Cool Roofs and Reroofing

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:

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

\[ \rho_{\text{initial}} = \text{Initial Solar Reflectance} \]

\[ \beta = \text{Soiling Resistance by product type:} \]

- 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

\[ 3\text{-yr Aged Solar Reflectance} = \left[ 0.2 + 0.65 (0.8 - 0.2) \right] \]
\[ = 0.2 + 0.39 \]
\[ = 0.59 \]

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).

Solar reflectance is the portion of the solar energy reflected by the roof. Thermal emittance is how well the roof surface radiates absorbed heat back to the outdoors. Some heat absorbed by the roof is transferred to the area below. Heat from the sun's radiation hits the roof.
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](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

<table>
<thead>
<tr>
<th>Roof Style</th>
<th>Climate Zone</th>
<th>Either these reflectance and emittance values</th>
<th>Or this SRI value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-slope</td>
<td>13 &amp; 15</td>
<td>Min. 3-yr Aged Reflectance</td>
<td>Min. Thermal Emittance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.63</td>
<td>0.75</td>
</tr>
<tr>
<td>Steep-slope</td>
<td>10 thru 15</td>
<td>0.20</td>
<td>0.75</td>
</tr>
</tbody>
</table>

### 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 is on addition ≤300 ft².
- Any slope: Roof construction has a thermal mass over the roof membrane with a weight of at least 25 lb/ft².
- Steep slope: An air-space of 1.0 inch is provided between top of roof deck and bottom of roofing product.
- Steep slope: Existing ducts in the attic are insulated and sealed according to §150.1(c)9.
- Steep slope: Building has a radiant barrier in the attic meeting the requirements of §150.1(c)2.
- Steep slope: Roofing has at least R-38 ceiling insulation.
- Steep slope: Roofing product profile ratio of rise to width is at least 1:5 for ≥50% of the width of the roofing product.
- Steep slope: R-4 or greater insulation above the roof deck in CZ 10-15.
- Low slope: 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

<table>
<thead>
<tr>
<th>Aged Solar Reflectance</th>
<th>Roof Deck Insulation R-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.62–0.60</td>
<td>2</td>
</tr>
<tr>
<td>0.59–0.55</td>
<td>4</td>
</tr>
<tr>
<td>0.54–0.50</td>
<td>6</td>
</tr>
<tr>
<td>0.49–0.45</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aged Solar Reflectance</th>
<th>Roof Deck Insulation R-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.44–0.40</td>
<td>12</td>
</tr>
<tr>
<td>0.39–0.35</td>
<td>16</td>
</tr>
<tr>
<td>0.34–0.30</td>
<td>20</td>
</tr>
<tr>
<td>0.29–0.25</td>
<td>24</td>
</tr>
</tbody>
</table>

### Documentation

- **Permit**
- **CF1R-ALT-01-E**: Certificate of Compliance — Residential Alterations
  - General information (Part A, of Page 1 of 4)
  - Roofing Replacement (Part C, Page 1 of 4)
  - Declaration Statement (Page 4 of 4)

  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-04-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-04-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-04-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(j)4 of the Standards

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

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