



2013 Cool Roofs Nonresidential Reroofing

Qualifying as a Cool Roof

To qualify as a cool roof under the Title 24 Building Energy Efficiency Standards, the roofing material must:

- Have a Cool Roof Rating Council (CRRC) rating for solar reflectance and thermal emittance
- Meet the Aged Solar Reflectance and Thermal Emittance — or SRI — values specified in the Standards (see back)

Roofing products must be tested and labeled by the Cool Roof Rating Council. You can search for rated products using the CRRC Rated Products Directory:

<http://www.coolroofs.org/products/search.php>



Note: Being included in the EPA's ENERGY STAR® list for cool roofing materials is NOT sufficient to meet the Standards.

Solar Reflectance Index

The SRI (Solar Reflectance Index) provides an alternative to meeting aged solar reflectance and thermal emittance requirements for cool roofs.

The SRI value is calculated based on:

- The aged solar reflectance and the thermal emittance of the roofing material
- The roof slope and the product weight of the roofing material

The SRI alternative is useful when a particular product exceeds the Building Energy Efficiency Standards requirement for either the aged solar reflectance or the thermal emittance, but does not meet both requirements. In this case the combination of the aged solar reflectance and the thermal emittance for the product may be sufficient to comply with the SRI requirement.

SRI values range from 0 to 100. The higher the SRI, the better the roofing material's ability to reduce heat transfer into the building. You can use the SRI calculator to determine the SRI value for a specific product:

http://www.energy.ca.gov/title24/2008standards/sri_calculator/

What Is a Cool Roof?

A cool roof is a roofing product with high solar reflectance and thermal emittance properties, which help reduce cooling loads by lowering roof temperatures on hot, sunny days. Solar reflectance and thermal emittance are properties of the roofing surface — not of insulation that may be used in conjunction with the roofing material.

Although often light in color, cool roofs come in a wide variety of colors ranging from white to black and including blues, grays, greens, oranges, browns, and tans.

Cool roofs also are available in a variety of styles: shingle, shake, tile, membrane, and spray-on liquid coatings.

Aged Solar Reflectance and Thermal Emittance

Specific aged solar reflectance and thermal emittance values must be met or exceeded for some climate zones and roof types (see back). The higher the solar reflectance, the better (the more heat is reflected from the roofing material).

Solar reflectance refers to a material's ability to reflect the sun's energy back into the atmosphere.



Aged solar reflectance is the solar reflectance of the surface after three years, which typically is lower than the initial reflectance value. If the aged solar reflectance is unavailable, its value can be derived from the CRRC initial value using this formula:

$$\text{3-year Aged Solar Reflectance} = (0.2 + \beta[\rho_{\text{initial}} - 0.2])$$

Where:

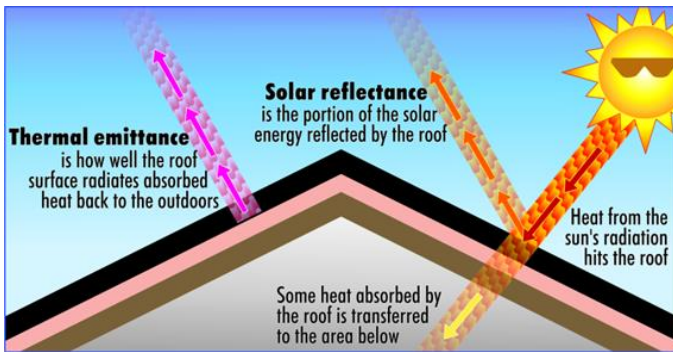
ρ_{initial} = Initial Solar Reflectance

β = Soiling Resistance (0.65 for Field-Applied Coating, or 0.70 for Not a Field Applied Coating)

Example — If the initial solar reflectance value is 0.8 for a field-applied coating

$$\begin{aligned} \text{3-yr Aged Solar Reflectance} &= (0.2 + 0.65[0.8 - 0.2]) \\ &= 0.2 + 0.39 \\ &= \mathbf{0.59} \end{aligned}$$

Thermal emittance provides a means of quantifying how much of the absorbed heat is rejected for a given material. The higher the thermal emittance value, the better (the more heat the roofing material emits back to the atmosphere).



2013 Nonresidential, High-rise Residential and Hotel/Motel Guest Rooms

The following information applies to re-roofing conditioned (mechanically cooled or heated) buildings demonstrating compliance using the Prescriptive approach: Standards §141.0(b)2B. **If a roofing product is not CRRC certified, it is assumed to have the following default aged solar reflectance/thermal emittance values: for asphalt shingles, 0.08/0.75; for all other roofing products, 0.10/0.75.**

For guidance regarding Cool Roofs and the Performance approach see Standards §141.0(b)3B.

Triggers

- In an affected climate zone (varies by roof slope; see below)



- Replacing, recovering or recoating the exterior surface of existing roofs, when altering:
 - > 50% of the existing roof surface area OR
 - > 2,000 ft² of existing roof surface whichever is less..

Requirements

Roof Style	Climate Zone (CZ)	Either these reflectance and emittance values		Or this SRI value
		Min. 3-yr Aged Solar Reflectance	Min. Thermal Emittance	Min. SRI
Nonresidential				
Low-sloped	1–16	0.63	0.75	75
Steep-sloped	1–16	0.20	0.75	16
High-rise Res, Hotel, Motel				
Low-sloped	9–11, 13–15	0.55	0.75	64
Steep-sloped	2–15	0.20	0.75	16

- Low-sloped = Rise to run ratio of 2:12 or less
 - (9.5 degrees or fewer from horizontal).
- Steep-sloped = Rise to run ratio greater than 2:12
 - (more than 9.5 degrees from horizontal).

Exceptions... Cool roof not required if:

Any roof	The roof area is covered by building-integrated photovoltaic panels or building-integrated solar thermal panels.
Any roof	Roof construction has a thermal mass over the roof membrane with a weight of at least 25 lb/ft ² . ¹
Nonres Low-sloped Wood-framed roofs in climate zones 3, 5	The roof assembly has a U-factor of 0.039 or lower.
Nonres Low-sloped Metal building roofs in climate zones 3, 5	The roof assembly has a U-factor of 0.048 or lower.

Table continued on next page

¹ This includes green roofs (roofs that are covered with vegetation) weighing at least 25 lb/ft², though any portion of the roof not covered with vegetation will need to comply with cool roof requirements if not otherwise exempt.

Nonres Low-sloped

Aged solar reflectance <0.63 is allowed provided the maximum roof / ceiling U-factor below is not exceeded.

Aged Solar Reflectance	U-factor	
	CZ 1, 3-9	CZ 2, 10-16
0.62-0.60	0.075	0.052
0.59-0.55	0.066	0.048
0.54-0.50	0.060	0.044
0.49-0.45	0.055	0.041
0.44-0.40	0.051	0.039
0.39-0.35	0.047	0.037
0.34-0.30	0.044	0.035
0.29-0.25	0.042	0.034

Insulation Requirements for Roof Alterations (Table 141.0-C)

When roofs are exposed to the roof deck, or to the roof recover boards, the exposed area must be insulated to the values noted in the table 141.0-C, as summarized below:

Nonresidential Climate Zones 1, 3-9		Nonres in Climate Zones 2, 10-16; All High-rise Res, Hotel/Motel Buildings	
Continuous Insulation R-value	U-factor	Continuous Insulation R-value	U-factor
R-8	0.082	R-14	0.055

Exceptions to Roof Insulation Requirements

If existing roof is insulated with at least R-7 insulation or it has a U-factor less than 0.089, you do not need to increase the insulation.

- If mechanical equipment on the roof will not be lifted as part of the roof replacement, you don't need to add more insulation than the maximum thickness that will allow 8 inches between the roof membrane surface and the top of the base flashing.
- You don't need to add more insulation than the maximum thickness that will allow 8 inches from the roof membrane surface to the top of the base flashing, provided that:
 - The penthouse or parapet walls are finished with an exterior cladding other than the roofing covering membrane material; AND
 - The penthouse or parapet walls have exterior cladding material that must be removed to install the new roof

covering membrane to maintain a base flashing height of 8 inches (203 mm); AND

- The ratio of the replaced roof area to the linear dimension of affected penthouse or parapet walls is:

For nonresidential:

- Climate zones 2, 10-16: less than 25sf per linear foot
- Climate zones 1, 3-9: less than 100sf per linear foot

For high-rise residential buildings, hotels or motels:

- All climate zones: less than 25sf per linear foot

At drains and other low points, you can use tapered insulation with a thermal resistance (R-Value) less shown in Table 141.0-C — if the insulation is increased enough at the high points so the average R-Value is equal to or greater than the value in Table 141.0-C.

Documentation

- **Permit**
- **NRCC-ENV-01-E:** Certificate of Compliance for Envelope Component Approach (and NRCC-ENV-03-E SRI Calculation Worksheet if necessary) — Submitted to the building department by the contractor or owner.
- **NRCI-ENV-01-E:** Certificate of Installation for Envelope — Completed and signed by the installing contractor and made available for final inspection by building department.
- **Product Labeling:** Available for final building dept. inspection.
 - For all roofing — CRRC label specifying the initial and aged ("weathered") solar reflectance and thermal emittance.

For liquid liquid-applied roof coatings — In addition to CRRC label, label stating the product meets the ASTM requirements specified in §110.8(i)4 of the Standards.

