

## **CALBO Cool Roofs Cool Roof Plan Review**

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### **Cool Roof Title 24 Standards for Plan Reviewers**

Building professionals responsible for plan review must be familiar with the documentation requirements for Cool Roof Title 24 compliance. Compliance documentation for Cool Roofs is fairly straightforward, but there are numerous options to show compliance. Plan reviewers must check the appropriate forms and then verify the data against information found on the Cool Roof Rating Council's website, [www.coolroofs.org](http://www.coolroofs.org).

### **Cool Roof Basics**

Cool Roof products, typically light colored, must have a surface reflectivity of 70% or more and an emissivity of at least 75% to qualify for energy credits. This means that at least 70% of the solar energy on a Cool Roof must be reflected, and that a minimum of 75% of the solar energy must be radiated away from the roof surface before it is absorbed.

Plan reviewers will see submittals for several types of products which can meet Title 24 criteria for Cool Roof technology on low-slope commercial roofs. They are:

- Single-ply roof membranes, which come in a roll, are rolled out on the roof and then installed with adhesives, mechanical fasteners or seams which are heat welded.
- A roofer may apply a fluid coating or a cap sheet over the top of a conventional built-up roof. This option works for both new and existing roof surfaces.
- A third option is spray polyurethane foam. The roofer then applies a protective, reflective coating over the top of the foam which provides the Cool Roof properties required for Title 24.
- A fourth product option is a fluid-applied membrane or coating.
- Other materials may also be used as Cool Roof products, including coated metal roofing products.

### **Cool Roof Criteria**

In new construction, buildings that meet the following criteria require a Cool Roof:

- Non-residential building (includes office, retail, light manufacturing and others)
- Low slope roof, with a pitch of 2:12 or less
- Only that portion of the roof that is directly over conditioned space is required to have a Cool Roof

If the roof is a replacement roof, Cool Roof requirements include the same criteria above. In addition, Cool Roofs are required *only* when at least 50% of the roof, or at least 2,000 square feet of roof area is being replaced. Plus, if a Cool Roof is required in a replacement scenario, Title 24 requires that the Cool Roof be applied *only* on that portion which is being replaced.

There are a few exceptions in which the permit applicant is *not* required to add a Cool Roof in a replacement situation (all criteria must be met for the exemption):

- The existing roof has a rock or gravel surface
- The new roof has a rock or gravel surface
- The contractor is not removing any existing layers of the roofing
- Less than 50% or less than 2,000 square feet of the roof surface is being replaced
- There is no planned recoating with a liquid-applied coating
- The roofer will not install a recover board or rigid insulation

### **Compliance Methodology**


There are three basic ways to demonstrate compliance with Title 24 requirements.

1. Prescriptive Envelope Component method
  - Simple, straightforward checklist for compliance
  - Requires form ENV-2-C
  - Cool Roof product used must be labeled
  - Submission notes must show specific adherence to the Cool Roof requirements in terms of reflectivity and emissivity
    - Approach allows tradeoffs between solar reflectivity and emissivity; if reflectivity is higher less than 70%, the emissivity can be lower than 75% according to an California Energy Commission formula that determines requirements
2. Prescriptive Overall Envelope method
  - More complicated approach
  - Requires form ENV-3-C
  - Must use labeled Cool Roof product, or use CEC default numbers in calculations
  - Allows applicant to trade off Cool Roof reflectivity and emissivity requirements via a formula that considers other energy efficiency measures used in the building envelope, such as insulation or energy efficient windows
3. Performance method
  - Provides applicant with a great deal of flexibility by combining elements of the other two methodologies
  - Requires form PERF-1
  - Must use labeled Cool Roof product, or use CEC default numbers in calculations
  - Establishes a Title 24 budget for the building, and the total energy use of the proposed building must meet or come in below budget

- Allows applicant to trade off Cool Roof reflectivity and emissivity requirements via a formula that considers the total energy usage of the building, including mechanical or lighting systems

## Verification

In order for the applicant to claim credit against Cool Roof requirements, the project must use a labeled product, which lists initial solar reflectivity and emissivity values for the roof surface. Acceptable labels for Title 24 compliance must be from the Cool Roof Rating Council (CRRC).

	<b><u>Initial</u></b>	<b><u>Weathered</u></b>	
	<b>Solar Reflectance</b>	<b>0.00</b>	<b>Pending</b>
	<b>Thermal Emittance</b>	<b>0.00</b>	<b>Pending</b>
	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>			

The CRRC publishes values related to roof performance on a variety of roofing products, and provides verification to ensure that the rated roofing products meet Title 24 requirements. While weathered (three-year) values are provided, applicants must use the initial values in the calculations.

Applicants have two choices when seeking Title 24 credit. They may use the reflectivity and emissivity ratings provided on the label certificate. Or, they may use default values published in Title 24. These values, however, are quite low and therefore punitive, making it difficult for the building to comply with Title 24 requirements unless other energy efficiency measures are taken. Note that applicants cannot use default values if they are using the Prescriptive Component method (form ENV-2-C).

## Documentation

The applicant must provide specific documentation to the building department to demonstrate compliance with Title 24 requirements. These forms vary, depending on the compliance methodology used. Regardless, though, all applicants must submit form ENV-1-C, the Envelope Certificate of Compliance. This form includes basic building information, including roof area, insulation R-value, and other facts. This form does *not* address information regarding roof surface performance.

Other documentation required depends on the compliance method used.

- Prescriptive Envelope Component method:

- Requires form ENV-2-C
- Two options for submittal:
  - Option One shows a straightforward and simple compliance method, documenting the roof surface's actual labeled reflectivity and emissivity ratings, and showing conformance to Title 24's required reflectivity of 70% and emissivity of 75% or more. The applicant checks 'Option One' on the form and verifies values using the CRRC's website.

ENVELOPE COMPONENT METHOD		(Part 2 of 2)		ENV-2-C								
PROJECT NAME Large Retail Space			DATE 1/16/07									
COOL ROOFS - LOW-SLOPED - See Section 3.4 in the NRM and §118(i)(3) and §143(a)(1) in the Energy Standards for further description about exterior roofs and mandatory requirements for Cool Roofs.												
APPLICABLE BOXES												
<input checked="" type="checkbox"/> <b>Option 1 - Tested - Initial Thermal Emittance <math>\geq 0.75</math> and Initial Solar Reflectance <math>\geq 0.70</math></b>												
Proposed emittance and reflectance must be $\geq$ the standard when tested with CRRC-1.												
1. Enter proposed initial thermal emittance, $\epsilon_{initial}$		Proposed	Standard	If proposed $\geq$ to the Standard then it complies.								
		0.85	$\geq 0.75$									
2. Enter the proposed initial solar reflectance, $\rho_{initial}$		Proposed	Standard	If proposed $\geq$ to the Standard then it complies.								
		0.79	$\geq 0.70$									
3. When applying Liquid Field Applied Coatings, the coating must be applied with a minimum dry mil thickness of 20 mils across the entire roof surface and meet minimum performance requirements listed in §118(i)(3) and Table 118-C. Select the applicable coating.												
<input type="checkbox"/> Aluminum-Pigmented Asphalt Roof Coating <input type="checkbox"/> Cement-Based Roof Coating <input type="checkbox"/> Other _____												
<input type="checkbox"/> <b>Option 2 - CRRC-1 Tested - Initial Thermal Emittance <math>&lt; 0.75</math></b>												
Proposed initial thermal emittance $< 0.75$ when tested with CRRC-1.												
1. Enter proposed initial thermal emittance, $\epsilon_{initial}$		Proposed	Standard	Go to line 2. Insert $\epsilon_{initial}$ value in calculation.								
			$< 0.75$									
2. Enter the initial solar reflectance, $\rho_{initial}$		Proposed	Standard	Go to line 2. Insert $\rho_{initial}$ value in calculation.								
		$0.70 + [0.34 \times (0.75 - \epsilon_{initial})]$										
3. To apply Liquid Field Applied Coatings, the coating must be applied with a minimum dry mil thickness of 20 mils across the entire roof surface and meet minimum performance requirements listed in §118(i)(3) and Table 118-C. Select the applicable coating.												
<input type="checkbox"/> Aluminum-Pigmented Asphalt Roof Coating <input type="checkbox"/> Cement-Based Roof Coating <input type="checkbox"/> Other _____												
<input checked="" type="checkbox"/> <b>CRRC-1 Label Attached to Submittal</b> (Note: if no CRRC-1 label is available, this compliance method can not be used).												
OPAQUE SURFACES												
ASSEMBLY NAME (e.g. Roof-1, Wall-1, Floor, soffits, etc.)	TYPE (e.g. Roof, Wall, Floor, demising, etc.)	HEAT CAPACITY	INSULATION R-VALUE*		ASSEMBLY U-FACTOR*							
			PROPOSED	MINIMUM ALLOWED	PROPOSED	Joint Appendix I/ REF	MAXIMUM ALLOWED					
R-19 Roof over Metal Deck	Roof	0.0	19	19	0.0453	06-A2	0.051					
* For each assembly type, meet the minimum insulation R-value or the maximum assembly U-factor.												
WINDOWS												
WINDOW NAME (e.g., Window-1, Window-2)	ORIENTATION			U-FACTOR		# OF PANELES	Fin. SHGC <sup>†</sup>	PROPOSED RSHG			PROP. RSHG	ALLOWED RSHG
	N	E	W	PROP.	ALLOW.			H	V	OHF		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							

\* From Fenestration Surfaces ENV-1-C, Part 2, Column G, or when Column H has a "C" identifier, calculate using the center of glass value SHGCc in SHGCren = 08 + (.86 x SHGCc) and enter value.

- Option two allows the applicant to trade off higher reflectivity for lower emissivity using a formula provided by the California Energy Commission and verified using the CRRC's website.



