Cool Roofs: 2008 Residential Reroofing

sponsored by the
Statewide Codes and Standards Program
under the auspices of the CPUC

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 reflectance and thermal emittance
- Meet the Aged 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

Solar Reflectance Index

The SRI (Solar Reflectance Index) provides an alternative to meeting 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 total 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 product is new and the aged solar reflectance value is unavailable, you can calculate the aged value using this formula:

3-year Aged Solar Reflectance = (0.2 + 0.7 x [$\rho_{initial}$ – 0.2])

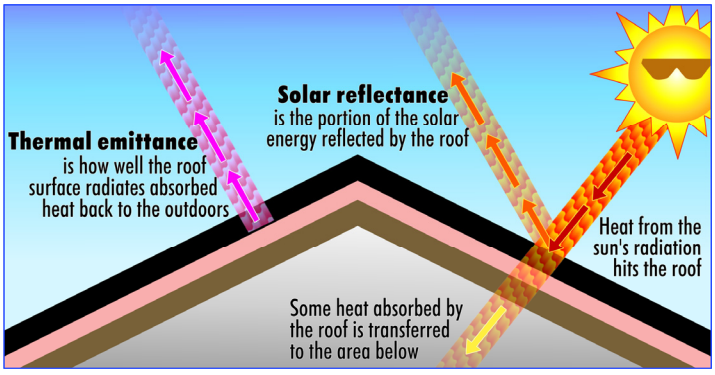
(where $\rho_{initial}$ = Initial Solar Reflectance)

Example

If the initial solar reflectance value is 0.8

3-yr Aged Solar Reflectance = (0.2 + 0.7 x [$\rho_{initial}$ – 0.2])
= (0.2 + 0.7 x [0.8 – 0.2])
= 0.2 + 0.42
= **0.62**

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).



Residential

Note: Aged solar reflectance and thermal emittance values noted in tables below must be derived from CRRC Rated Products Directory at http://www.coolroofs.org/products/search.php. Being included in the EPA's ENERGY STAR® list for cool roofing materials is NOT sufficient to meet the Standards. If a roofing product is not CRRC certified, it is assumed to have the following default aged reflectance/emittance values: for asphalt shingles: 0.08/0.75; for all other roofing products, 0.10/0.75.

The following information applies to conditioned (mechanically cooled or heated) residential buildings demonstrating compliance using the Prescriptive approach.

Triggers

- In an affected climate zone (varies by roof style; see below)
- Replacing, recovering or recoating the exterior surface of existing roofs, and
  > 50% of the existing roof surface area
  or
  > 1,000 ft^2 of existing roof surface
  whichever is less

Requirements

Roof Style	Climate Zone	Either these reflectance and emittance values		Or this SRI value
		Min. 3-yr Aged Solar Reflectance	Min. Thermal Emittance	Min. SRI
Low-slope [A]	13 & 15	0.55	0.75	64
Steep-slope [A] < 5 lb/ft²	10 thru 15	0.20	0.75	16
Steep-slope [A] ≥ 5 lb/ft²	1 thru 16	0.15	0.75	10

Exceptions… Cool roof is NOT required if:

Any slope	The roof area is covered by building-integrated photovoltaic panels or building-integrated solar thermal panels
Any slope	Building has no ducts in the attic
Any slope	Roof construction has a thermal mass over the roof membrane with a weight of at least 25 lb/ft^2.[B]
Steep slope	Insulation with a thermal resistance of at least 0.85 hr * ft^2 * °F/Btu (a little less than R-1) or at least a 3/4-inch air-space is added to the roof deck over an attic.
Steep slope	Existing ducts in the attic are insulated and sealed according to §151(f)10.
Steep slope	Building has a radiant barrier in the attic meeting the requirements of §151(f)2
Steep slope	Building has at least R-30 ceiling insulation
Steep slope climate zones 10, 12, 13	One (1) ft^2 of free ventilation area of attic ventilation for every 150 ft^2 of attic floor area, and where at least 30 percent of the free ventilation area is within 2 feet vertical distance of the roof ridge
Steep slope climate zones 10, 11, 13, 14	R-3 or greater roof deck insulation above vented attic

Documentation

- **Permit**
- **CF-1R-ALT**: Certificate of Compliance for Alterations
  - ☐ General information (top of Page 1 of 5)
  - ☐ Roofing Products (Cool Roofs) (Page 3 of 5)
  - ☐ Declaration Statement (bottom of Page 5 of 5)

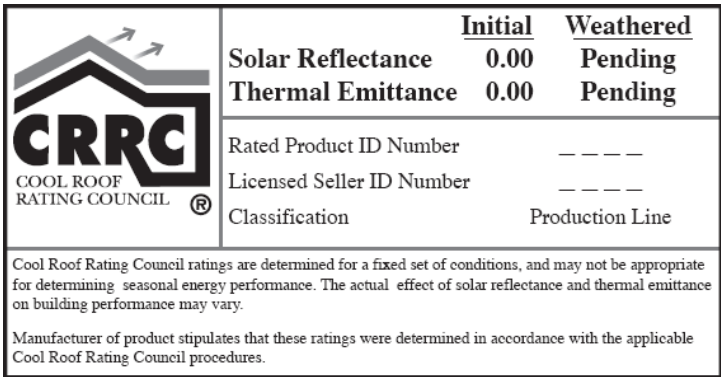
  Submitted to the building department by the contractor or the home owner
- **CF-6R-ENV 01**: Installation Certificate for Envelope — Insulation; Roofing; Fenestration
  - ☐ Description of Roofing Products (top half of Page 2 of 3)
  - ☐ Declaration Statement (Page 3 of 3)

  The CF-6R-ENV 01 must be completed and signed by the installing contractor and made available for final inspection by building department.

  CRRC label(s), described below, should be attached to the CF-6R-ENV 01 form.
- **Product Labeling:**
  - ☐ For all roofs:

    CRRC label specifying the initial and aged ("weathered") solar reflectance and thermal emittance
  - ☐ For liquid-applied roof coatings:
    - CRRC label specifying the initial and aged ("weathered") solar reflectance and thermal emittance
    - Label stating the product meets the ASTM requirements specified in Section 118(i) 4 of the Standards.

  Product labeling must be available for final inspection by building department.



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

[B] This includes green roofs (roofs that are covered with vegetation) weighing at least 25 lb/ft^2, though any portion of the roof not covered with vegetation will need to comply with cool roof requirements if not otherwise exempt.