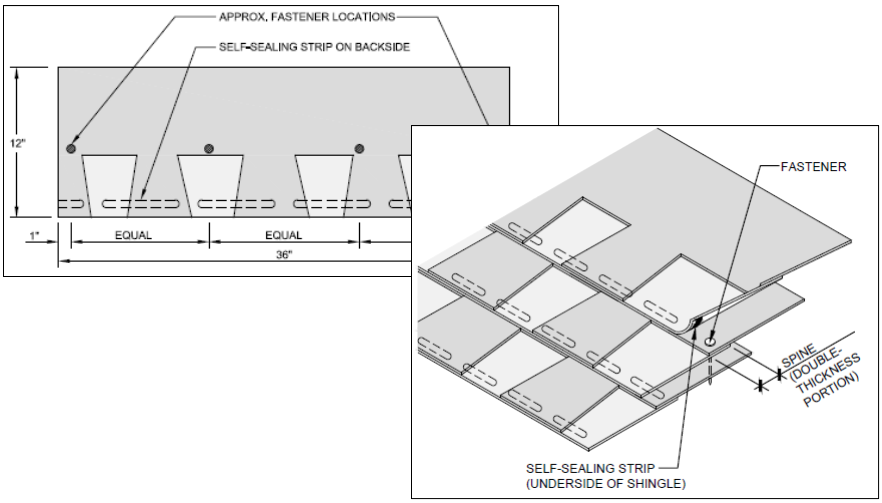
Asphalt shingles – Fastener placement

Architectural/laminated shingles



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Asphalt shingles - discoloration

Consider purchasing
algae-resistant (AR) shingles

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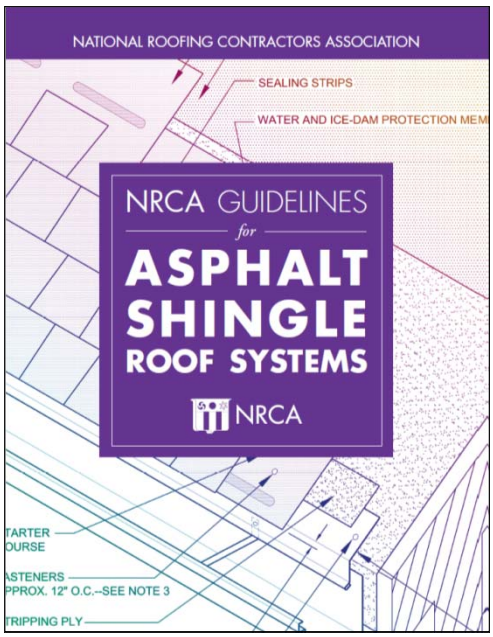

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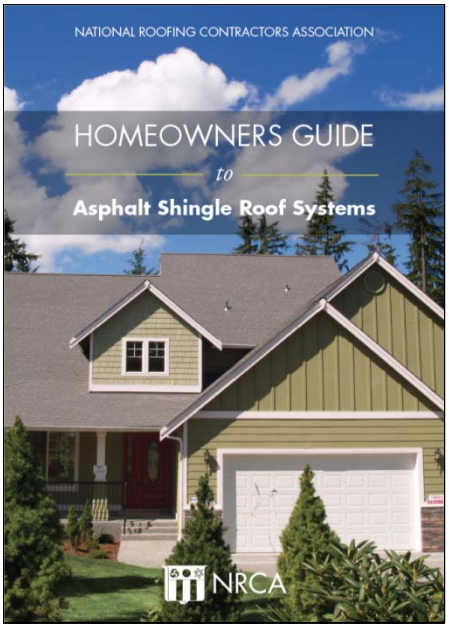

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NRCA App

Available to NRCA members:

- 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

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