



# Cool Roofs and 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 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/](http://www.energy.ca.gov/title24/2008standards/sri_calculator/)

## Triggers

The Residential Title 24, Part 6, Standards call for a cool roof when:

- ★ The project is in an affected climate zone. (This varies by roof style; see the "Requirements" table on the reverse side.)
- ★ Replacing, recovering or recoating the exterior surface of existing roofs when >50% of the roof is replaced.

## 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 & Thermal Emittance

Specific aged solar reflectance and thermal emittance values must be met or exceeded for some climate zones and roof types (see page 2). 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:

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

$\rho_{\text{initial}}$  = Initial Solar Reflectance

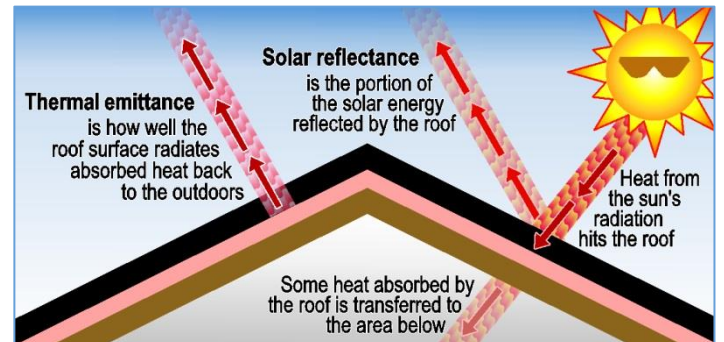
$\beta$  = Soiling Resistance by product type:

- ★ Field-Applied Coating  $\beta = 0.65$
- ★ Other  $\beta = 0.70$

**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).



**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.

## 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 <sup>A</sup>	13 & 15	0.63	0.75	75
Steep-slope <sup>A</sup>	10 thru 15	0.20	0.75	16

## Exceptions... Cool roof is NOT required if:

<b>Any slope</b>	The roof area is covered by building-integrated photovoltaic panels or building-integrated solar thermal panels
<b>Any slope</b>	Building has no ducts in the attic
<b>Any slope</b>	Roof is on addition $\leq 300$ ft <sup>2</sup>
<b>Any slope</b>	Roof construction has a thermal mass over the roof membrane with a weight of at least 25 lb/ft <sup>2</sup> . <sup>B</sup>
<b>Steep slope</b>	An air-space of 1.0 inch is provided between top of roof deck and bottom of roofing product.
<b>Steep slope</b>	Existing ducts in the attic are insulated and sealed according to §150.1(c)9.
<b>Steep slope</b>	Building has a radiant barrier in the attic meeting the requirements of §150.1(c)2
<b>Steep slope</b>	Building has at least R-38 ceiling insulation
<b>Steep slope</b>	Roofing product profile ratio of rise to width is at least 1:5 for $\geq 50\%$ of the width of the roofing product.
<b>Steep slope</b>	R-4 or greater insulation above the roof deck in CZ 10-15
<b>Low slope</b>	The aged solar reflectance can be traded off with additional insulation added at the roof deck as per Table 150.2-A.

### Values from Table 150.2-A

Aged Solar Reflectance	Roof Deck Insulation R-value	Aged Solar Reflectance	Roof Deck Insulation R-value
0.62–0.60	2	0.44–0.40	12
0.59–0.55	4	0.39–0.35	16
0.54–0.50	6	0.34–0.30	20
0.49–0.45	8	0.29–0.25	24

## Documentation

- ✦ **Permit**
- ✦ **CF1R-ALT-01-E:** Certificate of Compliance — Residential Alterations
  - ✦ General information (Part A, of Page 1 of 5)
  - ✦ Roofing Replacement (Part C, Page 1 of 5)
  - ✦ Declaration Statement (Page 5 of 5)

Submitted to the building department by the contractor or the home owner.

- ✦ (Optional) **CF1R-ENV-04-E:** Certificate of Compliance — Solar Reflectance Index Calculation Worksheet

- ✦ **CF2R-ENV-05-E:** Installation Certificate for Envelope — Insulation; Roofing; Fenestration

- ✦ Description of Roofing Products (top half of Page 1 of 2)

- ✦ Declaration Statement (Page 2 of 2)

The CF2R-ENV-05-E 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 CF2R-ENV-05-E form.


### ✦ Product Labeling:

- ✦ For all roofs: CRRC label specifying the initial and aged (“weathered”) solar reflectance and thermal emittance

- ✦ For liquid-applied roof coatings applied to low-sloped roofs:
  - CRRC label specifying the initial and aged (“weathered”) solar reflectance and thermal emittance

- Label stating the product meets the ASTM requirements specified in Section 110.8(i)4 of the Standards.

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

	<b>Solar Reflectance</b>	<b>Initial</b> 0.00	<b>Weathered</b> Pending
	<b>Thermal Emittance</b>	<b>Initial</b> 0.00	<b>Weathered</b> Pending
	Rated Product ID Number	-----	
	Licensed Seller ID Number	-----	
Classification	Production Line		
<small>Cool Roof Rating Council ratings are determined for a fixed set of conditions, and may not be appropriate for determining seasonal energy performance. The actual effect of solar reflectance and thermal emittance on building performance may vary.</small>			
<small>Manufacturer of product stipulates that these ratings were determined in accordance with the applicable Cool Roof Rating Council procedures.</small>			

<sup>A</sup> 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).

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

