

New Title 24 Cool Roof Requirements

As of January 1, 2010, the California Energy Commission's updated Title-24 Building Energy Efficiency Standards for residential and non-residential roofing are now in force, otherwise known as "Cool-Roof"

The new Cool Roof requirements affect new construction, significant repairs of existing roofs, re-roofing, plus additions and alterations of existing buildings and homes.

With the old 2005 Title-24 energy code a residential cool roof was an optional energy efficiency measure, however on January 1, 2010, cool roofs are now required for most residential buildings in many of California's 16 climate zones. Cool roof standards are designed to reduce air conditioner demand, save money, and reduce the urban heat island effect.

Cool roof requirements for residential and non-residential now apply to low-slope and steep-slope roofs. The solar reflectance and thermal emittance requirements will vary, depending on the slope of the roof, climate zone, and the density of the roofing product. All roofing products must be certified and labeled according to the **Cool Roof Rating Council (CRRC)** to comply with the Standards. There are exceptions to both residential and non-residential requirements.

Here's how it works:

New construction:

First, determine which climate zone your project is located in, 1 thru 16. The cool roof requirements vary depending on the climate zone.

Next, determine your roof slope. The Title-24 prescriptive requirements divide roofs into two categories, Low Slope (less than 2:12 pitch) and Steep Slope (greater than 2:12 pitch).

Then, determine the weight of the roofing material. The prescriptive tables divide roofing materials into two weight categories. Less than 5 lb/sq. ft. or greater than 5 lb/sq. ft. The cool roof requirements vary depending on roofing material weight. As a rule, lighter weight roofing material (asphalt shingles) have a lower cool roof requirements than heavier roofing products like tile roofing.

Once you have these factors determined then you simply consult one of the most important tables in the new 2008 Title-24 Building Efficiency Standards, Table 151-D. This table outlines all of the residential prescriptive requirements, including the cool roof requirements. Table 151-D is divided into the 16 unique California Climate Zones with their own specific building component requirements per climate zone.

First look across the top row to find your correct climate zone for your project location. We'll use climate zone #8 for an example. Then go down along the left hand column until you come to "Roofing Products". There you will select your roofing slope type and roofing weight per sq. ft. Then simply move to the right in the table until you see the Cool Roof requirements for your climate zone. In our example we are using tile roofing with a weight greater than 5 lb/sq. ft. on a steep slope roof (greater than 2:12) and for climate zone #8 the cool roof requirements are an Aged Solar Reflectance of 0.15 and a Thermal Emittance of 0.75. That is your Cool Roof specification for your roofing product. In addition, whatever roofing product you select must meet these numbers and be certified by the Cool Roof Rating Council, (CRRC). There are cool roof products sold in California that are Energy Star Certified but this does not automatically qualify the product as a CRRC certified product.

TABLE 151-C COMPONENT PACKAGE D

			Climate Zone																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Insulation minimums ¹	Ceilings		R38	R30	R38	R38	R38	R38	R38	R38									
		Walls																	
		Wood-frame walls	R21	R13	R19	R19	R19	R21	R21	R21									
		Heavy mass walls	(R4.7 6)	(R2.4 4)	(R4.7 6)	(R4.7 6)	(R4.7 6)	(R4.7 6)	(R4.7 6)	(R4.7 6)									
		Light mass walls	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
		Below-grade walls	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R13
		Floors																	
		Slab floor perm.	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	R7
		Raised floors	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19
		Concrete raised floors	R8	R8	R0	R8	R4	R8	R8	R4	R8								
Radiant Barrier			NR	REQ	NR	REQ	NR	NR	NR	REQ	NR								
Roofing Products	Low-sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.55	NR	0.55	NR	
		Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
	Steep Sloped (less than 5 lb/ft ²)	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR	
		Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	0.75	0.75	0.75	NR	
	Steep Sloped (5 lb/ft ² or more)	Aged Solar Reflectance	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
		Thermal Emittance	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
Fenestration	Maximum U-factor ²		0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	
	Maximum Solar Heat Gain Coefficient (SHGC) ³		NR	0.40	NR	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.35	NR
	Maximum Total Area		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Maximum West Facing Area		NR	5%	NR	5%	NR	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	NR

Re-Roofs

Cool roof requirements are triggered when either 50 percent of the roof area or more than 1,000 sq. ft., whichever is less is replaced. The cool roof requirements for re-roofs are the same as for new construction and use the same values from Table 151 noted above. However there are exceptions which can be used to offset the cool roof requirement. If one of the exceptions below applies then the cool roof requirements are not triggered:

Exceptions:

1. Buildings with no ducts in the attic, or

2. A radiant barrier is installed in the attic meeting the radiant barrier requirements of **section 152(f) 2** of the Title-24 Standards, or
3. Buildings with at least R-30 ceiling insulation or,
4. Buildings in Climate Zones 10, 11, 13 and 14, R-3 or greater roof deck insulation above a vented attic, or
5. Existing ducts in the attic are insulated and sealed and HERS tested according to section 151(f) 10, or
6. Insulation with a thermal resistance of at least 0.85hr ft² degree F/btu or at least 3/4 inch air-space is added to the roof deck over an attic, or
7. In climate zones, 10, 12, and 13, with 1 sq. ft. free ventilation area of attic ventilation for every 150 sq. ft. of attic floor area, and where at least 30 percent of the free ventilation area is within two feet vertical distance of the roof ridge; or
8. If the building can show compliance using the performance approach (Title-24 calculation)

Finding the Needle in the Haystack

The new 2008 Title-24 Manual and the separate Standards and Appendix all refer to the Cool Roof requirements but these references and tables are spread out in all three documents making it difficult to locate specific facts and figures. We've posted a helpful compilation in pdf format of all the relevant Cool Roof Title-24 code references including Table 151-D

[click here](#) to download

Cool roofing materials now come in a wide variety of materials and colors. Nonwhite pigments with high near-infrared (NIR) reflectance historically have been used to camouflage military surfaces (by mimicking foliage) and to minimize solar heating of dark exterior architectural surfaces, such as colored vinyl siding and gray battleship hulls. In recent years roofing manufacturers have incorporated NIR-reflecting pigments in coatings applied to a variety of nonwhite roofing products, such as metal panels and clay tiles.

Replacing NIR-absorbing ("conventional") roofing with visually similar, NIR-reflecting ("cool") roofing can significantly reduce building heat gain. A roof with a high solar reflectance (ability to reflect sunlight) and high thermal emittance (ability to radiate heat) stays cool in the sun, reduces demand for cooling power in conditioned buildings, and increases occupant comfort in unconditioned buildings.

Aged Reflectance Requirements

Effective January 1, 2010 the Standards will require that a Cool Roof material meet an aged solar reflectance value (3 year testing) provided by the Cool Roof Rating Council (CRRC): www.coolroofs.org

If the three year aged solar reflectance value is not available from the CRRC, then you can input the initial solar reflectance value from the CRRC into the calculation listed below which will assume an aged solar reflectance for the cool roof material.

Here is an example of how to complete the calculation:

1. Three year aged solar reflectance not available from the CRRC.
2. Initial solar reflectance value is available from the CRRC (let's assume an initial solar reflectance value of 0.77).
3. Input initial solar reflectance value into the equation:

$$[0.2 + 0.7 (\text{initial solar reflectance} - 0.2)]$$

$$[0.2 + 0.7 (0.77 - 0.2)]$$

$$[0.2 + 0.7 (0.57)]$$

$$[0.2 + 0.40] = 0.60 \text{ aged solar reflectance}$$