Nonresidential Roofing:
Guide to 2022 Energy Code Requirements

What is the energy code and why does it matter?

California's energy code, the **Building Energy Efficiency Standards** (Title 24, Part 6; the Standards), outlines the energy efficiency requirements for newly constructed buildings and additions and alterations to existing buildings. Energy efficiency reduces energy costs and wasteful consumption, improves building comfort, and reduces environmental impacts of energy use. The Standards ensure that builders use technologies and practices that are energy efficient and *cost effective* for building owners.

What are the roofing requirements?

The Standards require a permit when replacing a roof and require roof replacements to meet certain energy specifications. This document is intended to provide guidance on meeting compliance using a **prescriptive approach**, meaning that each component of a proposed project must meet a prescribed minimum energy requirement. The prescriptive requirements call for roofing products to meet the **thermal emittance** (the relative ability of the roof surface to radiate absorbed heat) and the three-year aged (or "weathered") **solar reflectance** (the fraction of solar energy that is reflected by the roof after three years) in both low-sloped and steep-sloped roof applications. An alternative to using the aged solar reflectance and thermal emittance required values is the **Solar Reflectance Index** (SRI) (a measure of the constructed surface's ability to stay cool in the sun by reflecting solar radiation and emitting thermal radiation). An SRI calculator can be used to determine the value by inputting the three-year aged solar reflectance and thermal emittance of the desired roofing material. Roofing products (tile, asphalt, shingles, etc.) with high solar reflectance and thermal emittance properties are called "**cool roofs**."

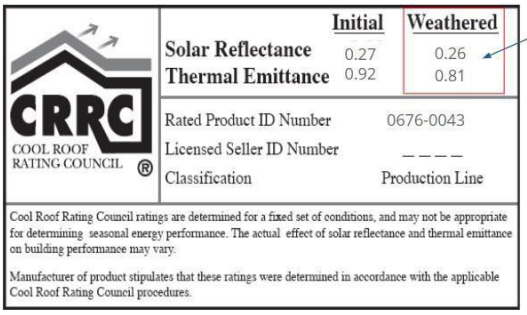

Figure 1: Sample CRRC Product Label and Information. *Image Source: CEC*

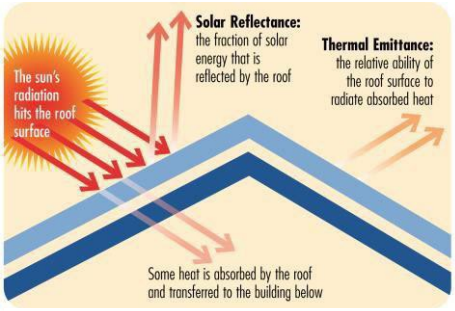

Figure 2: Solar Reflectance and Thermal Emittance. *Image Source: CRRC*

Cool Roof Specifications

Certified cool roofing product manufacturers are required to test aged solar reflectance and thermal emittance and are listed in the **Cool Roof Rating Council's (CRRC)** Rated Product Directory. Cool roofing products must be certified by the CRRC per §10-113 and §110.8(i) and must have an official CRRC package label indicating compliance. Figure 1 shows a sample of an approved CRRC product label. Cool roofing *requirements are triggered when more than 50% of the roof area or more than 2,000 square feet of roof, whichever is less, is being replaced*. Any areas of roof covered by building integrated photovoltaic panels and solar thermal panels are exempt. However, the area of roof not covered by photovoltaic panels is still required to meet any applicable cool roof requirements. To apply Liquid Field Applied Coatings, the coating must be applied across the entire roof surface and meet the dry mil thickness or coverage recommended by the coatings manufacturer and meet minimum performance requirements list in Section 110.8(i)4 of the 2022 Building Energy Efficiency Standards.

(Step-by-step permit requirement guide on page 2)

Required 2022 compliance documents can be found at:

https://energycodeace.com/NonresidentialForms/2022

For more information on 2022 Title 24 Part 6 requirements:

- Visit **www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency**
- Contact the Energy Standards Hotline at (800) 772-3300 or email: **title24@energy.ca.gov**
- Contact the BayREN Codes & Standards Program by email: **codes@bayren.org**

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COOL ROOF (only applies to roof area directly above conditioned or indirectly conditioned space, and not covered by building integrated solar PV panels)

WHAT IS REQUIRED:

Install roofing that meets the requirements outlined in Appendices A and B (The "Roofing Products" Sections of Tables 140.3-B and C in Chapter 3: Building Envelope of the *2022 Nonresidential Compliance Manual)*.

WHEN IS COOL ROOF *NOT* REQUIRED:

Cool Roof Exemptions: A cool roof is not required if any of the following statements about the project are true (please mark the applicable statements.) Do not include roof area over unconditioned space (e.g. warehouse) or process space (e.g. manufacturing) in formulas.

☐ For alterations, roof area to be replaced is less than 50% of total roof area AND less than 2000 ft^2

A. Area to be re-roofed = _____ ft^2

B. Total roof area = _____ft^2

C. (A / B) x 100 = _____% *Check box if A is less than 2000 ft^2 AND C is less than 50%.*

☐ Project other than guest rooms of hotel/motel buildings is in climate zone[1] 3 or 5 ***AND*** the roof is low-sloped and wood-framed with a U-factor (thermal performance data) ≤ 0.034 (See Reference Appendix JA4 for example U-factors)

☐ The roof construction is covered by thermal mass (e.g. gravel, concrete pavers, stone) with a weight ≥ 25 lb/ft^2

☐ For new construction low-sloped[2] roofs, an aged solar reflectance less than 0.63 is allowed provided the maximum roof/ceiling U-factor in from the Table 4 of Appendix D below is not exceeded.

☐ For altered low-sloped roofs, an aged solar reflectance less than 0.63 is allowed provided the maximum roof/ceiling U-factor in from the Table 5 of Appendix D below is not exceeded.

ROOF INSULATION FOR ROOF REPLACEMENTS (only applies for LOW-SLOPED roofs to roof area directly above conditioned or indirectly conditioned space, and not covered by building integrated solar PV panels)

WHAT IS REQUIRED **if NONE of the boxes below are checked?**

Install roof insulation that meets the applicable requirement in Appendix C (Table 141.0-C *of* in *Section 141.0(b)2Biiid the 2022 Building Energy Efficiency Standards for Residential and Nonresidential Buildings)***.** NOTE: At the drains and other low points, tapered insulation with a thermal resistance less than that prescribed in Appendix C may be used, provided that insulation thickness is increased at the high points of the roof so that the average thermal resistance equals or exceeds the value specified in Appendix C.

ROOF INSULATION IS *NOT* REQUIRED **if ANY of the following criteria are met:**

☐ The area of roof is being recoated.

☐ The roof is being recovered with new R-10 insulation added above the roof deck.

☐ When existing mechanical equipment located on the roof will not be disconnected and lifted, insulation added is the greater of R-10 or the maximum installed thickness that will allow the distance between the height of the roof membrane surface to the top of the base flashing to remain in accordance with the manufacturer's instructions.

☐ When roof area to be replaced is less than 50% of total roof area AND less than 2000 ft^2 (see calculation above in Cool Roof Exemptions section)

References:

2022 Building Energy Efficiency Standards for Residential and Nonresidential Buildings. PDF File. December 20, 2022.
https://www.energy.ca.gov/publications/2022/2022-building-energy-efficiency-standards-residential-and-nonresidential
2022 Nonresidential Compliance Manual. PDF File. December 20, 2022.
https://www.energy.ca.gov/publications/2022/2022-nonresidential-and-multifamily-compliance-manual-2022-building-energy

[1] California Building Climate Zone Areas: https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/climate-zone-tool-maps-and

[2] A low-sloped roof is defined as a roof that has a ratio of rise to run of less than 2:12 (9.5 degrees)

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Appendices

Appendix A

Table 1: Roofing Products Section of TABLE 140.3-B – PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL BUILDINGS

			Climate Zones															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Roofing Products	Low-Sloped	Aged Reflectance	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
		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
		SRI	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
	Steep-Sloped	Aged Reflectance	0.20	0.25	0.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		Thermal Emittance	0.75	0.80	0.75	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
		SRI	16	23	16	23	23	23	23	23	23	23	23	23	23	23	23	23

Appendix B

Table 2: Roofing Products Section of TABLE 140.3-C – PRESCRIPTIVE ENVELOPE CRITERIA FOR GUEST ROOMS OF HOTEL/MOTEL BUILDINGS

			Climate Zones															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Roofing Products	Low-Sloped	Aged Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	0.55	0.55	0.55	NR	0.55	0.55	0.55	NR
		Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	NR	0.75	0.75	0.75	NR
		SRI	NR	NR	NR	NR	NR	NR	NR	NR	64	64	64	NR	64	64	64	NR
	Steep-Sloped	Aged Reflectance	NR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	NR
		Thermal Emittance	NR	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	NR
		SRI	NR	16	16	16	16	16	16	16	16	16	16	16	16	16	16	NR

Appendix C

Table 3: Insulation Requirements for Roof Alterations (Energy Standards Table 141.0-C)

Climate Zone	Continuous Insulation R-value	U-factor
1-5, 9-16	R-23	0.037, with at least R-10 above deck
6-8	R-17	0.047, with at least R-10 above deck

Appendix D

Table 4: Tradeoff for New Construction Low-sloped Roofs

Aged Solar Reflectance	Metal Building Climate Zone 1-16 U-factor	Wood framed and Other Climate Zone 6 - 8 U-factor	Wood Framed and Other All Other Climate Zones U-factor
0.62-0.56	0.038	0.045	0.032
0.55-0.46	0.035	0.042	0.030
0.45-0.36	0.033	0.039	0.029
0.35-0.25	0.031	0.037	0.028

Table 5: Tradeoff for Altered Low-sloped Roofs

Aged Solar Reflectance	Climate Zones 6, 7, & 8 U-factor	All Other Climate Zones U-factor
0.62- 0.60	0.043	0.035
0.59-0.55	0.041	0.034
0.54-0.50	0.038	0.031
0.49-0.45	0.034	0.029
0.44-0.40	0.032	0.028
0.39-0.35	0.029	0.026
0.34-0.30	0.028	0.025
0.29-0.25	0.026	0.024