

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>



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:

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

ρ_{initial} = Initial Solar Reflectance

β = 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

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

Solar Reflectance Index

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

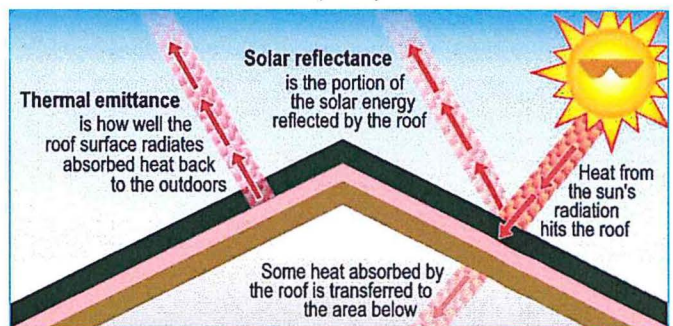
The SRI value is calculated based on:

- + 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/

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).



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.

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 ^A	13 & 15	0.63	0.75	75
Steep-slope ^A	10 thru 15	0.20	0.75	16

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 ft ²
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	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	Building 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

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

^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/ft², though any portion of the roof not covered with vegetation will need to comply with cool roof requirements if not otherwise exempt.

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.

	Solar Reflectance	Initial	Weathered
	Thermal Emittance	0.00	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>			

Should be Completed Prior to Permit Issuance

STATE OF CALIFORNIA

RESIDENTIAL ALTERATIONS

CEC-CF1R-ALT-01-E (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF COMPLIANCE		CF1R-ALT-01-E (Page 1 of 5)
Residential Alterations		
Project Name:	Date Prepared:	

A. GENERAL INFORMATION			
01	Project Name:	02	Date:
03	Project Location:	04	Compliance Method:
05	CA City:	06	Building Front Orientation (deg or cardinal):
07	Zip Code:	08	Number of Dwelling Units:
09	Climate Zone:	10	Fuel Type:
11	Building Type <input type="checkbox"/> Single Family <input type="checkbox"/> Multi Family	12	Total Conditioned Floor Area:
13	Project Type: <input type="checkbox"/> Insulation <input type="checkbox"/> Roof Replacement <input type="checkbox"/> Fenestration/Glazing <input type="checkbox"/> Heating System <input type="checkbox"/> Cooling System <input type="checkbox"/> Duct System <input type="checkbox"/> Water Heating	14	Slab Area:

B. BUILDING INSULATION DETAILS (Section 150.2(b)1)											
01	02	03	04	05	06		07	08	09	10	11
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Proposed			Appendix JA4 Reference		Required U-Factor	Comments
					Cavity R-value	Continuous Insulation R-value	U-factor	Table	Cell		
					R-38						

C. ROOF REPLACEMENT (Prescriptive Alteration, Section 150.2(b)1H)												
01	02	03	04	05	06	07	08		09	10	11	12
Altering > 50% of roof surface	Roof Pitch	Exception	CRRC Product ID Number	Product Type	R-value Deck Insulation	Aged Solar Reflectance	Proposed		SRI	Minimum Required		
							Thermal Emittance			Aged Solar Reflectance	Thermal Emittance	SRI

NOTES

- Mass roof with 25 lb/ft2 not required to comply with cool roof requirements
- Roof area covered by building integrated photovoltaic panels and solar thermal panels are exempt from the above Cool Roof requirements.
- Liquid field applied coatings must comply with installation criteria from section 110.8(i)4.

EXCEPTION:

Registration Number:

CA Building Energy Efficiency Standards - 2013 Residential Compliance

Registration Date/Time:

HERS Provider:

January 2014

Should be Completed Prior to Permit Issuance

STATE OF CALIFORNIA

RESIDENTIAL ALTERATIONS

CEC-CF1R-ALT-01-E (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF COMPLIANCE		CF1R-ALT-01-E (Page 5 of 5)
Residential Alterations		
Project Name:		Date Prepared:

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
Address:	CEA/ HERS Certification Identification (if applicable):
City/State/Zip:	Phone:
RESPONSIBLE PERSON'S DECLARATION STATEMENT	
I certify the following under penalty of perjury, under the laws of the State of California:	
<ol style="list-style-type: none"> The information provided on this Certificate of Compliance is true and correct. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer). That the energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application. I will ensure that a registered copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy. 	
Responsible Designer Name:	Responsible Designer Signature:
Company :	Date Signed:
Address:	License:
City/State/Zip:	Phone:

For assistance or questions regarding the Energy Standards, contact the Energy Hotline at: 1-800-772-3300.



RESIDENTIAL REROOF PROCEDURES FOR COOL ROOF PRODUCTS **2013 CALIFORNIA ENERGY CODE SECTION 150.2(b) H**

Beginning July 1, 2014 the 2013 California Energy Efficiency Standards will go into effect and require all re-roofing to meet the Cool Roof requirements of the updated Title 24 Energy Standards. Roofing products that are used for compliance with the standards are required to be tested and labeled by the Cool Roof Rating Council (CRRC)

The 2010 California Energy Code provided exceptions where a Cool Roof product would not be required on reroof projects if approved alternatives were provided. The new 2013 California Energy Code has revised the list of alternatives that can be used as an exception to the Cool Roof requirements. This bulletin is designed to provide the new exceptions allowed in the 2013 Standards and how the local jurisdictions will document and verify compliance with the exceptions.

2010 Cool Roof Exceptions:

- a. Insulation with a thermal resistance of at least 0.85 hr·ft²·F/Btu or at least a ¾ inch airspace is added to the roof deck over an attic; **or**
- b. Existing ducts in the attic are insulated and sealed according to Section 151(f)10, HERS rating required with CF-4R Form **or**
- c. Attic ventilation equal to 1/150 of the attic floor area and 30% within 2' vertical of the ridge.
- d. R-30 attic insulation. **or**
- e. Building has a radiant barrier in the attic meeting the requirements of Section 151(f) 2. **or**
- f. Building has no ducts in the attic. **or**
- g. R-3 insulation installed on the deck above vented attic.

2013 Cool Roof Exceptions: No Exception Changes for 2016

- a. Air-space of 1.0 inch airspace is provided between the top of the roof deck to the bottom of the roofing product; **or**
- b. The installed roofing product has a profile ratio of rise to width of 1 to 5 for 50% or greater of the width of the roofing product; **or**
- c. Existing ducts in the attic are insulated and sealed according to Section 150.1(c)9, HERS rating required with CF-3R Form; **or**
- d. R-38 attic insulation (Insulation Certificate required); **or**
- e. Building has a radiant barrier in the attic meeting the requirements of Section 150.1(c) 2. **or**
- f. Building has no ducts in the attic. **or**
- g. R-4 insulation installed on the deck above vented attic.

As shown in the comparisons above, the exception by providing increased attic ventilation has been removed in the 2013 Standards, and insulation values have increased.

- If exception "c" is proposed, it shall be required that a duct leakage test be provided and certified by a third party HERS rater.
- If exception "d" is proposed, it shall require an Insulation Certificate be provided by a licensed Insulation Contractor to verify the minimum R-38 attic insulation exists.

Must be completed, signed and Provided for Final Inspection if Cool Roof Installed

CF2R-ENV-05-E

(Page 1 of 2)

CERTIFICATE OF INSTALLATION

Roofing and Cool Roofs

Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City:	Zip Code:

If more than one person has responsibility for installation of the items on this certificate, each person shall prepare and sign a certificate applicable to the portion of construction for which they are responsible. Alternatively, the person with chief responsibility for construction shall prepare and sign this certificate for the entire construction. The signer agrees that all applicable Mandatory Measures were met. Temporary labels are not to be removed before verification by the building inspector.

A. COOL ROOF PRODUCT

1	2	3	4	5	6	7	8
Installed Brand Name	Liquid Coating Type	Required			Installed		
		Aged Solar Reflectance	Thermal Emittance	SRI	Aged Solar Reflectance	Thermal Emittance	SRI

If using a liquid coating, indicate whether the type is: (a) Aluminum-Pigmented Asphalt Roof Coating, (b) Cement-Based Roof Coating, or (c) Other.

B. RADIANT BARRIER

1	2
Brand Name	Installation Type

NOTE: Radiant barrier must be installed on gable ends and all other vertical surfaces in the attic.

Installation types are: (1) attached to underside of roof deck, (2) attached to bottom of truss/rafters, (3) attached between truss/rafters, or (4) draped over top of truss/rafters

C. MANDATORY REQUIREMENTS

Roofing Products	1.	Certification & Labeling , Sections 10-113; 110.8(i): Products must be listed with the Cool Roof Rating Council (CRRC) to use the emittance, reflectance or SRI numbers.
	2.	Defaults for Noncertified Asphalt Shingles , Section 110.8(i)1A: Asphalt Shingles not listed with the CRRC must use default solar reflectance/thermal emittance values of 0.08/0.75.
	3.	Defaults for all Other Noncertified Roofing Products , Section 110.8(i)1B: Products not listed with the CRRC must use the default solar reflectance/thermal emittance values of 0.10/0.75.
	4.	No CRRC Testing for aged solar reflectance , Section 110.8(i)2: if aged CRRC numbers are not available then calculate aged solar reflectance from formula: <ul style="list-style-type: none"> $\rho_{aged} = [0.2 + \beta[\rho_{initial} - 0.2]]$, where $\rho_{initial}$ = initial solar reflectance soiling resistance: $\beta = 0.65$ for Field-Applied Coating; $\beta = 0.70$ all other roofing products
	5.	Solar Reflectance Index (SRI) , Section 110.8(i)3: SRI values must be calculated using form CF1R-PRSC-WS-04, Cool Roof and SRI Worksheet
	6.	Liquid Applied Coatings , Section 110.8(i)4: Liquid applied coatings must be applied to the dry mill thickness as required by the manufacturer. The material must meet performance requirements of TABLE 110.8-C.
Radiant Barrier	7.	Emittance & Certification , Section 110.8(j): Radiant Barrier shall have an emittance of 0.05 or less, be tested with ASTM C1371 or ASTM E408; certified and listed with Department of Consumer Affairs, Standards for Insulating Material.

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2013 Residential Compliance

January 2014

CERTIFICATE OF INSTALLATION

CF2R-ENV-05-E

Roofing and Cool Roofs

(Page 2 of 2)

Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Installation documentation is accurate and complete.

Name:	Signature:
Company:	Date:
Address:	CEA or CEPE or HERS Certification # If Applicable:
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

- I certify under penalty of perjury, under the laws of the State of California, the information provided on this form is true and correct.
- I am eligible under Division 3 of the Business and Professions Code to accept responsibility for construction, or an authorized representative of the person responsible for construction (responsible person).
- I certify that the installed features, materials, components, or manufactured devices identified on this certificate (the installation) conforms to all applicable codes and regulations, and the installation is consistent with the plans and specifications approved by the enforcement agency.
- I reviewed a copy of the Certificate of Compliance (CF1R) approved by the enforcement agency that identifies the specific requirements for the installation. I certify that the requirements detailed on the CF1R that apply to the installation have been met.
- I will ensure that a completed, signed copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a signed copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.**

Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)		
Responsible Person's Name:	Responsible Person's Signature:	
CSLB License:	Date Signed:	Position With Company (Title):