



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

2008 – §143(a)

- Cool roof requirements depended on:
 - Roof slope
 - Climate zone
 - Product density (lb/ft²)
- Requirements in Tables 143-A through 143-C

2013 – §140.3(a)

- Cool roof requirements now depend on:
 - Roof slope
 - Steep-slope (> 2:12)
 - Low-slope (≤ 2:12)
 - Climate zone
- Requirements in Tables 140.3-B through 140.3-D



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

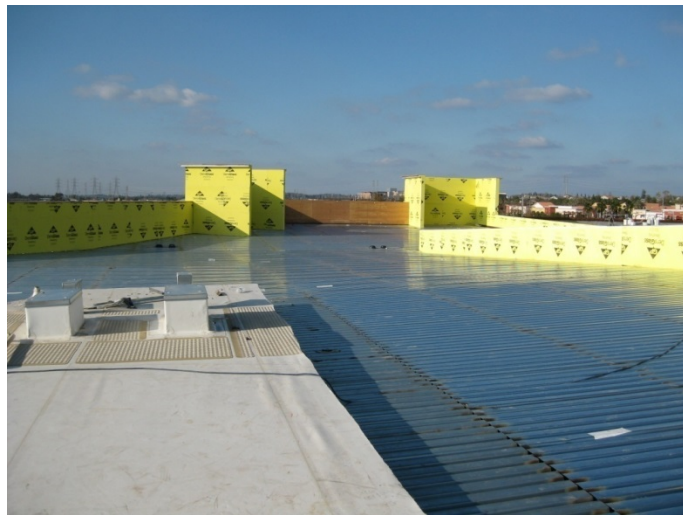
- High-rise residential, guestrooms of hotels/motels
 - Roofing area with integrated solar collector
 - Mass roof
- For other Nonres buildings
 - Roofing area with integrated solar collector
 - Mass roof
 - Insulation/solar reflectance tradeoff, per Table 141.0-B

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

2008 – §151(f)12

- Package D cool roof requirements depended on:
 - Roof slope
 - Climate zone
 - Product density (lb/ft²)
- Requirements in Table 151-B

2013 – §150.1(c)11

- Package A cool roof requirements depend on:
 - Roof slope
 - Climate zone
- Revisions to scope & application
- Requirements in Table 150.1-A



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

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