Cool Roofs

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COOL ROOFS

“Wow, that’s a very cool roof—where did you get it?”

Goals of this session:

• The function of a cool roof assembly
• Changes since last code cycle for Res and Nonres
• New and alteration impacts
• What Plans Examiners and Field Inspectors should look for
Cool Roofs

What does a “cool roof” do?

- Reduces attic temperature
  - To help the *conditioned space* stay cooler
  - To help ductwork & equipment stay cooler
Cool Roofs

First Axiom of energy-saving roofs:

• All roofs are “cool roofs” at night.
Cool Roofs

Definitions:

- *Thermal emittance*: Ratio of heat given off, relative to heat absorbed
- *Solar reflectance*: Ratio of how much solar gets bounced away, relative to heat absorbed—given as an “aged” value

Helpful hints:

- For both, the higher the number, the better
- Yes, they can calculate & submit a *solar reflectance index* instead of TE & SR, but SRI must be calculated as “aged”
- “Cool roof” is not a type of product per se. It is a concept for saving energy. Roofing must meet TE & SR values for a given CZ and roof slope to be called “cool roof”
Cool Roofs

Is a “cool roof” a Mandatory Measure?

• No. Sect 110.8 simply says that solar reflectance and thermal emittance need to be identified for particular roofing, or use default values for non-certified materials.

• Sect 10-113 governs every roofing product intending to take compliance credit, or meet Prescriptive Requirements, to be certified by Cool Roof Rating Council.
Nonresidential New Construction & Additions
### Newly Constructed Roofs
Nonres - Prescriptive - New roof

<table>
<thead>
<tr>
<th>2008 – §143(a)</th>
<th>2013 – §140.3(a)</th>
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</thead>
<tbody>
<tr>
<td>• Cool roof requirements. depended on:</td>
<td>• Cool roof requirements now depend on:</td>
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<tr>
<td>• Requirements in Tables 143-A through 143-C</td>
<td>• Requirements in Tables 140.3-B through 140.3-D</td>
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</tbody>
</table>
There are always exceptions
Nonres - New roof

• High-rise residential, guestrooms of hotels/motels
  ➢ Mass (low-sloped) roof (“over the membrane”)
  ➢ Roofing area with an integrated solar collector

• For other Nonres buildings
  ➢ Insulation/solar reflectance (low-sloped) tradeoff, per Table 140.3
  ➢ Wood-framed roofs (low-sloped) in certain CZs & improved insulation
  ➢ Metal building roofs (low-sloped) in certain CZs & improved insulation
  ➢ Mass (low-sloped) roof
  ➢ Area covered by integrated solar collector
New Construction and the Plans Examiner - §140.3

Nonres - New roof

- **Verify characteristics** on NRCC-ENV-01
  - “Roofing Products” *(Section E on form)*

- **Match indications** on construction documents
  - Notes on drawings/spec

- Did they take an **exception**? Are they **exempt**?

- What if there are **multiple slopes**?

- What if it’s a field-applied **liquid coating**?
New Construction and the Field Inspector - §140.3
Nonres - New roof

• At Framing stage verify:
  
  ➢ Roofing efficiency (TE & SR)
    ➢ CRRC product label
    ➢ values to match NRCC-ENV-01
  
  ➢ If SR tradeoff is taken, confirm insulation assembly
  
  ➢ If integrated panels exception is taken, confirm collection system
Nonresidential
Roof Alteration
(Prescriptive Requirements)
# Alterations/Re-roofs

## Nonres - Prescriptive - Altered roof

### 2008 – §149(b)1B

- Threshold: When more than 50% or 2,000 ft² replaced (whichever is less), must be cool roof
- Same as prescriptive requirements for new construction, (low & steep sloped roofs)
  - Roof insulation alternative in TABLE 149-A

### 2013 – §141.0(b)2B

- Same threshold criteria
- Same efficiency requirements as prescriptive for new construction
- Hotels/motels & hi-rise Res have different values
- Density criteria removed
- Insulation/solar reflectance trade-off
Nonres Altered Roof

What is a *re-roof* (roofing alteration)?

- Replaced (system)
- Recovered
- Recoated

What triggers a *cool-roof* requirement when doing a re-roof?

- Greater than 50% of the existing roof area
- Greater than 2000 sq ft of area

First one triggered

Note: Any roofing not being altered is not subject to requirements
There are always exceptions
Nonres - Altered roof

• High-rise residential, guestrooms of hotels/motels
  ➢ Roofing area with integrated solar collector
  ➢ Mass roof

• For other Nonres buildings
  ➢ Roofing area with integrated solar collector
  ➢ Mass roof
  ➢ Insulation/solar reflectance tradeoff, per Table 141.0-B

Note: When is an exception an exemption, & why?
Alterations & the Examiner/Inspector - §141.0(b)2B

Nonres - Prescriptive - Altered roof

- **Verify at permit**
  - SR and TE values meets NRCC-ENV-01
  - Confirm if tradeoff or exception comes into play

- **Verify at Inspection**
  - Installed cool roof values meet or exceed NRCC-ENV-01 values (form shows actual & required)
    - (CRRC product label)
  - Verify NRCI-ENV-01 from installer
QUESTIONS...

About Nonres cool roofs?
Residential New Construction & Additions
## Newly Constructed Roofs

Res - Prescriptive - New Roof

<table>
<thead>
<tr>
<th>2008 – §151(f)12</th>
<th>2013 – §150.1(c)11</th>
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<tr>
<td>• Package D cool roof requirements depended on:</td>
<td>• Package A cool roof requirements depend on:</td>
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<tr>
<td>➢ Roof slope</td>
<td>➢ Roof slope</td>
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<tr>
<td>➢ Climate zone</td>
<td>➢ Climate zone</td>
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<tr>
<td>➢ Product density (lb/ft²)</td>
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<td>• Revisions to scope &amp; application</td>
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<td></td>
<td>• Requirements in Table 150.1-A</td>
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<tr>
<td>• Requirements in Table 151-B</td>
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</table>
There are always exceptions

Res - New roof

- Mass roof
- Roofing area with an integrated solar collector
New Construction and the Plans Examiner - §150.1(c)11
Res - New Roof

• **Verify characteristics** on CF1R-NCB-01
• **Match indications** on construction documents
• Did they take an **exception**?
• Most applicants use **Performance Approach**
  - Penalized if cool roof not modeled, or if actual values are better than required
New Construction and the Field Inspector - §150.1(c)11

Res - New roof

- Verify values at framing
  - Roofing efficiency (TE & SR)
    - CRRC product label
    - Values to match CF1R

- Verify indications on CF2R-ENV-04-E
  - Form shows actual & required
Residential Alteration
(Prescriptive Requirements)
### Res Re-roofs

**Res - Prescriptive - Altered roof**

<table>
<thead>
<tr>
<th>2008 – §152(b)1H</th>
<th>2013 – §150.2(b)1H</th>
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**2008 – §152(b)1H**

- When more than 50% or 1,000 ft² replaced (whichever is less), must be cool roof
  - Steep-sloped roofs: same reqs. as prescriptive (new const.)
    - Numerous alternatives
  - Low-sloped roofs: same reqs. as prescriptive (new const.)
    - Exempt if no ducts in attic

**2013 – §150.2(b)1H**

- When more than 50% replaced, must be cool roof
  - Steep-sloped roofs: same as new construction/prescriptive requirement.
    - Alternatives revised/added
  - Low-sloped roofs: same as new construction/prescriptive requirement.
    - Tradeoff for reflectance/insulation
Res Altered Roof

What is a *re-roof* (roofing alteration)?

- Replaced

What triggers a *cool-roof* requirement when doing a re-roof?

- Greater than 50% of the existing roof area

Note: Any roofing not being altered is not subject to requirements
There are always exceptions
Res - Altered roof

• Low-sloped roofs
  ➢ Attics with no ducts
  ➢ Reflectance/insulation tradeoff, per Table 150.2-A

• Steep-sloped roofs (considered equivalent)
  ➢ Air space between roofing & roof deck
  ➢ Profile ratio of roofing product
  ➢ Existing ducts insulated & sealed (HERS)
  ➢ Ceiling has at least R-38 insulation
  ➢ Attics with radiant barrier
  ➢ Attics with no ducts
  ➢ Insulate above roof deck (CZ 10-15)

Note: If you are a *Blueprint* subscriber, you already know this
Alterations & the Examiner/Inspector - §150.2(b)1H
Res - Prescriptive - Altered roof

• **Require at permit**
  - Verify SR and TE values meets CF1R-ALT-05
  - May require at Final

• **Verify at Inspection**
  - Installed cool roof values meet or exceed CF1R-ALT-05
  - Verify CF2R-ALT-05-E
  - Match CRRC product label
Forms Exception Rule
§10-103

• For alterations that do not require HERS testing:
  ➢ Building Department may not require CF1R form
  ➢ OR, can create simplified version of CF1R

• Does not exempt applicant from complying with code; only from submitting forms

• Recommend including requirements on permit application for simplification (i.e. solar reflectance, thermal emittance, exception/alternative, etc.)
QUESTIONS…

About Res cool roofs?
Conclusion

• Cool roof requirements are not “Mandatory Requirements”

• Dependent factors include roof slope and climate zone

• There are many triggers for alternative ways of meeting intent and achieving compliance

• There are many exceptions and exemptions to help designers meet compliance economically